

POSITION PAPER ON **RENEWABLE ENERGY**

**Promoting Clean Energy Solutions for Sustainable
Livelihoods and Community Resilience**



Research and Development Foundation (RDF)

With the Support of: **Kindernothilfe (KNH)**

Funded by: **German Federal Ministry for Economic Cooperation and Development (BMZ)**

PROJECT REPORT

A Review and Analysis of Pakistan's ARE Policy 2019: Challenges, Opportunities, and Implementation Roadmap.

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FOUNDATION**

2026



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Executive Summary

Pakistan's Alternative and Renewable Energy (ARE) Policy 2019 represents the country's most ambitious policy initiative for transitioning toward a cleaner, more sustainable, and domestically secure energy system. Introduced against the backdrop of increasing energy insecurity, rising fossil fuel import dependence, chronic circular debt, and escalating climate vulnerability, the policy sought to accelerate the deployment of renewable energy technologies including solar, wind, biomass, small hydropower, and distributed energy systems. The policy established targets of achieving 20% renewable energy share in installed generation capacity by 2025 and 30% by 2030, while simultaneously promoting private sector participation, competitive procurement, local manufacturing, and climate-aligned development.

This report critically evaluates the design, implementation framework, institutional architecture, and effectiveness of the ARE Policy 2019 through a combination of policy analysis, international benchmarking, and stakeholder consultation. The study applies a mixed-method approach integrating qualitative and quantitative evidence from policy documents, global best practices, and responses from 95 stakeholders representing government institutions, regulators, academia, think tanks, power sector entities, private industry, financial institutions, climate experts, civil society organizations, and international development partners.

The analysis reveals that the ARE Policy 2019 constitutes a significant conceptual improvement over Pakistan's Renewable Energy Policy 2006. The policy broadened technology coverage, adopted competitive procurement mechanisms, strengthened climate alignment, recognized distributed generation, and attempted to modernize the renewable energy governance framework. However, despite these advancements, the study finds that the policy suffers from severe structural, institutional, regulatory, financial, and infrastructural weaknesses that have substantially undermined implementation progress.

One of the report's central findings is that Pakistan's renewable energy challenge is no longer primarily a policy declaration problem; rather, it is fundamentally an implementation and governance crisis. Although the policy articulates ambitious targets, these targets remain non-binding and unsupported by statutory enforcement mechanisms, annual milestones, or institutional accountability systems. The absence of legally enforceable obligations has allowed repeated implementation delays without formal consequences or corrective action.

The report's global benchmarking analysis demonstrates that successful renewable energy transitions in countries such as Germany, Denmark, India, Brazil, Bangladesh, Morocco, South Africa, and Rwanda are underpinned by several common characteristics: legally binding renewable energy targets, empowered implementation agencies, synchronized grid modernization planning, transparent competitive procurement systems, investment de-risking mechanisms, dedicated research ecosystems, strong monitoring and evaluation systems, and integrated climate policy frameworks. Pakistan's current framework falls substantially behind these international best practices in nearly all major dimensions.

The benchmarking exercise identifies several critical design-level deficiencies within the ARE Policy 2019 itself. These include:

- Non-binding targets without annual implementation milestones;
- Absence of a formal federal-provincial coordination framework following the 18th constitutional amendment;
- Competitive procurement introduced without adequate market readiness;
- Lack of implementation architecture for local manufacturing;
- Absence of operational frameworks for mini-grids and off-grid electrification;
- Weak monitoring and evaluation systems;
- Inadequate treatment of energy storage and grid integration; and
- The absence of gender-responsive policy provisions.

The stakeholder consultation findings reinforce and deepen these conclusions. Quantitative analysis reveals widespread concern regarding the policy's implementation trajectory. Only 37.9% of respondents believe that

Pakistan's target of achieving 30% renewable energy by 2030 is achievable under current conditions, while 62.1% expressed doubt or uncertainty. Similarly, 83.2% of respondents considered current private sector incentives to be insufficient, citing financial risk, payment insecurity, regulatory complexity, and investor uncertainty as major obstacles.

The strongest stakeholder consensus emerged regarding grid integration and energy storage deficiencies. An overwhelming 91.6% of respondents stated that the policy inadequately addresses grid modernization and storage infrastructure, making this the most severe implementation gap identified in the study. Stakeholders consistently emphasized that Pakistan's transmission system lacks the technical capacity to integrate large-scale variable renewable energy, particularly in high-potential renewable corridors of Sindh and Balochistan. The absence of utility-scale storage systems, smart-grid infrastructure, advanced forecasting systems, and flexible dispatch mechanisms significantly constrains renewable energy deployment and increases curtailment risk.

Stakeholders also highlighted persistent institutional fragmentation as a major implementation barrier. Following the devolution of energy responsibilities under the 18th Amendment, provinces assumed expanded responsibilities without corresponding fiscal resources, technical capacity, or clearly defined coordination mechanisms. The subsequent absorption of the Alternative Energy Development Board (AEDB) into the Ministry of Energy further weakened institutional clarity by eliminating Pakistan's only autonomous renewable energy facilitation body without establishing a statutory replacement.

The report further identifies serious deficiencies in investment facilitation. Developers continue to face lengthy and fragmented approval processes involving multiple institutions including NEPRA, NTDC, provincial departments, and federal agencies. Financial institutions and private investors identified sovereign payment risk, currency instability, circular debt, weak PPAs, and absence of de-risking mechanisms as key deterrents to investment. Although the policy formally transitioned from feed-in tariffs to competitive procurement, the supporting institutional prerequisites required for auction success were never fully established.

The study also highlights Pakistan's missed opportunity to link renewable energy deployment with industrial development. Despite policy references to local manufacturing and indigenization, no enforceable local content requirements, industrial incentives, or manufacturing roadmaps have been implemented. As a result, Pakistan remains heavily dependent on imported renewable energy equipment, particularly solar panels and inverters, resulting in substantial foreign exchange outflows.

At the same time, the report recognizes important positive developments associated with the ARE Policy 2019. The expansion of distributed solar and net-metering represents one of the policy's most successful outcomes. By 2025, net-metered rooftop solar capacity exceeded several gigawatts, driven by falling global solar prices and rising domestic electricity tariffs. Stakeholders also broadly supported the policy's shift toward competitive procurement in principle, even while criticizing implementation shortcomings. Furthermore, there was overwhelming consensus in favor of introducing additional incentives for emerging renewable technologies such as battery storage, green hydrogen, waste-to-energy, geothermal, and offshore wind systems.

Drawing upon the evidence generated across all chapters, the report proposes a comprehensive reform agenda to strengthen Pakistan's renewable energy transition. The recommendations emphasize structural reforms rather than incremental adjustments. Key recommendations include:

- enactment of a Renewable Energy Transition Act with legally binding targets;
- establishment of an autonomous National Renewable Energy Authority;
- creation of a formal federal-provincial renewable energy coordination council;
- launch of a National Grid Modernization and Energy Storage Program;
- development of sovereign risk mitigation and green finance frameworks;
- implementation of a national renewable energy industrial policy;

- establishment of a mini-grid and off-grid electrification framework;
- creation of a national renewable energy monitoring dashboard;
- expansion of renewable energy research and innovation ecosystems;
- and integration of gender-responsive and socially inclusive mechanisms into future policy frameworks.

The report concludes that Pakistan possesses substantial renewable energy potential and retains a strategic opportunity to transition toward a cleaner, more secure, and economically resilient energy system. However, the realization of this potential requires immediate and coordinated institutional reforms. Without decisive action to address governance fragmentation, grid modernization, financial de-risking, legal enforceability, and implementation accountability, Pakistan is unlikely to achieve either its ARE Policy targets or its international climate commitments. Conversely, if the reforms proposed in this report are implemented systematically and with political continuity, renewable energy can become a central pillar of Pakistan's long-term economic stability, energy sovereignty, climate resilience, and sustainable development.

CHAPTER 1 Introduction

1.1 Background and Context

The global energy landscape is undergoing a profound transition from fossil-fuel-dominated systems toward cleaner, decentralized, and low-carbon energy pathways. This transformation is being driven by three interconnected pressures: accelerating climate change, growing energy security concerns, and rapid technological advancements in renewable energy technologies. Countries across the world are increasingly adopting renewable energy (RE) policies not only as environmental instruments, but also as mechanisms for industrial development, energy independence, employment generation, and long-term economic resilience.

For Pakistan, the renewable energy transition carries exceptional strategic significance. The country faces persistent structural problems within its energy sector, including heavy dependence on imported fossil fuels, chronic circular debt, transmission and distribution inefficiencies, rising electricity tariffs, and inadequate energy access in remote regions. Pakistan's dependence on imported oil, liquefied natural gas (LNG), and coal has exposed the national economy to global fuel price volatility and balance-of-payment pressures. Simultaneously, climate vulnerability has emerged as a critical national concern. Pakistan is consistently ranked among the countries most vulnerable to climate change despite contributing less than 1% of global greenhouse gas emissions. Floods, heatwaves, droughts, and water stress increasingly threaten economic stability and human security.

Within this context, renewable energy represents not merely an environmental choice, but a strategic necessity for Pakistan's long-term energy security and sustainable development. Pakistan possesses substantial indigenous renewable energy potential. The Gharo–Keti Bandar wind corridor in Sindh is considered among the world's most promising wind zones. The country receives high solar irradiance across most regions, while opportunities also exist in biomass, small hydropower, waste-to-energy, geothermal, and emerging hydrogen technologies. Harnessing these resources could substantially reduce import dependence, improve grid resilience, stimulate industrial growth, create employment opportunities, and support Pakistan's international climate commitments.

Recognizing these opportunities and challenges, the Government of Pakistan introduced the Alternative and Renewable Energy (ARE) Policy 2019, approved by the Council of Common Interests (CCI) and operationalized in 2020. The policy replaced the Renewable Energy Policy 2006 and constituted Pakistan's most ambitious renewable energy framework to date. The policy established targets of achieving 20% renewable energy share in installed generation capacity by 2025 and 30% by 2030. It also sought to transition the sector from administratively determined feed-in tariffs toward competitive procurement through auctions, while encouraging private sector participation, distributed generation, local manufacturing, off-grid electrification, and climate-aligned development.

Despite these ambitious objectives, the implementation trajectory of the ARE Policy 2019 has remained contested. Multiple structural and institutional challenges have constrained progress, including weak grid infrastructure, fragmented governance after the 18th Constitutional Amendment, regulatory uncertainty, inadequate financial de-risking mechanisms, and the absence of a coherent monitoring and evaluation framework. Global benchmarking further reveals that Pakistan's policy architecture remains significantly weaker than international best practices in areas such as legal enforceability, institutional streamlining, energy storage integration, local manufacturing frameworks, and monitoring systems.

Stakeholder consultations conducted as part of this study similarly indicate widespread concern regarding implementation effectiveness. While most stakeholders acknowledge that the policy is directionally aligned with Pakistan's climate and energy objectives, confidence in the achievement of its 2030 targets remains low due to operational, financial, and institutional deficiencies. The most severe concerns identified by stakeholders relate to grid integration, energy storage inadequacies, weak private-sector incentives, and fragmented regulatory processes.

These realities necessitate a systematic policy review to evaluate whether the ARE Policy 2019 possesses the institutional, regulatory, financial, and technological architecture required to achieve its intended outcomes.

1.2 Problem Statement

Although the ARE Policy 2019 represents a significant advancement in Pakistan's renewable energy ambitions, substantial evidence suggests that the policy has not translated into implementation outcomes consistent with its stated targets. The policy's targets remain non-binding and unsupported by statutory enforcement mechanisms. Competitive procurement mechanisms were introduced without establishing the institutional prerequisites necessary for auction success, including bankable payment guarantees, sovereign risk mitigation, and transmission readiness. Federal-provincial coordination mechanisms remain weak following the devolution of energy responsibilities under the 18th Constitutional Amendment. Furthermore, the policy lacks a robust monitoring and evaluation framework, resulting in the absence of transparent progress reporting against policy targets.

At the operational level, Pakistan's electricity grid remains inadequately prepared for high penetration of variable renewable energy sources. The absence of large-scale energy storage systems, smart-grid infrastructure, and synchronized transmission planning threatens the viability of future renewable energy integration. Simultaneously, investor confidence has weakened due to circular debt, delayed approvals, regulatory uncertainty, and inadequate financial de-risking instruments.

Additionally, the policy demonstrates important design-level gaps in areas such as local manufacturing, gender inclusion, off-grid electrification, and research and innovation ecosystems. These shortcomings collectively raise serious concerns regarding the feasibility of achieving Pakistan's renewable energy and climate commitments under current policy arrangements.

1.3 Research Objectives

The primary objective of this policy review is to critically evaluate the design, implementation framework, and effectiveness of Pakistan's Alternative and Renewable Energy Policy 2019.

The specific objectives are:

1. To examine the historical evolution of renewable energy policy in Pakistan and evaluate the institutional transition from the RE Policy 2006 to the ARE Policy 2019.
2. To benchmark the ARE Policy 2019 against global best practices in renewable energy governance, financing, procurement, grid integration, and institutional design.
3. To assess the strengths, implementation gaps, and structural deficiencies of the policy using international comparative analysis and stakeholder perspectives.
4. To analyze stakeholder perceptions regarding policy effectiveness, investment climate, institutional coordination, and implementation barriers.
5. To identify critical policy, regulatory, financial, and technological reforms required for achieving Pakistan's renewable energy and climate targets.
6. To develop evidence-based recommendations for strengthening Pakistan's renewable energy governance framework and accelerating renewable energy deployment.

1.4 Research Questions

This policy review seeks to answer the following research questions:

1. How does the ARE Policy 2019 differ from the Renewable Energy Policy 2006 in terms of policy design, institutional structure, and implementation mechanisms?
2. To what extent does the ARE Policy 2019 align with international best practices in renewable energy governance and policy implementation?
3. What are the major institutional, financial, technical, and regulatory barriers affecting policy implementation?

4. How do different stakeholder groups perceive the effectiveness of the ARE Policy 2019?
5. What reforms are necessary to improve renewable energy deployment and achieve Pakistan's 2030 renewable energy and climate targets?

1.4 Methodology of the Policy Review

The review follows a dual-method approach: first, by benchmarking the policy against international renewable energy frameworks; and second, by collecting primary data through structured consultations with diverse stakeholders including federal and provincial departments, regulatory bodies, academic institutions, private sector entities, civil society organizations, media representatives, and community leaders.

1.4.1 Benchmarking Against Global Best Practices

A detailed literature review was conducted to identify international best practices in renewable energy policy and implementation. Countries including Germany, India, Denmark, Morocco, Brazil, Bangladesh and South Africa were analysed for their exemplary policies on renewable energy targets, procurement mechanisms, grid integration, financial de-risking, and local manufacturing.

A Policy Evaluation Matrix was developed to compare ARE Policy 2019 against these global benchmarks. Sources included reports and data from international organizations such as IRENA, IEA, World Bank, GIZ, and national regulatory authorities.

1.4.2 Stakeholder-Based Policy Appraisal

A structured questionnaire was administered via Google Forms to gather insights from a wide range of stakeholders. The survey included both closed-ended Likert scale questions and open-ended responses.

Respondents were drawn from the following sectors:

- Ministry of Energy (Power Division)
- Ministry of Climate Change
- Provincial energy and disaster management departments
- NEPRA, AEDB, and other regulatory bodies
- Academic and research institutions
- Private sector renewable energy developers and consultants
- Civil society organizations and NGOs
- Youth representatives, community leaders, and media professionals

Over 95 responses were collected, thematically coded, and analysed for recurring patterns, policy gaps, and strategic recommendations.

1.4.3 Analytical Framework

The data collected through benchmarking and stakeholder consultation was synthesized using a comparative and thematic analysis framework. The following components were evaluated

Table 1.1 Mapping of Policy Component with Analysis Method

Component	Analysis Method
Global Benchmarks	Gap analysis, comparative scoring
Questionnaire Responses	Thematic coding, frequency mapping
Policy Document Review	Clause-by-clause mapping to benchmarks
Stakeholder Perspectives	Disaggregated by group and sentiment
Implementation Assessment	Alignment with national goals and SDGs

1.5 Justification of Methodology

This methodology was selected for its comprehensiveness and alignment with international evaluation standards, including:

- OECD-DAC Evaluation Criteria
- UNDP Policy and Institutional Review Guidelines
- World Bank's Energy Sector Governance Framework

By triangulating desk-based analysis with empirical stakeholder input, this approach offers a well-rounded, credible, and policy-relevant assessment. It not only reviews policy intent but also assesses its operationalization, public perception, and reform potential.

1.6 Significance of the Study

This study holds significance at multiple levels.

At the policy level, it provides an evidence-based assessment of Pakistan's principal renewable energy framework at a time when the country faces escalating energy insecurity and climate vulnerability. The study contributes practical recommendations for improving institutional coordination, investor confidence, grid modernization, and implementation effectiveness.

At the academic level, the study contributes to the limited scholarly literature on renewable energy governance in Pakistan by integrating comparative international benchmarking with empirical stakeholder analysis. The study also applies multiple theoretical perspectives — including the Multi-Level Perspective (MLP), Technological Innovation Systems (TIS), and Policy Mix frameworks — to evaluate renewable energy transitions in a developing-country context.

At the practical level, the findings may assist policymakers, regulators, development partners, investors, researchers, and civil society organizations in identifying reform priorities and implementation bottlenecks. The study also contributes to ongoing debates concerning Pakistan's energy transition, industrial policy, climate commitments, and sustainable development pathways.

1.7 Scope and Limitations

This study focuses specifically on Pakistan's Alternative and Renewable Energy Policy 2019 and its implementation environment. The analysis covers key dimensions including policy design, institutional architecture, competitive procurement mechanisms, grid integration, financing frameworks, local manufacturing, monitoring systems, and stakeholder perceptions.

The study relies primarily on:

- Policy documents,
- Official reports,
- International benchmarking literature,
- Stakeholder consultation data.

The research does not undertake techno-economic modelling of specific renewable technologies or project-level feasibility assessments. Furthermore, some implementation data remains limited due to the absence of publicly available monitoring systems and updated government reporting mechanism.

CHAPTER 2

Overview of Pakistan's Alternative and Renewable Energy (ARE) Policy 2019

2.1 Introduction

Pakistan's Alternative and Renewable Energy (ARE) Policy 2019 represents the country's most comprehensive legislative effort to accelerate the deployment of clean, indigenous energy sources, including solar, wind, biomass, small hydropower, and hybrid systems, across its national power grid. Approved by the Council of Common Interests (CCI) and formally operationalized in 2020 ^[1], the policy marks a deliberate departure from thirteen years of experience under its predecessor, the Renewable Energy Policy 2006, which had produced only limited capacity additions despite a relatively favourable administrative structure.

This chapter provides an evidence-based overview of the ARE Policy 2019, structured to address the analytical gaps that weakened earlier treatments of the subject. It begins with a historical contextualization of Pakistan's renewable energy policy evolution, followed by a structured comparison of the 2006 and 2019 policies across ten critical dimensions. It then examines the policy's vision, institutional architecture, key instruments, monitoring framework, and alignment with Pakistan's Nationally Determined Contributions (NDCs) under the Paris Agreement ^[2]. The chapter concludes with an assessment of the policy's sectoral impacts and an identification of design-level gaps that subsequent chapters address in depth.

2.2 Historical Evolution of Renewable Energy Policy in Pakistan

2.2.1 Pre-2006: Fragmented Institutional Landscape

Prior to 2006, Pakistan had no unified renewable energy policy. Institutional responsibilities were dispersed across several poorly coordinated bodies. The Solar Energy Research Centre, established in 1981, focused narrowly on solar R&D ^[3]. The Pakistan Council for Appropriate Technology (PCAT), founded in 1985, addressed hydropower, biogas, and small-scale wind systems but lacked the mandate or resources to drive commercial deployment ^[3]. Both institutions were merged in 2002 to form the Pakistan Council of Renewable Energy Technologies (PCRET) ^[3]. A year later, the Alternative Energy Development Board (AEDB) was established as a federal body specifically charged with developing policies, strategies, and plans for the promotion of wind, solar, and small-scale hydropower ^[4]. These institutional efforts, however, operated without a coherent overarching policy until the promulgation of the RE Policy 2006.

2.2.2 The Renewable Energy Policy 2006: Pakistan's First Dedicated Framework

Introduced by AEDB in 2006 and formally approved by the Government of Pakistan, the Policy for Development of Renewable Energy for Power Generation 2006 was a landmark document in its time ^[5]. It set Pakistan's first explicit renewable energy targets, established the administrative architecture for IPP-based RE development, and introduced the Feed-in Tariff (FiT), known locally as the 'upfront tariff' as the primary pricing mechanism ^[6].

The 2006 Policy's key features included: a target of achieving 5% of total installed electricity capacity from renewable sources by 2030, equivalent to approximately 9,700 MW ^[4,5]; an emphasis on wind energy development in the Ghara-Ketti Bandar corridor of coastal Sindh; a technology-neutral IPP model under which

AEDB facilitated private investment through Letters of Intent (LoIs) and Letters of Support (LoS); and fiscal incentives including duty exemptions on RE equipment imports ^[5]. Off-grid rural electrification was also addressed, with a target of electrifying 7,874 remote villages in Sindh and Balochistan through renewable energy solutions, and a biodiesel blending target of 5% by 2015 and 10% by 2025 ^[4].

2.2.3 Outcomes and Limitations of the 2006 Policy

The 2006 Policy stimulated early momentum, particularly in wind energy, but its overall outcomes fell significantly short of its stated targets. By the time the policy expired in March 2018, it had added approximately 1,235 MW of wind capacity and 430 MW of solar capacity to Pakistan's system ^[6]. Against a target of 9,700 MW from all renewable sources by 2030, this represented a fundamental underperformance.

Multiple studies identified recurring structural barriers ^[3,6,7,8]: regulatory insufficiency at NEPRA in processing tariff applications; high upfront project costs without adequate financial de-risking instruments; absence of institutional coordination between AEDB, NEPRA, NTDC, and provincial departments; lack of grid infrastructure in resource-rich areas; and inadequate data on wind and solar resources that deterred investor due diligence ^[3,8]. The upfront tariff, while useful in attracting early investors, became a source of inflated and non-competitive pricing as technology costs fell globally, imposing above-market costs on CPPA-G and contributing to circular debt accumulation ^[6,9].

The 2006 Policy's expiry in 2018 without a replacement for over a year created a regulatory vacuum that further eroded investor confidence, as developers were left uncertain whether their projects would be processed under the old regime or an anticipated new framework ^[9]. This transition failure became one of the key motivations for designing the ARE Policy 2019 around competitive procurement rather than administratively set tariffs.

2.3 Comparative Analysis: RE Policy 2006 vs. ARE Policy 2019

Table 2.1 provides a structured comparison of the two major renewable energy policy frameworks Pakistan has implemented. The comparison covers ten critical dimensions of policy design and implementation architecture, highlighting how ARE Policy 2019 sought to address the shortcomings of its predecessor, and identifying where new or residual gaps remain.

Policy Dimension	RE Policy 2006	ARE Policy 2019	Critical Assessment
Policy Scope and Technology Coverage	Focused primarily on wind and solar; bioenergy explicitly excluded [5,10]	Broader scope: solar, wind, biomass, small hydro, waste-to-energy, geothermal, hydrogen [1]	2019 rightly broadens technology coverage. However, geothermal and hydrogen remain aspirational given Pakistan's current technological capacity [7].
Quantitative Targets	5% of total installed capacity from RE by 2030 (~9,700 MW) [4,5]	20% generation capacity from RE by 2025; 30% by 2030 [1]	2019 targets are substantially more ambitious but remain non-binding and without annual milestones. The 2025 target has already been missed with no official acknowledgement [11].
Legal Enforceability	Policy document; no statutory mandate [5]	CCI-approved policy; no statutory mandate [1]	Both policies share the same fundamental weakness: no legal enforceability through statute. Neither NEPRA Act nor any RE-

			specific legislation embeds these targets as binding obligations [7,9].
Tariff and Pricing Mechanism	Feed-in Tariff (upfront tariff) set administratively by NEPRA; guaranteed for 25-year PPA [5,6]	Technology-neutral competitive reverse bidding (CYREPP); FiT formally abolished [1,9]	The shift to competitive bidding is conceptually sound, but the abrupt removal of upfront tariffs before functioning auctions were established created a regulatory vacuum that deterred investment from 2018 onward [9].
Institutional Lead	AEDB as primary coordinating body with autonomous mandate [4,5]	Ministry of Energy (Power Division) as lead; AEDB absorbed into Ministry in 2020 [1]	The 2020 AEDB merger eliminated the one autonomous RE implementation body without a clear statutory replacement, creating institutional ambiguity that persists [7,11].
Provincial Coordination	Pre-18th Amendment; provinces had limited autonomous role [5]	Post-18th Amendment; provincial energy departments formally recognized [1]	The 18th Amendment devolved energy functions to provinces but the ARE Policy does not establish a formal federal-provincial coordination protocol. Research confirms provinces received responsibilities without matched fiscal transfers or coordination mechanisms [12,13].
Distributed Generation and Net Metering	Not addressed in the 2006 framework [5]	Explicitly supported through Net Metering Regulations 2015 (extended) and distributed generation framework [1]	A significant improvement. By June 2025, net-metered capacity reached 6.1 GW — though this is citizen-led rather than policy-planned, and has created unintended cross-subsidy burdens on non-solar consumers [11].
Off-Grid and Rural Electrification	Target of 7,874 villages in Sindh/Balochistan; some SHS programmes implemented [4,5]	Policy references micro-grids and off-grid solutions but lacks a dedicated financing vehicle or mini-grid regulatory framework [1]	The 2019 Policy is weaker than 2006 in operational off-grid specificity. No Pakistan Mini-Grid Policy exists, and off-grid program outcomes remain unmonitored [7,11].
Monitoring, Evaluation, and Transparency	No formal M&E framework; implementation data not publicly reported [5,8]	CYREPP-based annual procurement planning and IGCEP alignment envisaged; dashboard not implemented [1,11]	The M&E gap worsened rather than improved between 2006 and 2019. Neither policy embedded statutory reporting obligations, and no national ARE dashboard existed as of 2025 [11].

Climate and SDG Alignment	No explicit reference to Paris Agreement or NDCs (pre-Paris, 2015) [5]	Explicitly aligned with NDCs, SDG 7, SDG 13, and SDG 9 [1,2]	The 2019 Policy's climate alignment is a genuine advance. However, the linkage remains declaratory — no carbon credit integration, no NDC progress reporting mechanism, and no alignment with Pakistan's updated 2021 NDC targets [2,14].
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Table 2.1: Comparative Analysis of Pakistan's RE Policy 2006 and ARE Policy 2019 across Ten Critical Dimensions Sources: [1] ARE Policy 2019, GoP; [4,5] RE Policy 2006, AEDB/GoP; [6] Courtingthelaw.com (2021); [7] Zafar et al. (2018); [9] IEEFA (2022); [11] Renewables First (2025); [12,13] UNDP (2022); [14] GoP NDC (2021)

The comparative analysis reveals that the ARE Policy 2019 represents genuine progress over its 2006 predecessor in terms of ambition, technology breadth, climate alignment, and institutional rationalization. However, it inherits three structural weaknesses from the 2006 framework that it fails to correct: the absence of legally binding targets, the absence of a statutory M&E obligation, and the absence of a federal-provincial coordination framework commensurate with the post-18th Amendment constitutional reality. Additionally, the 2019 Policy's transition away from Feed-in Tariffs, while economically sound in principle, was executed without the institutional prerequisites for competitive bidding to function, creating a gap that proved more damaging to investor confidence than the 2006 regime's pricing rigidities.

2.4 Salient Features of the ARE Policy 2019

2.4.1 Policy Vision and Strategic Objectives

The ARE Policy 2019 was approved by the Council of Common Interests (CCI), Pakistan's highest federal-provincial consultative body, reflecting a recognition that renewable energy transition requires national consensus rather than federal imposition ^[1]. Its vision is to establish Pakistan as a country powered increasingly by clean, indigenous energy, thereby simultaneously addressing energy security, environmental sustainability, and economic competitiveness.

The key strategic targets of the policy are:

- Achieving 20% of total electricity generation capacity from renewable energy sources by 2025;
- Increasing this share to 30% by 2030;
- Integrating both on-grid and off-grid renewable solutions across urban and rural Pakistan;
- Promoting public-private partnerships, technology transfer, and phased local manufacturing of RE components.

It bears noting that these targets relate to installed generation capacity rather than actual electricity generation, a methodological distinction that complicates direct comparison with NDC targets framed in terms of generation mix. The policy does not clarify this distinction or specify how target attainment will be measured and reported ^[7,11].

2.4.2 Institutional Framework and Roles

The implementation architecture of the ARE Policy 2019 is organized around a multi-tiered structure spanning federal, provincial, and regulatory levels ^[1]. The Ministry of Energy (Power Division) provides strategic direction and inter-agency coordination. NEPRA regulates licensing, tariff approvals, and grid code compliance. NTDC manages grid integration through the Indicative Generation Capacity Expansion Plan

(IGCEP). Provincial Energy Departments are expected to facilitate localized RE deployment, particularly in the post-18th Amendment context.

The most significant institutional change embedded in the ARE Policy 2019, though not explicitly stated in its text, is the subsequent absorption of AEDB into the Ministry of Energy in 2020. AEDB had served under the 2006 Policy as an autonomous one-window facilitation body for RE projects ^[4]. Its elimination without a statutory successor body created ambiguity in institutional roles that persists as of 2025 ^[11]. The policy's federal design, particularly its expectation of provincial participation, also sits in unresolved tension with the 18th Amendment, which devolved significant energy functions to provinces without creating a formal RE coordination mechanism ^[12]. Research by the UNDP confirms that provinces received devolved responsibilities without fully matched fiscal transfers and administrative capacity, limiting their ability to implement federally designed programs ^[13].

2.4.3 Key Policy Instruments and Mechanisms

The ARE Policy 2019 introduces seven principal instruments for accelerating renewable energy adoption, each representing a deliberate departure from or evolution of the 2006 regime ^[1]:

Instrument	Description	Assessment of Design
Competitive Procurement (CYREPP)	Technology-neutral reverse bidding auctions for least-cost RE procurement, replacing the FiT regime [1]	Conceptually sound. Implementation has failed: no auction completed since policy's launch [9,11].
Net Metering and Distributed Generation	Consumer-side solar and hybrid installations under NEPRA Net Metering Regulations 2015 [1]	Highly effective in practice: 6.1 GW by June 2025. Creates cross-subsidy tensions requiring regulatory reform [11].
G2G Project Mode	Bilateral cooperation with countries offering concessional financing terms [1]	Useful for specific projects (e.g., CPEC-linked solar). Lacks transparency framework for concessional terms [7].
Fiscal Incentives	Duty and tax exemptions on RE equipment; PKR-denominated tariff regime [1]	Reduces project cost, though 10% GST imposed on solar imports in 2025 partially reverses this benefit [11].
Local Manufacturing and Indigenization	Phased import substitution strategy for RE equipment and components [1]	No execution framework or enforcement mechanism developed. Pakistan imported 17 GW of panels in 2024 alone [11].
Off-Grid Electrification	Support for micro-grids and solar home systems in underserved rural areas [1]	Lacks a dedicated financing vehicle, mini-grid regulatory framework, or provincial delivery mechanism [7,11].
Private Sector Facilitation (IPPs)	IPPs, investors, and joint ventures under transparent competitive regulatory regime [1]	IPP interest contingent on investor confidence — currently depressed by

		circular debt and auction failures [9,11].
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Table 2.2: ARE Policy 2019 Key Instruments — Description and Design Assessment Sources: [1] ARE Policy 2019; [7] Zafar et al. (2018); [9] IEEFA (2022); [11] Renewables First (2025)

2.4.4 Monitoring, Evaluation, and Implementation Planning

The ARE Policy 2019 articulates a monitoring framework around Annual Renewable Energy Procurement Plans (CYREPP), IGCEP-based capacity planning, and performance indicators to be jointly developed by the Ministry of Energy and NEPRA ^[1]. In practice, this framework has not been operationalized. As of 2025, no consolidated national ARE implementation dashboard exists in the public domain. NEPRA publishes State of Industry Reports containing sectoral data, but these are not structured around ARE Policy-specific KPIs ^[11]. Neither the Ministry of Energy nor NEPRA has published a formal progress report against the policy's 2025 target in the six years since the policy's launch ^[11]. This monitoring gap is not merely an administrative oversight, it represents a failure to establish institutional accountability for a policy whose stated targets have materially not been met.

2.5 Critical Assessment: Identified Design-Level Gaps in the ARE Policy 2019

A systematic review of the ARE Policy 2019's text against international benchmarks and Pakistan-specific implementation evidence reveals seven substantive design-level gaps that the policy inherited, introduced, or failed to address. These are distinct from implementation gaps, they are weaknesses in the policy document itself that would constrain even well-resourced and well-governed implementation.

Gap 1: Non-Binding Targets Without Annual Milestones

The policy's targets, 20% by 2025, 30% by 2030, are aspirational statements with no legal force, no annual sub-targets, and no consequence for non-attainment ^[1,7]. By contrast, Germany's Renewable Energy Sources Act (EEG) and the EU Renewable Energy Directive embed binding annual trajectories into law, with compliance mechanisms ^[15]. The 20% by 2025 target has been missed with no official acknowledgement, confirming that aspirational targets without enforcement architecture produce no accountability ^[11].

Gap 2: No Capacity Target-Generation Mix Translation

The policy specifies targets in terms of installed **capacity** (20%, 30%) while Pakistan's NDC and international comparators frame targets in terms of electricity **generation** or energy mix share. This definitional ambiguity allows apparent compliance (capacity additions) while actual generation share lags, particularly problematic given Pakistan's grid over-capacity situation where installed capacity already exceeds demand ^[11]. The policy provides no methodology for converting capacity targets into generation targets, leaving monitoring frameworks without a common measurement basis.

Gap 3: Competitive Procurement Without Market Readiness Prerequisites

The shift from upfront tariffs to competitive auctions was sound in principle but introduced without addressing the prerequisites for auction success: a creditworthy off-taker (DISCO solvency), a sovereign risk mitigation framework, a minimum benchmark tariff calibrated to Pakistan's country risk premium, and a functioning grid for project interconnection ^[9]. The IEEFA observed in 2022 that 'policy uncertainty, created by an abrupt removal of the upfront tariff scheme and the delay in initiating auctions, has led to a loss of investor confidence in the stability of renewable energy markets in Pakistan' ^[9]. The policy document does not address any of these market readiness conditions.

Gap 4: Federal-Provincial Coordination Architecture Absent

The 18th Constitutional Amendment (2010) devolved significant energy functions to provinces, creating a constitutional framework that the ARE Policy 2019, approved nearly a decade later, does not adequately address ^[12]. The policy references 'provincial energy departments' without specifying their reporting obligations, data contribution to national targets, or resource entitlements. Research by the UNDP confirms that devolved sectors in Pakistan suffered from 'administrative and legislative implementation gaps' because 'provinces received expanded responsibilities without fully matched fiscal transfers' ^[13]. The ARE Policy 2019 provides no federal-provincial compact that would integrate provincial RE deployment into national target accounting.

Gap 5: Local Manufacturing Without Implementation Framework

The policy endorses local manufacturing and indigenization of RE equipment through 'phased import substitution' ^[1] but provides no implementation framework: no local content requirements linked to auction eligibility, no production-linked incentives, no industrial policy companion, and no timeline for the 'phased' approach. The result is that Pakistan imported approximately 17 GW of solar panels in 2024 alone, more than any other country, without any domestic manufacturing base having been developed ^[11]. This represents a missed opportunity for import substitution at scale that the policy itself identified as a priority.

Gap 6: Off-Grid Program Without Regulatory or Financing Architecture

The ARE Policy 2019 mentions off-grid micro-grids and solar home systems as supported modalities ^[1] but provides no regulatory architecture for mini-grids (tariff determination, interconnection standards, licensing), no dedicated financing vehicle comparable to Bangladesh's IDCOL model ^[16], and no provincial delivery framework. Without these enabling structures, off-grid deployment remains dependent on ad hoc NGO or donor initiatives without government coordination or accountability ^[7].

Gap 7: Gender-Blind Design

The ARE Policy 2019 contains no gender-responsive provisions. It does not disaggregate energy access targets by gender, recognize women as a distinct stakeholder category, set employment equity targets for the RE workforce, or reference Pakistan's gender commitments under Vision 2025 or the National Policy for Development and Empowerment of Women. This is analytically significant: research by GIZ (2025) found that only 9% of women participate in local energy governance in Pakistan ^[17], while CGIAR (2024) documented that energy poverty in rural Pakistan disproportionately constrains women's time, health, and economic participation ^[18]. A renewable energy policy that does not actively address gender dynamics will reproduce existing inequalities in the distribution of energy transition benefits.

2.6 The ARE Policy 2019 and NDC Target Alignment

The ARE Policy 2019 is explicitly positioned as an instrument for achieving Pakistan's climate commitments under the Paris Agreement ^[1,2]. Pakistan's updated NDC, submitted in 2021, outlines targets across the energy, transport, and land-use sectors, with the energy sector targets directly dependent on ARE Policy implementation ^[2]. Table 2.3 presents the alignment between policy and NDC targets, extended to include the critical measurement gap identified above.

Policy Commitment /	Target Category	Specific Goal	Target Year	Measurement Basis
ARE Policy 2019 [1]	RE Capacity Share	20% of total generation capacity from RE	2025	Installed capacity
ARE Policy 2019 [1]	RE Capacity Share	30% of total generation capacity from RE	2030	Installed capacity

ARE Policy 2019 [1]	Wind Specific	30 GW from wind power	2030	Installed capacity
Pakistan NDC 2021 [2]	RE Energy Mix	60% renewable in overall energy mix (incl. hydro)	2030	Energy mix / generation
Pakistan NDC 2021 [2]	Emission Reduction	15% unconditional reduction vs. 2015 baseline	2030	GHG tonnes CO ₂ e
Pakistan NDC 2021 [2]	Emission Reduction	35% conditional reduction (total 50%)	2030	GHG tonnes CO ₂ e
Pakistan NDC 2021 [2]	Transport	30% electric vehicle deployment	2030	Vehicle fleet share

Table 2.3: ARE Policy 2019 and Pakistan's NDC 2021, Target Alignment Matrix Sources: [1] ARE Policy 2019, GoP (2019); [2] Government of Pakistan NDC (2021)

A critical analytical observation from Table 2.3 is that the ARE Policy 2019 frames its targets in terms of installed **capacity** share, while the 2021 NDC frames its energy target in terms of **energy mix** share, two distinct metrics that can yield substantially different figures for the same physical infrastructure ^[11]. Pakistan's total installed capacity already substantially exceeds demand, meaning a capacity-based target can appear to be met while actual renewable generation remains far below target in terms of energy produced. The policy document does not address this definitional divergence, creating an inherent accountability gap in assessing NDC progress through ARE Policy instruments.

The NDC's 60% RE target by 2030, representing a major upward revision from the ARE Policy's 30%, was promulgated in 2021 without a corresponding revision of the ARE Policy itself ^[2]. This creates a coherence gap: the operative implementation policy (ARE 2019) has targets half the level of the government's international climate commitment (NDC 2021). Closing this gap requires either an ARE Policy amendment to align its targets with the 2021 NDC or a bridging instrument that operationalizes the additional 30 percentage points of the NDC target through specific sector plans.

2.7 Sectoral Impacts of the ARE Policy 2019

2.7.1 Energy Sector

The ARE Policy 2019's most direct impact is on the energy sector itself. The policy drove, or coincided with, a significant transformation in Pakistan's distributed solar market. By April 2025, net-metered rooftop solar installations reached a cumulative 5.3 GW, a nearly tenfold increase in two years, driven by the combination of rising grid tariffs and plummeting global panel prices ^[11]. At the utility scale, however, progress has been limited: only 1.1 GW of utility-scale solar was operational by FY2024, with no new utility-scale projects commissioned in 2025 ^[11].

Wind capacity stands at approximately 1,845 MW from 36 operational projects, primarily in the Ghara-Jhimpir corridor ^[19]. This capacity base was built largely under the 2006 Policy's upfront tariff framework rather than the 2019 Policy's competitive bidding mechanism, which has yet to produce a completed auction ^[9,11]. Pakistan imported 17 GW of solar panels in 2024, more than any other country in the world, with approximately 45 GW of panels imported over the past four to five years, a figure roughly equivalent to the entire national grid's installed capacity ^[11]. This citizen-led solar revolution, while positive for energy access and emissions, has strained DISCO finances through regressive cost-shifting and reduced grid electricity demand.

2.7.2 Transport Sector

The ARE Policy 2019's impact on transport is indirect: its primary contribution is ensuring that the electricity supply available to an expanding EV fleet carries a progressively lower carbon intensity ^[1]. Pakistan's NDC targets 30% EV deployment by 2030 ^[2]. The National Electric Vehicle Policy 2019 provides the direct regulatory framework for this transition, while the ARE Policy provides the energy foundation. Meaningful decarbonization of transport through electrification depends critically on the renewable share of the generation mix, a contribution the ARE Policy has thus far delivered only partially.

2.7.3 Industrial Sector

The industrial sector stands to benefit from more reliable, lower-cost, and lower-carbon electricity, but the policy's industrial impact has been ambiguous in practice. The growth of captive and distributed solar has allowed industrially intensive sectors (textiles, cement, chemicals) to reduce exposure to grid unreliability and high tariffs ^[11]. However, DISCO revenue losses from grid exit by industrial prosumers have intensified the circular debt spiral, indirectly raising grid tariffs for remaining consumers ^[11]. The ARE Policy does not address this transition dynamic or specify how industrial decarbonization will be managed as grid electricity use contracts.

2.7.4 Socio-Economic and Environmental Implications

The ARE Policy 2019 carries significant potential for socio-economic transformation: job creation in RE installation and operations, foreign exchange savings through reduced fossil fuel imports, improved air quality through reduced thermal generation, and expanded energy access for underserved communities ^[1,7]. However, these benefits have been inequitably distributed in practice. Rooftop solar adoption has been concentrated among urban, affluent households, the middle and upper classes who can afford upfront system costs ^[11]. Rural and low-income populations, particularly women, have received minimal direct benefit from the policy's implementation, despite bearing disproportionate costs of energy poverty ^[17,18]. Realizing the policy's full socio-economic potential requires deliberate redistributive design elements, subsidized financing for low-income households, women-inclusive program targeting, and off-grid rural electrification at scale, that are currently absent from the policy framework.

2.8 Chapter Summary

The ARE Policy 2019 represents Pakistan's most ambitious renewable energy policy framework to date, correcting several design limitations of its 2006 predecessor, particularly in target ambition, technology breadth, procurement mechanism, climate alignment, and recognition of distributed generation. It was approved through the constitutionally appropriate CCI process and broadly aligns with Pakistan's international obligations under the Paris Agreement and the 2021 NDC.

However, the policy's design contains seven substantive gaps that have constrained its effectiveness independent of implementation challenges: non-binding targets without annual milestones; definitional inconsistency between capacity and generation targets; competitive procurement introduced without market readiness prerequisites; absence of a federal-provincial coordination framework; local manufacturing endorsed without an enforcement or incentive mechanism; off-grid program referenced without regulatory or financing architecture; and gender-blind design that fails to address Pakistan's severe energy-poverty inequalities.

A structured comparison with the 2006 Policy reveals that while the ARE Policy 2019 advances the policy framework in important ways, it inherits three of the 2006 Policy's fundamental weaknesses: the absence of legal enforceability, the absence of a statutory M&E obligation, and inadequate provision for off-grid rural electrification. The policy's most significant new weakness — the abrupt removal of upfront tariffs without a functioning auction replacement, has proven more damaging to investor confidence than the pricing rigidities it was designed to correct.

Subsequent chapters of this review examine these gaps in implementation evidence, stakeholder feedback, and comparative benchmarking, and propose a sequenced, evidence-based reform roadmap for strengthening the ARE Policy framework to meet Pakistan's 2030 NDC commitments and its revised 60% renewable energy target.

References

- [1]. Government of Pakistan. (2019). Alternative and Renewable Energy (ARE) Policy 2019. Ministry of Energy (Power Division), Islamabad. Approved by the Council of Common Interests (CCI).
- [2]. Government of Pakistan. (2021). Pakistan's Updated Nationally Determined Contribution (NDC). Ministry of Climate Change, Islamabad.
- [3]. Khattak, N.U.K., Hussain, A., & Arshad, M. (2006). Renewable Energy Resources in Pakistan. In: Proceedings of the Pakistan Engineering Congress. Lahore: PEC.
- [4]. Pakistan Council of Renewable Energy Technologies (PCRET). (2009). Country Report: Pakistan. Islamabad: Asia Pacific Centre for Transfer of Technology (APCTT), UN-ESCAP.
- [5]. Government of Pakistan / AEDB. (2006). Policy for Development of Renewable Energy for Power Generation 2006. Alternative Energy Development Board, Islamabad. Available at: <https://www.ppib.gov.pk/policies/REpolicy2006.pdf>
- [6]. Courtingthelaw.com. (2021, April). Renewable Energy Policy in Pakistan: A Critique. [Online commentary]. Retrieved from <https://courtingthelaw.com/2021/04/19/commentary/renewable-energy-policy-in-pakistan-a-critique/>
- [7]. Zafar, U., Rashid, T., Alvi, J., & Khalid, M.S. (2018). An Overview of Implemented Renewable Energy Policy of Pakistan. *Renewable and Sustainable Energy Reviews*, 82(3), 654–665. <https://doi.org/10.1016/j.rser.2017.09.006>
- [8]. Yazdanie, M. (n.d.). Renewable Energy in Pakistan: Policy Strengths, Challenges & the Path Forward. ETH Zurich, CEPE Selected Term Papers. Retrieved from <https://ethz.ch/content/dam/ethz/special-interest/mtec/cepe>
- [9]. IEEFA. (2022). Boosting Pakistan's Renewable Investments through Auctions Would Require an Enhanced Benchmark Tariff and Financial Guarantees. Institute for Energy Economics and Financial Analysis, Lakewood, OH. Retrieved from <https://ieefa.org/articles/boosting-pakistans-renewable-investments>.
- [10]. Ali, S.M. et al. (2021). A Comparison of Energy Policies of Pakistan and Their Impact on Bioenergy Development. *Sustainable Energy Technologies and Assessments*, 45, 101139. <https://doi.org/10.1016/j.seta.2021.101139>
- [11]. Renewables First. (2025). Pakistan Electricity Review 2025. Islamabad: Renewables First. Retrieved from https://uploads.renewablesfirst.org/Pakistan_Electricity_Review_2025.pdf
- [12]. International Journal of Social Sciences Bulletin. (2025). Federalism in Transition: Evaluating Pakistan's Eighteenth Amendment between Autonomy and Governance Challenges. *IJSSB*, 2(1). <https://ijssbulletin.com/index.php/IJSSB/article/download/1256>
- [13]. UNDP Pakistan. (2022). Federalism: 18th Amendment Report. United Nations Development Programme, Islamabad. Retrieved from <https://www.undp.org/pakistan/publications/federalism-18th-amendment>
- [14]. Government of Pakistan. (2021). Updated Nationally Determined Contribution (NDC). Islamabad: Ministry of Climate Change.
- [15]. European Commission. (2023). Renewable Energy Directive (RED III) — Directive (EU) 2023/2413. Official Journal of the European Union, L1.
- [16]. Infrastructure Development Company Limited (IDCOL). (2023). Annual Report 2023: Solar Home System Programme. Dhaka: IDCOL Bangladesh.
- [17]. GIZ. (2025, September). Knowledge Note: Gender-Inclusive Energy Solutions for Rural Pakistan. Deutsche Gesellschaft für Internationale Zusammenarbeit, Islamabad.

- [18]. CGIAR / IWMI Pakistan. (2024, October). Where Energy Poverty Limits Not Only Lights but Lives: Discussions in Rural Pakistan. CGIAR NEXUS Gains Initiative. Retrieved from <https://www.cgiar.org/news-events/news/where-energy-poverty-limits-not-only-lights-but-lives>
- [19]. ISSRA. (2026, January). Prospects of Wind Energy in Pakistan. Institute for Strategic Studies Research and Analysis, Islamabad. Retrieved from <https://issra.pk/insight/2026/prospects-of-wind-energy-in-pakistan>

CHAPTER 3

Global Best Practices and Benchmarks for Renewable Energy Policy Evaluation

3.1 Introduction

The global transition to renewable energy (RE) represents one of the most consequential policy challenges of the twenty-first century, demanding not only technological change but deep institutional, regulatory, and financial transformation. National policies play a pivotal role in steering investment, structuring markets, managing risk, and aligning energy systems with broader developmental and environmental objectives. Pakistan's Alternative and Renewable Energy (ARE) Policy 2019 constitutes a significant formal commitment in this direction; however, evaluating its design and implementation requires systematic benchmarking against international experience.

This chapter undertakes that benchmarking exercise, drawing on a structured review of scholarly literature and institutional sources to identify global best practices, diagnose gaps in Pakistan's current policy framework, and propose actionable pathways for improvement. The analysis covers ten substantive policy dimensions — from target-setting and procurement to grid integration, financial instruments, local manufacturing, community energy access, research and development, monitoring and evaluation, and climate alignment. Each dimension is assessed comparatively, drawing on quantitative evidence where available, to produce an evidence-based evaluation matrix that can inform policy revision and future research.

3.2 Theoretical Framework for Benchmarking

Benchmarking exercises in energy policy are most rigorous when grounded in a coherent theoretical framework that specifies what to measure and why. This chapter draws on three complementary analytical lenses that are well-established in the energy transitions literature.

Multi-Level Perspective (MLP). The MLP framework, developed by Geels (2002, 2019), conceptualises energy transitions as interactions among three levels: the technological niche, the socio-technical regime, and the broader socio-technical landscape. Policies that successfully accelerate RE transitions do so by creating protected niche spaces, challenging incumbent regime rules (such as fossil fuel subsidies and centralised grid architectures), and exploiting landscape pressures (such as climate commitments and international finance conditionality). The MLP lens directs attention to whether Pakistan's ARE Policy 2019 creates sufficient niche protection for emerging RE technologies and challenges entrenched regime rules.

Technological Innovation System (TIS). The TIS framework (Hekkert et al., 2007; Bergek et al., 2008) analyses the functions that an innovation system must perform to develop and diffuse a new technology: knowledge development, knowledge diffusion through networks, market formation, resource mobilisation, legitimation, entrepreneurial experimentation, and development of positive externalities. Countries that have scaled RE successfully have typically built all seven TIS functions simultaneously. The TIS lens identifies which functions are weak or absent in Pakistan's current institutional landscape.

Policy Mix Framework. The Policy Mix framework (Flanagan et al., 2011; Rogge & Reichardt, 2016) emphasises that effective energy transitions require not single instruments but coherent portfolios of complementary policies, regulatory mandates, economic incentives, R&D support, and infrastructure investment, characterised by consistency, comprehensiveness, and credibility. A fragmented or internally inconsistent policy mix, such as aspirational targets without enforcement mechanisms, undermines investor confidence and delays deployment. This framework provides the basis for evaluating whether ARE Policy 2019 constitutes a coherent and credible policy mix.

Together, these three frameworks inform both the selection of benchmarking dimensions and the diagnostic judgements in Section 3.4. Table 3.1 below maps each dimension to its primary theoretical rationale.

3.3 Methodology

The benchmarking methodology follows a structured comparative policy analysis approach (Howlett & Cashore, 2009). Ten policy dimensions were selected based on three criteria: (i) theoretical significance, as identified by the MLP, TIS, and Policy Mix frameworks; (ii) empirical prominence in the peer-reviewed and institutional literature on RE policy success; and (iii) direct relevance to documented implementation challenges in Pakistan's energy sector.

Country comparators were selected to ensure diversity across income levels, geographic contexts, and RE resource endowments. The sample includes high-income countries with mature RE systems (Germany, Denmark, United Kingdom), upper-middle-income countries with large-scale deployment experience (Brazil, South Africa, Morocco), lower-middle-income countries with instructive developmental models (India, Bangladesh), and countries with relevant institutional parallels to Pakistan (Kenya, Rwanda). This selection enables both aspirational benchmarking (against global leaders) and developmental benchmarking (against contextually similar countries).

For each dimension, the analysis follows a four-step protocol: (1) characterisation of the global best practice based on published evidence; (2) assessment of Pakistan's current status drawing on official reports from AEDB, NEPRA, NTDC, and PPIB, supplemented by World Bank, IRENA, and IEA data; (3) identification of the performance gap with quantitative indicators wherever available; and (4) formulation of targeted recommendations. The results are synthesised in an evaluation matrix (Table 3.2) incorporating a priority classification (High/Medium/Low) based on the severity of the gap and the feasibility of near-term action.

Table 3.1: Benchmarking Framework: Dimension Selection and Theoretical Rationale

Benchmarking Dimension	Theoretical Rationale (TIS/MLP/Policy Mix)	Key Country Examples	Selection Criterion
RE Targets & Legal Mandates	Institutional legitimacy (MLP); binding commitments stabilise expectations (Policy Mix)	Germany, EU	Legal enforceability is a foundational policy design requirement
Competitive Procurement & Auctions	Market formation (TIS); competitive pressure drives cost reduction (Policy Mix)	India, Brazil, South Africa	Auction design directly affects investment flows and tariff levels
Grid Integration & Smart Systems	Technological regime shift (MLP); enabling infrastructure for variable RE (TIS)	Denmark, Germany	Grid inadequacy is a primary technical barrier to RE scaling
Institutional Streamlining	Governance & rule-setting (TIS); reduced transaction costs (Policy Mix)	UAE, India	Administrative complexity raises project risk and deters private capital

Financial De-risking Instruments	Resource mobilisation (TIS); blended finance lowers cost of capital (Policy Mix)	Morocco, Kenya	Access to long-term capital is the binding constraint in emerging markets
Local Manufacturing & Industrial Strategy	Niche creation and protected space (MLP); industrial policy spillovers (TIS)	Brazil, India	Local content ties RE policy to broader economic development goals
Community-Based & Off-Grid Solutions	Landscape pressure (MLP); energy access as equity dimension (Policy Mix)	Bangladesh, Rwanda	Rural electrification gap is disproportionate in Pakistan's context
R&D and Innovation Ecosystem	Knowledge development (TIS); innovation system building (MLP)	USA (NREL), South Korea (KIER)	Technological learning is prerequisite for indigenisation and cost parity
Monitoring, Reporting & Evaluation (MRE)	System building and feedback loops (TIS); accountability mechanisms (Policy Mix)	UK (BEIS), India (MNRE)	Absence of MRE undermines adaptive policy management
Climate and SDG Alignment	Landscape narrative (MLP); co-benefits and carbon finance (Policy Mix)	Chile, Costa Rica, EU	NDC coherence determines access to international climate finance

3.4 Benchmarking Dimensions and Comparative Insights

3.4.1 Renewable Energy Targets and Legal Mandates

Legally binding renewable energy targets, supported by real-time performance tracking, have been foundational to successful energy transitions in leading economies. Germany's Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG), first enacted in 2000 and substantially revised in 2021 and 2023, commits to specific annual targets with enforceable compliance mechanisms and sector-level monitoring audited by the Federal Network Agency (Bundesnetzagentur). By 2022, Germany had achieved a 46% RE share in gross electricity consumption, up from 6% in 2000 (BMWK, 2022). The European Union's revised Renewable Energy Directive (RED III, 2023) mandates a binding 42.5% RE share by 2030 across member states, enforced through infringement proceedings by the European Commission (European Commission, 2023).

The Philippines' Renewable Energy Act of 2008 and India's Electricity Act amendments similarly demonstrate that legislative embedding of targets creates the institutional confidence necessary for long-term infrastructure investment (IRENA, 2022). In each case, targets were accompanied by annual progress reports, independent verification, and mid-course correction mechanisms.

In contrast, Pakistan's ARE Policy 2019 sets targets of 20% RE by 2025 and 30% by 2030 as aspirational objectives without legal enforceability. As of 2023, RE's share in Pakistan's electricity generation mix stood at approximately 4.8% (excluding large hydro), and the 2025 target is widely regarded as unachievable under current trajectories (NEPRA, 2022; AEDB, 2023). No annual progress report against the ARE Policy targets has been

publicly released. This absence of legal mandates, performance dashboards, and accountability mechanisms represents the most fundamental design weakness in Pakistan's current policy framework, undermining both investor confidence and internal government accountability.

3.4.2 Competitive Procurement and Auction Design

Transparent, regularly scheduled competitive auctions have become the global standard for RE procurement, demonstrating consistent ability to reduce generation costs and attract private capital. India's Solar Energy Corporation of India (SECI) has driven utility-scale solar tariffs from USD 0.076/kWh in 2016 to a record USD 0.019/kWh in 2023 through competitive reverse auctions, mobilising over USD 60 billion in private RE investment cumulatively (MNRE, 2023). Brazil's centralised energy auctions, operating since 2005, have similarly delivered wind tariffs below USD 0.025/kWh and stimulated the development of a domestic manufacturing base (IEA, 2021).

South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is particularly instructive as a developing-country model. By introducing community ownership requirements (2.5% community equity), local content criteria, and socio-economic development conditions alongside price competition, REIPPPP mobilised over USD 14 billion in private investment across 6.3 GW of capacity through five bid windows (Eberhard et al., 2014; IRENA, 2022). The programme also demonstrated the value of regular bid window scheduling — irregular or unpredictable auction rounds were found to significantly reduce competition and raise tariffs in later rounds (Baker et al., 2014).

Pakistan's ARE Policy 2019 endorses competitive bidding but lacks the critical institutional infrastructure that makes auctions effective: no published multi-year auction schedule exists; outcome disclosure is partial and delayed; and there are no provisions for community equity, socio-economic development criteria, or independent post-auction performance monitoring. The result is a procurement environment characterised by high transaction costs, perceived regulatory risk, and limited competition, all of which inflate the effective cost of RE deployment.

3.4.3 Grid Integration and Smart Energy Systems

High penetration of variable RE, solar and wind requires commensurate investment in grid flexibility, storage, and forecasting infrastructure. Denmark, which sources over 60% of its electricity from wind, has achieved this through a combination of cross-border interconnection, flexible demand response, distributed combined heat and power (CHP), and advanced grid management systems operated by Energinet (IEA, 2020). Germany deployed approximately 9.4 GW of battery storage capacity by the end of 2022 and invested over EUR 44 billion in grid infrastructure between 2010 and 2022 as part of its Energiewende (BMWK, 2022).

The key institutional innovation in high-performing countries is synchronised planning between generation expansion and transmission upgrades, typically embedded in a national grid development plan with statutory status. In contrast, Pakistan's national grid, managed by the National Transmission and Despatch Company (NTDC), reported technical and non-technical losses of 17.8% in 2021–22, far above the 4–6% benchmarks of leading systems, and has negligible operational storage capacity, estimated below 50 MW (NEPRA, 2022). The absence of a published grid modernisation roadmap tied to the RE expansion trajectory means that grid inadequacy will increasingly constrain RE integration as capacity grows, creating the risk of curtailment, instability, and stranded investment.

3.4.4 Institutional Streamlining and Regulatory Efficiency

Complex, multi-agency approval processes impose significant transaction costs on RE developers and are consistently identified in investor surveys as a leading deterrent to deployment in emerging markets (World Bank, 2021). In response, leading countries have created one-window or single-agency clearance systems with time-bound approvals. The UAE's Masdar City initiative operates a single-window model that completes project approvals within six to eight weeks (IRENA, 2019). India's SPIN (Solar Photo-Voltaic Installation) portal under

the Ministry of New and Renewable Energy has processed over 1.2 million applications digitally, with online tracking, automated subsidy calculation, and inter-agency coordination built into the workflow (MNRE, 2022).

Pakistan's ARE Policy 2019 acknowledges the need for streamlined approvals but has not delivered the institutional mechanism to achieve it. A typical utility-scale RE project in Pakistan must navigate separate processes at AEDB (policy approval), NEPRA (generation licence and upfront tariff determination), PPIB (implementation agreement for projects above 50 MW), the Board of Investment (investment facilitation), and relevant provincial authorities for land and environmental clearances. The World Bank (2021) estimated that this fragmented process adds an average of 18 to 24 months to project timelines relative to comparable markets, materially increasing pre-construction financing costs and deterring smaller developers. No integrated digital platform exists to coordinate these processes or provide developers with real-time status updates.

3.4.5 Financial Instruments and Investment De-risking

Access to affordable long-term capital is the binding constraint for RE deployment in most developing countries, and the most successful programmes have systematically addressed this through layered de-risking instruments. Morocco's Noor concentrated solar power (CSP) project secured USD 1.9 billion in concessional and commercial financing through a structure combining World Bank IBRD loans, CTF concessional finance, and KfW guarantees, enabling a sovereign-backed offtake agreement that reduced perceived risk sufficiently to attract European project finance (World Bank, 2018). Kenya's GET-FiT programme, supported by GIZ and the Ugandan government, applied premium payments and political risk guarantees to crowd in private capital at a 3:1 private-to-public ratio across 17 off-grid projects (GIZ, 2020).

Green bonds have emerged as a mainstream instrument for mobilising institutional capital for RE. In 2022, global green bond issuance exceeded USD 520 billion, with a growing share directed at developing country RE projects through credit-enhanced structures (Climate Bonds Initiative, 2023). Islamic green sukuk, structurally important for Pakistan's predominantly Islamic investor base have been issued successfully in Malaysia, Indonesia, and Saudi Arabia to finance RE assets.

Pakistan's RE sector remains structurally under-financed. Foreign direct investment in the energy sector fell by 43% in FY2022–23 (SBP, 2023), and there is no dedicated RE risk facility or blended finance vehicle. The State Bank of Pakistan's Green Banking Guidelines (2021) represent a nascent step, but uptake has been limited due to the absence of pipeline guarantees and offtake certainty. Currency risk, in particular, has been cited by international developers as the single largest deterrent to investment in Pakistan's RE sector (World Bank, 2021).

3.4.6 Local Manufacturing and Industrial Strategy

Leading RE countries have consistently deployed industrial policy instruments to build domestic manufacturing capacity alongside RE deployment, transforming energy transition from an import-dependent cost centre into an engine of economic diversification. Brazil mandates local content requirements (50–60% for wind turbines, 60% for wind towers) as a qualification criterion for energy auction participation, which stimulated the development of a domestic wind industry employing over 150,000 people by 2020 (IEA, 2021). India's Production Linked Incentive (PLI) scheme for solar photovoltaic modules, launched in 2021 with an allocation of INR 4,500 crore (approximately USD 540 million), attracted over USD 2.4 billion in committed manufacturing investment within two years (MNRE, 2023).

China's Golden Sun programme and subsequent feed-in tariff policy drove domestic solar module manufacturing from near-zero to global market dominance between 2009 and 2015, contributing to the 90% reduction in global solar module costs over the same period (IEA, 2019). These experiences demonstrate that local content policies, when well-designed, create self-reinforcing dynamics between deployment scale and manufacturing competitiveness.

Pakistan's ARE Policy 2019 refers to indigenisation as an objective but contains no enforceable local content requirements, no fiscal incentives for RE manufacturing, and no articulated industrial development roadmap. The

country currently imports virtually all solar panels, inverters, and wind turbine components, resulting in significant foreign exchange outflows that offset part of the balance-of-payments benefit of RE-driven fuel import substitution. The absence of manufacturing policy constitutes a missed opportunity to link the energy transition to broader industrial development goals.

3.4.7 Community-Based and Off-Grid Electrification

Inclusive RE policy addresses not only utility-scale generation but also the energy access dimension, reaching populations unserved or underserved by national grids. Bangladesh's Infrastructure Development Company Limited (IDCOL) programme represents the most celebrated success story in this domain: through a combination of subsidised solar home systems (SHS), microfinance, and community-level technician training, IDCOL installed over 6 million systems by 2021, serving approximately 18 million people and contributing to Bangladesh's achievement of near-universal electricity access (IDCOL, 2021; Yadav & Lal, 2017).

Rwanda's mini-grid regulatory framework, enacted in 2016, standardised tariff methodologies, licensing procedures, and technical specifications for private mini-grid operators, reducing the cost of rural electrification by an estimated 35% compared to grid extension (IRENA, 2020). Nigeria's Rural Electrification Agency (REA) similarly deployed a result-based financing mechanism that disbursed public subsidy only upon verified connections, achieving 1.3 million new connections between 2019 and 2022 (REA, 2022).

Pakistan's rural electrification rate remains approximately 65% (NEPRA, 2022), and the country has over 50 million people without reliable electricity access (World Bank, 2021). AEDB's solar village programme has operated at modest scale without a standardised regulatory framework, financing mechanism, or technology specification for mini-grids. This gap is particularly acute given Pakistan's dispersed rural settlements, the high cost of grid extension in mountainous regions such as Gilgit-Baltistan and Balochistan, and the productive use potential of decentralised energy for agricultural processing and small enterprise development.

3.4.8 Research, Development, and Innovation Ecosystem

Sustained RE cost reduction and technological adaptation require a robust domestic innovation ecosystem encompassing publicly funded research institutions, competitive grant mechanisms, and structured university-industry collaboration. The United States National Renewable Energy Laboratory (NREL), established in 1977, generated an estimated USD 4.8 billion in economic output and supported over 24,000 jobs in 2021 through its research, technology transfer, and commercialisation activities (NREL, 2022). South Korea's Korea Institute of Energy Research (KIER) filed over 3,200 RE-related patents between 2010 and 2022, making South Korea a net exporter of RE technology in storage and fuel cell systems (KIER, 2022).

China's Golden Sun programme illustrates the power of combining public R&D investment with deployment subsidies: a systematic government-supported R&D push between 2009 and 2015, coordinated with feed-in tariffs and export market development, drove solar manufacturing costs down by over 80% and positioned China as the dominant global supplier of photovoltaic technology (IEA, 2019). India's National Solar Mission embedded dedicated R&D funding streams alongside deployment targets, establishing the Solar Energy Research Institute for India and the United States (SERIUS) in partnership with NREL (IEA, 2021).

Pakistan has no dedicated RE research institute. The Higher Education Commission (HEC) allocates less than 0.1% of its annual research budget to energy topics, and cross-institutional RE research networks are nascent. The public sector development programme (PSDP) contains negligible allocations for energy R&D. This innovation deficit limits Pakistan's capacity to adapt imported technologies to local conditions, particularly relevant for solar performance under high-dust environments, wind resource assessment, and small hydro design, and perpetuates technology import dependence.

3.4.9 Monitoring, Reporting, and Evaluation

Effective policy implementation requires real-time feedback mechanisms that allow governments to identify underperformance, reallocate resources, and make evidence-based mid-course corrections. India's MNRE maintains a live online dashboard tracking cumulative installed capacity by state and technology type, updated daily, and publishes quarterly RE statistics disaggregated by project, developer, and tariff (MNRE, 2022). The United Kingdom's Department for Energy Security and Net Zero (DESNZ, formerly BEIS) publishes quarterly Digest of United Kingdom Energy Statistics (DUKES) data alongside project-level Renewable Energy Planning Database updates, enabling independent verification of progress against statutory targets (DESNZ, 2023).

Germany's Federal Network Agency publishes annual monitoring reports on the Energiewende that cover generation, grid, investment, employment, and cost dimensions, providing the evidential basis for EEG amendments. These systems share three common features: data granularity at the project level, public accessibility, and institutional independence of the reporting entity from the implementing agency.

Pakistan's ARE Policy 2019 has no formal monitoring and evaluation framework. AEDB's public reporting is limited to aggregate statistics with significant temporal lags. No annual ARE Policy implementation report has been published. No independent review of policy performance has been commissioned. This opacity prevents parliamentary accountability, impedes mid-course correction, and makes it impossible for external stakeholders — including international financiers, researchers, and civil society — to assess policy effectiveness. The absence of a credible MRE system is arguably the single most significant operational gap in ARE Policy implementation.

3.4.10 Climate and SDG Alignment

The most effective RE policies are designed not as standalone energy sector instruments but as integral components of national climate commitments, SDG implementation frameworks, and international finance strategies. Chile's RE expansion, which reached 54% of electricity generation in 2022 (up from 5% in 2013), was architected to align with its NDC commitment to carbon neutrality by 2050 and enabled the country to generate approximately USD 140 million in carbon credit revenues in 2021 under Article 6 of the Paris Agreement (IRENA, 2022). Costa Rica has maintained a 99%+ RE electricity supply for seven consecutive years, underpinning its legally binding carbon neutrality target for 2050 (IRENA, 2022).

The EU's Green Deal framework explicitly links RE targets to the European Emissions Trading System (EU ETS), making RE deployment integral to carbon market dynamics. These experiences demonstrate that RE policy aligned with carbon pricing mechanisms and climate finance architecture can access additional revenue streams and international concessional capital that are unavailable to standalone energy sector policies.

Pakistan's updated NDC (2021) commits to 60% RE in electricity generation by 2030, a target that is materially more ambitious than the ARE Policy 2019's 30% target. This internal inconsistency between Pakistan's international climate commitment and its domestic energy policy framework is a significant credibility problem that undermines access to climate finance from the Green Climate Fund, the Climate Investment Funds, and bilateral donor agencies. Pakistan also has not engaged meaningfully with Article 6 carbon market mechanisms. The nominal reference to carbon credits in ARE Policy 2019 has not been operationalised through engagement with UNFCCC carbon market frameworks or the development of Nationally Appropriate Mitigation Action (NAMA) programmes.

3.5 Lessons from Policy Failures and Incomplete Transitions

A rigorous benchmarking exercise must acknowledge that international experience also offers cautionary lessons. South Africa's REIPPPP, widely cited as a success, encountered significant implementation failures in bid windows 3.5, 4, and subsequent rounds when the national utility Eskom — facing financial distress and ideological opposition from internal factions — refused to sign power purchase agreements, resulting in a three-year hiatus (2016–2018) that cost the country an estimated ZAR 5–7 billion in stranded development costs and deterred investment (Baker et al., 2014; Eberhard & Naude, 2016). The lesson is that RE policy success requires

not only good instrument design but also alignment of the implementing utility's institutional incentives with policy objectives — a directly relevant challenge for Pakistan's CPPA-G and DISCOs.

India's early feed-in tariff regime (2010–2013) under the Jawaharlal Nehru National Solar Mission experienced significant contract cancellations and renegotiation pressures when international solar panel prices fell faster than anticipated, demonstrating the risk of long-term price guarantees in rapidly evolving technology markets (IEA, 2021). Spain's retrospective cuts to solar feed-in tariff guarantees (2012–2014) triggered international arbitration claims totalling over EUR 7 billion and permanently damaged the country's reputation as a RE investment destination, illustrating the catastrophic consequences of regulatory instability for investor confidence (Couture & Cory, 2009).

For Pakistan, these failure cases highlight two critical risks: first, the danger of institutional non-alignment between policy intent and implementing entity incentives, particularly relevant given the financial distress of Pakistani DISCOs and CPPA-G's structural dependence on capacity payments; and second, the severe reputational and financial cost of policy reversal, which underscores the importance of designing realistic, stable, and legally anchored commitment mechanisms from the outset.

3.6 Synthesis: Cross-Cutting Findings

The benchmarking exercise reveals several cross-cutting patterns that transcend individual policy dimensions and have particular salience for Pakistan's ARE Policy reform agenda.

First, institutional coherence is the precondition for all other improvements. The countries that have achieved rapid, sustained RE scaling share a common institutional characteristic: a single empowered agency with a clear mandate, adequate technical capacity, and political backing — whether Germany's Bundesnetzagentur, India's MNRE, or South Africa's Department of Mineral Resources and Energy. Pakistan's fragmented regulatory architecture — with overlapping jurisdictions among AEDB, NEPRA, PPIB, BOI, and provincial bodies — is the root cause of delays and investor uncertainty that no amount of target-setting or financial instrument design can overcome without structural rationalisation.

Second, quantitative data reveals the scale of Pakistan's performance gap. Pakistan's RE share of approximately 4.8% (excluding large hydro) against an ARE Policy target of 20% by 2025 represents a gap of comparable magnitude to countries that subsequently achieved rapid catch-up — but only after addressing the institutional bottlenecks identified above. Grid losses of 17.8% are more than three times the benchmark of leading systems. FDI decline of 43% in FY2022–23 signals deteriorating investor confidence. These quantitative benchmarks provide the diagnostic basis for prioritising reforms.

Third, financial de-risking and grid modernisation are the binding constraints. Across multiple developing country transitions, the two variables most consistently associated with accelerated RE scaling are access to affordable long-term capital (addressed through de-risking instruments) and grid adequacy (addressed through synchronised transmission investment). Both are weak in Pakistan's current framework and should be treated as the highest-priority reform areas, alongside institutional streamlining.

Fourth, the NDC-ARE Policy inconsistency is a strategic liability. The gap between Pakistan's NDC commitment (60% RE by 2030) and ARE Policy target (30% by 2030) is not merely a technical inconsistency — it actively impedes access to the international climate finance flows that Pakistan urgently needs. Resolving this inconsistency, and formally integrating RE policy targets into the NDC monitoring architecture, should be an immediate priority for the Ministry of Energy and the Ministry of Climate Change.

3.7 Comprehensive Evaluation Matrix

Table 3.2 presents the full evaluation matrix for ARE Policy 2019, synthesising the benchmarking analysis across all ten dimensions with quantitative evidence, gap assessment, priority classification, and actionable recommendations. Priority classifications (High/Medium/Low) reflect two composite criteria: the severity of the

identified gap relative to global best practice, and the feasibility of near-term implementation within Pakistan's current institutional context.

Table 3.2: Comprehensive Evaluation Matrix for Pakistan's ARE Policy 2019

Policy Element	Global Best Practice	Current Status in Pakistan	Key Evidence / Data	Priority (H/M/L)	Recommendations
RE Targets & Legal Mandates	Legally binding targets with real-time tracking dashboards (BMWK, 2022; EC, 2021)	Non-binding aspirational targets (20% by 2025; 30% by 2030) with no enforcement mechanism	Germany's EEG achieved 46% RE share in 2022; EU binding targets enforced via infringement proceedings	High	Legislate targets under a dedicated RE Act; establish online progress dashboard reporting quarterly
Competitive Procurement & Auctions	Regular, transparent auctions with published timelines and outcome disclosure (IRENA, 2020)	Irregular bidding rounds; limited disclosure of auction outcomes and no published schedule	India's SECI drove solar tariffs from USD 0.076/kWh (2016) to USD 0.019/kWh (2023); South Africa REIPPPP mobilised USD 14 billion private capital	High	Establish annual procurement schedule; mandate online publication of auction results within 30 days
Grid Integration & Smart Systems	Smart grids, storage investment, demand response, and real-time RE forecasting (IEA, 2020)	Centralized grid; <50 MW operational storage; limited automation; no national grid modernization roadmap	Denmark integrates >60% wind; Germany deployed 9.4 GW battery storage by 2022; Pakistan's NTDC reported grid losses of 17.8% (NEPRA, 2022)	High	Develop a 10-year Grid Modernization Roadmap with NTDC; allocate PSDP funds for storage pilot and SCADA upgrades
Regulatory Streamlining & One-Window Clearance	Single-window, time-bound approvals with digital tracking (UAE Masdar; IEA, 2020)	Multi-agency fragmented process involving AEDB, NEPRA, and provincial governments	UAE achieves project approval in 6–8 weeks; India's SPIN portal processed 1.2 million applications in 2022	High	Launch a unified digital RE Clearance Portal under AEDB; mandate 90-day approval SLAs with NTDC

	India SPIN portal)	PPIB, BOI, and provincial authorities	applications digitally; Pakistan's average approval timeline estimated at 18–24 months (World Bank, 2021)		escalation mechanism
Financial De-risking Instruments	Sovereign guarantees, blended finance, green bonds, and FX hedging to crowd in private capital	Limited green bond market; no dedicated RE risk facility; Government guarantees concentrated in IPP sector	Morocco Noor secured USD 1.9 billion via WB-backed guarantees; Kenya GET-FiT mobilised 3:1 private:public ratio; Pakistan's RE FDI fell 43% in FY2022–23 (SBP, 2023)	High	Establish a Pakistan Renewable Energy Risk Facility (PRERF) with WB/ADB co-financing; launch sovereign green sukuk for RE infrastructure
Local Manufacturing & Industrial Strategy	Local content mandates tied to auction qualification; PLI-style fiscal incentives (IEA, 2021)	No enforceable local content requirements; solar panels and wind turbines predominantly imported	India's PLI scheme attracted USD 2.4 billion in solar manufacturing investment; Brazil's local content rules generated 150,000 RE jobs by 2020	Medium	Develop a RE Industrial Policy linking local content milestones to bid scoring; establish PLI-equivalent for solar module manufacturing
Community-Based & Off-Grid Solutions	Subsidised solar home systems via microfinance; standardised mini-grid regulatory frameworks	AEDB's solar village program remains small-scale; no standardised mini-grid licensing or tariff framework	Bangladesh's IDCOL installed 6 million solar home systems serving 18 million people; Rwanda's mini-grid policy reduced rural electrification cost by 35% (IRENA, 2020); Pakistan's rural electrification rate remains	Medium	Enact a Mini-Grid Regulation with standardised tariffs; launch Rural RE Access Fund capitalised at PKR 20 billion

			~65% (NEPRA, 2022)		
R&D and Innovation Ecosystem	Dedicated national RE laboratories; competitive grant funding; university-industry collaboration (IEA, 2019)	No dedicated RE research institute; PSDP allocation for energy R&D less than 0.1% of energy sector budget	US NREL generated USD 4.8 billion in economic output in 2021; South Korea's KIER filed 3,200 RE patents 2010–2022; China's Golden Sun program scaled solar from 0.3 GW (2009) to 392 GW (2022)	Medium	Establish Pakistan RE Innovation Centre (PREIC) under HEC-AEDB partnership; create competitive RE Research Grant Fund (PKR 5 billion over 5 years)
Monitoring, Reporting & Evaluation (MRE)	Real-time online dashboards, annual implementation audits, and independent performance reviews (BEIS, 2023; MNRE, 2022)	No formal MRE framework for ARE Policy 2019; AEDB publishes limited project-level data with significant lag	India's MNRE dashboard tracks 175 GW capacity in real time; UK's BEIS publishes quarterly RE statistics with project-level disclosure; Pakistan has no equivalent public system	High	Develop ARE Policy MRE Framework with quarterly AEDB dashboard; mandate annual independent implementation audit by NEPRA
Climate and SDG Alignment	RE targets integrated with NDC commitments; access to carbon finance mechanisms (EU ETS, Article 6 Paris Agreement)	ARE Policy makes nominal reference to climate goals; NDC (updated 2021) and ARE Policy targets not formally aligned; no carbon market participation	Chile's RE expansion enabled USD 140 million in carbon credit revenues (2021); Costa Rica's 99% RE grid supports carbon neutrality by 2050; Pakistan's NDC targets 60% RE by 2030 but ARE Policy target is only 30%	Medium	Align ARE Policy targets with NDC; appoint focal ministry for Article 6 carbon market access; develop transition roadmap linking RE milestones to climate finance eligibility

3.8 Conclusion

This chapter has demonstrated that Pakistan's ARE Policy 2019, while conceptually aligned with global RE policy directions, exhibits structural deficiencies across all ten benchmarked dimensions that collectively explain the significant gap between stated targets and realised deployment. The analysis has moved beyond qualitative characterisation to establish quantitative benchmarks — Germany's 46% RE share, India's USD 0.019/kWh solar tariff, South Africa's USD 14 billion private investment mobilisation, Bangladesh's 6 million solar home systems — against which Pakistan's current performance can be assessed with precision.

Four gaps stand out as analytically and practically primary: (i) the absence of legally binding targets and enforceable MRE mechanisms, which undermines the credibility of all other policy commitments; (ii) institutional fragmentation across multiple agencies without a clear coordinating authority; (iii) the absence of a dedicated financial de-risking facility to address the cost and availability of long-term RE capital; and (iv) the misalignment between the ARE Policy's 30% RE target and the NDC's 60% commitment, which forecloses access to international climate finance. Addressing these four gaps would, in the judgement of this analysis, do more to accelerate Pakistan's RE transition than any combination of incremental adjustments to secondary policy instruments.

The findings of this chapter establish the empirical and theoretical foundation for the primary research undertaken in subsequent chapters, which examine the ARE Policy's implementation barriers and enablers through structured stakeholder engagement and field-level evidence.

References

- [1]. AEDB. (2019). Alternative and Renewable Energy Policy 2019. Government of Pakistan, Islamabad.
- [2]. AEDB. (2023). Renewable Energy Status Report 2022–23. Alternative Energy Development Board, Islamabad.
- [3]. Baker, L., Newell, P., & Phillips, J. (2014). The political economy of energy transitions: The case of South Africa. *New Political Economy*, 19(6), 791–818.
- [4]. Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy*, 37(3), 407–429.
- [5]. BMWK. (2022). Renewable Energy Sources Act (EEG) 2021: Progress Report. Federal Ministry for Economic Affairs and Climate Action, Berlin.
- [6]. Climate Bonds Initiative. (2023). Green Bond Market Summary: 2022. London.
- [7]. Couture, T., & Cory, K. (2009). State Clean Energy Policies Analysis (SCEPA) Project: An Analysis of Renewable Energy Feed-in Tariffs in the United States. National Renewable Energy Laboratory, Golden, CO.
- [8]. DESNZ. (2023). Digest of United Kingdom Energy Statistics 2023. Department for Energy Security and Net Zero, London.
- [9]. Eberhard, A., & Naude, R. (2016). The South Africa Renewable Energy Independent Power Producer Procurement Programme: A Review and Lessons Learned. *Journal of Energy in Southern Africa*, 27(4), 1–14.
- [10]. Eberhard, A., Kolker, J., & Leigland, J. (2014). South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons. World Bank, Washington, DC.

- [11]. European Commission. (2021). Renewable Energy Directive (2018/2001/EU) — Revised Proposal (RED III). https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules_en
- [12]. European Commission. (2023). Revised Renewable Energy Directive (RED III): Council Adoption. Official Journal of the European Union.
- [13]. Flanagan, K., Uyarra, E., & Laranja, M. (2011). Reconceptualising the 'policy mix' for innovation. *Research Policy*, 40(5), 702–713.
- [14]. Geels, F.W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case study. *Research Policy*, 31(8–9), 1257–1274.
- [15]. Geels, F.W. (2019). Sociotechnical transitions to sustainability: A review of criticisms and elaborations of the multi-level perspective. *Current Opinion in Environmental Sustainability*, 39, 187–201.
- [16]. GIZ. (2020). GET-FiT Kenya Programme Overview. Deutsche Gesellschaft für Internationale Zusammenarbeit, Nairobi.
- [17]. Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S., & Smits, R.E.H.M. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change*, 74(4), 413–432.
- [18]. Howlett, M., & Cashore, B. (2009). The dependent variable problem in the study of policy change: Understanding policy change as a methodological problem. *Journal of Comparative Policy Analysis*, 11(1), 33–46.
- [19]. IDCOL. (2021). Annual Report 2020–21. Infrastructure Development Company Limited, Dhaka.
- [20]. IEA. (2019). China Solar PV Industry Development: Trends and Prospects. International Energy Agency, Paris.
- [21]. IEA. (2020). Integrating Variable Renewables: Challenges and Solutions. International Energy Agency, Paris.
- [22]. IEA. (2021). India Energy Outlook 2021. International Energy Agency, Paris.
- [23]. IRENA. (2019). Renewable Energy Market Analysis: GCC 2019. International Renewable Energy Agency, Abu Dhabi.
- [24]. IRENA. (2020). Renewable Power Generation Costs in 2019. International Renewable Energy Agency, Abu Dhabi.
- [25]. IRENA. (2022). Renewable Power Generation Costs in 2021. International Renewable Energy Agency, Abu Dhabi.
- [26]. KIER. (2022). Annual Research Report 2022. Korea Institute of Energy Research, Daejeon.
- [27]. MNRE. (2022). Annual Report 2021–22. Ministry of New and Renewable Energy, Government of India, New Delhi.
- [28]. MNRE. (2023). RE Capacity Addition Statistics: Q4 FY2022–23. Ministry of New and Renewable Energy, New Delhi.

- [29]. NEPRA. (2022). State of Industry Report 2021–22. National Electric Power Regulatory Authority, Islamabad.
- [30]. NREL. (2022). NREL Annual Report 2021–22: Transforming Energy. National Renewable Energy Laboratory, Golden, CO.
- [31]. REA. (2022). Results-Based Financing Programme: Annual Report 2021–22. Rural Electrification Agency, Abuja.
- [32]. Rogge, K.S., & Reichardt, K. (2016). Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Research Policy*, 45(8), 1620–1635.
- [33]. SBP. (2023). Pakistan Balance of Payments: Annual Report FY2022–23. State Bank of Pakistan, Karachi.
- [34]. World Bank. (2018). Morocco Noor Solar Power Project: Implementation Completion and Results Report. World Bank, Washington, DC.
- [35]. World Bank. (2021). Pakistan Country Climate and Development Report. World Bank, Washington, DC.
- [36]. Yadav, P., & Lal, P. (2017). Solar energy for rural development: Bangladesh's IDCOL model. *Energy Policy*, 101, 118–126.

CHAPTER 4

Stakeholder Analysis

4.1 Introduction

This chapter presents a mixed-method analysis of stakeholder perspectives on Pakistan's Alternative and Renewable Energy (ARE) Policy 2019. The analysis is based on a structured questionnaire administered to 95 respondents covering nine stakeholder categories, government organisations and regulatory bodies, academia and research institutions, energy experts and think tanks, power sector entities and utilities, private sector and industry representatives, climate change and environmental experts, financial institutions and donors, civil society and consumer rights groups, and international and development partners.

The questionnaire comprised two components: (i) five close-ended questions (CQ1–CQ5) with categorical response options, generating quantitative data amenable to frequency analysis and cross-tabulation; and (ii) six general open-ended questions (OQ1–OQ6) together with five stakeholder-group-specific questions (SQ1–SQ5), generating qualitative data coded thematically. This chapter integrates both streams systematically: quantitative findings ground the analysis in measurable evidence, while qualitative responses illuminate the reasoning, context, and nuance behind the numbers.

The chapter is structured as follows: **Section 4.2** presents the methodology and respondent profile. **Section 4.3** delivers the complete quantitative analysis. **Sections 4.4 through 4.8** provide thematic analysis across the five close-ended question domains, each integrating the quantitative finding with qualitative stakeholder voices. **Section 4.9** presents conclusions and evidence-based recommendations.

4.2 Stakeholder Consultation Methodology

4.2.1 Survey Instrument

A structured mixed-method questionnaire was developed and administered via Google Forms. The instrument was organised into two tiers. The first tier comprised five core close-ended questions common to all respondents, using categorical response scales with three options each, designed to generate directly comparable frequency data across stakeholder groups. The five questions and their response scales were:

- CQ1: Policy Target Achievability: Is the ARE Policy's goal of achieving 30% renewable energy by 2030 achievable? (Yes / Not Sure / No)
- CQ2: Private Sector Incentives: Does the policy provide sufficient incentives for private sector investment? (Yes / Needs Improvement / No)
- CQ3: Competitive Bidding Effectiveness: How effective is the current competitive bidding process for renewable energy projects? (Highly Effective / Moderately Effective / Not Effective)
- CQ4: Emerging Technology Incentives: Should there be additional incentives for emerging renewable energy technologies? (Yes / Not Sure / No)
- CQ5: Grid and Storage Adequacy: Does the policy adequately address energy storage and grid integration? (Yes / Needs Improvement / No)

The second tier comprised six open-ended questions applicable to all respondents (OQ1–OQ6) covering NDC alignment, policy strengths, implementation barriers, stakeholder collaboration, private sector enhancement, and policy gaps. An additional five questions specific to each stakeholder group's domain (SQ1–SQ5) were administered to ensure depth of sector-relevant insight.

4.2.2 Respondent Profile

A total of 95 respondents participated across all nine stakeholder categories. Table 4.1 presents the respondent profile.

Table 4.1: Respondent Profile Summary (N = 95)

Stakeholder Category	n	%	Male	Female
Government Organizations & Regulatory Bodies	12	12.6%	8	4
Academia & Research Institutions	20	21.1%	13	7
Energy Experts & Think Tanks	15	15.8%	11	4
Power Sector Entities & Utilities	8	8.4%	5	3
Private Sector & Industry Representatives	12	12.6%	7	5
Climate Change & Environmental Experts	8	8.4%	4	4
Financial Institutions & Donors	8	8.4%	4	4
Civil Society & Consumer Rights Groups	7	7.4%	4	3
International & Development Partners	5	5.3%	3	2
Total	95	100%	63 (66.3%)	32 (33.7%)

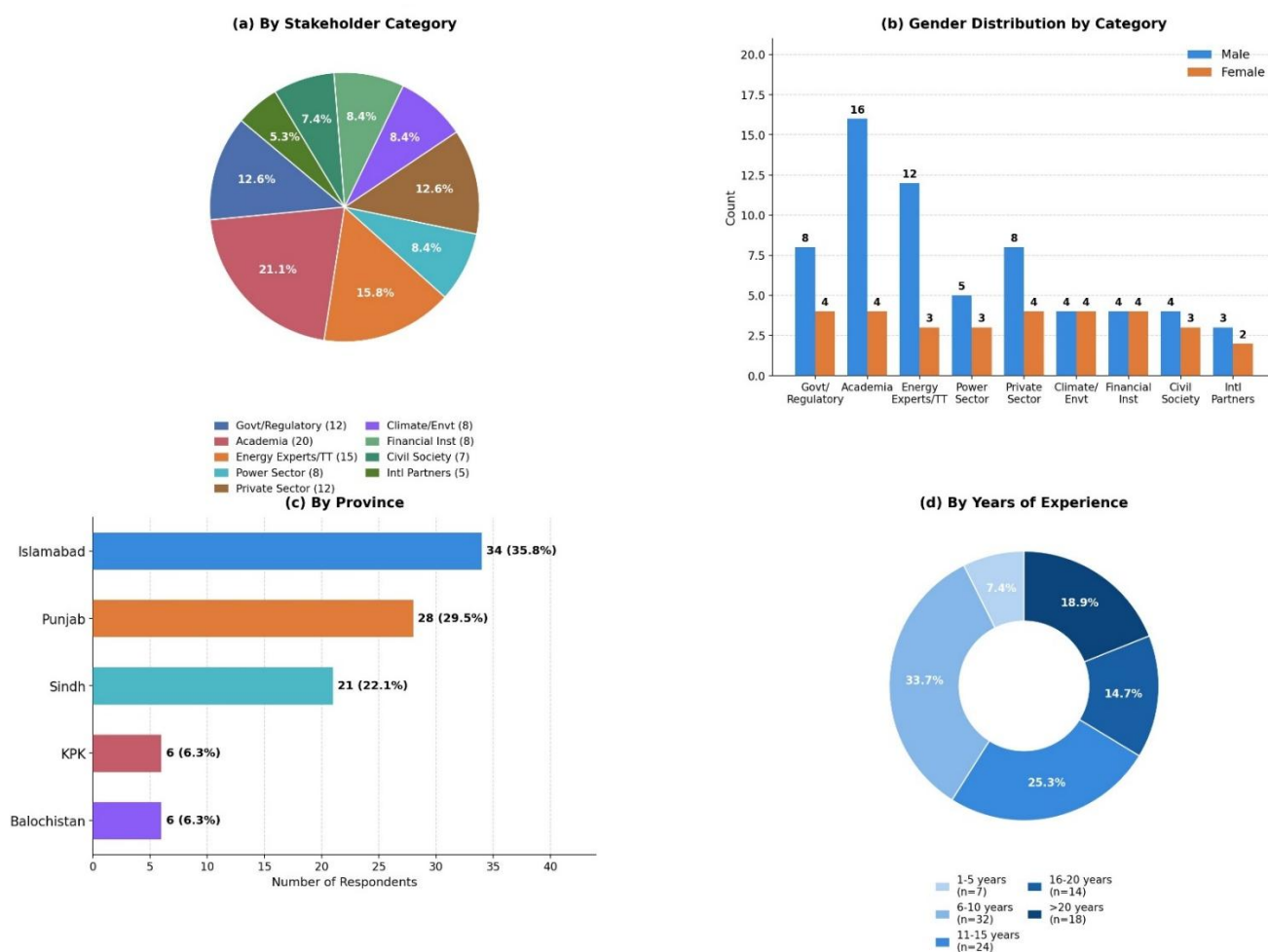


Figure 4.1: Respondent Profile Dashboard: Category, Gender, Province, and Experience (N = 95)

4.3 Quantitative Analysis of Survey Responses

This section presents the quantitative analysis of responses to the five close-ended questions. All figures are derived directly from the 95-respondent dataset. The analysis proceeds from overall frequency distributions to cross-tabulations by stakeholder category, gender, province, and experience level, and concludes with a Composite Policy Sentiment Index that synthesises all five questions into a single comparative metric.

4.3.1 Overall Frequency Distribution

Table 4.2 presents the frequency distribution for all five questions across the full sample, and Figure 4.2 renders the distributions as a stacked 100% bar chart enabling direct visual comparison across questions.

Table 4.2: Frequency Distribution: All Five Close-Ended Questions (N = 95)

Question	Response Option	n	% of Total	Cumul. %	Interpretation
CQ1: 30% RE by 2030 Achievable?	Yes	36	37.9%	37.9%	Minority positive, majority doubtful
	Not Sure	38	40.0%	77.9%	Largest group, low confidence in trajectory
	No	21	22.1%	100.0%	Significant scepticism
CQ2: Sufficient Private Sector Incentives?	Yes	16	16.8%	16.8%	Very small minority, critical incentive gap
	Needs Improvement	43	45.3%	62.1%	Largest group, reform urgency is clear
	No	36	37.9%	100.0%	83.2% say insufficient or need improvement
CQ3: Competitive Bidding Effectiveness	Highly Effective	20	21.1%	21.1%	Only 1 in 5 fully satisfied with process
	Moderately Effective	49	51.6%	72.6%	Majority accept mechanism, see room for reform
	Not Effective	26	27.4%	100.0%	27.4% reject effectiveness, significant pressure for change
CQ4: Additional Incentives for Emerging RE?	Yes	68	71.6%	71.6%	Strong supermajority consensus, clearest signal in dataset
	Not Sure	22	23.2%	94.7%	Open to persuasion, not opposed
	No	5	5.3%	100.0%	Near-negligible opposition, 94.7% positive or open
CQ5: Storage & Grid Integration Adequate?	Yes	8	8.4%	8.4%	Critically low, most acute deficiency in the survey
	Needs Improvement	37	38.9%	47.4%	Partial recognition, insufficient in practice
	No	50	52.6%	100.0%	91.6% say inadequate, single largest unaddressed gap

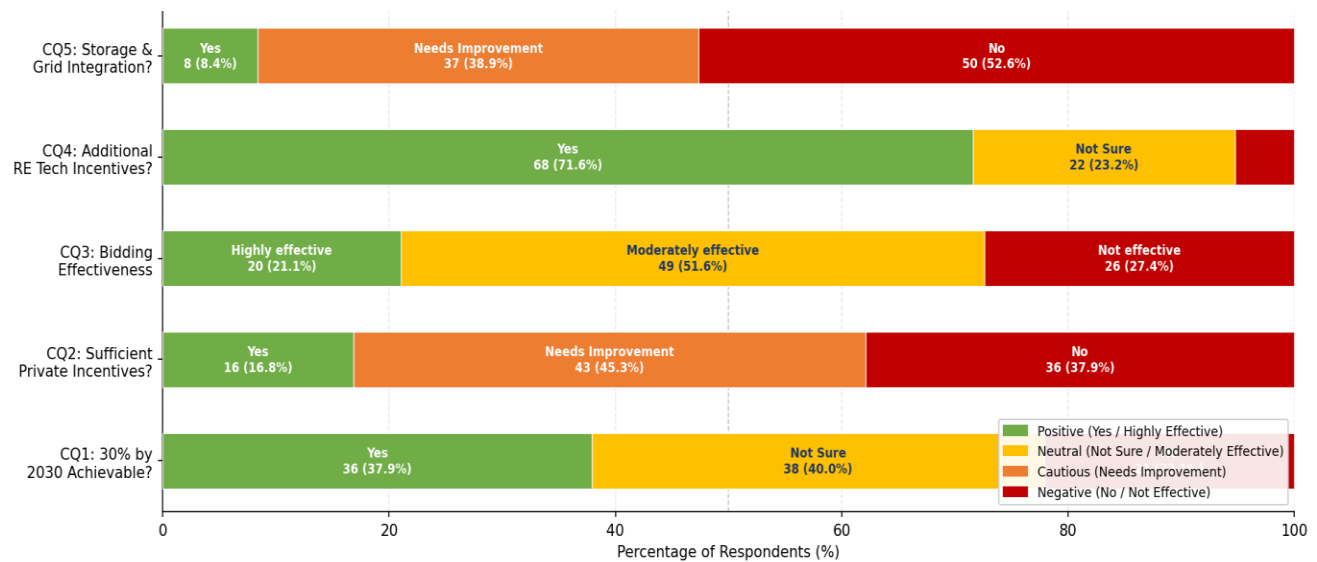
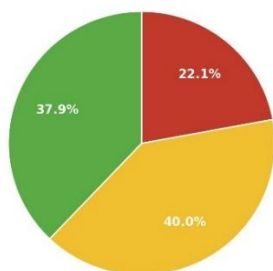


Figure 4.2: Overall Response Distribution : All Five Close-Ended Questions (N = 95)

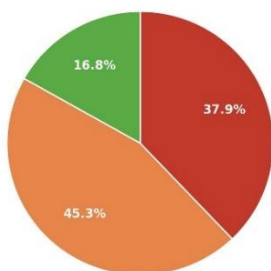
Five findings stand out from the overall distribution. First, on target achievability (CQ1), 62.1% of respondents express doubt, either uncertainty (40.0%) or outright disbelief (22.1%) that the 30% RE target will be achieved by 2030, with only 37.9% confident it is on track. Second, on private sector incentives (CQ2), 83.2% find existing incentives insufficient, making this the most negatively rated policy element after storage and grid integration. Third, on competitive bidding (CQ3), the modal response is 'moderately effective' (51.6%), suggesting broad acceptance of the mechanism's design but significant reservations about its execution. Fourth, on emerging technology incentives (CQ4), 71.6% firmly support additional incentives, the strongest and most unambiguous consensus in the entire dataset, with only 5.3% opposed. Fifth, and most critically, on storage and grid integration (CQ5), 91.6% of respondents rate the policy as inadequate, with 52.6% choosing the outright 'No' option, this represents the most acute policy deficiency identified by the survey.

CQ1: Is the 30% RE Target by 2030 Achievable?



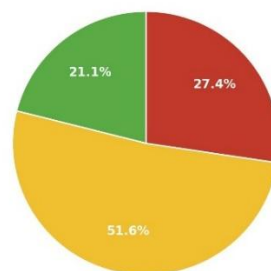
Yes: 36 (38%)
Not Sure: 38 (40%)
No: 21 (22%)

CQ2: Sufficient Incentives for Private Sector?



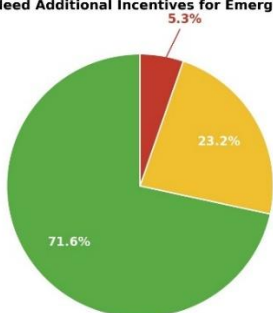
Yes: 16 (17%)
Needs Improvement: 43 (45%)
No: 36 (38%)

CQ3: Competitive Bidding Process Effectiveness



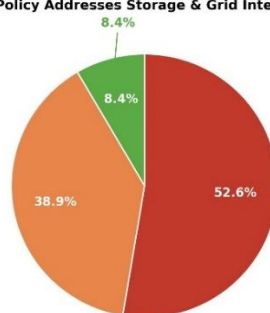
Highly effective: 20 (21%)
Moderately effective: 49 (52%)
Not effective: 26 (27%)

CQ4: Need Additional Incentives for Emerging RE?



Yes: 68 (72%)
Not Sure: 22 (23%)
No: 5 (5%)

CQ5: Policy Addresses Storage & Grid Integration?



Yes: 8 (8%)
Needs Improvement: 37 (39%)
No: 50 (53%)

Figure 4.3: Individual Response Distributions, Five Close-Ended Questions (N = 95)

4.3.4 Responses Comparison by Gender

Figure 4.4 compares percentage-positive responses between male (n=63) and female (n=32) respondents. Female respondents are systematically more positive on CQ4 (80% vs 65%) and CQ1 (44% vs 35%), while both genders are similarly pessimistic on CQ5. These modest but consistent differences likely reflect the greater representation of female respondents in climate, civil society, and international development roles, where optimism about emerging technologies and policy intent tends to be higher.

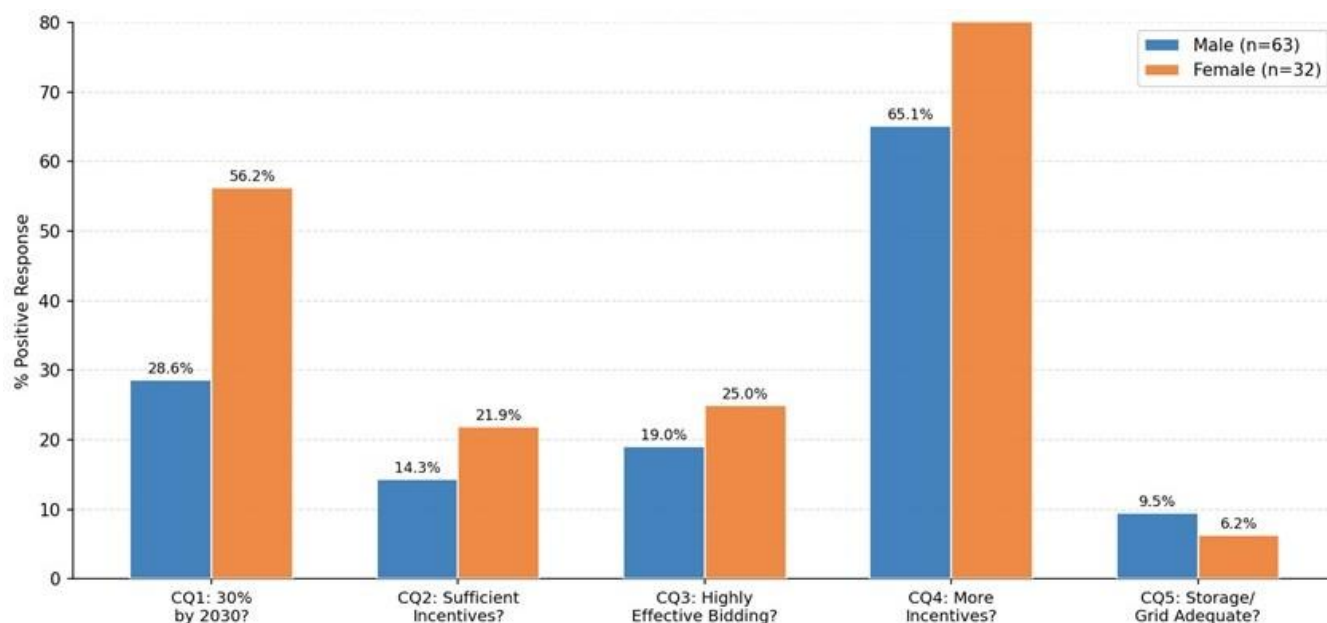


Figure 4.4: Gender Comparison

4.3.5 Composite Policy Sentiment Index

A Composite Policy Sentiment Index (CPSI) was constructed by scoring each response as: Positive (Yes / Highly Effective) = 2 points; Neutral (Not Sure / Moderately Effective / Needs Improvement) = 1 point; Negative (No / Not Effective) = 0 points. Summing across all five questions yields a score of 0–10 per respondent. The Index percentage is calculated as $\text{Mean Score} \div 10 \times 100$, where 100% represents uniformly positive responses and 0% represents uniformly negative responses.

Table 4.8: Composite Policy Sentiment Index — All Disaggregations (N = 95)

Group	n	Mean Score (/10)	Std Dev	CPSI Index %	vs. Average	Interpretation
BY STAKEHOLDER CATEGORY						
Intl. Partners	5	6.80	1.10	68.0%	↑ Above avg	High Positive — most favourable policy view
Govt/Regulatory	12	6.08	1.83	60.8%	↑ Above avg	High Positive — implementation ownership shapes optimism
Financial Inst.	8	5.62	1.06	56.2%	↑ Above avg	Moderate-High — see investment framework as workable
Climate/Env't	8	5.12	1.36	51.2%	At average	Moderate — aligned on goals, critical on gaps
Power Sector	8	5.00	1.20	50.0%	At average	Moderate — operational realities temper expectations

Group	n	Mean Score (/10)	Std Dev	CPSI Index %	vs. Average	Interpretation
Academia	20	4.95	1.57	49.5%	↓ Below avg	Moderate-Low — research community sees widest implementation gap
Energy Experts/TT	15	4.67	1.40	46.7%	↓ Below avg	Moderate-Low — analytical lens shows systemic failures
Private Sector	12	4.67	1.15	46.7%	↓ Below avg	Moderate-Low — investment barriers dominate outlook
Civil Society	7	3.86	2.12	38.6%	↓ Below avg	Low — ground-level actors most dissatisfied
BY GENDER						
Female	32	5.69	1.40	56.9%	↑ Above avg	More positive — climate/development roles inform optimism
Male	63	4.81	1.58	48.1%	↓ Below avg	Below average — wider group includes more critical sectors
BY PROVINCE						
Islamabad	34	5.41	1.54	54.1%	↑ Above avg	Federal capital — policy proximity shapes positive view
Balochistan	6	5.33	1.75	53.3%	↑ Above avg	Notable — perhaps reflecting high RE potential awareness
Sindh	21	5.00	1.73	50.0%	At average	Moderate — mixed urban/rural exposure
Punjab	28	4.96	1.53	49.6%	↓ Below avg	Slightly below — energy security concerns in industrial province
KPK	6	4.17	1.17	41.7%	↓ Below avg	Most sceptical province — grid and coordination failures most acute
BY EXPERIENCE LEVEL						
6–10 years	32	5.28	1.37	52.8%	↑ Above avg	Most positive — experienced progress but still engaged
11–15 years	24	5.17	1.83	51.7%	At average	Mid-career — balanced perspective

Group	n	Mean Score (/10)	Std Dev	CPSI Index %	vs. Average	Interpretation
>20 years	18	5.17	1.58	51.7%	At average	Senior practitioners, nuanced, non-polarised view
1–5 years	7	4.71	1.89	47.1%	↓ Below avg	Early career, high expectations not met by observation
16–20 years	14	4.71	1.49	47.1%	↓ Below avg	Peak-career, bureaucratic barriers most visible
OVERALL AVERAGE	SAMPLE 95	5.11	1.54	51.1%	Reference	Moderate, policy accepted in intent, contested in delivery

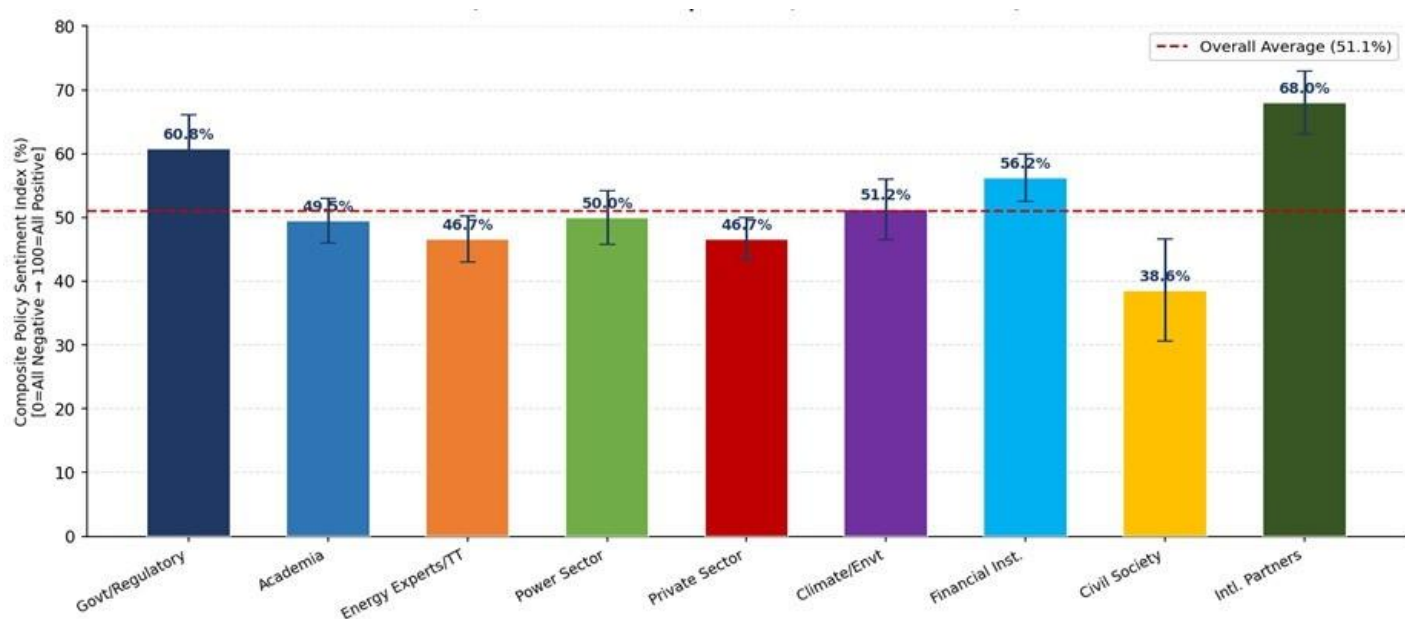


Figure 4.5: Composite Policy Sentiment Index by Stakeholder Category (Error bars = ± 1 SE)

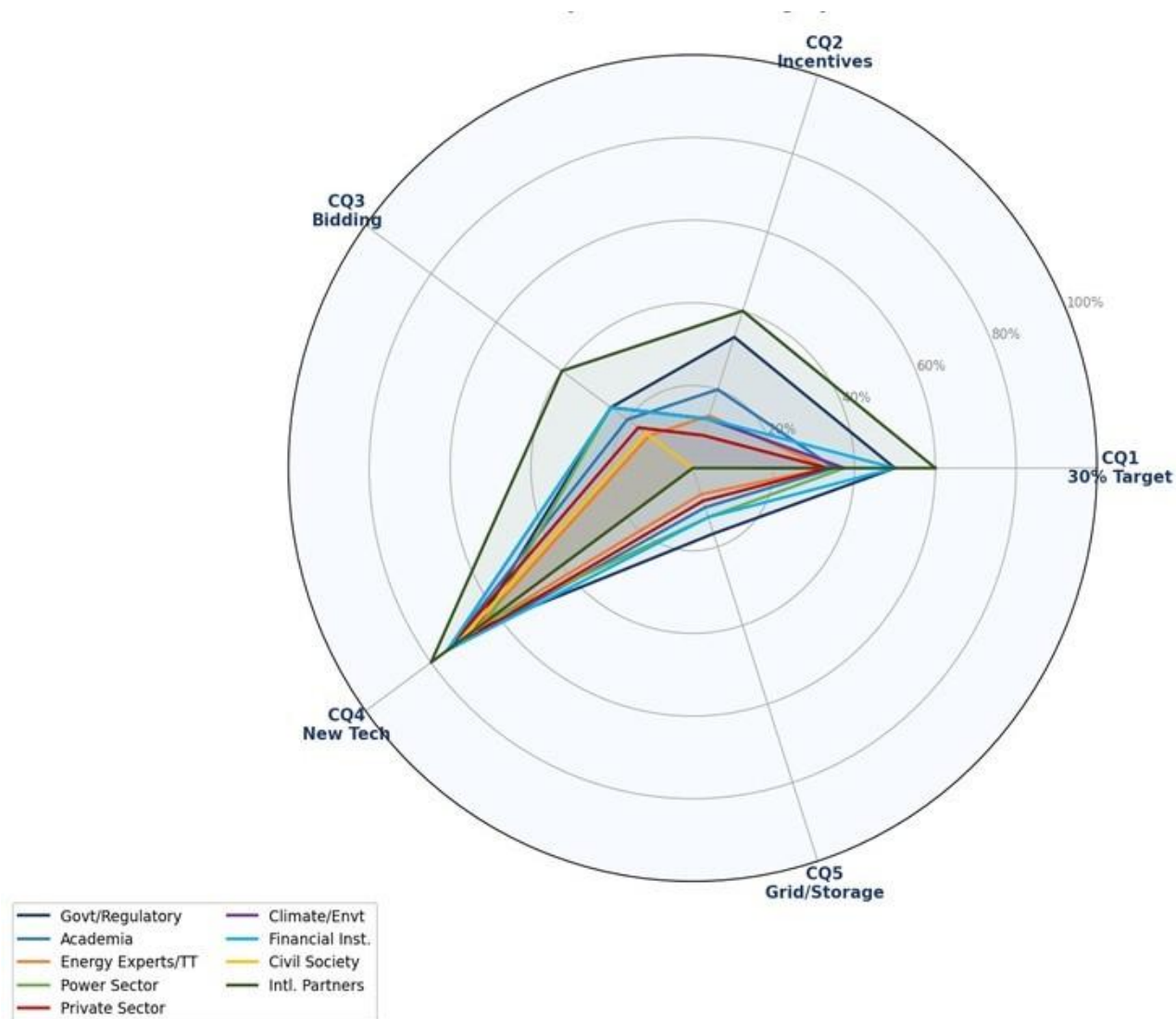


Figure 4.6: Radar Chart: Positive Sentiment Profile per Question by Stakeholder Category

The CPSI of 51.1% across the full sample indicates that overall policy sentiment is moderate, respondents neither comprehensively endorse nor reject the ARE Policy 2019, but position it squarely in a contested middle ground. The radar chart (Figure 4.6) visually confirms that CQ4 (additional incentives for emerging RE) is the single dimension on which all nine stakeholder categories show high positive sentiment, while CQ5 (storage and grid) collapses to near zero for virtually every group.

4.3 CQ1: Is the 30% Renewable Energy Target by 2030 Achievable?

Only 37.9% of respondents (n=36) believe the 30% RE target is on track, while 62.1% express doubt, either uncertainty (40.0%, n=38) or outright disbelief (22.1%, n=21). The divergence across stakeholder groups is analytically significant. International Development Partners are the most optimistic (60% Yes, 0% No), reflecting their engagement with the policy at the framework level rather than in daily implementation realities. Government and Regulatory respondents come second at 50% Yes, consistent with institutional ownership of the targets. Civil Society respondents are the most sceptical (only 14% Yes, 43% No), which is equally coherent: they encounter the ground-level consequences of policy under delivery most directly.

Qualitative responses to OQ1 reveal the mechanism behind this divergence. While stakeholders across all categories acknowledge that the policy's stated targets are directionally correct and broadly aligned with Pakistan's Nationally Determined Contributions, their confidence in delivery is undermined by what one energy regulator described as a policy that 'sounds great on paper but struggles in execution.' The recurring themes in qualitative responses include slow implementation timelines, weak grid infrastructure, the absence of a fossil fuel subsidy phase-out, and institutional fragmentation arising from the 18th Amendment's devolution of energy responsibilities to provinces without a corresponding federal coordination framework.

The implication is clear: stakeholders regard the 2030 target as technically feasible in principle, but the current implementation trajectory is not aligned with achieving it. The predominance of 'Not Sure' responses (40.0%) rather than outright rejection suggests the window for course correction is perceived to be open, but narrowing. Government must treat this as an urgent signal to demonstrate implementation progress rather than policy drafting capability.

4.5 CQ2: Does the Policy Provide Sufficient Private Sector Incentives?

This question produced the most uniformly negative response in the survey. Across all nine stakeholder groups, 83.2% of respondents (n=79) find existing private sector incentives either insufficient (45.3%, n=43) or entirely absent (37.9%, n=36). Only 16.8% (n=16) are satisfied with current incentive provisions, and this minority is concentrated almost entirely within the Government/Regulatory and International Development categories.

The starkest finding is from Private Sector respondents themselves: 92% rate incentives as insufficient, with 50% choosing the outright 'No' option, the highest concentration of outright rejection from any group on any question. Civil Society respondents register zero 'Yes' responses, reflecting that from a consumer and community perspective, the policy's incentive architecture is entirely disconnected from their reality. Financial Institutions, notably, show 88% dissatisfaction, with 62% choosing 'Needs Improvement' rather than 'No', suggesting that financiers see the framework as reformable rather than fundamentally broken, if key instruments such as sovereign guarantees, green bond frameworks, and first-loss guarantee facilities are introduced.

Qualitative responses (OQ5, SQ1, SQ2) consistently identified the following barriers: government payment risk through financially weak DISCOs; the absence of bankable Power Purchase Agreements with adequate payment security; multiple sequential regulatory approvals from AEDB, NEPRA, NTDC, and provincial departments; currency volatility and high domestic interest rates that make project financing prohibitively expensive; and insufficient protection for foreign investors. These qualitative signals are entirely consistent with the quantitative pattern: the policy's incentive provisions exist on paper, but the financial and regulatory environment within which private investors must operate neutralises their effect.

4.6 CQ3: How Effective is the Competitive Bidding Process?

The competitive bidding mechanism is the policy element that generates the most differentiated, and in some ways the most nuanced, response profile. The modal response is 'Moderately Effective' (51.6%, n=49), indicating that the majority of stakeholders regard the competitive auction framework as conceptually sound and an improvement over the previous feed-in-tariff approach, while stopping well short of endorsing its current implementation quality. A meaningful minority of 27.4% (n=26) rate it as outright 'Not Effective,' concentrated most heavily among Civil Society respondents (57%), Energy Experts (33%), Private Sector (33%), and Academia (30%).

The group-specific cross-tabulation reveals an analytically important gradient: those closest to the policy design and international benchmarking, International Development Partners (0% Not Effective) and Financial Institutions (12% Not Effective), are the most positive, while those closest to ground-level project development or excluded from the process, Civil Society (57% Not Effective) and Energy Experts (33% Not Effective), are most critical. This suggests the mechanism works better in theory and at a macro-financial level than it does for smaller developers, communities, and those seeking to navigate the practical approval process.

Qualitative responses to SQ3 and SQ4 (group-specific questions) identify the following specific concerns: opaque bid evaluation criteria that create perceptions of favouritism; ineligibility of smaller developers and communities for competitive processes designed around utility-scale projects; slow tariff determination timelines at NEPRA that reduce auction certainty; and the absence of standardised PPA templates that increase transaction costs and legal risk for all parties. International partners, by contrast, note that the shift to competitive procurement aligns with global best practice and has significantly reduced the cost of solar and wind energy in Pakistan, confirming that the mechanism's design is sound even where implementation falls short.

4.7 CQ4: Should There Be Additional Incentives for Emerging RE Technologies?

CQ4 generated the clearest and most unambiguous consensus in the entire survey: 71.6% (n=68) of respondents answered 'Yes,' with only 5.3% (n=5) saying 'No.' Across all nine stakeholder groups, the Yes response dominates, ranging from 62% (Power Sector) to 80% (International Partners). Critically, even among the 23.2% who responded 'Not Sure,' qualitative elaborations reveal that the reservation is about implementation sequencing rather than principled opposition, several respondents noted that storage, green hydrogen, and tidal energy incentives are desirable but should be phased in once the foundational solar and wind framework stabilises.

This finding carries important policy implications. Emerging technologies, including advanced energy storage, green hydrogen, waste-to-energy, geothermal, and offshore wind, are precisely the technologies that will be required to achieve higher-than-30% renewable penetration beyond 2030 and to address the grid stability and curtailment challenges that are already constraining existing renewable assets. The near-universal consensus on this question, achieved across groups as diverse as Civil Society (71% Yes), Academia (75% Yes), Government (67% Yes), and Financial Institutions (75% Yes), suggests that an extension of the ARE Policy framework to formally include emerging technology incentive provisions would encounter minimal political resistance and maximum stakeholder buy-in.

Qualitative inputs from SQ5 (group-specific questions) identified the following as the highest priority emerging technology areas: energy storage systems (battery and pumped hydro), green hydrogen linked to renewable electricity, waste-to-energy and municipal solid waste gasification, geothermal development in Balochistan, and tidal and wave energy research for the Makran coast. The financial institutions specifically advocated for Islamic finance-compatible (sukuk) instruments for emerging RE technologies, while environmental experts emphasised that biodiversity impacts and climate resilience standards should be built into any new incentive frameworks from the outset.

4.8 CQ5: Does the Policy Adequately Address Energy Storage & Grid Integration?

CQ5 produces the most unequivocal finding in the survey and represents the single most critical policy deficiency identified by the stakeholder community: 91.6% of respondents (n=87) find the policy's treatment of energy storage and grid integration inadequate, with 52.6% (n=50) choosing the outright 'No' option. Only 8.4% (n=8) are satisfied, a figure that falls to zero for Climate and Environmental Experts, Civil Society, and International Development Partners.

The cross-tabulation reveals complete consistency across groups on this question in a way that is unique in the dataset: every stakeholder category has more than 83% of its members rating the policy as inadequate on this dimension. Even Government and Regulatory respondents, who are most positive across other questions, register 83% dissatisfaction on CQ5 (17% Yes, 58% Needs Improvement, 25% No). This is not a politically divided finding or a matter of different sectoral interests pulling in different directions; it is a convergent, evidence-grounded assessment that the ARE Policy 2019 has a fundamental structural gap in its treatment of the enabling infrastructure that would make renewable energy deployments actually function at scale.

Qualitative responses from all group-specific question sets converge on the same diagnosis. Technical respondents (Power Sector, Academia, Energy Experts) confirm that Pakistan's transmission infrastructure

lacks the capacity to absorb variable renewable generation at scale, particularly in wind-rich corridors in Sindh and Balochistan, and that the national grid operates without energy storage, demand-side management, or real-time dispatch capabilities adequate for high RE penetration. Private Sector respondents note that curtailment risk directly affects project bankability, with lenders requiring contractual protections against revenue loss from grid limitations that DISCOs are unable to guarantee. Financial institutions identify the absence of regulatory frameworks for battery storage, wheeling, and open access as barriers that prevent the market from pricing storage as a standalone asset class. Civil Society respondents, while less technically specific, communicate the same gap from a user perspective: rural communities and off-grid households cannot access the benefits of nearby renewable generation because distribution infrastructure and net metering systems are inadequate.

The policy implications are unambiguous. Grid modernisation and energy storage infrastructure must be elevated from an implicit aspiration, mentioned in passing in the ARE Policy 2019's preamble, to a mandated, funded, and time-bound programme with explicit directives to NTDC, DISCOs, and NEPRA. The recommendation to invest in smart grid technologies, advanced metering infrastructure, transmission expansion in renewable-rich zones, and a dedicated energy storage regulatory framework emerges from every stakeholder category with unusual consistency and urgency.

4.9 Qualitative Analysis

Beyond the close-ended question data, the open-ended questions (OQ1–OQ6 and SQ1–SQ5) generated rich qualitative evidence that deepens the quantitative picture. This section synthesises the principal themes from qualitative responses, organised by open-ended question domain.

4.9.1 NDC Alignment and Energy Security (OQ1)

Across all stakeholder groups, qualitative responses confirm the quantitative finding that policy-level alignment with Pakistan's NDC commitments is acknowledged, but operational delivery is questioned. Respondents consistently described the alignment as 'declarative rather than tangible', the 2025 and 2030 targets are seen as the 'right direction,' but without enforced intermediate milestones, binding regulatory commitments, or a monitoring and evaluation framework with published KPIs, they function more as aspirational statements than governance instruments. Government respondents were most likely to rate alignment positively in text, while simultaneously acknowledging, in the same response, that enforcement mechanisms are weak. This self-contradicting pattern is itself a signal: institutional ownership of the policy exists, but institutional accountability does not.

4.9.2 Policy Strengths (OQ2)

Five policy elements were consistently identified as strengths across qualitative responses, in approximate order of frequency: the competitive bidding and auction framework; clear and measurable renewable energy targets; private sector participation incentives including IPP provisions and profit repatriation guarantees; the net metering framework enabling distributed generation; and the policy's broad technology scope encompassing solar, wind, biomass, small hydro, and off-grid solutions. These strengths are real and valued, and several respondents, particularly from international development organisations, noted that Pakistan's transition to competitive procurement represents a genuine structural improvement aligned with global best practice. The lesson is not that the policy is without merit, but that its conceptual architecture is sounder than its implementation ecosystem.

4.9.3 Key Implementation Barriers (OQ3)

Seven barriers were identified with high cross-group frequency. Federal-provincial coordination gaps arising from the 18th Amendment's devolution of energy responsibilities were the most commonly cited structural obstacle, appearing in qualitative responses from all nine groups. Weak grid infrastructure and integration capacity, insufficient financing mechanisms and persistent DISCO payment risk, slow and complex multi-agency approval processes, the weakening of AEDB's institutional role, the complete absence of indigenous manufacturing for RE components, and continuing fossil fuel market distortions including subsidies and circular

debt were consistently listed. The depth and specificity of these responses, aligned with the quantitative signal from CQ2 and CQ5, confirms that implementation barriers, not policy design flaws, are the primary obstacle to achieving the 2030 target.

4.9.4 Stakeholder Collaboration and Private Sector Enhancement (OQ4, OQ5)

Qualitative responses to OQ4 and OQ5 were notably convergent across groups. On collaboration, the most frequently proposed mechanism was a formal joint federal-provincial energy coordination committee with binding mandates, essentially, an institutionalised successor to the informal inter-agency arrangements that currently exist. Digital project tracking platforms, quarterly multi-stakeholder progress reviews, and a reinvigorated AEDB with clear coordinating authority were also widely recommended. On private sector enhancement, the top priorities were: bankable PPAs with government payment guarantees; a single-window regulatory clearance process replacing the current multi-agency sequential approval chain; expanded green financing instruments including sovereign guarantees, dedicated RE credit lines, and green bond frameworks; and explicit international arbitration rights for foreign investors. Private sector respondents were emphatic that ease-of-doing-business improvements are more valuable than additional fiscal incentives if they are not accompanied by regulatory certainty and payment security.

4.9.5 Policy Gaps for Future Revisions (OQ6)

The most frequently cited policy gaps across all qualitative responses were: the absence of a fossil fuel subsidy phase-out strategy; no mandatory targets for energy storage and grid modernisation; the lack of a formal monitoring and evaluation framework with published annual progress reports; insufficient gender-responsive energy access provisions; no just transition framework for workers and communities currently dependent on fossil fuel energy systems; and the underdevelopment of carbon market linkages and a green investment taxonomy consistent with international climate finance standards. These gaps are distinct from implementation failures, they represent provisions that are absent from the policy's text entirely, and their correction would require substantive policy revision rather than improved enforcement of existing provisions.

4.10 Conclusions and Evidence-Based Recommendations

The quantitative and qualitative analysis presented in this chapter converges on a coherent and actionable set of conclusions. Table 4.9 summarises the key findings across all five close-ended questions alongside their primary policy implications.

Table 4.3: Summary of Key Findings and Policy Implications

Q	Key Quantitative Finding	Root Cause (Qualitative)	Primary Policy Implication
CQ1	62.1% uncertain or negative about 30% target	Slow implementation; no enforced milestones; institutional fragmentation	Establish binding intermediate targets with published progress reports and agency accountability
CQ2	83.2% find private sector incentives insufficient	DISCO payment risk; slow approvals; currency/interest rate exposure; no bankable PPAs	Introduce sovereign guarantees, streamline to single-window approval, launch green bond framework
CQ3	51.6% moderately effective; 27.4% not effective	Inaccessible to smaller developers; slow NEPRA tariff process; opaque evaluation criteria	Standardise PPA templates, expand auction eligibility, publish bid evaluation criteria, set mandatory timelines

Q	Key Quantitative Finding	Root Cause (Qualitative)	Primary Policy Implication
CQ4	71.6% strongly support additional emerging tech incentives	Recognition that current tech base is insufficient for post-2030 targets	Extend ARE Policy to explicitly cover storage, green hydrogen, geothermal; create dedicated incentive tier
CQ5	91.6% find storage and grid provisions inadequate	Grid cannot absorb variable RE at scale; no storage regulation; no wheeling framework	Mandate and fund grid modernisation programme with NTDC; develop standalone energy storage regulatory framework

From the discussion above, five key conclusions can be drawn explicitly:

- First, the ARE Policy 2019 is valued for its design but distrusted for its delivery, the Composite Policy Sentiment Index of 51.1% reflects a population that accepts the policy's framework but does not believe the current implementation trajectory will produce its stated outcomes.
- Second, the storage and grid integration gap (CQ5: 91.6% negative) is the most critical and urgent deficiency, representing a technical constraint that will physically prevent renewable energy targets from being achieved regardless of how many projects are approved.
- Third, emerging technology incentives (CQ4: 71.6% positive) represent the strongest available political consensus for policy expansion, and a revised ARE Policy should capitalise on this alignment to build a forward-looking clean energy framework for the post-2030 period.
- Fourth, private sector confidence requires structural, rather than cosmetic, reform. Bankable payment security, regulatory certainty, and single-window approvals are preconditions for the investment scale required to achieve 30% renewables.
- Fifth, Civil Society respondents consistently score the lowest CPSI (38.6%) across all disaggregation, confirming that the policy's affordability, awareness, and community access dimensions remain almost entirely unaddressed.

These conclusions are not offered as academic observations. They represent the synthesised, evidence-grounded assessment of 95 practitioners whose expertise collectively spans the entire ARE Policy ecosystem, ranging from policy design to community implementation and from international finance to rural energy access. Acted upon with the urgency the data demands, they constitute a clear and achievable reform agenda that can redirect Pakistan's renewable energy trajectory toward the delivery of its 2030 commitments.

Chapter 5: Recommendations and Conclusion

5.1 Introduction

The findings from Chapters 2, 3, and 4 demonstrate that Pakistan's ARE Policy 2019 possesses a comparatively strong conceptual foundation but suffers from severe institutional, regulatory, financial, and infrastructural weaknesses that undermine implementation effectiveness. The evidence indicates that Pakistan's renewable energy challenge is no longer primarily one of policy declaration, but one of governance execution, grid readiness, investment credibility, and institutional coordination.

This chapter presents a set of evidence-based recommendations derived directly from:

- The policy design assessment in Chapter 2,
- The international benchmarking analysis in Chapter 3,
- The stakeholder findings in Chapter 4.

The recommendations prioritize structural reforms capable of producing measurable implementation outcomes rather than generic policy intentions.

5.2 Strategic Policy Recommendations

5.2.1 Enact a Renewable Energy Transition Act with Legally Binding Targets

Pakistan should replace the current non-binding policy framework with a Renewable Energy Transition Act enacted through Parliament. The Act should legally mandate:

- Annual renewable energy deployment targets,
- Sector-wise renewable energy obligations,
- Grid modernization milestones,
- Annual reporting obligations,
- Institutional accountability mechanisms.

The law should convert the current aspirational targets into enforceable obligations with:

- Annual sub-targets,
- Parliamentary reporting requirements,
- Mandatory corrective action plans in case of underperformance.

The legislation should also harmonize the ARE Policy targets with Pakistan's updated 2021 NDC commitment of 60% renewable electricity by 2030.

5.2.2 Establish a Statutory National Renewable Energy Authority

The dissolution of AEDB created a severe institutional vacuum. Pakistan requires a single autonomous renewable energy implementation authority with statutory powers.

The proposed National Renewable Energy Authority (NREA) should:

- Function as a one-window institution,
- Coordinate federal and provincial implementation,
- Manage auctions,
- Monitor policy progress,
- Maintain renewable energy databases,
- Oversee investor facilitation.

The authority should possess independent technical, financial, and regulatory coordination capacity rather than functioning merely as a departmental wing of the Ministry of Energy.

5.2.3 Create a Federal–Provincial Renewable Energy Coordination Council

The absence of a formal post-18th Amendment coordination mechanism emerged as one of the most critical structural weaknesses identified across all chapters.

A permanent Federal–Provincial Renewable Energy Coordination Council should therefore be established under the Council of Common Interests (CCI) framework.

The Council should:

- Integrate provincial renewable energy plans into national targets,
- Coordinate transmission planning,
- Standardize provincial regulatory procedures,
- Manage data-sharing obligations.

Each province should be assigned province-specific renewable energy targets aligned with national objectives.

5.2.4 Launch a National Grid Modernization and Energy Storage Program

The stakeholder survey identified storage and grid integration as the single largest policy deficiency, with 91.6% dissatisfaction.

Pakistan should therefore initiate a dedicated National Grid Modernization and Storage Program comprising:

- Transmission expansion in renewable-rich corridors,
- Utility-scale battery storage systems,
- Advanced forecasting systems,
- Smart-grid technologies,
- Dynamic dispatch systems,
- Demand-response infrastructure.

Specific actions should include:

- Mandatory storage integration requirements for large RE projects,
- Battery storage pilot projects in Sindh and Baluchistan,
- Time-of-use tariff structures,
- Modernization of NTDC dispatch infrastructure.

A dedicated Energy Storage Regulatory Framework should be issued by NEPRA within 12 months.

5.2.5 Replace Ad-Hoc Auctions with a Multi-Year Competitive Procurement Framework

Pakistan's competitive procurement system lacks predictability and investor confidence.

The government should publish:

- A rolling five-year auction calendar,
- Standardized Power Purchase Agreements (PPAs),
- Transparent bid evaluation criteria,
- Fixed tariff determination timelines.

Auctions should include:

- Separate windows for utility-scale,
- Community-scale,
- Distributed generation,
- Hybrid-storage projects.

Community equity participation requirements similar to South Africa's REIPPPP model should also be introduced.

5.2.6 Establish a Renewable Energy Sovereign Risk Facility

Investor confidence cannot improve without addressing payment risk and currency instability.

Pakistan should establish a Renewable Energy Sovereign Risk Facility jointly supported by:

- The Ministry of Finance,
- State Bank of Pakistan,
- Multilateral donors,
- Development finance institutions.

The facility should provide:

- Sovereign-backed payment guarantees,
- Currency hedging instruments,
- Political risk insurance,
- First-loss guarantee mechanisms for renewable energy investments.

This mechanism would substantially improve bankability and reduce financing costs.

5.2.7 Develop a National Green Finance and Islamic Climate Finance Framework

Pakistan should institutionalize green financing through:

- Sovereign green bonds,
- Islamic green sukuk,
- Renewable energy infrastructure funds,
- Concessional green credit lines.

The State Bank should mandate:

- Renewable energy lending targets for commercial banks,
- Preferential financing rates,
- Climate-risk disclosure obligations.

A Green Taxonomy Framework should also be developed to standardize sustainable investments.

5.2.8 Implement a Renewable Energy Industrial Policy and Local Manufacturing Strategy

Pakistan's renewable transition currently functions as an import-dependent consumption model rather than an industrial development strategy.

The government should therefore establish:

- Local content requirements,
- Production-linked incentives,
- Renewable energy special economic zones,
- Export-oriented manufacturing clusters.

Priority industries should include:

- Solar panels,
- Battery systems,
- Inverters,
- Wind turbine towers,
- Smart-grid equipment.

Auction eligibility should gradually incorporate minimum domestic-content thresholds.

5.2.9 Develop a National Mini-Grid and Off-Grid Electrification Framework

The ARE Policy 2019 lacks operational architecture for decentralized electrification.

Pakistan should adopt a dedicated Mini-Grid Policy with:

- Simplified licensing procedures,
- Standardized tariffs,
- Viability-gap funding,
- Rural energy service regulations.

A Rural Renewable Energy Fund should be created to support:

- Solar villages,
- Agricultural mini-grids,
- Productive-use electrification,
- Community-owned energy systems.

5.2.10 Establish a National Renewable Energy Research and Innovation Network

Pakistan's renewable energy transition cannot remain permanently dependent on imported technologies.

The government should establish:

- National Renewable Energy Research Institute,
- Specialized university-industry research centres,
- Dedicated RE innovation funds.

Priority research areas should include:

- Battery storage,
- Hydrogen systems,
- Smart grids,
- Dust-resistant solar technologies,
- Hybrid renewable systems,
- Climate-resilient infrastructure.

A minimum percentage of PSDP and HEC research funding should be reserved for renewable energy innovation.

5.2.11 Introduce a National Renewable Energy Monitoring Dashboard

The absence of transparent monitoring severely weakens accountability.

Pakistan should establish a real-time national renewable energy dashboard publicly displaying:

- Installed capacity,
- Actual generation share,
- Provincial progress,
- Grid curtailment,
- Storage deployment,
- Emissions reduction,
- Investment flows.

Quarterly implementation reports should become mandatory.

5.2.12 Integrate Gender and Social Inclusion into Renewable Energy Policy

Future renewable energy reforms must explicitly incorporate gender-responsive and socially inclusive mechanisms.

The revised policy should include:

- Women-focused renewable energy entrepreneurship programs,
- Technical training for female technicians,
- Gender-disaggregated energy access indicators,
- Employment equity targets in renewable projects.

Community participation mechanisms should also be institutionalized for local ownership and acceptance.

5.2.13 Phase Out Fossil Fuel Distortions Through a Managed Energy Transition Plan

Renewable energy expansion cannot succeed while fossil fuel subsidies continue distorting market signals.

Pakistan should gradually:

- Phase out inefficient fossil-fuel subsidies,
- Introduce carbon-pricing mechanisms,
- Redirect subsidy savings toward renewable energy infrastructure and grid modernization.

The transition should be phased carefully to minimize social disruption while improving renewable competitiveness.

Chapter 6

Conclusion

Pakistan's Alternative and Renewable Energy (ARE) Policy 2019 represents one of the most significant policy initiatives undertaken by the country to address the interconnected challenges of energy insecurity, climate vulnerability, fossil fuel dependence, and unsustainable economic exposure to imported energy resources. The policy emerged at a critical historical moment when Pakistan's conventional energy model had become increasingly unsustainable due to rising circular debt, escalating electricity tariffs, transmission inefficiencies, foreign exchange pressures, and intensifying climate risks. In this context, the ARE Policy 2019 sought to reposition renewable energy not merely as an environmental alternative, but as a strategic instrument for national energy security, economic resilience, technological modernization, and sustainable development.

This report critically evaluated the ARE Policy 2019 through three integrated analytical dimensions: policy and institutional assessment, global benchmarking against international best practices, and empirical stakeholder analysis. Collectively, the findings reveal a policy framework that is conceptually ambitious and directionally appropriate, yet operationally constrained by severe structural, institutional, regulatory, financial, and infrastructural weaknesses.

The historical review presented in Chapter 2 demonstrated that the ARE Policy 2019 marked a substantial progression beyond the Renewable Energy Policy 2006 in several important respects. The policy expanded technology coverage, introduced competitive procurement mechanisms, recognized distributed generation and net metering, aligned more explicitly with climate and sustainability objectives, and attempted to integrate renewable energy into Pakistan's broader economic and development agenda. However, despite these conceptual improvements, the analysis identified multiple design-level deficiencies embedded within the policy itself.

Most significantly, the policy's renewable energy targets remain aspirational rather than legally binding. The absence of statutory enforceability, annual implementation milestones, monitoring obligations, and institutional accountability mechanisms fundamentally weakens implementation discipline. Furthermore, the policy introduced competitive procurement mechanisms without establishing the enabling market conditions required for successful auctions, including sovereign payment guarantees, bankable regulatory frameworks, and adequate transmission infrastructure. The policy also failed to develop a coherent federal-provincial coordination framework following the 18th Constitutional Amendment, leaving major implementation responsibilities fragmented across overlapping institutional jurisdictions.

The global benchmarking analysis in Chapter 3 reinforced these concerns by demonstrating that successful renewable energy transitions internationally are consistently associated with strong institutional coherence, legally enforceable targets, synchronized grid modernization, transparent procurement systems, investment de-risking instruments, robust monitoring systems, and integrated industrial and climate strategies. Countries such as Germany, Denmark, India, Morocco, Bangladesh, Brazil, and South Africa have achieved substantial renewable energy scaling not simply because of ambitious targets, but because they established implementation ecosystems capable of translating policy commitments into measurable deployment outcomes.

In contrast, Pakistan's renewable energy governance framework remains institutionally fragmented and operationally underdeveloped. The benchmarking exercise identified particularly severe weaknesses in grid integration planning, institutional streamlining, monitoring and evaluation systems, financial de-risking mechanisms, local manufacturing frameworks, and research and innovation capacity. The study further revealed that Pakistan's ARE Policy targets are themselves inconsistent with the country's updated Nationally Determined Contributions (NDCs), creating a strategic disconnect between domestic energy policy and international climate commitments.

The stakeholder consultation findings presented in Chapter 4 provide perhaps the clearest indication of the implementation crisis confronting the ARE Policy 2019. Although stakeholders broadly acknowledged that the policy is conceptually aligned with Pakistan's renewable energy and climate objectives, confidence in implementation remains low across virtually all stakeholder categories. Only a minority of respondents believe that the policy's 2030 renewable energy targets are realistically achievable under current institutional and infrastructural conditions.

The most severe concern identified by stakeholders relates to energy storage and grid integration. An overwhelming majority of respondents concluded that Pakistan's transmission infrastructure lacks the technical capacity necessary for large-scale integration of variable renewable energy. The absence of utility-scale storage systems, smart-grid infrastructure, advanced forecasting systems, and flexible dispatch mechanisms represents a critical structural bottleneck that threatens future renewable energy deployment regardless of policy ambition.

Stakeholders also identified persistent institutional fragmentation, regulatory complexity, financial insecurity, and weak investment protection as major barriers to renewable energy expansion. Developers continue to face lengthy approval procedures, overlapping institutional mandates, payment uncertainty arising from circular debt, and insufficient sovereign risk mitigation mechanisms. The dissolution of AEDB without establishing a strong autonomous replacement institution further compounded institutional uncertainty within the renewable energy sector.

At the same time, the study identified important areas of progress and opportunity. The rapid expansion of distributed solar and net-metering demonstrates that Pakistan's renewable energy potential is substantial when regulatory and market conditions become favorable. Stakeholders also showed strong support for expanding renewable energy incentives into emerging technologies such as battery storage, green hydrogen, geothermal systems, offshore wind, and waste-to-energy solutions. These findings indicate that the underlying political, technical, and social foundation for renewable energy expansion exists; however, it remains constrained by governance and implementation failures rather than by lack of renewable energy potential.

The recommendations developed in Chapter 5 therefore emphasize structural transformation rather than incremental policy adjustments. The report concludes that Pakistan's renewable energy transition requires a shift from declaratory policy-making toward implementation-centered governance. This requires legally enforceable renewable energy legislation, empowered implementation institutions, integrated federal-provincial coordination mechanisms, large-scale grid modernization programs, sovereign investment de-risking facilities, industrial manufacturing strategies, and transparent monitoring systems.

Equally important, the report emphasizes that renewable energy policy in Pakistan must no longer be viewed exclusively through the narrow lens of electricity generation. International experience demonstrates that successful renewable energy transitions function simultaneously as energy policy, industrial policy, climate policy, technological policy, and social development policy. Renewable energy deployment has the potential to stimulate domestic manufacturing, create employment, improve energy access, reduce import dependence, strengthen climate resilience, and expand economic competitiveness. Pakistan's future renewable energy strategy must therefore adopt a similarly integrated and long-term developmental perspective.

Ultimately, the central conclusion of this study is that Pakistan does not suffer from a lack of renewable energy potential; rather, it suffers from institutional under-preparedness for managing energy transition at scale. The ARE Policy 2019 established an important strategic direction, but it did not establish the implementation architecture necessary to realize its ambitions. Unless immediate reforms are undertaken in governance coordination, legal enforceability, grid modernization, investment facilitation, and institutional accountability, Pakistan risks repeating the underperformance experienced under the Renewable Energy Policy 2006.

Conversely, if the structural reforms proposed in this report are implemented systematically and with sustained political commitment, Pakistan possesses the opportunity to fundamentally transform its energy future. A successful renewable energy transition could significantly reduce dependence on imported fossil fuels, strengthen macroeconomic stability, improve environmental sustainability, enhance climate resilience, stimulate industrial growth, and expand energy access for underserved communities.

The coming decade will therefore be decisive. The challenge facing Pakistan is no longer whether renewable energy should become central to national development policy; that question has effectively been settled. The critical challenge now is whether the country can build the institutional, financial, regulatory, and technological systems necessary to operationalize that transition effectively. The future success of Pakistan's renewable energy ambitions will depend not on policy rhetoric, but on governance capacity, implementation discipline, and long-term institutional continuity.