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# Pakistan's Alternative and Renewable Energy Policy-Step towards Energy Security

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## Abstract

Pakistan is an energy insecure country, deeply linked with the national security having adverse effects on the economic growth. Energy management particularly the ever increasing circular debt will make or break the energy sector. Pakistan's energy is heavily dependent on imported fossil fuels. National share of renewable energy resources in the total energy mix is up to 2.4%, which is negligible. Pakistan has formulated several policies for power and renewable energy, mainly addressing the country's power crisis. Pakistan is thriving to change its import-driven energy policy from energy dependence (energy scarce and insecure) to an energy independent country in order to control its foreign exchange drain in the long run. 'Alternative and Renewable Energy Policy 2019' has been initiated to enhance the renewable deployment, promising to ensure affordable and clean energy across all regions of Pakistan. As part of national security, energy security is the most neglected element in Pakistan's economic discourse. In Pakistan's perspective, dimensions of energy security are 4A's, i.e., availability (sufficient supply of varied resources), affordability (reasonable price), accessibility (reliable technology), and acceptability. This paper offers an analysis of the practical actions, measures, and frameworks that have been placed and suggested in the Alternative and Renewable Energy Policy (AREP) 2019. The methodology is based on Hajer (2006) framework analysis and explores three core pillars of policy framework, institutional framework, and implementation framework and recommends some policy tools to meet the targets of AREP, 2019. After conducting in-depth interviews with the experts in the renewable energy sector, this study concludes that there still exists certain loopholes, shortcomings, and implementation hurdles in the policy. The infrastructural and technological barriers, absence of reliable renewable resource data, and unskilled workforce are major impediments as per the findings of this study.


**Keywords;** Energy Security, Renewable Energy Resources, AREP, AEDB, NEPRA.

## 1. Introduction

At the dawn of the new millennium, the global perspective of developed and developing nations has transformed mainly due to the experience of climate change and shifting energy prints. The contemporary economic societies of the modern world have depended mainly on the assurance of ample energy supply. An established global consensus has marked that the consequent use of energy by liberty and autonomy is an elucidation to achieve and uphold the supreme affluence in the struggle of global challenges. The entire energy system endures a complete shift from nonrenewable to resourceful renewable energy, and this shift is linked with scientific advancement sited to keep climate change as fossil fuels.

Energy security became a question of national strategy and security during World War II when William Churchill shifted the Royal Navy ship's power source from coal to oil. The term energy security has emerged as a matter of serious concern and rethought in nation's geo-economic relations on the eve of tight and high oil market prices, the vulnerability of terrorism, nationalist armed conflicts, geopolitical challenges, political turmoil, economic instability in some OPEC states, natural disasters, and climate threats. Energy security is not limited to safe supplies of oil and gas; relatively, it has gained eye-centered attention and enlarged approach to sustainable, affordable, and reliable, clean resources and systems of electric power supplies to all developed, underdeveloped, and developing countries. According to the International energy agency, energy security is the "uninterrupted availability of affordable energy sources at affordable rates." The interpretation of energy security varies depending upon the country's energy status. For a developed nation, energy security is a simple available, accessible and affordable energy supply. For energy export countries, the "security of demand" and control over "strategic resources" are primary concerns. For energy import countries, their dependence on global energy markets, the energy prices, and the balance of payments are core concerns. Energy security is a multivariate theme and a nexus between geo (economic and political) facets. With the advancement of technology and scientific innovation, the framework of energy security has evolved to deal with human security, foreign and international affairs, and smart landscapes of energy capacity. Energy insecurity has a direct effect on the prices of food and other commodities.

The clean, secure, and affordable energy supplies are bringing major structural changes and transitions in the energy sector profile as the scope of energy security has expanded due to cyber criminality and attacks on clean energy technologies. The objectives of climate change, favorable for the environment and cost reductions are accelerating the transition of diffused and decentralized renewable energy. Renewables may improve the resilience of the energy system against climate and natural disasters. The practice of renewable energy sources has rapidly felt in the development of the world during the last era. It accounted for approximately 20% of global energy use, which is half of all new power generation. More than 150 countries have national targets for renewable energy in power, and Denmark is the unique country in the world that has a target of 100% energy from renewable sources (REN21, 2018).

## 1.1 Pakistan Renewable Energy Perspective

Energy is being considered a public good as it greatly affects people's life and upholds one's living standards. Energy, economy, and the environment are the three foremost constituents under academic discussion in developing countries. Energy plays a vital role in the accomplishment of socio-economic and industrial stability for sustainable development of Pakistan as the 2Es, i.e., the energy demand and economic development, are correlated in provisions of the energy mix. Pakistan's energy status is a scarce state and has energy threats.

According to Economic Survey of Pakistan 2021-22 shows that percentage contribution energy generation from thermal is about 60.90% while the contribution of hydel is about 23.7%. Similarly the percentage share of nuclear and renewable is about 12.40% and 3.0% respectively. Although Pakistan's share in global carbon emission is less than 1% in 2021, the global climate risk /vulnerability index 2021 by a think tank German-watch report marked Pakistan's position at number 8$^{th}$ among the ten most affected countries due to extreme weather events.

Pakistan has 168GW potential for renewable energy (Rafique & Rehman, 2017). Pakistan has remarkable potential to attach its home-grown renewables and energy-mix allocations to amplify and affirm energy security. Pakistan's geo-tropical location provides a nonstop supply of solar energy throughout the year. Similarly, Pakistan has an 1100 km coastal length with a high wind energy potential in Sindh and Baluchistan. Renewables have the capacity to increase energy security and decrease reliance on energy imports. There are numerous key barriers hampering the renewable energy deployment in Pakistan, such as outdated technology, financial risks, and market integration. This necessitates the analysis of domestic policies through the lens of international best practices to identify loopholes and provide necessary feedback on incentives for markets to make them functional.

## 1.2 Alternative and Renewable Energy Policy 2019

The first document of developing renewable energy policy was drafted in 2006, which accentuated small-scale hydro, solar photovoltaic, and wind projects in-country in the provision of sustainable energy supply based on energy security, self-reliance, social fairness, and economic returns. Later the midterm policy framework in 2011 was formulated as an extension of the previous renewable policy 2006 to get 5% of energy needs by the efficient use of renewables by 2025. The outline of the Alternative and Renewable Energy Policy 2019 has intended "to develop a favorable environment for sustainable, attainable and affordable renewable energy growth mechanism in Pakistan." Pakistan's energy prerequisites are being increased swiftly, up to 5% annually. The striving target of Alternative and Renewable Energy Policy 2019 is to increase the share of renewable resources in the total energy mix of the country up to 30% by 2030. The new policy envisaged that the renewables' share would have increased up to 25% and 30% of the total energy mix by 2025 and 2030, respectively, by accelerating the renewable energy resources using effective measures within the domain of policy, institutional, and implementation frameworks.

## 2. Literature Review

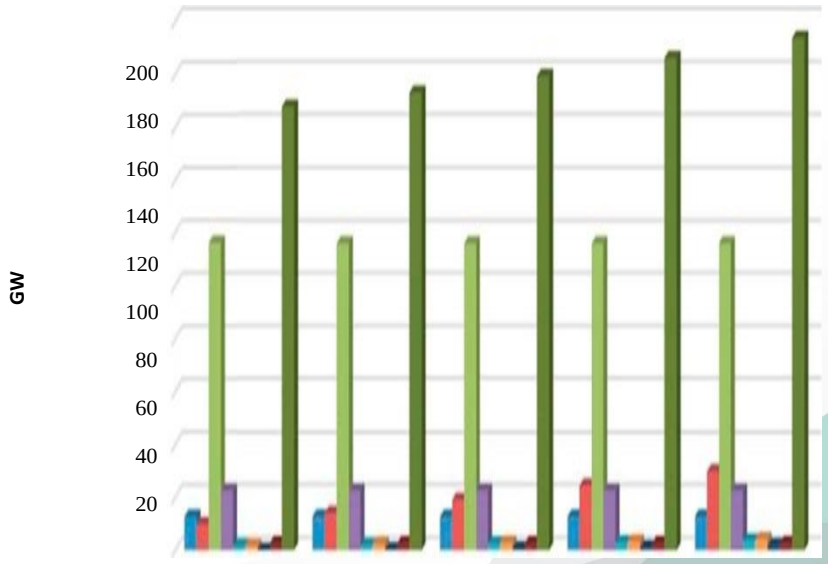
In Pakistan, there is an embryonic trend of renewable energy that has magnetized the interest of academia, policymakers, and other stakeholders. A new series of studies have anticipated the full potential of the renewable energy capacity of power generation in the country. The upcoming panorama of renewable energy has a total potential of 170GW, which is eight times extra than the real demand of 21GW of the country, a very hopeful and adequate to overcome the energy gap. Pakistan's energy system has a centerline network of grids because of hydropower generation for the agro-based economy. Many studies argue that the utilization of sustainable energy and vast resources of available renewables like wind, solar, biomass, and geothermal is the ultimate source to overcome the power and economic crisis in the country. Alternative and renewable energy policy 2019 is comparatively a new document in academia. Available literature has focused on technical and scientific aspects, and less notice has been paid to the policy angle of this public issue.

| | |
|---|---|
| Mazhar Hussain Baloch et al., 2019 | Hybrid energy is the solution to the power crisis in Pakistan |
| Farooqui, 2014 | Pakistan has a feasible potential of 50GW from wind and 30GW from Hydel |
| Wang and Solangi 2020 | Using SWOT and Fuzzy Analytical Hierarchy Process, identified a multi-perspective approach to economic, environmental, and technical factors that affect socio-political perspectives of renewable energy technologies in Pakistan. Energy demand is correlated with economic growth as it depends upon the factors like technological accessibility, life quality, real income, and economic structure. |
| Rehman, Cai, Mirjat, Walasai, & Nafees, 2019 | Using the PAK-TIMES model, explained the energy, economy, and environment nexus for electricity generation and recommended that investments in renewable energy technologies make low environmental costs possible |
| Ghafoor, Rehman, Munir, Ahmad, & Iqbal, 2016 | The current renewable energy status in-country is not significant and needs more research and development to utilize the existing potential |
| Kanwa, Khan, & Qasim Rauf, 2020 | A sustainable and decentralized power system is essential for the energy infrastructure in Pakistan |
| Hanif, Aziz, & Chaudhry, 2019 | To accelerate the investment trend in renewable technologies for carbon-free sustainable economic growth, the green bond market is being recommended as a valuable tool |
| Luqman, Ahmad, & Bakhsh, 2019 | Renewable and favorable nuclear energy consumption will bring robust effects on the economic growth of Pakistan in both small and extensive runs. |
| Farooq, Kumar, & Shrestha, 2013 | A policy for renewable energy generation on the basis of renewable portfolio standards up to 50% is substantial for the reduction in import dependence, fuel cost, climate mitigation, and increases the investments in the renewable sector |

| | |
|---|---|
| Aized, Shahid, Bhatti, Saleem, & Anandarajah, 2018 | To enter the Green Pakistan Scenario, renewable energy technologies are the least expensive options in addition to the least operational and externalities costs |
| Shah, Qureshi, Bhutto, & Shah, 2011 | Low awareness of the policies of renewable energy and science and technology in Pakistan as a key hurdle in attaining sustainable targets through renewable energy resources |
| Farooq et al., 2019 | Renewable energy depends upon the technical, geographical, economic, and practical potentials of renewable resources |
| Khan, Ali, & Ashfaq, 2018 | These plentiful renewable resources are ample to accomplish the energy demands of the whole world and to decrease carbon emissions |

For highly accurate, real-time, and validated data of solar, wind, and biomass mapping in Pakistan, the Alternate Energy Development Board (AEDB) has installed different weather stations funded by the World Bank's Energy Sector Management Assistance Program (ESMAP).

**A projected technical prospective of deferent renewables resources of energy for power generation in Pakistan, 2010–2050**




| Wind (grid connected) | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Solar PV (DCNT) | 13 | 13 | 13 | 13 | 13 |
| Solar PV (CNT) | 10 | 14 | 20 | 25 | 30 |
| Solar thermal (CNT) | 117 | 117 | 117 | 117 | 117 |
| Biomass (field residues) | 23 | 23 | 23 | 23 | 23 |
| Biomass (animal waste) | 2 | 2.5 | 3 | 3.3 | 4 |
| Biomass (MSW) | 2 | 3 | 3 | 3 | 4 |
| Small Hydro | 0.1 | 1 | 1 | 1 | 2 |
| Total | 3 | 3 | 3 | 3 | 3 |
| Wind (grid connected) | 170.1 | 176.5 | 183 | 188.3 | 196 |

## 3. Pakistan Policy Attempts in the Development of Renewable Energy Policy

The power and energy policies of Pakistan are marked with issues of policy inconsistency, implementation gaps, and lack of integrated energy planning (Mirjat et al., 2017). In 1985, the federal government first initiated a privacy policy as a preface step to attract the private sector GW 16 investments in electricity generation to overcome the monopoly of government organizations and unlock the alternative of renewable energy search.

### 3.1 Private Power Policy Framework 1994 and 1995 Hydel Power Policy Framework

First official and comprehensive investment-oriented power policy of Pakistan was introduced to allow the privately-owned power generation projects. The government, by using a public-private partnership (PPP), offered the 'Build, Own and Operate (BOO) model to the private investor. This policy was an important shift in diverse energy resources in-country. The policy was partially successful in the establishment of an indicative bulk tariff with indexation mechanisms for fuel and inflation, attractive financial and fiscal incentives, and a standardized security package. The policy had inconsistent implementation mechanisms in terms of capacity and location, fuel selection, and technology. The policy had no clear mechanism for the government to prioritize projects. The basis on which projects were selected and accorded attention, was not transparent and subjected to political influence, which led to perceptions of corruption. The policy failed in the case of hydropower plants and proved to be a liability and trap for the government. A key hitch of this policy was the use of furnace oil by a maximum number of IPP plants. Small number of power plants using natural gas resulted in increased generation costs and pollution (Rafique & Rehman, 2017). This policy document paid no attention to the alternative and renewable energy options.

### 3.2 New Private Independent Power Projects

It was introduced in July 1998, with a framework of competitive power market based on setting the minimum level tariff on a competitive process. The tax incentive was the same as in the 1994-95 policy, but this policy did not attract investments because of tight procedural risk. For renewable energy options in the country, this policy permitted the unsolicited bids for renewable sources and small hydro plants devoid of the requirements for competitive biddings.

### 3.3 Policy for Power Generation Projects 2002

It was in action with the key objectives of utilization and encouraging indigenous resource exploitation. The policy was more investor-friendly on unsolicited proposal actions, and competitive bidding was introduced. This policy showed thrust in the development of indigenous and renewable-based power projects.

### 3.4 Energy Security Action Plan 2005-2030

This plan was approved in 2005 to attain the basics of Pakistan's Vision 2030 of consistent and quality energy supply. The key objective of this plan was to enhance energy supply by optimal diversification of energy mix and utilize the indigenous and renewable resources to expand the combined share up to 30% by 2030.

### 3.5 Policy for Development of Renewable Energy for Power Generation

The Alternate energy development board drafted first comprehensive energy policy document (2006). It focused on the development of renewable energy sources and technologies like solar, wind, and small hydro projects up to 50MW in the country. The biomass and bio-fuels projects

were excluded from this policy. The policy framework was intended to shore up the macro and micro-level renewable energy projects. The policy targeted to increase the share of renewables up to 10% in the total energy mix by 2015. The policy framed a mechanism to assemble a local investment strategy in order to foster domestic technical skills and job prospects. The leading textures of this policy as a short-term framework were:

- Permission of investors from the private sector for independent power projects and off-grid power projects.
- The investor was being permitted to generate power at one place and be given the same to another place on the grid. The generation cost and the transmission charges were liable to the investors.
- The policy made obligations to the Central Power Purchasing Agency to purchase electricity on or after qualified renewable energy projects.
- With arrangements on a net basis, permit the net metering and billing.
- Tariff determination is based on a transparent principle.
- Policy fairly protects the investor from the peril of resource inconsistency.
- To avoid GHG emissions, introduce the carbon credits in renewable projects.

## 3.6 National Energy Conservation Policy 2006

It was initiated as a policy guideline to increase the end-use energy conservation and efficiency pertaining to energy, economy, and environment. On the renewable front, the policy focused on the promotion of cost-effective and feasible renewable resources and technologies like solar thermal, solar water heater, and solar desalinates. The policy objectives included fostering and developing energy conservation by regularization of the total energy management program for the promotion of sustainable growth.

## 3.7 National Policy for Power Cogeneration by Sugar Industry 2008

The Co-Gen policy was an independent and stand-alone policy notified in January 2008, based on the biogases, a stringy residue of sugarcane and highly environment friendly. The initiative of the Co-Gen policy was a reduction in the cost of energy and pollution under government clean and energy secure plans. The rationale of the Co-Gen policy was to make the sugar industry viable to add power to the national grid during the winter season (November-February) when the Hydel generation is at its lowest, using bagasse as a major fuel. The incentives offered in this policy for Co-generated projects were the same as for IPPs in renewable policy 2006.

## 3.8 National Energy Policy 2010-12

It was an era of load shedding and energy crisis in-country, which compelled the government to devise a short energy policy in April 2012. The policy's main concern was an energy conservation plan and short-term electricity generation through Rental Power Plants, as well as investments by IPPs.

## 3.9 Mid-term policy 2011

This policy was an extension of the short-term strategy of renewable energy development in 2006. The policy introduced incentive plans and opportunities for investor's attraction to increase the alternate and renewable energy deployment and promotion. The policy made comprehensive guidelines to attain the optimization level of the alternate and renewable energy projects explicitly in underdeveloped and remote areas through community participation giving socio-economic benefits. Special focus was made on increasing the institutional and technical

capacity of renewable energy technologies in the country. The policy recommended increasing the budget of research and development for the promotion of research in the renewable sector as well as for developing the domestic manufacturing market for alternate and renewable energy.

## 3.10 Policy Framework for Power Cogeneration Biomass and Bagasse 2013

On March 6, 2013, Economic Coordination Committee (ECC) approved an amendment in the mid-term renewable energy policy 2011 by the inclusion of biomass, bagasse, waste to energy, and bio-energy as sources of renewables. The power producers under this framework were given the choice of establishing the project as a separate entity or as part of existing sugar mills along with the choice of opting for upfront tariffs.

## 3.11 National Power Policy 2013

This policy had the vision to develop an efficient, consumer-centric power generation, transmission, and distribution system to attain the robust, sustainable cluster and affordable energy targets. To achieve aforesaid policy targets, the tools of efficiency, competition, and sustainability were used and emphasized on switching to indigenous cheaper fuels like coal and renewables.

## 3.12 Net Metering policy for Solar PV and Wind projects 2015

On September 1st, 2015, the National Electric Power Regulatory Authority NEPRA approved a net metering policy. The draft said, "Solar PV and wind generators of 1MW capacity are allowed to sell back the produced electricity to the national grid. The aim to implement net metering in the power shortage era is an injection merely for small-scale solar PV. The enterprises and residential sectors are going to get advantages by trading off surplus energy generation to their solar PV mechanism and adding back to the national grid.

## 3.13 Power Policy 2015

This policy was a replacement for Power Generation Projects Policy 2002, which offered profitable and better business incentives for thermal and large hydro development, greater than 50MW, investors through the simplified process under public-private partnership projects. The incentives included tax-free corporate income with no turnover, with-holding, and sales tax. The other incentives included only a 5% concessionary duty on imported plants.

## 3.14 Power Policy 2019

This policy has a portfolio of National Electricity Policy. This was firstly named as Alternative and renewable energy policy, but strangely enough, it was unexpectedly renamed National Electricity Policy 2020. The renewable target of 25% and 30% share in Alternative and Renewable Energy 2019 has not been mentioned in this power policy.

# 4. Methodology

This study adopts the qualitative approach of Marten Hajer's (2006) policy discourse analysis. Hajer (2006) is a systematic model of ten steps; desk research, helicopter interviews, document analysis, interviews with key players, identification of key incidents, analysis of practices in particular cases of argumentation, and interpretation. Hajer's view about the quality of public policy in the public domain was as explicit attention in a phase of joint deliberation. The discourse analysis has characteristics in the identification of loopholes to make policy robust and comprehensive. The rationale for applying the discourse for this research is to identify the

gaps during the review of the new inscribe Alternative and Renewable Energy Policy 2019 document to investigate the best path. With the given tool, the study elaborates the concerned policy by assessing its objectives, actions, tools, constraints, players, instruments, interventions, and integration to understand the chances of success and to pinpoint the elements of concern. Exploration of new trends in policy discourse revision will probably provoke an imperative approach to deal with renewable energy more practical.

# 5. Analysis

## 5.1 Desk Research

In this first and vital step, the prominent policy documents such as Alternative and Renewable Energy Policy 2019, Policy for Development of Renewable Energy for Power Generation 2006, Midterm Policy 2011, Net metering policy 2015, a report of IRENA named "Pakistan's Power Future; Renewable Energy Provides a More Diverse, Secure and Cost-Effective Alternative, Renewable Readiness Assessment: Pakistan 2018", and another report of IRENA named "Renewable Energy Policies in a Time of Transition," and the chronological background of renewable energy and succeeding developments in Pakistan, have been analyzed.

## 5.2 Helicopter interviews and synthesis

The rationale of helicopter interviews is to search out a general impression of Alternative and Renewable Energy Policy 2019 from multi-perspective opinions. As per Hajer (2006) framework, the four actors are identified for conduction of helicopter interviews from different backgrounds with diverse experiences like a key informed journalist of renewable energy, a key government official, a policy expert of renewable energy, and a technical expert of renewable energy technologies. All helicopter respondents have the consensus on some common points such as policy needs a comprehensive analysis to address the certain loopholes and shortcomings; policy measures are sufficient and on real grounds, but policy targets seem to be unrealistic. Respondents identified policy options of decentralized, off-grid solar, wind, and net metering solutions. Respondents' perspective on the policy framework was an initiative of policy intervention like financial and fiscal incentives will help to attract the private sector for the development of different renewable energy projects. Respondents have common views that Pakistan's Alternative and Renewable Energy Policy 2019 should align with the IRENA's three-fold strategy on energy, economy, and environment. Respondents rightly highlighted the key bottlenecks in policy like institutional red-tapism, no robust market mechanism for renewables, complex regulations, broken energy management, low awareness among masses about energy conservation, unskilled labor, poor infrastructure of transmission &distribution, and lack of technical expertise.

## 5.3 Document Analysis

After reading relevant policy documents in detail from a different perspective, we scrutinized that a comprehensive policy framework enfolds diverse themes like policy options, policy interventions, and policy tools to achieve the strategic policy objectives. It is important to understand that the spirit of this policy framework is very close to the IRENA's three-fold strategy of energy, economy, and environment.

## 5.4 Interviews with Key Players

To understand the alternate, in-depth interviews are very important in this aspect to get others' views of discussion. These interviews are different from the above-conducted helicopter

interviews as these interviews cover extracted themes from the policy document under policy, institutional, and implementation frameworks.

IRENA's report named "Pakistan's Power Future; Renewable Energy Provides a More Diverse, Secure and Cost-Effective Alternative, Renewable Readiness Assessment: Pakistan 2018" is an important policy guideline in the provision of technical assistance and best power options based on available renewable resources. This assessment report has significant worth in shaping policymaking, investment openings, and energy-related actions because there are 48 basic policy inaccuracies related to renewable energy development as a key barrier to sustainable development. The report describes how to devise an effective implementation mechanism for renewables to attain the strategic targets and improve the energy security in Pakistan. The report also highlighted the key policy tools like competitive bidding for innovative renewable projects, net metering for distribution of power generation, and infrastructural developments to increase institutional capability. This report comprehensively highlighted the existing grid infrastructure constraints and technical challenges and suggested the best option to reduce the costs to strengthen the renewable targets by inviting the private investors for off-grid and rural electrification.

## 5.5 Sites of Argumentation

Explored the insight of AEDB, which has the mandate of Alternative and Renewable Energy Policy formulation and renewables deployment and promotion directives. AEDB claimed that a comprehensive consultation process was made with all relevant stakeholders and attached departments before the formulation of the final draft. It also understood that the lack of technical and skilled human resources, was a major hurdle.

## 5.7 Analysis for Positioning Effects

The standpoint of policy experts working in different organizations, academia, and NGOs' persons, and journalists by conducting in-depth, comprehensive interviews along with structured questions on the policy framework, institutional framework, and implementation framework.

### 5.7.1 Renewable Energy Policy Framework

An inclusive policy framework is our first area of analysis. It is evident that the world is blessed with renewable resources; thus, a significant global trend of renewable energy policy framework has increasingly developed. Alternate and renewable is a sub-sector of national energy policy, and it should have a clear scheme and strategy. AEDB supported the view that alternate and renewable energy projects should be backed by political announcements and vision statements for the renewable energy policy landscape. Alternate and renewable energy projects framework must be based on matured technological and institutional settings, which are the key to the success of the policy. Global renewable technologies have gained matured status in world energy markets; thus, the global renewable policies have adopted the regulatory, fiscal and financial policy instruments for the promotion of renewable energy in their economics.

#### 5.7.1.1 Policy Tools

Globally, different policy instruments in terms of financial and regulations like administratively-set fed-in-tariff, premium, auctions, electric utility quotas and obligations, renewable portfolio standards, tax rebates, carbon credits, capital grants, and net metering, are being used in parallel to extend the renewable power generation and electricity deployments

through technological maturity. The policy instruments merely depend on the energy market and technological advancements. Therefore, the need for alternate and renewable energy projects is to standardize the economy with a sustainable development approach by attracting new investors and making a new competitive market of alternate and renewable energy technologies. A carbon dividend or carbon fee is a key to a consistent transition from electricity to energy as it is a tool to balance the financial impacts of fossil consumption expenses. To make a gradual increase in the taxes on fossil fuels consumption and as a result, the revenue is redistributed to taxpayers by dividends, rebates, tax reductions, and fixed payments. This policy tool can shift the investment trend from traditional fossils to innovative renewable energy solutions.

#### 5.7.1.2 Financial and Fiscal

Fiscal incentives such as tax credits and rebates have key importance in overcoming the financial constraints to renewable energy deployments and development. Fiscal and regulatory tools are being adopted to promote mature technologies from large-scale business installations to small-scale domestic renewable energy systems. Financial support for the initial deployment of renewables is important in the absence of local supply chains and regulatory frameworks. To complete the policy targets, there are always some financial and fiscal incentives in terms of policy support with the aim of attracting private investment. There is a need for rapid change in the dynamic renewable market by an increase in impressive investments set on the innovative business models to enhance the installed capacity in-country. The government shows a pledge in the policy document for the financial and fiscal incentives under the law of Pakistan. There should be a level playing field for renewable energy systems and deployments in the country. In Pakistan, the subsidies mechanism on fossil fuels has distorted the energy market because of a lack of transparency. To remove fossil fuel subsidies, there should be carbon pricing as a policy intervention, and it needs political will and governance because greater political aspiration is a must to accelerate the energy shift. The government should allow this subsidy to twist the renewable market from electricity to energy. Political will is major policy support and instrument to achieve policy targets and accelerate the momentum of energy transition.

A well-designed carbon pricing mechanism may drive the alternate and renewable energy technologies operation by internalizing various externalities of fossil fuels in the way to increase the relative cost of fossil fuels. The impact of carbon pricing varies by renewable technology and the energy sector, along with power market prices within trading systems and government regulations. The carbon pricing and carbon tax should be implemented to replicate the true cost of fossil fuel, increase in carbon emission, air pollution, and impacts on health quality. Climate mitigation is a key policy driver and rationale cited in the policy. To an extent, growth of renewable energy has been directly linked with decarburization. The carbon pricing initiatives include carbon taxes and a trading system. Carbon taxes and emission trading mechanisms are well-recognized policy incentives worldwide to persuade interest in low carbon. AEDB has given the mandate to promote, facilitate and support the alternate and renewable energy developers to apply the most successful approach in acquiring carbon credits by carbon crediting mechanism.

#### 5.7.1.3 Regulations

Policy identifies the impact of competitive bidding in lowering the tariffs. The policy suggests a simplification of regulations to remove the overlapping of regulatory subjects. To reduce timeframe, compliance cost, and regulatory fee, the licensing framework should be rational and simple. Policy advocates that NEPRA should remove entry barriers for non-utility

procurements consisting of prolonged and expensive steps like public hearings and technical descriptions of plant designs. The policy allows AEDB and provincial energy departments to conduct competitive public utilities bidding procurements for solar and wind projects and discontinues both upfront and cost-plus tariffs for established renewable technologies. NEPRA determines the tariff by considering the multiple features such as resource availability, capacity factor, equipment and financing cost, operation and management expenses, project construction period, and length of the energy purchase agreement.

#### 5.7.1.4 Auctions and Feed-in-Tariff

The policy suggested that the competitive procurement bidding of new renewable projects will be made by auctions on a yearly basis. Auction is centralized and competitive procurement of renewables from the government to government has emerged as a policy instrument driven by renewable prices, especially solar PV and wind. Auctions may also be considered to overcome unplanned outcomes that were ignored in previous power policies, like segregation of local participants and specific areas of project concentration. An auction based on a legal frame can guarantee transparency and commitment. The auction mechanism should be flexible to design tenders and to meet national renewable targets and multiple policy objectives further than giving agreements at low prices. The feed-in tariff is also a viable policy tool to support utility-scale renewable projects and provide stable income to generators. Feed-in tariffs may also use in technology and have high project development costs. Auctions are being used for large-scale projects and a feed-in tariff for small-scale projects.

#### 5.7.1.5 Net metering

Small scale renewable energy projects need policy support for grid access and remuneration for surplus electricity to feed into the grid. It is the primary mechanism case that has a special regulatory framework for renewables power generation. The net metering regulations make possible 33MW capacity so far. AEDB has a practical part in net-metering by approved installer certifications and rating services. In the near future, the increasing deployment of grid-connected net metering will lead to legal and political challenges and, as a result, will demand policy shift or revision.

#### 5.7.1.6 Policy options

New technologies and business models foster the renewable expanded energy access through the development of off-grid and stand-alone renewable energy markets. The policy recognizes the incredible options of mini-grids, off-grids, stand-alone decentralized energy systems, to attain the deployment of renewables in the country. The off-grid solution, in the form of solar power, has the most accepted and welcoming self-generation option. Mini-grids and local energy systems have a feature of independent operation to relieve the utility loads and are being adopted to cater to a cluster of consumers. Alternate and Renewable Energy Policy 2019 specifies the measures of regulatory support and leaves the solutions of reorientation from bulk power operation to the mini-grids and decentralized local energy systems to market operators and entrepreneurs. For this attractive purpose, a loan is a viable option. Governments may also act as financial intermediaries to help small enterprises in this sector. Microfinancing is another possible option to access energy markets for consumers to purchase clean energy markets. The policy has oversighted the incentives for captive power, a self-generation mode by industrial facilities. Globally captive power has gained the rise in trend to initiate the alternate and renewable energy technologies for large industries, businesses, and offices. In Pakistan, it is an unaddressed and unregulated renewable option for bulk power consumers owned by federal procurement utilities. To attract and influence the decisions of private sector investment, policy

consistency and inevitability are significant actions. To decrease the cost, NEPRA should set up benchmark tariffs for solar and wind projects based on competitive bidding.

#### 5.7.1.7 Policy interventions

Tax exemptions on imports break the hindrance in the local equipment development. The policy shows intentions to engage the Chamber of Commerce and Industries to make a domestic renewable market and promote the local industry by injecting a more skilled and technical workforce. To withdraw taxes and import duties' exemption on plants and machinery, the policy demands such interventions from FBR at the request of AEDB. The incentives remain mute for local investors to manufacture alternative and renewable energy technologies. The respondent assured that AEDB supports the proactive measures and intervenes to remove such tax anomalies that create discrimination against local industries.

#### 5.7.1.9 Policy Integration

Renewable energy technologies have expected support from climate policy targeting mitigation and adaptation. A specific target of Alternative and Renewable Energy Policy 2019 is to secure clean and eco-friendly energy through emission reductions. Development of renewable energy has wide implications for the energy sector alone, and energy policy must be sinking of security policy, economic policy, climate policy, national energy conservation policy, trade policy, industrial policy, and education policy. It should allege capacity building to enhance the multi-benefits of local value chains' development and job creations.

### 5.7.2 Institutional framework

The implementation of Alternative and Renewable Energy Policy 2019 requires a specific and comprehensive institutional framework under defined national parameters. The institutional frame of the energy sector in Pakistan has a complex network encompassing AEDB and transmission and distribution utilities, power system regulators, federal and provincial energy departments, power project developers, development partners, and technical, financial and technological departments. This complex network of energy infrastructure comprises different institutions from generation to consumption that has deficient functional and technical compatibilities. Indigenous renewable technology development, institutional infrastructure, and capacity building are the challenges of alternate renewable energy technologies in Pakistan. AEDB has the status of the focal institution in the development of alternate renewable energy technologies in the country. The board is dedicated to extending its proactive role in coordination, information, regulation, intervention, and supporting the alternative renewable energy technologies for off-grid, mini-grid, localized energy systems, B2B, wheeling, net-metering, municipal authorities, and entrepreneurs. There are institutional flaws, and such an irrational overlapping in functions in institutional arrangements of energy departments. They lack financial and technical resources and are low in infrastructural and professional human skilled force. The policy lacks the underpinned resource renewable energy data. AEDB should produce and publish comprehensive renewable resource data based on international standards and statics. The resource data is helpful in designing specific policy measures and deployment costs. Improved and reliable data is important in the assessing the progress of action plans and strategic energy objectives, as well as for the impact evaluation of the effectiveness of policy measures and tools. The role of AEDB should be an active change agent and make progressive interventions for the promotion, penetration, and indigestions of renewable energy technologies. The lack of a skilled and untrained workforce is a major hurdle in the implementation of renewable energy policy. The policy highlighted the importance of trained and skilled labor in the deployment of renewable technologies. It guided the AEDB to establish

a financially self-sustaining institute of renewable technologies under the institutional framework and its sub-campuses across the country with the cosponsor of academic and industrial stakeholders. The aim of the institute is to encourage the research activities of renewable energy technologies for commercial operations and to create a need base and trained job market. In the true democratic societies across the globe, the institutions under the control of municipal authorities have legitimate and financially empowered status in order to deal with the civic and environmental concerns in parallel through a public-private partnership program. But in Pakistan, the municipal institutions have never gained a strong position because of lacking in a weak institutional framework and lack of political will. The policy is given holistic support that municipal departments may work by public-private moods in alternate and renewable energy projects like solar parking, street lights, schools, mosques, and basic health units lighting, and projects of waste to energy. The policy has given the task to AEDB to design competitive procurement schemes for municipal bodies and may offer assistance in structuring projects on demand. NEPRA will also be entertaining the licensing and tariff regime under the regulatory framework.

### 5.7.3 Implementation Framework

AEDB informant said that before the 18th amendment, the power generation, transmission, and distribution was the sole responsibility of the federal government by WAPDA. But after the devolution plan of the 18th amendment, under article 157 of the constitution, all provinces are empowered in devising their own policy, plan, and infrastructural arrangements. Provinces are allowed to develop power generation projects on their own, transmission and distribution line up free from NTDC/DISCOs, and tariff adjustments if alternate and renewable energy projects are not added to the national grid. The provincial energy departments and allied agencies have the benefit of direct contracts with alternate and renewable energy project developers with complete financial autonomy. In the competitive bidding process of federal procured utilities, the provinces will participate by making members of the AEDB and steering committee; facilitate the bidding process by making land available in their own boundaries to incentivize the location of alternate and renewable energy projects. The respondent from AEDB said that the policy announces a foremost directional shift by setting up of practical steering committee for smooth coordination among all federating units and key stakeholders of energy management and operation in the country. The steering committee performs its function as a sub-committee of AEDB. The structure of the committee comprises following

i. An additional secretary of the Ministry of Energy
ii. CEO AEDB
iii. Provinces Energy Secretaries
iv. CEO Market operator
v. CEO System operator

The mandate of the steering committee is to prepare reliable operating procedures allied with the Alternative and Renewable Energy Policy 2019. The committee will also be responsible for preparing a current provisional year renewable energy procurement plan for the fiscal year by 30th September of such year and submitting it to the board for approval. In the future, a system approach policy framework will be needed to develop a well cooperated and fully integrated national energy plan focusing on the renewable energy sector incorporating infrastructural support. The ownership frame of the power market in the country, the available renewable resources across the provinces, and constitutional powers that provincial governments have, will put emphasis on integrated energy planning. The integrated energy

plan will provide an analysis of policy options like future technological settings, capacity building, resource supplies, and energy balances of demand and supply sectors and also make the competitive bidding process more efficient and sounder. The design of the implementation mechanism should be on a collaborative basis with the involvement of public and private sector stakeholders.

## 5.8 Interpretation

Followings are the keynotes and understanding of this discourse.

i. The policy lacks long-term targets that may provide a clear trend and vision to the market and industry. The long-term targets have a high dependence on the political will and always need policy actions for proper implementation. To achieve the policy measures stated in the draft, there is a need for complete collaboration and broad consensus among all energy stakeholders and agencies.

## 5.9 Policy Framework

ii. The policy recommends different tools, but each has its own strength and limitations. Auctions are flexible in design with a perspective of actual price innovation, but on the other hand, they involve the risk of underbidding and driving small and new competitors out of the market. The financial and fiscal incentives improve technological affordability and assist in overcoming the investment barriers. But due to frequent political priorities, there are possible variations in incentive support.

iii. Feed in-tariff and premium enable market incorporation of renewable energy and provide an incentive to small-scale projects to generate electricity with low supply. The challenges include setting and adjusting tariffs when the cost structure varies robustly. Net metering has the potential to offer savings both to the consumers and the system and also provides support in the reduction of transmission and distribution losses. It has the risk that tariffs may not correctly determine the real value of electricity at each site and period.

iv. Policy or plan should be designed with the aim to overcome the key barriers such as the high cost of new technologies, insufficient energy infrastructure, and sustainability of the energy system. The policy should push, encourage and improve the understanding of decisions for integrated energy plans among all stakeholders of the energy system.

## 5.10 Institutional Framework

v. Policy is impressive in introducing different policy instruments for successful and efficient renewable deployment in the country. But on the other hand, a number of barriers have been found in policy documents. Policy highlighted the lack of skilled workforce and training programs but ignored the importance of reliable data and information about renewables function, operation, maintenance, development, and performance. Thus, policy has overlooked awareness and capacity barriers. Similarly, environmental features and an unsuitable location of the project or without public acceptance and involvement, the renewable project may rise in cost or be delayed and even canceled. The policy also sighted the public acceptance and environmental barriers.

vi. NEPRA has introduced auctions as a policy instrument. The policy did not highlight the regulatory barriers of auctions and left the broad framework for NEPRA's role. The monopolistic role of NEPRA is highly condemned by a few of our respondents.

vii. All respondents agreed that policy lacks empirical data. For example, the policy suggests that carbon taxes can offer price signals and are important in externalities reduction, but implementation remains a challenge in competitive extensive energy markets and demand for tax exemptions.

## 5.11 Implementation Framework

viii. Alternative and Renewable Energy Policy 2019 needs a commitment that relates to the institutional aspect in a way that policy vision should come from premier hierarchal ranks with a clear implementation mechanism. Successful implementation of policy is hard because of ill institutional practices, absence of a political will, outdated technologies, untrained and unskilled human resources, and financial constraints.

ix. After the 18th amendment, the constitutional powers of provinces, the power market structure, and the renewable resources stretched across all the provinces, emphasized that there is a need for time to develop an integrated and well-cooperated energy development plan based on a comprehensive cost-benefit analysis of social, economic and environmental paradigm of renewables deployment in Pakistan. For this purpose the steering committee should come forward and play its active role by engaging all stakeholders from the provinces.

x. Community involvement through municipal bodies is a best practice to gain public support for renewables. Policy persuades the individual ownerships and profit-sharing mechanism from renewables.

# 6. Conclusion

The formulation of the Alternative and Renewable Energy Policy 2019 is a robust and remarkable step of the government of Pakistan in the adoption of renewable energy technologies for affordable energy to gain the momentum of sustainable economic growth and tackle the climate challenges. The document focused on the adoption and promotion of policy measures for the deployment and development of all alternative and renewable technologies and sources, primarily solar, wind, biogas, small hydro, geothermal, and solid waste. Policy acknowledged improvement of institution's role and capacity in terms of skills and training to human resources collaborated with international donors as it is highlighted that there is lack of skilled workforce and training programs in the renewable energy sector. The policy ignores the importance of reliable empirical data and information about renewables' function, operation, maintenance, development, and performance. Alternative and Renewable Energy Policy 2019 is in the implementation phase but without a robust implementation mechanism.

## 6.1 Recommendations

Some improvements of Alternative and Renewable Energy Policy 2019 based on this discourse are presented below:

- The policy demands comprehensive research work and analysis from researchers covering all perspectives of economic, technical, and social processes on rational grounds in identifying certain loopholes and shortcomings to improve the status of Alternative and Renewable Energy Policy 2019.
- Public awareness programs should be designed to educate the end-users of electricity about the benefits of renewables, their impacts on communities-development, local economics, emission reduction, air quality, and climate resilience with the support of media campaigns.

- Policies should be transparent and stable. To push the mainstream renewables in the energy market, the set targets in policy should be realistic, well defined, legitimate, and time-bounded with self-enforcement implementing mechanisms to translate into projects.
- As analyzed that policy oversights the market structure and mechanism for the renewable energy sector, there should be a proper market design that encourages competition, innovation, and investments in the renewable energy sector.
- This discourse analyzed that there is a lack of empirical data. AEDB should publish comprehensive renewable energy data on the basis of resources, technologies, costs, and policy mechanisms with the collaboration of international energy statistics.
- HRD should be initiated by the introduction of RET courses at all levels of education from secondary to post-graduation, along with innovative base salaries for the RET's professionals.
- Renewable portfolio standards (RPS) are one of the best regulatory tools that should be practiced in the country, along with its analysis of energy, economy, and environmental implications.

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