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## Scaling-up Wind Power Deployment for Sustainable Energy Infrastructure in Pakistan

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### **Abstract:**

The role of electric power in socio-economic development of a country is widely acknowledged. This study analyses the potential lying in wind power technology to develop sustainable energy infrastructure in Pakistan and critically examines the barriers that have impeded the growth of wind energy market in the country, albeit the private sector is highly incentivized. The existing literature on global wind energy policies identifies the barriers existing in different markets and suggests mitigating policy tools. The literature on Pakistan's wind energy market follows a similar approach, but falls short of offering policy tools and hence assisting the policy-makers. This study intends to fill this gap through introducing the public and private sector's perspectives and contribute to the on-going energy policy debate in the country. It concludes that the support mechanisms offered by Pakistani Government are sufficient; however, government's inability to effectively implement these policy tools has become a major barrier. The study offers policy measures to overcome these barriers and contributes to the existing literature about Pakistan. It further contributes to the global energy policy discourse, and underlines the need for a supportive role by multilateral agencies, such as UN, to direct their resources in partnering with the developing countries' governments and help them expanding their institutional and absorptive capacities to encourage private sector participation.

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### **Key Words:**

Renewable Energy Policy, Sustainability, Private Infrastructure, Pakistan

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World Wind Energy Association

## **Fostering Wind Power Deployment for Sustainable Energy Infrastructure in Pakistan**

Sohaib Malik\*

### **Introduction**

Pakistan has been harnessing its abundantly available renewable power generation resources for last many decades. The hydropower generation has been a key component of the country's power generation mix. To overcome growing energy demands the country envisioned a program for renewable energies commercialisation in 1980's, termed as "a major effort in the field of renewables by the World Bank (Hagler Bailly Pakistan, 2003, pp. 2-3). However, it was not before 2006 that the country realised the need for devising a comprehensive policy framework to promote renewable energy technologies (RET) through private sector participation in the country.

The "Policy for Development of Renewable Energy for Power Generation 2006" (hereinafter RE Policy 2006) offered guaranteed grid connectivity and tariffs along with multiple financial and fiscal incentives. The policy aiming "energy security, economic benefits, social equity, and environmental protection"<sup>1</sup> has fallen short of achieving any of its renewable energy deployment targets. For instance, the Alternative Energy Development Board of Pakistan (AEDB), the agency endowed with the responsibility of RETs promotion in the country through the private sector participation, set a target of 880<sup>2</sup> megawatt (MW) to be connected to the national grid by December 2012. Contrary to that, there was not a single megawatt of power generation capacity interconnected to the grid within the stipulated time through employing RETs as targeted through the RE Policy 2006.

This study engages in a discussion to analyse the sufficiency, or a lack thereof, of Pakistan's RE Policy 2006 incentives to promote RETs in the country through comparing it with the world's leading wind energy markets' policies. After this analysis it gathers perspectives from public and private sector decision-makers and investigates the barriers that have confined the wind energy market to a nascent stage. Based on this analysis, the study intends assisting the public policymakers through quantifying the seriousness of each barrier and proposes policy tools in a prioritised manner.

### **1. Problem Statement**

The RE Policy 2006 offers a comprehensive policy framework for the promotion of RETs in the country. The policy is unique in its nature as it recognized RETs' importance and

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<sup>1</sup> The RE Policy notes these four strategic objectives to be achieved through the promotion of RETs.

<sup>2</sup> This figure denotes the target only for wind power set by the Alternative Energy Development Board. There are no specific targets set for solar, small hydro, or biomass. The small-hydro projects with capacity less than 50 MW have become the provincial governments' responsibility, instead of AEDB.

targeted their deployment for the country's increasing energy demand. It incentivized the private sector and set an ambitious target of 9,700 Megawatts (MW) power generation, 10 percent of country's total electricity demand, through RETs by 2030 (Government of Pakistan, 2006). The policy clearly defines modalities and elaborates means to achieve this target. The stated strategic policy objectives are to achieve; energy security, economic benefits, social equity, and environmental protection. The road-map is designed in a 'phased and evolutionary' manner and is divided into short-term, medium-term, and long-term phases. Institutional roles and responsibilities of various government departments are well defined to ensure smooth working of the support mechanisms. For investors, incentives include financial and fiscal benefits along with sovereign guarantees. More importantly, as these incentives are generally believed to be instrumental in RETs deployment in the power infrastructure, the government promised; guaranteed prices for generated power, grid connectivity, and sovereign guarantees.

This holistic approach was believed to deliver the desired results and meet the RET development targets. Even though well-targeted, strategically designed, and offering 'liberal' incentives to the private sector, the policy fell far short of its targets. Contrary to the targeted deployment of 880 MW by 2012 only two projects with a cumulative capacity of 105.9 MW have been completed and are connected to the national grid.<sup>3</sup>

There is an increasing consensus among researchers, investors, and national and international policymakers that policies, such as guaranteed payments, access to the grid, and sovereign guarantees, would mobilize private capital to meet world's ever-increasing energy demand in a sustainable manner. Furthermore, it is also generally believed to be a pragmatic choice to eradicate energy poverty and infrastructure problems in the developing world. However, the case of Pakistan demonstrates somehow a different narrative. It gives an impression that even putting these support mechanisms in place is not a sufficient condition; it might be a necessary condition though.

It is noteworthy that the RE Policy 2006 successfully attracted investors' interest. In fact, there are more than 40 investors (used interchangeably with 'project developers'), mostly domestic, who requested and have been issued 'Letters of Intent' (LOI) by Alternative Energy Development Board (AEDB)<sup>4</sup>. The proposed total capacity of these projects is 2,982 MW. This is nearly 50 percent of the country's present electricity shortfall of more than 5,000 MW (NEPRA, 2014). Instead of offering an optimistic outlook, it further exacerbates the situation because the private sector is willing to invest and the support mechanisms are in place; however, after six years of policy implementation, the policy outcomes are less than satisfactory. This perplexing scenario solicits for researchers and policymakers' concerns and lends itself for an academic probe and policy evaluation exercise.

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<sup>3</sup> This is according to the "Projects Status Report" obtained from AEDB.

<sup>4</sup> AEDB is solely responsible for RETs deployment in the country. It is designated to work as one-window facility for processing RE projects (for all capacity sizes, except hydel projects larger than 50 MW)

## 2. Research Questions:

This study intends to answer the following research questions:

- a) Is wind energy sector in Pakistan facing different barriers than normally faced by other countries? If yes, what are those barriers?
- b) If the wind energy sector in Pakistan faces similar barriers like other developing countries; then, why the support mechanisms offered through RE Policy 2006 – generally believed to be instrumental to overcome these barriers – have become less effective in Pakistan?
- c) How can Pakistan's existing public policies and support mechanisms be adapted to solve the problems faced by the wind energy sector in Pakistan?

## 3. Analysing Support Mechanisms for Wind Energy Promotion

The blueprint for a perfect RE market support mechanism is non-existent. Therefore, the governments generally tailor policies to meet their requirements. There exist some policy tools that are believed to be relatively more effective. Feed-in Tariffs<sup>5</sup> (FiT), for example, is among those incentives; 71 countries and 28 provinces/states have adopted one or another form of FiT to promote RETs (REN21, 2013, p. 72). However, its effectiveness is closely linked with other policy instruments such as guaranteed grid access, smooth administrative process, legal security, and a stable macroeconomic environment. For instance, one of Europe's highest FiT rates offered by Greece proved less favorable in an unfavorable macroeconomic environment (IRENA/GWEC, 2012, p. 24). Similarly, Portuguese and Spanish wind energy markets considerably slowed down due to economic stagnation (GWEC, 2013).

This framework provides a basis to analyse Pakistan's RE Policy 2006. In prima-facie, RE Policy 2006 seems to have proactively mitigated risks through offering several incentives, expected at different stages of the RE market development. Table 1 summarizes the incentives offered by Pakistan and compares them with the tools adopted by other governments in well-functioning wind energy markets. These policy tools adopted in other countries might not have ensured the perfection of support mechanisms for enabling REs' market development; however, their instrumental role is difficult to deny (IRENA/GWEC, 2012).

It is intriguing to observe that the RE Policy 2006 offers incentives considered necessary – it steps further in offering risk covers against uncontrollable and unconventional risks, e.g. wind resource variability. One can rightly invoke the “macroeconomic instability” argument here. Nonetheless, the economy grew at a modest rate of 3.6 percent annually from FY2006-07 to FY2012-13 (Ministry of Finance, 2013). Furthermore, taking into account the dire need of developing energy sources, it seems less convincing that the government has given less

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<sup>5</sup> Feed-in Tariff is a price-setting mechanism under which, governments set prices often at a premium for different RE sources and utilities are required to purchase power from producers at these tariffs (Zhang, 2013).



than required importance to this sector. This perplexing situation validates the need for a study examining the factors that have stultified governmental efforts and are depriving the wind energy market of an excellent opportunity to transform itself from the nascent to a well-functioning stage.

#### 4. Literature Review

The power sector is a key component of infrastructure facilities. The amount of resources required to ensure access to modern electricity services to the masses in developing countries remains a key challenge for the governments. There are an estimated 1.3 billion people without access to electricity (Trimble, Yoshida, & Saqib, 2011) with an overall 76.1 per cent electrification rate in the developing world (IEA, 2013). This lack of resources limits the potential of economic growth and hence poverty reduction in the developing world. To overcome this problem, the governments started joining hands with the private sector in the 1990s to ensure the provision of infrastructural facilities, including energy, telecommunications, transport, and water & sewerage. It is pertinent that the governments have to put in place an effective regulatory framework to protect the interests of consumers due to inherent monopolistic nature of many infrastructure project (World Bank, 2004), especially electric power sector (Gomez-Ibanez J. A., 2006), along with offering acceptable incentives to the private sector. Therefore the governments must strike a balance to create a win-win situation for both the consumers and the investors.

**Table 1 A comparison between RE support policies in Pakistan and leading wind energy markets<sup>††</sup>**

		China	Denmark	India	Germany	Turkey	Pakistan
Regulatory Policy & Targets	Feed-in Tariff or Premium Payment	✓	✓	✓	✓	✓	✓
	Renewable Energy Targets (binding or indicative)	✓	✓	✓	✓	✓	✓
	Net Metering	-	✓	✓	-	-	✓
	Tradable RE Certificate or Carbon Credits	-	✓	✓	-	-	✓
	Electric Utility Quota Obligation or RPS	✓	-	✓	-	-	-
	Priority Access to the Grid and/or Power Purchase Guarantees	✓	✓	-	✓	-	✓
Fiscal Incentives	Capital Subsidy, Grant, or Rebate	✓	✓	✓	✓	✓	✓
	Reduction in Taxes (e.g. Import Duties, VAT, Sales)	✓	✓	✓	✓	-	✓
	Investment or Production Tax Credits	-	-	✓	✓	-	-
Public Financing	Public Investment, Loans, or Grants	✓	✓	✓	✓	✓	✓
	Public Competitive Bidding or Tendering	✓	✓	✓	-	-	-

In addition to these incentives RE Policy 2006 offers incentives such as repatriation of equity in US \$, cover against risks including wind resource availability risk, political risk, exchange rate risk, and a one-window-processing facility to remove administrative barriers. AEDB is designated to provide "one-window-facilities."

<sup>††</sup> Turkey would hardly qualify to be categorised in the "league of leading wind energy markets," however its market's characteristics are similar with Pakistan. One most prominent commonality is a lack of an advanced domestic wind turbine manufacturing industry, which makes it a good case to compare with.

Source: REN21 (2013), IRENA/GWEC (2012), Saidur *et al.* (2010), RE Policy 2006 (GoP 2006), with input from Mr. Irfan Yusuf (Deputy Director, AEDB Pakistan)

### (i) Reviewing Challenges for Private Infrastructure Projects

What kind of incentives would be able to attract the private sector investments remain a key question due to the heterogeneous nature of infrastructure facilities (Prud'homme, 2004). Different infrastructure projects would require sector-specific incentives. There are however some conditions which are considered necessary for infrastructure projects in general. Table 2 summarises such conditions.

Following this framework for the private sector facilitation there come sector-specific incentives for the electric power sector and then for the wind power deployment. Wind power technology, being an innovation that needs to be diffused at macro level, does not only require incentives but faces various barriers that needs to be overcome through the government's proactive approach. This is because of the fact that the existing electric power systems are regarded as "*Large Technical Systems*" (LTS) which are a combination of multiple firms engaged in a vertically-linked system (Markard & Truffer, 2006). Therefore, any step toward promoting wind power technology has to undertake the importance of the interdependency of different components of the electric power system and its sub-sectors (Hughes, 1987), which might undermine these steps if not addressed appropriately.

The challenges faced by the wind energy sector are thus multifaceted. On one hand, the

Table 2 - Necessary conditions for a favourable policy framework for private infrastructure provision	
Pargal (2003)	After examining the determinants of the private sector investment in nine large Latin American countries, Pargal (2003) concludes that <u>the passage of the legislation liberalising the investment regime</u> was the most important policy tool. Furthermore, the presence of an <u>independent and credible regulator</u> strengthens investor's confidence.
Lamech & Saeed (2003)	Lamech and Saeed (2003) conducted a survey to evaluate preferences of the international investors investing in developing countries' power sector. The <u>legal framework defining the rights and obligations</u> of the private sector is ranked the most important priority for investors. The second and third most important priority include <u>legal enforceability of contracts</u> and <u>government or multilateral agencies' guarantees</u> .
Henisz (2002)	Henisz (2002) argues that the presence of a <u>credible and consistent policy framework</u> is the most decisive factor. According to him, its absence in the market would cause extreme disadvantage for the respective country, and socio-economic, demographic, or policy-related factors would become irrelevant to foster diffusion and infrastructure investments.
Alexander & Harris (2001)	Alexander & Harris (2001) asserts a <u>clearly defined policy for tariff determination</u> is important for investors. It is further noted that the governments can introduce an incentive-based revenue & cost pass-through hybrid methodology for this purpose and this could help to increase efficiency.
Wells (1999); Lovei & McKechine (2000)	Some general conditions like <u>managing higher non-commercial risks</u> (Wells, 1999) and <u>controlling higher corruption</u> (Lovei & McKechine, 2000) are also believed to be taken care of while drafting liberalisation legislation and engineering institutional framework.



governments need to create an enabling environment for the private sector participation for the provision of infrastructure. On the other hand, they need to devise policy mechanisms that can eliminate barriers faced by wind energy projects. The literature dealing with the deployment of RETs has been widely discussing the barriers that are hindering the progress of these technologies in different parts of the world and offers insights about various policy tools to overcome these barriers. Table 3 summarises these studies that have identified different barriers in wind energy markets. These barriers include policy, institutional, regulatory, information & technology, financial & investment risk, and market related barriers.

Initially, policy mechanisms to promote wind energy were altogether absent. With the passage of time, the governments heeded the need for promoting this technology and started offering different sets of policy tools. It has been noted that to devise an effective policy mechanism the principles of careful designing and transparency must be adhered to (Wiser & Pickle, 1998; Luethi & Praesler, 2011). The institutional barriers refer to the administrative capacity limitations of the government agencies endowed with the responsibility of policy implementation. There is overwhelming evidence in the studies reviewed below about the need for establishing specialised institutes with clear mandate and sufficient administrative capacities through trained personnel etc. The absence of an independent and credible regulatory body needs to be replaced with such a body that operates in a well-defined framework.

The capital intensive nature of wind energy requires higher capital expenditures when compared with their conventional counterparts. The situation is exacerbated due to higher political and country risks in developing countries. The mitigation strategies suggested for these risks guaranteed payments to the private sector power producers (DBCCA, 2011; World Bank/Climate Investment Funds, 2013) and sovereign guarantees (de Jagir & Rathmann, 2008). Lack of skilled labour and technical know-how is another serious barrier which can be possibly eliminated through skill development programs and awareness campaigns. The market related barriers remain widely observed barriers in different wind energy markets, be it a nascent or a mature market. For instance, lack of grid interconnection and power evacuation facilities have been noted to be serious bottlenecks for further expansion of wind energy markets in countries like Germany and China (GWEC, 2013). Therefore, the governments need to develop or upgrade grid infrastructures that can integrate additionally produced wind power.

It is noteworthy that despite having visible consensus about the nature of the barriers and the need to eliminate them, a blueprint of mitigation tools and their effectiveness remain a contentious matter among the scholarship (Friebe, 2012). And therefore researchers advocate a customized approach of policy making. Feed-in Tariff (FiT), for example, was argued as the most lucrative incentive and a precondition for the investors in Europe (Fouquet & Johansson, 2008). However, China, India, and South Africa are believed to have developed wind energy markets in the absence of FiT (Becker & Fischer, 2013). What has been more

<b>Table 3 - Identifying Barriers and Support Mechanisms in Wind Energy Markets</b>		
<b>Barrier Category</b>	<b>Description</b>	<b>Proposed Support Mechanisms</b>
<b>Policy Barriers</b>	<ul style="list-style-type: none"> <li>• Uncertain and inconsistent government policies (PN, UN)</li> <li>• Lack of transparency in government policies (UN)</li> </ul>	<ul style="list-style-type: none"> <li>• Strong government commitment with set targets (PN, SC)</li> <li>• Predictable and transparent policy framework (IEA, UN)</li> </ul>
<b>Institutional Barriers</b>	<ul style="list-style-type: none"> <li>• Lack of dedicated institutions (PN, UN)</li> <li>• Administrative hurdles and authorisation delays (IEA, UN, UNDP)</li> <li>• Unclear and overlapping institutional responsibilities and mandates (UN, UNDP)</li> <li>• Lack of experience in policy implementation (UN)</li> </ul>	<ul style="list-style-type: none"> <li>• Establish specialised agencies with clearly defined responsibilities and mandates (PN, DL, UN, UNDP)</li> <li>• Policy training and awareness about international best practises for public administrators (PN, UN)</li> <li>• Monitoring of policy impacts and incorporating lessons for institutional learning (UN)</li> </ul>
<b>Regulatory Barriers</b>	<ul style="list-style-type: none"> <li>• Lack of regulatory or institutional framework (PN, DL)</li> </ul>	<ul style="list-style-type: none"> <li>• Setting up independent and credible regulatory bodies (PN)</li> <li>• Developing appropriate regulatory frameworks (UN)</li> </ul>
<b>Information &amp; Technology Barriers</b>	<ul style="list-style-type: none"> <li>• Lack of information/awareness (PN, SC, UNEP, UN)</li> <li>• Lack of skilled work force (IEA, DL, UN)</li> <li>• Lack of standards &amp; codes (PN, DL)</li> <li>• Lack of social acceptance (PN, IEA, UN)</li> <li>• Lack of reliable wind resource data (UNEP)</li> </ul>	<ul style="list-style-type: none"> <li>• Skill development programmes by governments (PN)</li> <li>• Standardisation of wind technology (PN)</li> <li>• Information and awareness campaigns (PN)</li> <li>• Public promotion of R&amp;D (SC)</li> </ul>

<b>Financial &amp; Investment Risk Barriers</b>	<ul style="list-style-type: none"> <li>• Higher capital costs for wind power projects (PN)</li> <li>• Inadequate availability of financial resources (PN, DL, UN)</li> <li>• Capital intensive technology (UNEP)</li> <li>• Lower financial &amp; fiscal incentives (DL)</li> </ul>	<ul style="list-style-type: none"> <li>• Capital subsidies (PN)</li> <li>• Minimum level of guaranteed remuneration for wind power projects (e.g. FiT) (IEA, SC, UNEP)</li> <li>• Fiscal concessions (SC, DL, UNEP, UN, UNDP)</li> <li>• Provision of finance from local and international sources and development banks loans (UNEP, UN, UNDP)</li> <li>• Government / multilateral agencies' guarantees and insurances for country and political risks (UNEP, UNDP)</li> <li>• Mobilise financial resources of institutional investors like pension funds etc. (DL)</li> </ul>
<b>Market Related Barriers</b>	<ul style="list-style-type: none"> <li>• Poor electricity infrastructure &amp; grid access (PN, IEA, SC, DL, UN)</li> <li>• Integration issues into current energy systems (UN)</li> <li>• Highly centralised &amp; monopolised energy market design (PN, IEA)</li> <li>• Favourable treatment &amp; subsidies for fossil-fuel based generation (PN, SC, UNEP, DL)</li> </ul>	<ul style="list-style-type: none"> <li>• Guaranteed grid access &amp; deregulated energy market (PN)</li> <li>• Setting wind power quotas for energymarket (DL, UNEP)</li> <li>• Determine price of carbon emissions caused by fossil-fuel based generation (UNEP)</li> <li>• Cross-subsidise wind power and phase-out subsidies for fossil-fuel-based sources (DL)</li> </ul>
<p>PN denotes Painuly(2001); the study analyzes barriers and suggests measures irrespective of technology or a country.</p> <p>IEA denotes IEA/OECD (2008); the study analyzes barriers for all RETs in OECD and BRICS countries and suggests measures.</p> <p>SC denotes Sovacool (2010); the study analyzes barriers for all RETs in Southeast Asian markets and suggests measures.</p> <p>UNEP denotes UNEP (2012); the study focuses on Sub-Saharan Africa, and analyses barriers for all RETs and suggests measures.</p> <p>DL denotes Dulal <i>et al.</i>, (2013); the study focuses on Asian RETs markets, identifies barriers, and suggests measures.</p> <p>UN denotes UN/IEA (2013); the study analyzes barriers &amp; suggests measures to achieve universal access to electricity by 2030.</p> <p>UNDP denotes UNDP (2013); the study identifies barriers and how they inflate RET costs in developing countries, and suggests measures</p>		

important in this regard is not the existence or absence of FiT mechanism, however, a minimum level of guaranteed prices to the investors.

The required support mechanisms also vary with the stages of market development. Financial and fiscal incentives remain an effective tool for the creation of an enabling environment but their effectiveness starts fading away beyond a minimum threshold level. And then the barriers pertaining to regulatory, institutional and market affairs become more evident and needs to be addressed (IEA/OECD, 2008). Therefore, an efficacious role of government is not only underlined, but also regarded as a pre-condition for diffusing wind power technology in energy systems (IEA/OECD, 2008; UN/IEA, 2013; UNDP, 2013).

## **(ii) Pakistan's Experience with Private Infrastructure Provision:**

Before engaging in the debate about the barriers faced by Pakistan's wind energy market, analysing a general framework for private sector participation in the country's infrastructure development, and specifically energy sector, tends to be more logical.

Pakistan's power sector has been historically relying on extensive government support. For instance, 38 percent of total public spending was appropriated for this sector in the Sixth Five-Year Plan (1983-88) (Looney, 1992). The proportion increased to a staggering 50 percent for the Fiscal Year 1989-90 (FY). Despite having eaten up a sizeable amount of public money, the power sector, solely owned and operated by the government, could not bring visible improvements in chronic inefficiency and ultimately failing to fulfill growing demand (Sanghvi, 1991). In response to this, the government proceeded strategically (Kemal, 2002) and invited the private sector to install additional generation capacity to overcome supply shortfall. The government introduced the Power Policy 1994 which laid the foundation for private sector participation in the power sector. Along with offering attractive incentives for power generation, as the invitation was extended for the generation sector only, the government opted for "discretionary regulation"<sup>6</sup> to govern the newly created market.

The policy attracted a total of US\$ 4 billion investment in the power generation sector during 1994-97 (Business Recorder, 2001). However, the change of government led to the allegations of wide scale corruption in awarding licenses and negotiated tariffs. The newly elected government cancelled the contracts with the Independent Power Producers (IPP). But the pressure from the multilateral financial institutions that funded these projects, the government renegotiated tariffs with the IPPs which earned US\$ 1.4 billion of present value benefits to the public utilities (Hagler Bailly Pakistan, 2003a). This lack of coherence among changing national governments seriously deteriorated investors' confidence which remained insignificant between the years 1997 – 2007. Meanwhile, the infrastructure investments were redirected to the newly deregulated telecommunications sector.

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<sup>6</sup> Discretionary regulation is a form of regulation where government regulators set the prices and service standards for private infrastructure suppliers.

The state-owned Pakistan Telecommunication Company Limited (PTCL) was privatised in 2005 and the telecom sector was deregulated. The sector overtook the power sector with US\$ 16.725 billion against US\$ 12.596 billion between the years 1990-2011 (World Bank/PPIAF, 2013). The country is expected to attract more investment in this sector after having auctioned 3G and 4G spectrum recently for a record license fee US\$ 1.1 billion (Reuters, 2014).

The power and the telecom sector attracted 92 per cent of the total private sector investment from 1990 to 2011 and corroborate the basic premise that the government can attract the private sector investment through creating an enabling environment. It would however require consistency and reliability of government policies with a satisfactory macroeconomic stability.

### **(iii) Identifying Barriers in Wind Energy Market**

Pakistan's past experience in private infrastructure projects delivered mixed trends. For instance, the Power Policy 1994 attracted significant foreign direct investment in electric power sector but led the country to a highly expensive fuel mix and ultimately inflated generation costs (NEPRA, 2014). On the other hand, telecom sector has shown continuous growth, both in terms of quality of services and teledensity which had reached a level of 75.6 per cent by April 2014 (Pakistan Telecommunication Authority, 2014). It is however pertinent to note that the nature of both the infrastructure sector significantly differ. Telecom companies offer services to their customers directly without relying on other sub-sector and hence do not have the characteristics of an LTS. The power sector depends on a number of sub-sectors namely generation, transmission and distribution and therefore requires more carefully selected set of policy tools. And the wind energy technology deployment requires sector specific policy incentives due to the LTS nature of the power sector.

Despite having a prolific renewable energy resource base and the country's ability to tap these resources (Raja & Abro, 1994; Muneer & Asif, 2007; Asif, 2009; Amer & Daim, 2011), the state of renewable energy sector remains pitiful. Table 3 summarises the studies that identify barriers hindering the growth of RETs in Pakistan.

In general, these studies combine solar, wind, bio-fuel sources together and discuss them in a consolidated single market of RETs market, except Mirza *et al.* (2012), which solely focus on wind power. Moreover, looking at the nature of the barriers, it can be observed that it changes with the passage of time. A 'lack of importance accorded to RETs', for example, was identified as a barrier (Mirza, Ahmad, Majeed, & Harijan, 2006). After the introduction of RE Policy 2006 this barrier ceases to be identified in subsequent studies.

In terms of institutional barriers, it can be noted that initially it was argued that a lack of clarity about institutional mandates is a barrier (Mirza *et al.*, 2006). The same has been transformed into a lack of coordination between different government institutes (Mirza *et al.*, 2009; Mirza *et al.*, 2012). It is necessary that after the policy defines different institutional mandates, the coordination among different agencies and departments is sommmth for efficient



**Table 4 - Summary of studies identifying RET deployment barriers in Pakistan**

Study Barriers	Policy Barriers	Institutional Barriers	Regulatory Barriers	Financial Barriers	Information and Technology Barriers	Market Related Barriers
Mirza <i>et al.</i> (2006)	Importance accorded to RETs remain very low	Unclear definition of mandates and responsibilities of institutions	Absence of regulations pertaining to the RET commercialisation	Lack of fiscal and financial incentives for the private sector	Lack of general awareness and technological knowledge	—
Chaudhry, Raza, & Hayat (2009)	—	—	—	Financial limitations & costlier commercial credit	Lack of public awareness and human resources	Stiff competition by conventional sources
Mirza <i>et al.</i> (2009)	Absence of well defined policies for RETs deployment	Lack of coordination & cooperation between different government agencies	Structural deficiencies in the power purchase agreements	Lack of financial resources & lending facilities	Lack of trained personnel and community participation	Subsidies to conventional resources and a lack of basic infrastructure
Shah, Qureshi, Bhutto, & Shah (2011)	The study argues that a serious lack of awareness among different stakeholders about RETs and their potential role in sustainable development is the key hurdle. It emphasises the need of inclusion of RETs in the country's science and technology policy and educational policy to enhance awareness and mobilise community participation.					
Mirza, Ahmed, & Khalil (2012)	—	Lack of coordination among different government agencies	—	Lack of adequate financing opportunities, especially for small scale projects	Limited access to information, technology, unreliable wind data. Lack of social awareness	Lack of competition with conventional power generation & inadequate work force

administrative process. The same seems true in terms of regulatory barriers. In this case, the regulations were non-existent (Mirza *et al.*, 2006). However, now it is argued that there are some structural deficiencies in the power purchase agreements, offered by the government (Mirza *et al.*, 2012).

The barriers pertaining to the availability and affordability of finance have been unanimously endorsed by studies conducted in different times. It is important since Pakistan has a high country risk and the domestic financial markets are less-developed. This, on one hand, limits the availability of capital for wind energy, on the other hand, it inflates the cost of available capital. The lack of information, social awareness, technology, trained-personnel, also seem to be less addressed over time. Similarly, market barriers, including subsidies to the conventional sources and poor existing infrastructure are being identified since the very start.

Since the nature of barriers keep on changing with the market growth, it is important that the scholarship of this discipline adopts an active approach. These studies provide a comprehensive overview of the barriers, but have not offered the viewpoint of different stakeholders such as investors, public sector, financial institutions. Similarly, there is little evidence found that which barriers are considered the most crucial. Moreover, due to specific policy requirements for different RETs, it is necessary to separate barriers that are hindering the progress of utility-scale wind power from the rest. The need for this methodological approach stems from the government's limited capabilities and scarce economic resources. Therefore, there is a firm need to examine this area to better help the policymakers and existing and potential wind energy developers to refresh their knowledge about existing barriers in the wind power sector and to cope with them in a more pragmatic and prioritised manner.

#### (iv) Analytical Framework

For public policy-makers it is important to evaluate the performance of policies they engineer and implement. Policy evaluation offers a feedback loop and enables policymakers to learn from their experiences (Newton & Deth, 2010, pp. 315-336). According to Newton and Deth, policies should be evaluated in terms of goals. Since RE Policy 2006 set specific goals, therefore, evaluation exercise can focus on whether these goals have been achieved or not and their respective causes.

Dinica (2006) maintains that investors' perspective in diffusion of RETs is vital to consider and they should be involved to analyse effectiveness of different support mechanisms. It is also important since the RE Policy 2006 categorically targets the private sector and encourages its participation through multiple incentives. However, involving different stakeholders or their perspectives mean bringing together conflicting-interests (Newton & Deth, 2010). Then, it depends on the government that which public policy structure it finds suitable. This study focuses on a multi-sectoral approach and evaluates the policy and barriers in this theoretical realm. It identifies barriers through collecting point of view of investors, public officials, and financial institutions. It then grades these barriers according to their relative seriousness and invokes investors' preferences regarding the removal of these

barriers. Since the public officials' perspectives differ significantly, their responses could not be quantified.

## 5. Research Methodology

The study selects the wind energy market in Pakistan and analyses it using the case study method. This method is employed in social sciences research in a number of fields; the term "*case study*" is however ambiguous and lacks a definite definition due to the heterogeneity of different research techniques applied in it (Johansson, 2003; Gerring, 2004). Therefore, different researchers have defined it differently (Seawright & Gerring, 2008). According to Seawright & Gerring (2008), "[a case study means...] the intensive (qualitative or quantitative) analysis of a single unit or a small number of units (the cases), where the researcher's goal is to understand a larger class of similar units (a population of cases)". Thomas (2011) sheds further light on the different elements of the case study method.

Lijphart (1971) believes that this methodology can be applied to only one case to research it extensively. Yet it is an inherent feature of a case study that it involves comparison with other cases – not a *comparative study*, which is a completely different methodology (Lijphart, 1971; Eckstein, 2000). Another important feature and advantage of the case study method is that one can combine both qualitative and quantitative concepts of validation for a given case, but this approach can also lead to confusion and has to be handled carefully (Johansson, 2003). The methodological approach of combining different methodologies for data collection is called "*Triangulation*" (Johansson, 2003). For this study, that, on one hand, analyses the barriers quantitatively; on the other hand, seeks stakeholders' perspectives and suggestions in a qualitative manner. The triangulation technique seems more pragmatic and useful.

Following the selection of the case study method, another important facet is how to select a case? Should it be selected randomly or *purposefully*? Since the purpose of selecting a particular case is essential, randomly selected cases might not serve that *purpose* sufficiently. The advantage of purpose-based selection is that it helps selecting the most appropriate case for a given theory, research strategy etc. (Seawright & Gerring, 2008). Therefore the case of Pakistan has been selected in a purposeful manner.

**Target Population:** The target population for this study can be divided into three groups: Group A, Group B, and Group C – based on the purpose of data collection. Group A comprises of three private investors/project managers, a government official, and two consultants. The private sector stakeholders were chosen on the basis of the project completion stage and the managerial role of the prospective interviewee. The government official, officer grade, was selected due to his active engagement in wind energy projects. The consultants were selected with only one criterion that they have offered consultancy services to wind energy projects in Pakistan. For this purpose, AEDB's help was sought and based on this information, the consultants were contacted.

Group B comprises of project developers. The identified respondents include CEOs, directors, and project managers. There are 42 wind energy projects in the country<sup>7</sup>. The population is not too big; therefore, all of them were selected for the analysis to have a holistic picture of the market. Due to the contact detail constraints, it was possible to reach only to 20 project developers, 29 projects. All of these projects are at different stages of completion.

Group C comprises of the stakeholders other than the investors; it includes officials from the public sector and financial institutions. A total of six officials were contacted.

**Data Collection:** The targeted respondents were separately contacted due to the nature of responses sought. DELPHI model is applied to gather the information from these three groups of respondents. According to Dalmey & Helmer (1963), the purpose of the Delphi method is, “to obtain the most reliable consensus of opinion of a group of experts.” In this method, the questions asked from the respondents rotate around a central problem or a theme and the responses are recorded. This study applies Delphi method with a little variation. According to the standard Delphi method, the individuals/respondents are asked the questions repeatedly over time and their responses are recorded (Dalkey & Helmer, 1963). However, this study does not repeat the questions to the same individuals. Rather, it seeks information from Group A to have a broader understanding of the market barriers. Then, based on this general framework, it develops a survey and collects data from individuals at key positions in different projects. Lastly, it follows an un-structured interview approach to know the viewpoint of other stakeholders.

Data Collection - Group “A”	Data Collection - Group “B”	Data Collection - Group “C”
Telephone interviews. Open-ended questions. Notes of the responses taken	Questionnaire was prepared at the online platform, Google Docs, on the basis of information collected from Group A. The emails were sent through and responses collected through Google Docs. (see annex for an example of the questions) Following the emails, in-person interviews were conducted and notes were taken	The Group C was contacted and in-person interviews were conducted with open-ended questions through unstructured interview. Notes were taken from the discussion.

The factor identified in Figure 1 pertains to the electricity tariff setting mechanism. The first two questions, *closed-ended (Yes/no) questions*, intend to identify the existence of a barrier. The first question explores developer’s perception about the overall market, whereas the second question identifies if the developer has faced this barriers in his project. This division was necessary because every project is at different stage of completion. Third and

<sup>7</sup> There are some project developers, who are developing more than one project. Hence, the number of project developers is less than the total number of projects.

**Figure 1 - Sample of a factor and related questions asked in questionnaire**

Edit this form

## Pakistan Wind Energy Sector Survey

**\* Required**

### 1. Tariff Setting Mechanism

Currently, two tariff setting mechanisms (Up Front and Cost-plus) are implemented by the government. Do you think this mechanism fulfils the basic criterion of "guaranteed payments to the investors"? \*

☐ It sufficiently serves the purpose of guaranteed payment  
☐ It does NOT sufficiently serve the purpose of guarantee payment

If this is not sufficient, did/do you face this barrier in your project?

☐ Yes, we have faced this barrier in our project  
☐ No, we have NOT faced this barrier in our project

If you face this barrier, how seriously it affect(ed) your project?

1 2 3 4 5

Not serious at all ☐ ☐ ☐ ☐ ☐ Very seriously

How important is to overcome this barrier?

1 2 3 4 5

Not important at all ☐ ☐ ☐ ☐ ☐ Very important

**How can the government improve its tariff setting mechanism? Any comment?**  
 Please feel free to give your suggestions, it will greatly improve the effectiveness of policy tools, we shall devise through this project

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fourth question use factor-rating technique through assigning numeral to each possible rating. “Not serious/important at all” was given the value 1, “limited seriousness/importance” the value 2, “average seriousness/importance” the value 3, “significantly serious/important” the value 4, and “very serious/important” the 5. The World Bank follows a similar scaling technique, with four scales, in a study inquiring private infrastructure investors’ preferences about different factors (cf. Lamech & Saeed, 2003).

These questions are then followed by an open-ended question. This question seeks respondent’s feedback about the support mechanism and what he believes, how it can be improved, if necessary. The open-ended question offers an opportunity to the respondent to precisely elaborate the nature of the sub-factor s/he is facing under the umbrella of power purchase obligations. Last section of the questionnaire, demographics, does not include extensive personal details except respondent’s job title, contact details, project capacity, and expected completion date.

The responses collected from Group B are analysed through using statistical tools in Microsoft Excel. The qualitative aspects do not form the part of statistical analysis; they are analysed to ascertain their conformity with the statistical analysis. Furthermore, they are employed to devise policy tools and policy recommendations.

According to Sartori (1994), in a comparative study, variables are not inherently dependent or independent as it depends on the organising conditions. It implies that a (some) variable(s) can be considered dependent and others can be assumed independent as per researcher’s choice. This case study follows theory-confirming approach<sup>8</sup> (Lijphart, 1971). It assumes the growth of wind energy market as a dependent variable, and barriers or support mechanisms as explanatory or independent variables that influence the growth of wind energy market. However, it is also necessary to note that “*theory-confirming*” approach can also serve the purpose of *hypothesis-generation*. This is because of the fact that this study evaluates why generally believed support mechanisms have failed to provide stimulus to the Pakistani market. However, since it is a single case, its theoretical importance remains minimal. For that purpose, these findings have to be tested and confirmed in different cases and markets.

**Data Analysis:** The quantitative responses are processed using Microsoft Excel. Each factor is assigned a code F1, F2, F3...F9 and is treated as a barrier. Cross Tabulation is applied to analyse how many respondents identify a barrier in the market or in their project. Arithmetic Mean of each barrier’s (a) seriousness and (b) importance with respect to the eradication is calculated. This average is relative seriousness of each barrier and importance assigned by the respondents for eradication. After these calculations, these averages are assigned ordinals from the lowest value to the highest. These averages are then compared for cross-check for the ratings. Since the value 1 represents “not serious/important,” it is ignored while calculating averages. This analytical technique has been replicated from the study conducted by the World Bank (cf. Lamech & Saeed, 2003).

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<sup>8</sup> Theory confirming or infirming case studies are analyses of a single case in an existing framework of established generalizations. For more about this, see Lijphart (1971, p. 691-93).

The public and financial sector decision-makers were selected on the basis of their experience of dealing with the wind energy projects. Since there is a variety of the roles that have been played by these players, “unstructured interview technique” was adopted to give greater leverage to different interviewees. The technique has been selected correctly if we analyse the responses from different actors. For instance, the factors identified by the AEDB and National Electric Power Regulatory Authority (NEPRA) officials differ significantly and the ones identified by the financial sector are different altogether. Nonetheless, this technique poses serious challenge to integrate all of these factors and present a consolidated picture.

## 6. Findings & Discussion

The **quantitative analysis** is conducted after receiving responses from the respondents, through statistical tools and qualitative analysis is discussed separately. The tools including Frequency Distribution and Arithmetic Mean are employed for statistical analysis to compare relative seriousness of each barrier according to the ordinal scale assigned. Following table summarises survey results with respect to the barrier identification questions. Grid infrastructure and interconnection facilities (F3) has been identified as a barrier by all the respondents and six respondents have faced this barrier in their projects. The other two mostly identified barriers are tariff setting mechanism (F1) and coordination among different government agencies (F7).

No.	Factor Name	Do you think there exists a barrier with respect to this Factor?		Have you faced this barrier in your project?	
		Yes	No	Yes	No
F1	Tariff-Setting Mechanism & Guaranteed Price Criterion	6	1	2	5
F2	Land Allocation for Project Development as per Government Policy	5	2	3	4
F3	Grid Infrastructure and Interconnection Facilities	7	0	6	1
F4	Power Purchase Obligations are Effective and as per RE Policy 2006	5	2	5	2
F5	Consistent & Reliable Government Policies	5	2	3	4
F6	Institutional Arrangements & Technical Know-how in Related Govt. Agencies	4	3	3	4
F7	Coordination among Different Govt. Departments & Agencies	6	1	6	1
F8	Financing Facilities from National & International Financial Markets	5	2	4	2
F9	Overall Business Environment & Macroeconomic Situation in the Country	4	3	1	6

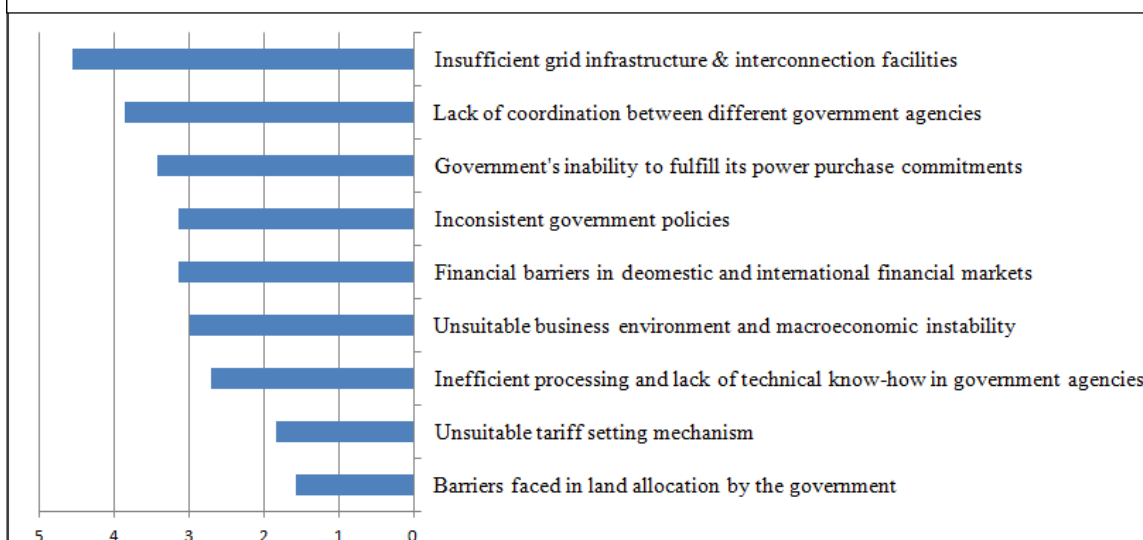
**Table 5 - Findings of Barriers Identification Questions**

After identifying barriers in different factors, the developers were asked to rank the seriousness of barriers on a scale 1-5 (“1” is ignored for mean calculations). The means are ranked in descending order and presented in Figure 2.

Following are the main findings:

- Lack of grid infrastructure and interconnection problems have been ranked as the most serious barrier in the market. Six, out of seven, developers put it into the “most serious” (5) category and only one ranks it with limited seriousness (2). This lower rating (2) from a single respondent is apparently because of the fact that this project was one of the pioneers and faced little problem with regard to grid interconnection. This barrier has the highest average, 4.57. The second most serious barrier is lack of coordination between different government agencies. The average score for this barrier is 3.86. Three, out of seven, respondents have ranked it “significantly serious” (4). The third most serious problem is government’s inability to fulfill the power purchase commitments. Average score for this barrier is also high, 3.43. It means that it be categorised in the rank of the most serious barriers. Three respondents believe that it is a “very serious” barrier. It is interesting to see that all three most serious barriers are related to the project development stage. It implies that the wind energy market is developing but facing very serious problems for expansion.
- The barriers having average seriousness include inconsistent government policies, financial barriers, and unsuitable business environment. There is no major difference between the averages obtained by these barriers, i.e. 3.14, 3.14, and 3 respectively. This cluster is not directly related to the market development, unlike top three barriers. These are more a kind of additional support mechanism, which can be believed necessary for developing any market or sector of economy. These barriers also represent the macro-picture of the power market.
- The third cluster includes barriers having below than average seriousness. These include inefficient processing and capacity limitations of various government agencies (2.71), unsuitable tariff determination procedures (1.85), and land allocation mechanism (1.57). In terms of tariff-setting mechanism, majority (4/7) of investors do not find this barrier

**Figure 2 - What are the most serious barriers in Pakistan's wind energy market**



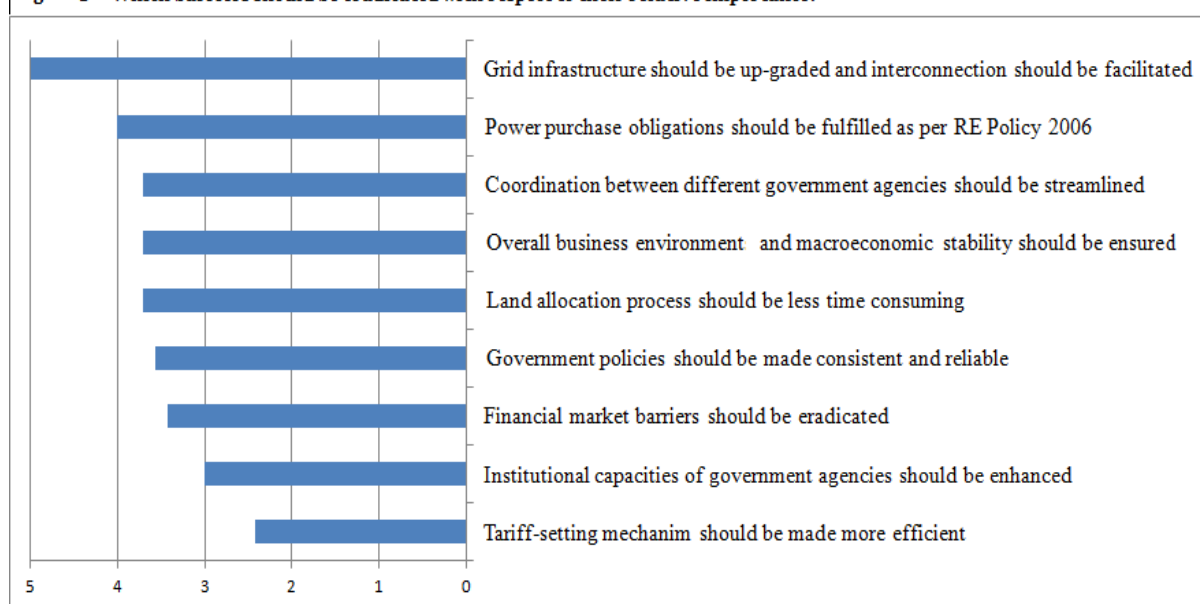
serious at all. However, the remaining three have ranked it 4 (2 times) and 5 (1 time). This means that investors' perception vary in this regard. Land allocation and government agencies' limited capacities rather depict a much-balanced picture.

Following the barrier identification phase, the respondents were asked to rank the relative importance of barriers with respect to elimination. It could be assumed that the most serious barriers should be eliminated first, as is usually done in similar studies. However, it is important to note that the respondents could have faced a barrier in his own project, but that might have been overcome now. Alternatively, the respondent might not have faced a barrier in his project more seriously than he believes but it has now become and should be overcome. A few variations in results endorse the validity of this assumption. The responses obtained are processed in a similar manner as in the barrier seriousness analysis and the results are summarised in Figure 3.

The values assigned to the importance of barriers are relatively higher than assigned to the seriousness by the respondents. For instance, the average of means of all barriers with respect to seriousness is 3.03; whereas, this average for importance is 3.63. This is also visible in the individual means. Lack of grid infrastructure was identified as the most serious barrier with an average mean 4.57; the importance assigned to this barrier for elimination is 5.0. All respondents have unanimously responded that eliminating grid related problem is "very important." The second most important factor is elimination of barrier pertaining to the power purchase obligations with a mean 4.0. Third spot is shared by factor pertaining to land allocation, coordination between different agencies, and overall business environment. Average individual mean for each of these three factors is 3.71.

Land allocation was previously assigned a much lower "seriousness factor". It was believed to be the second least serious barrier with 8<sup>th</sup> position. Now, it has been assigned higher importance because new projects are facing multiple land allocation hurdles. Similarly, the need for providing suitable business environment has been emphasised more than the seriousness. It is necessary since for market expansion and attracting foreign investors,

**Figure 3 - Which barriers should be eradicated with respect to their relative importance?**



macroeconomic stability will play a crucial role. The need for reliable and credible government policies and eliminating financial market barriers can also be categorised in the similar cluster for their relative significance.

Corrective measures with respect to institutional capacities of government agencies and tariff-setting mechanism are relatively the least important. Low importance assigned to the tariff-setting mechanism shows that the currently offered tariffs are sufficiently fulfilling investors' expectations, albeit having some procedural hurdles.

The **Qualitative Analysis** can be divided into two categories; the response from the private sector and the response from public and financial sector officials. Both are discussed separately.

The private sector's qualitative response is in conformity with the quantitative analysis discussed above. In response to the question about naming three most important barriers impeding the wind energy market growth in Pakistan, six (6/7) respondents singled out lack of grid infrastructure and interconnection barriers as the major problem. Table 6 summarises these findings:

- F1 – Tariff-setting mechanism remains sufficient and it is suggested to keep it attractive. It is further suggested to fix tariff for 3-5 years.
- F2 – Computerization of land records and making provincial revenue department more efficient is suggested to better meet investors' needs.
- F3 – Grid infrastructure remains a high priority for the respondents. The respondents have discussed this factor in the most detailed form. It is believed that the government should create a holistic picture of this sector, mobilise funds, and seek some funding for the sole-purpose of the grid development.
- F4 – Investors are less felicitous due to the delayed processing of electricity purchase agreements (EPA). Therefore, it is argued that setting a 30-days limit will bind government officials and investors to conclude these negotiations in stipulated time.
- F5 – It is argued that the government is not well aware about the problems being faced by the wind energy sector, it should hence involve investors in the policy-making process. (This study intends filling this gap and assist policymakers in decision making)
- F6 – Investors are not very much convinced that the current government agencies are having sufficient human and technical resources to meet their needs efficiently. Lack of standardisation and interdependence should be eliminated through defining standard operating procedures and making AEDB an independent body. The role of UNO is also encouraged for capacity building.
- F7 – Delayed responses from different agencies are one of the most serious problems. It is argued that offering one-window facility can overcome this problem.
- F8 – Circular debt has seriously affected country's energy sector. Elimination of circular debt, it is believed, would restore bankers' confidence in the energy sector and developers can benefit from banks' finances.



No.	Factors	Identified Barrier	Policy Measures - Investors' Perspectives
F1	<b>Tariff-setting Mechanism</b>	Tariff-setting Mechanism is not Efficient	Tariff should remain attractive and should be fixed for 3-5 years instead of project-based calculations
F2	<b>Land Allocation Mechanism</b>	Unsuitable Land Allocation Mechanism	Federal and provincial governments should clearly define their roles and responsibilities Computerize land records to eradicate procedural problems
F3	<b>Grid Infrastructure &amp; Interconnection Facilities</b>	Insufficient Grid Infrastructure & Interconnection Facilities	Create a holistic picture about the grid to better understand the problems Make an action plan to develop grid for the current and future needs and expand it at the earliest Provide financial resources to CPPA for grid construction Seek potential donor for the single purpose grant to develop grid infrastructure (estimated cost US\$ 70 million - respondent)
F4	<b>Power Purchase Obligations</b>	Power Purchase Obligations not being Fulfilled	EPA template should be immediately made available EPA negotiations should be completed within 30 days Power purchaser should be trained about the wind power projects
F5	<b>Consistent &amp; Reliable Government Policies</b>	Government Policies are not Consistent Enough	Prefer wind and solar projects for the next 3 years – without substantial change in policies in medium term Involve investors in the policymaking process to understand their needs
F6	<b>Institutional Arrangement &amp; Efficiency</b>	Lack of Efficiency and Know-how in Govt. Agencies	Empower AEDB and make it independent body Recruit professionals with sector-specific knowledge Standardise processing time for government agencies and departments UNO and Green Climate Fund should be involved to enhance capacities of government agencies with technical and financial resources
F7	<b>Coordination Between Different Agencies</b>	Lack of Coordination Between Different Agencies	One window processing facility should be introduced to avoid unnecessary delays caused
<b>Table 6 : Policy measures - Investors' perspective</b>			

- F9 – Country’s poor law and order condition is believed to hamper the growth of wind energy market. It is suggested to improve law and order and offer investor friendly taxation regime. It seems necessary for international investors.

Four government officials were interviewed. The differences observed within different government agencies calls for greater effort by the public policymakers to bring everyone on the same page. The perspectives about the wind energy sector are summarised below:

- The power generation through wind and solar are unreliable and inconsistent (intermittent behaviour). There is a risk perception within the government about this problem.
- There is a lack of knowledge about renewable energies in different government agencies and DISCOs. The capacity of the government agencies was also questioned because the renewable energies require sector specific knowledge and capacities to implement government’s policies successfully. In addition to that, the decision-making process is less analytical and critical.
- Wind energy is capital intensive technology and its affordability is a major issue, especially when the government is targeting to curtail the cost of power generation in the country.
- The grid infrastructure is weak and power evacuation problems can be anticipated. Moreover, the grid availability would be a major challenge when new wind corridors are identified.
- The government has not conducted a detailed resource assessment exercise in the country. The investors are invited to develop project only in a specified area.
- Following the Supreme Court of Pakistan’s ban on further land lease agreements, the land allocation has become serious problem and new projects will find it a major hurdle.

The financial sector officials share the following views:

- Lack of clear policies that what the government wants. The factor of inconsistency in policies crowds out the financial institutions from financing new technologies.
- Land allocation has become a major issue.
- The turnaround time (TAT) with respect to different government agencies is irrationally lengthy. Moreover, the poor coordination mechanism between these agencies also increase the time required.
- The country risk is higher which inflates the cost of projects.
- Lack of standardisation of procedures pertaining to approvals and commissioning of the projects.
- Financial institutions’ leverage to fund energy sector project has been undermined by circular debt problems.
- Wind energy projects of 50 MW are small in size and in terms of actual generation capacity they are even smaller. It is therefore recommended that the capacity of these projects should be increased.

## 7. Limitations of the Study

The results of a case study should be interpreted in a context-specific manner. Moreover, it seems more pragmatic to draw and learn lessons on the basis of some common features in two/more different cases (or wind energy markets, as is this study). To interpret the results of this study, it is advised to take the following limitations of this study into due consideration:

- a) Pakistan's power crisis is multi-dimensional and includes various market participants. This crisis has to be dealt with a comprehensive approach involving measures to overcome generation gap, improve operational efficiency, and ensure good governance. This study limits itself to the deployment of wind power technology to enhance generation capabilities through private sector's participation. It deals only with the supply-side of the electricity market.
- b) The study employs the case study method; therefore, the results should be interpreted in a context-specific manner. Furthermore, to make these results more relevant in another country or region, it is necessary to give due consideration to commonalities between other markets and Pakistan.
- c) The survey population of this study is not very large. The results should be therefore carefully interpreted.

## 8. Conclusion

The preceding discussion analyzing quantitative and qualitative responses from the project developers lays down the foundations to answer the research questions of this study and test the hypothesis. These questions are discussed below:

- a) *Is wind energy sector in Pakistan facing different barriers than normally faced by other countries? If yes, what are those barriers?*

Most serious barriers identified in Pakistan include lack of grid infrastructure, lack of coordination between different agencies, government's inability to fulfill power purchase obligation and inconsistent government policies. Therefore, it can be concluded that the Pakistani market is facing similar barriers faced by other markets.

- b) *If the wind energy sector in Pakistan faces similar barriers like other developing countries; then, why the support mechanisms offered through RE Policy 2006 – generally believed to be instrumental to overcome these barriers – have become less effective in Pakistan?*

The study finds that the nature of barriers in Pakistani market is similar. Furthermore, the support mechanisms offered by the government have not been seriously questioned in the qualitative responses. There are a few developers, who believe that the tariffs offered should be increased; however, majority was more concerned about fixing the current level for few years. The support mechanisms offered by the government are much convincing for the private sector. Nevertheless, a serious lack of financial, technical, and human resources on

part of the government, is confining its ability to effectively implement the support mechanisms. Circular debt seems to have affected the wind energy market as well. It is concluded that the support mechanisms, when implemented effectively, can lead to a mature wind energy market in the country.

- c) *How can Pakistan's existing public policies and support mechanisms be adapted to solve the problems faced by the wind energy sector in Pakistan?*

The support mechanisms offered through RE Policy 2006 seems to be enough. However, the government has to ensure their effective implementation. The government needs to bring some improvements in its policies with respect to institutional and regulatory arrangements. Lack of coordination should be eliminated through standardizing the procedures and enhancing capacities of the concerned government authorities. Moreover, the government has to devise long-term policy and should commit to avoid radical changes in this policy in the near future. It is necessary that the government recognizes private sector's role and address its concerns through making it part of the solution. The government has to make itself well-aware about the problems faced by developers. For this purpose, the private sector should be involved in the policy evaluation and policymaking exercises.

## 9. Policy Implications

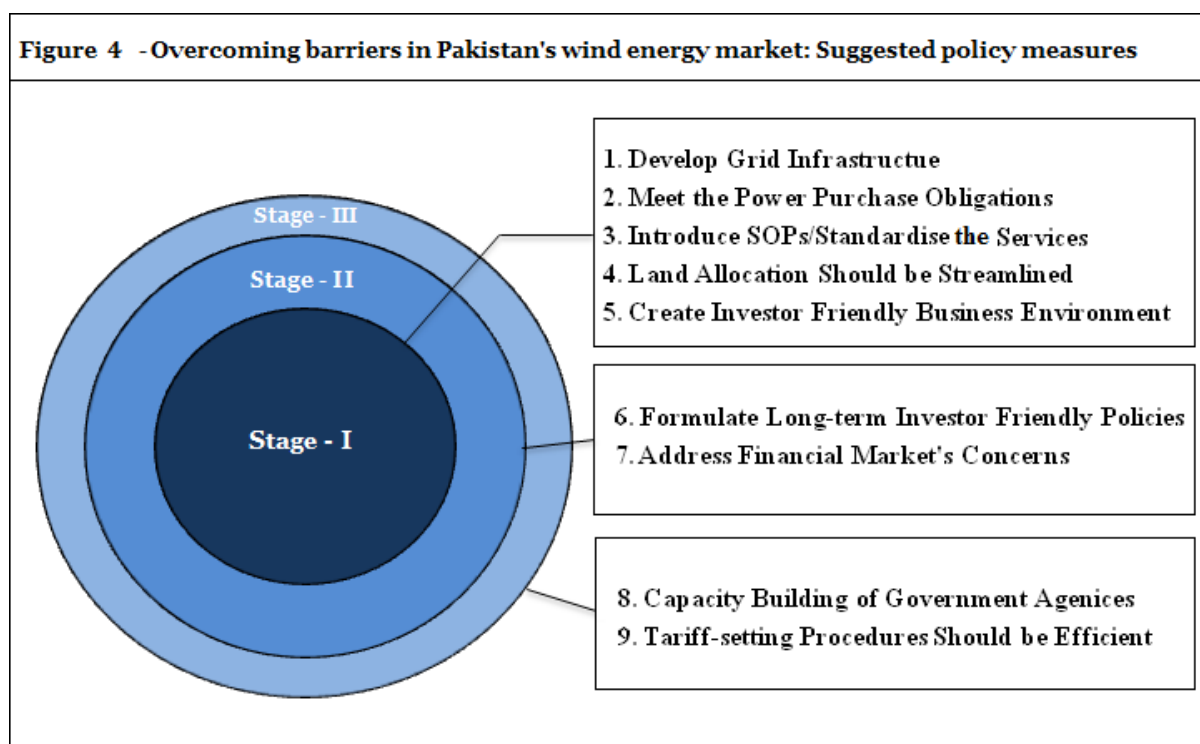
The lessons learned from this case study can be not only helpful for Pakistani policymakers but also their counterparts aiming to develop wind energy sources in other developing countries. These lessons can also be helpful for various multilateral agencies engaged in the promotion of renewable energies worldwide. Following is the summary of policy implications based on the findings of the study:

### (i) Policy Tools for Pakistani Policy-makers

The RE Policy 2006 developed by the government of Pakistan is sufficient to meet the targeted goals to deploy wind energy in the country. There is however strong need to ensure that the policy is implemented in letter and spirit. Furthermore, the private sector participation in the policy-making process should be encouraged and their input should be institutionalized to enhance welfare gains. The following policy framework is based on the private sector perspectives and engineers tools through investors' preferences and government's anticipated capabilities.

Figure 4 presents the policy implications in a prioritised manner. Stage-I highlights the policy measures, the government must take immediately to ensure that the on-going wind power development projects continue and complete smoothly. Stage-II and Stage-II represents the measures that can be taken in the medium term to attract more private investors and create a mature wind energy market in the country.

- The most serious challenge is developing the grid infrastructure in Stage-I. The government is burdened with fiscal constraints and hence unable to provide financial



resources for this purpose. The government should outline a concrete grid development plan and allocate funds through its own resources or seek international support from multilateral agencies and development banks. The government should develop the grid in a manner that it not only fulfils current needs but also ensures connectivity to the future investors and developers<sup>9</sup>. The government can perhaps also seek private sector assistance in developing new distribution systems.

- The power purchase obligations have two major problems. Firstly, power purchaser's illiquid financial health and secondly, structural deficiencies in the power purchase agreements. As far as the latter is concerned, it is suggested to document lessons from the past experiences and seek technical assistance from the World Bank, like it has been done in past. For the first problem, the government needs to overcome the circular debt issue through minimising its fuel-dependence and transferring generation costs to the end-users. However, since a considerable percentage of population is living below poverty line, the government has to carefully mitigate inflationary pressure that will be caused due to the power tariff hikes.
- Lack of coordination between different agencies is also closely linked with the limited administrative capacities of various government agencies. To overcome this problem, it is suggested to enhance capacities of concerned government agencies and enhance their independence. Moreover, the procedures should be standardised to overcome the barriers of lack of coordination. For this purpose, the government could possibly introduce a mechanism with defined timelines for each government agency for a particular task

<sup>9</sup> Asian Development Bank has committed funds for developing new and overhauling the existing electricity infrastructure. These funds can be possibly utilised in a targeted manner, which would not only help the wind energy market but also other power producers (ADB, 2013).



- It is rightly mentioned by many investors that computerisation of the land records will significantly overcome bureaucratic constraints involved in the land allocation process. Moreover, the federal and provincial governments have to be on the same page with regard to land allocation because the land is owned by the provincial governments. Similarly, the federal and provincial governments should enhance coordination on the matters related to taxation and law & order to create an investor friendly environment.
- The government has kept the RE policy unchanged for many years; it is hence suggested to follow the same. One alternative might be transforming RE Policy 2006 into a law. This would not only create a well-desired credible policy mechanism but will also help avoiding any unpleasant consequences of overnight policy changes. This may have long lasting effects to restore investors' confidence in the wind energy market and spur the involvement of financial markets.
- The third stage is closely linked with the lack of coordination between different government agencies. The investors believe that the tariff-setting mechanism is not efficient due a lack of coordination between AEDB, NEPRA, and NTDC. To overcome this problem, the government might follow an auction-based system, like Brazil. This may help overcoming this problem. However, this process has to be executed transparently.

## (ii) Policy Implications for Multilateral Institutions

The role of various multilateral agencies, such as UNO, IRENA, and development banks, such as World Bank or ADB, has become quite visible in promoting the renewables. Therefore, it would be helpful for these institutions to document the following lessons drawn from this study:

- The current approach of promoting the private sector participation in the renewable energy sector is commendable and should be sustained.
- Developing countries' governments should be assisted in much-needed policy advice and knowledge exchange spectrums. This will help them building the necessary knowledge base to formulate policy support mechanisms.
- In addition to the policy advice, it is equally important to conduct country specific need-assessment exercises. This should involve the public and private representatives. This would help to create a holistic picture of various renewable energy markets and devise policy tools that can help overcoming anticipated barriers.
- After formulating these policies, it is necessary to ensure that the proposed support mechanisms are implemented effectively. For this purpose, the developing world need financial and technical resources. The proposed multibillion dollar Green Climate Fund could help coping with the financial barriers and specialised agencies, such as IRENA, WWEA, and IEA, can render their services for expanding administrative capacities.
- These agencies should prioritise the needs of developing countries and offer their assistance in a context-specific manner.

**(iii) Implications for Researchers**

This study contributes to the on-going renewable energy policy debate worldwide. For future research on this discourse, this study suggests the following directions and research focuses:

- The future research in Pakistan and other developing countries can explore what barriers the governments are facing in fulfilling their commitments. What are precisely the causes of such failures?
- Researchers should prefer adopting the research methodologies that involve direct participation of different stakeholders. It will help the policy-makers in various parts of the world to incorporate the research findings for making informed policy decisions. Since most of the researchers in the field of renewable energy policy intend assisting national and international policy-makers, this approach will help them accomplishing their desired goals.

