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Mapping the Growth of Pakistan's Wind Energy Market

Lessons Learned and Policy Solutions

WWEA
World Wind Energy Association

HEINRICH BÖLL STIFTUNG PAKISTAN

This policy paper has been produced under the research project*, Mapping the Growth of Pakistan's Wind Energy Market – Barriers Identification and Capacity Building*, implemented by the World Wind Energy Association and Heinrich Böll Foundation, Pakistan. The second phase of the project will focus on capacity building activities for the relevant stakeholders in Pakistan. This work complements the research findings co-published by WWEA and hbs in November 2014, titled *"Scaling up Wind Power Deployment in Pakistan: The Barriers and the Way Forward."*

The policy paper is co-authored by Sohaib Malik and Muhammad Zeeshan Ashfaq and was reviewed and edited by Stefan Gsänger. Sohaib remained lead author and project manager till October 2015. The authors duly acknowledge the support and invaluable contributions from public and private sector decision makers.

About the Partners

The World Wind Energy Association (WWEA), an international non-profit association headquartered in Bonn, Germany, is working in cooperation with various governments and international agencies to promote wind energy uptake worldwide. With a network of associates in more than 100 countries, developed and developing economies alike, it has assisted many governments, multilateral organisations in developing effective policies for the promotion of renewable energy technologies.

The **Heinrich Böll Stiftung** is a German foundation and part of the Green political movement that has developed worldwide as a response to the traditional politics of socialism, liberalism, and conservatism. Main tenets of the foundation are ecology and sustainability, democracy and human rights, self-determination and justice. Particular emphasis is placed on gender democracy, meaning social emancipation and equal rights for women and men. The foundation is committed to equal rights for cultural and ethnic minorities and promotes non-violence and proactive peace policies. To achieve its goals, the foundation seeks strategic partnerships with others who share our values. Heinrich Böll as namesake of the foundation personifies its values: protection of freedom, civic courage, tolerance, open debate, and the valuation of art and culture as independent spheres of thought and action.

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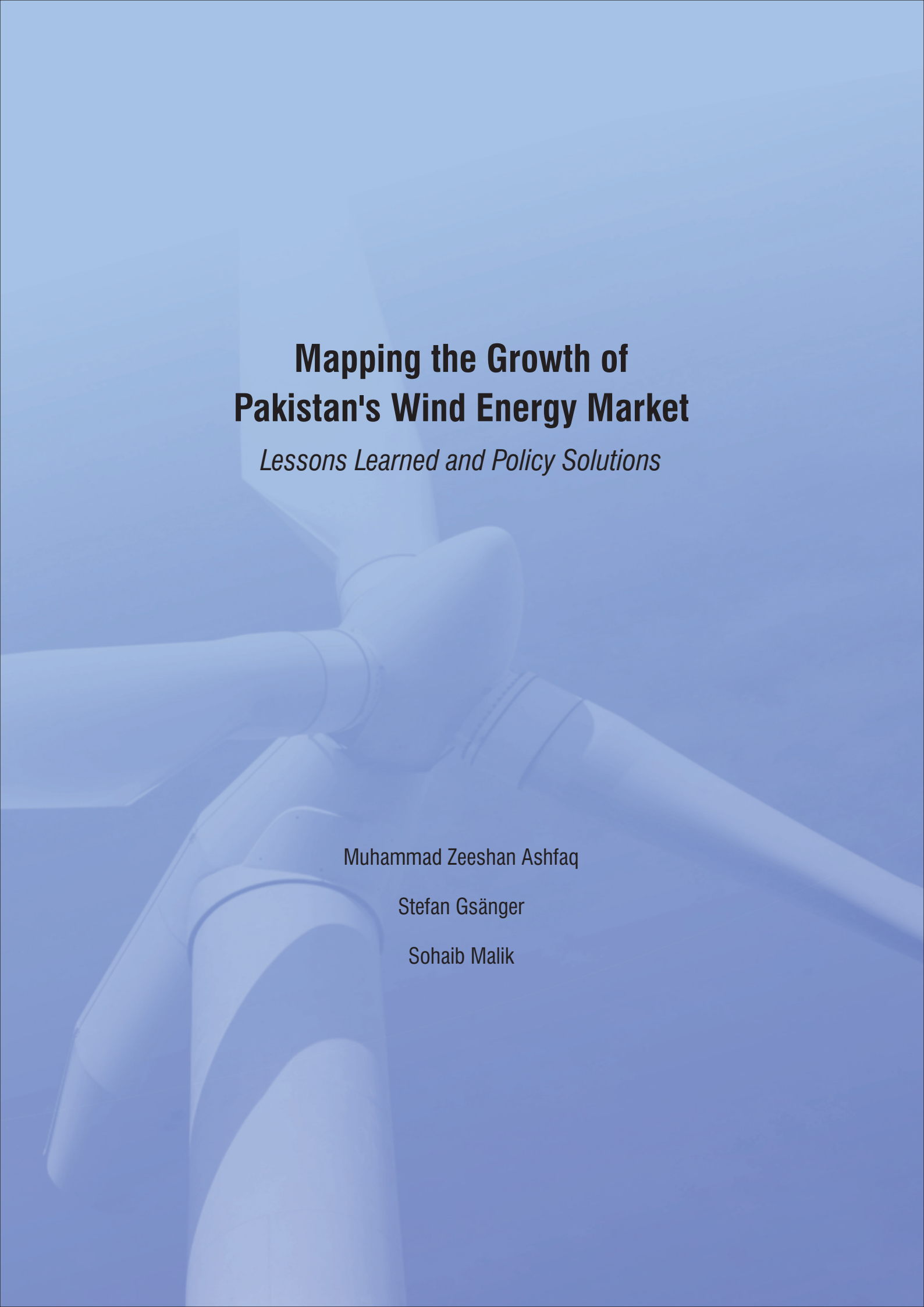


Muhammad Zeeshan Ashfaq

Stefan Gsänger

Sohaib Malik

Preface by the World Wind Energy Association

More than two years ago, the World Wind Energy Association started, in cooperation with Heinrich Böll Stiftung , the endeavour to analyse the main barriers on the way to an energy sufficient country, based on interviews with many of the key players of the Pakistani wind energy market.

At that time, four areas for action were identified which needed to be addressed within Pakistan:

Policy and regulation: The way wind power policies have been deployed – more clarity and better coordination amongst different government agencies was requested.

Technology: Especially, grid connection problems were often mentioned, and reference was made to international experience to assist on this.

Socioeconomic impact: Another topic raised was the huge potential of wind energy to empower local communities.

In addition, it came out that there are major problems related to financing wind investment.

Almost two years later, we found it was time to analyse the new status and see whether some progress has been made. The first and good news: Pakistan has now become a real wind market, although still rather small.

Secondly, we have noticed that some of the problems have been tackled, but there is still some work which needs to be accomplished, in particular with regard to grid infrastructure.

There is also still a lot of potential to get more support from international financiers such as the Green Climate Fund. Community based investment has not yet played a significant role in the country but should be pursued, in particular in cooperation with international donor programmes.

The update of our analysis of the Pakistani wind market comes exactly at the right time: In Paris, all governments of the world have practically agreed to phase out fossil fuels by the middle of this century and to go for a 100 % renewable energy future – as the new normal.

This fundamental shift has many reasons, beyond climate change. However, it emphasises why it makes a lot of sense for Pakistan to stay on track, implement the adopted policies fast, and even accelerate the implementation of wind and other renewables.

We hope that our research will assist the decision-makers in Pakistan to take the right decisions.

Stefan Gsänger

Secretary General

Preface by Heinrich Böll Stiftung

Climate warming and climate-change impacts are visible in natural and human systems on all continents and across all oceans. Continued emissions of greenhouse gases will cause further warming and changes to the land, atmosphere and oceans in all regions of the globe and in all countries. Pakistan already today is among the countries affected most by impacts of climate change.

Global greenhouse gas emissions, over the last century, were the highest in human history and without significant global mitigation action to reduce greenhouse gas emissions, global average temperature is likely to be as much as 4 or 5°C higher by the end of the century. To stop these developments, a global phase out of carbon emissions and a phase-in towards a sufficient use of renewable energy is required.

With the focus to identify barriers for wind power development in Pakistan and ways to overcome them, World Wind Energy Association and Heinrich Böll Stiftung Pakistan entered into a partnership in 2013 and successfully concluded project activities with two international conferences and two policy papers by end of 2014.

Drafted in 2015, this policy paper intends to monitor and evaluate impacts of the previous project. Interviews were conducted to assess progress in reference to the barriers identified earlier; namely lack of grid infrastructure, operational inefficiencies of government agencies, and (non) availability of finance. Interview findings were reflected with a group of selected stakeholders from the private and the public sector. The policy paper now presents recommendations regarding steps to be taken for moving forward in promoting Pakistan's large potential for wind power generation.

hbs Pakistan is delighted to be able to support this continuous effort of WWEA as a contribution towards creating better understanding about the importance of renewable energy usage among decision makers and civil society in Pakistan. Renewable energy sources still make a much to small proportion of Pakistan's energy mix and much of the focus of the government remains on large infrastructure and regional projects.

Today's energy security challenges present an opportunity for Pakistan to make choices which fix energy problems sustainably. All relevant stakeholders from public and private sector, academia and civil society need to be made aware about alternative energy solutions that present sustainable and climate just options for the future.

We therefore hope that this publication will promote discussions and decisions on the use of alternative energy sources and lead to policy developments and realistic solutions for promotion of the wind energy sector in Pakistan.

Marion Regina Müller

Country Director,
Heinrich Böll Stiftung Pakistan

Executive Summary

The role of energy in improving human life and ensuring sustainable economic growth without aggravating environmental risks is recognised world over. Innovations in the field of renewable energy technologies (RETs) offer a promising outlook for the future. Renewables represented 58.5 percent of the total power generation capacity installed globally during the year 2014, outpacing combined capacity of power generation from fossil-fuel and nuclear technology.

Traditionally, developed countries were leading in Renewable Energy (RE) deployments, but in the year 2014, the gap was narrowed by modest 2 percent in favour of the developed countries. Yet, the promotion of RETs in developing countries confronts challenges like higher cost of investment and perceived risks associated with investment. There is an increased need to overcome these challenges through engineering policy tools that encourage private sector participation and by assisting public policy makers to take informed decisions. This study attempts to map the growth of the wind energy sector in Pakistan by emphasizing the issues confronting the market growth at various levels of development.

By involving perspectives from public and private sector, this policy paper offers an insight into the nature of various barriers and offers policy suggestions for public officials. It highlights the significance of participatory policy making in the power sector of Pakistan as well as capacity building needs of key actors. The stakeholder responses from public and private sectors are collected through in-person interviews and qualitative and quantitative techniques of data analysis are applied.

The study finds that the support mechanisms introduced by the government of Pakistan are perceived favourably by investors. What has caused unsatisfactory market growth is ineffective implementation of these support mechanisms. For instance, the policy offers guaranteed grid access, whereas investors believe that lack of grid infrastructure is the most serious barrier faced by them. Similarly, lack of coordination among different government agencies and lack of consistent policies are identified as serious problems.

Investors' response demonstrates that government failed to take necessary steps for the growth of wind power during last year. Investors stressed upon the non-availability of grid interconnection, inconsistency in government's policies and operational inefficiencies of government departments as major obstacles in the growth of the wind energy sector.

The responses from public sector officials remain divided. The differences range from the cost of RE generation to the ability of renewables in meeting power demands of the country that is undergoing an acute energy crisis. The regulator and the planner believe that RE is not cost effective in comparison to other energy sources. Alternative Energy Development Board officials believe that the cost of RE is decreasing, and by introducing new techniques, RE can be made more efficient. National Transmission and Despatch Company is of the view that non-availability of finances is a considerable bottleneck in developing grids.

The study concludes in saying that there is a serious lack of will on part of the government to harness abundant RE resources. It is necessary that government mobilises financial resources for grid construction and reinforcement including new funding streams through the Green Climate Fund; standardise operating procedures in government agencies and enforce them; ensure applicability of incentives and keep them unchanged for 3-5 years; address capacity building needs of government officials through engaging bi and multilateral partners.

List of Abbreviations

AEDB	Alternative Energy Development Board
COD	Commercial Operations Date
COP21	21st Conference of Parties
CPPA-G	Central Power Purchasing Agency (Guarantee) Limited
GW	Gigawatt
hbs	Heinrich Böll Stiftung
IRENA	International Renewable Energy Agency
kWh	Killowatt-hour
LOI	Letter of Intent
MW	Megawatt
NEPRA	National Electric Power Regulatory Authority
NTDC	National Transmission and Despatch Company
PV	Photovoltaic
RE	Renewable Energy
RETs	Renewable Energy Technologies
UN	United Nations
WWEA	World Wind Energy Association

Contents

Section A: Study Context

Introduction

Energy plays a pivotal role in improving human life and ensuring economic growth. Owing to the increasing demand of energy, especially, after the industrial revolution, provision of energy to masses has become an arduous challenge for many governments. Traditionally, the world energy demand was met by fossil fuels that resulted in environmental degradation. Moreover, 1.1 billion people in the world have no access to electricity yet.[1] It is now widely believed that electrifying those underprivileged people through applying traditional centralised power generation and distribution mechanisms does not make economic or technical sense. At the same time, there is a wide consensus that our current energy systems have to be decarbonised and shifted towards renewable energy sources.

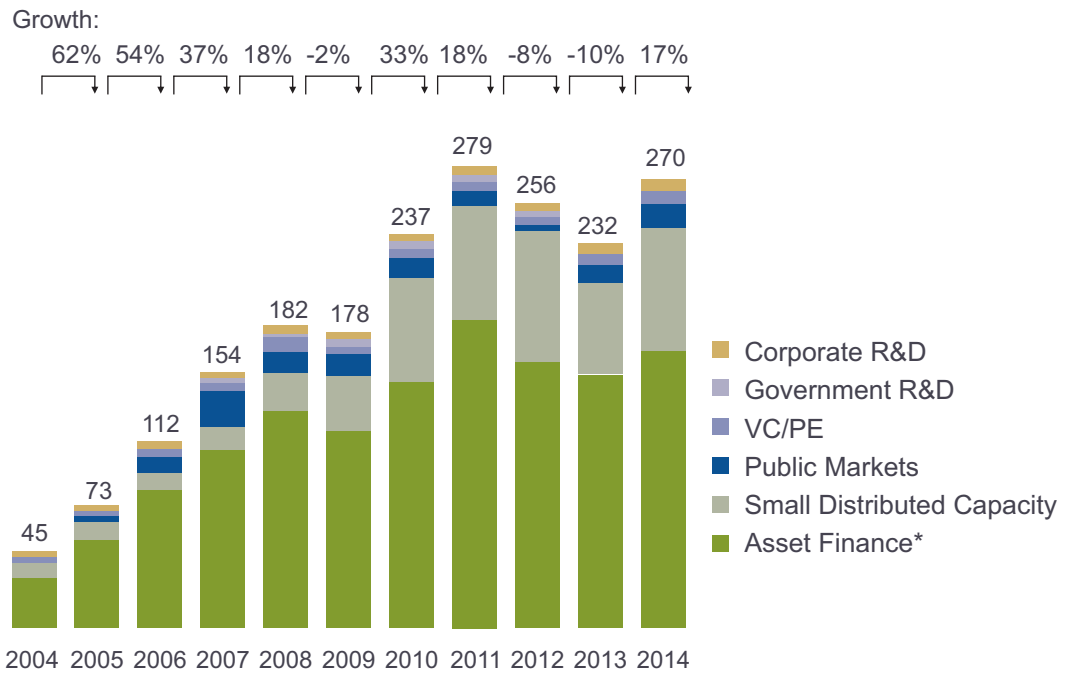
The opportunity offered by the modernization of renewable energy technologies (RETs), such as wind and solar Photovoltaic (PV), provides an effective tool to meet the growing energy needs without compromising environmental and economic sustainability. These advancements offer an unparalleled opportunity to ensure continuous and reliable energy supply to existing consumers and expanding outreach to deprived communities. Having the magnitude of problem in mind, the United Nations (UN) has targeted doubling the share of renewable energy (RE) in total energy consumption of the world by 2030.[2] The role of RE were also most stressed upon to fight climate change and ensure economic development during the 21st Conference of Parties (COP) in Paris this year, and the call to shift to 100 % renewables by middle of this century was supported by many governments. The achieved Paris Agreement refers to greenhouse gas neutrality as the main goal, however, practically this will mean an energy supply based on renewable energy.

It is noteworthy that RE has already proved its significance, and many developed and developing countries alike have set targets for their deployment. The benefits of deploying renewables are manifold including, but not limited to, energy security, economic development, RE manufacturing industry promotion and reducing environmental concerns. It has been noted that as of early 2015, about 143 countries have put RE support mechanisms in place and 164 countries have set binding or non-binding RE targets.[3]Moreover, drastic reduction by 50 percent in global oil prices could not deter the increasing level of investment in RE sector. The year 2014 recorded investment of $270 billion globally in new RE projects.[4]

Figure 1 represents the historical trend of RE investments for the period 2004-2014. It illustrates the amount of investments made by public and private sector investors. It is noteworthy that these investments recorded positive growth after successive two years of negative growth. Renewables represented 58.5 percent of total global power generation capacity installed during the year 2014, outpacing fossil-fuel and nuclear power generation together.[5] This validates the market competitiveness of renewable energy projects worldwide and their ability to attract commercial investments for small and large-scale projects. Among various renewables, wind and solar are the leading technologies that attracted $249.1 billion of $270.02 billion in the year 2014.[6]

[1] (World Bank, 2015)
[2] (IRENA, 2014)
[3](REN21, 2015)
[4](Frankfurt School FS-UNEP Collaborating Centre, 2015)
[5](REN21, 2015)
[6](Frankfurt School - UNEP Collaborating Centre, 2015 (b))

Figure 1: Historical Trends of RE Investments 2004-2014



Growing importance of renewables can also be seen from the investment trends in developing and developed countries. For instance, figure 2 illustrates that in 2004 total RE investments stood at US$ 45 billion globally, of which 80 percent was invested in developed countries. Since then developing countries have been consistently catching up with developed countries. In 2009 the share of developing countries had reached nearly one-third of the total investments and the year 2014 recorded a slight difference of 2 percent in favour of developed countries. The total amount of investments in the developing world recorded was US$131 billion. Reading these trends, in line with the higher cost of investments and perceived risks in the developing world, furthers the importance of renewables.

By the end of 2014, globally the installed capacity of renewables stood at 1,712 gigawatt (GW) in which wind energy constituted 371,374 Megawatts (MW) and solar PV 177 GW of the global share.[7]Approx-mately 95 GW of solar PV and wind power was installed globally in 2014. As a result of the incr-easing reliance on wind energy, 105 countries used wind power for electricity generation and 52.6 GW of wind power was installed worldwide during the same year[8] (Figure 3).

[7] *ibid*

[8] (World Wind Energy Association, 2015)

Figure 2: RE Investment Trends in Developing and Developed Countries 2004-2014

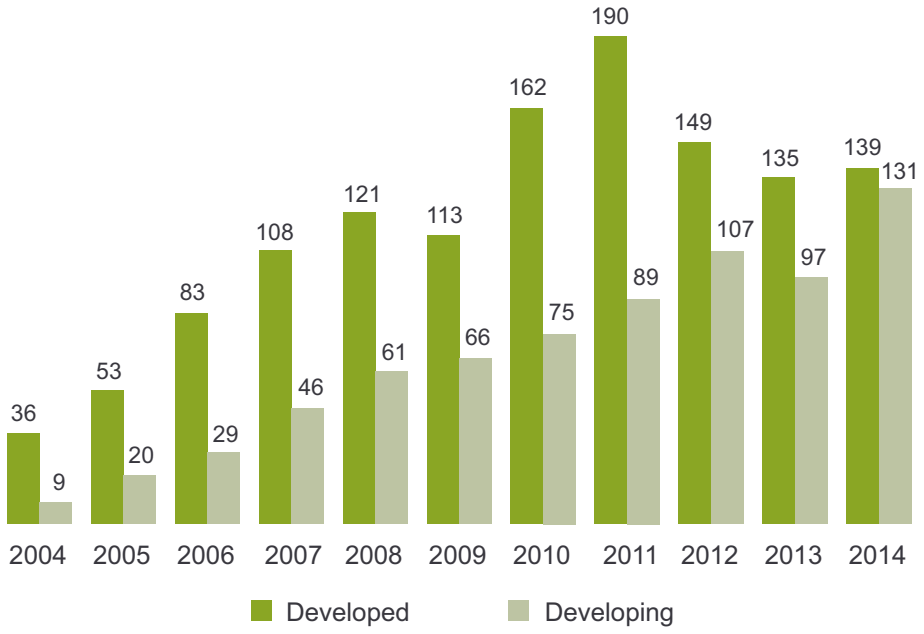
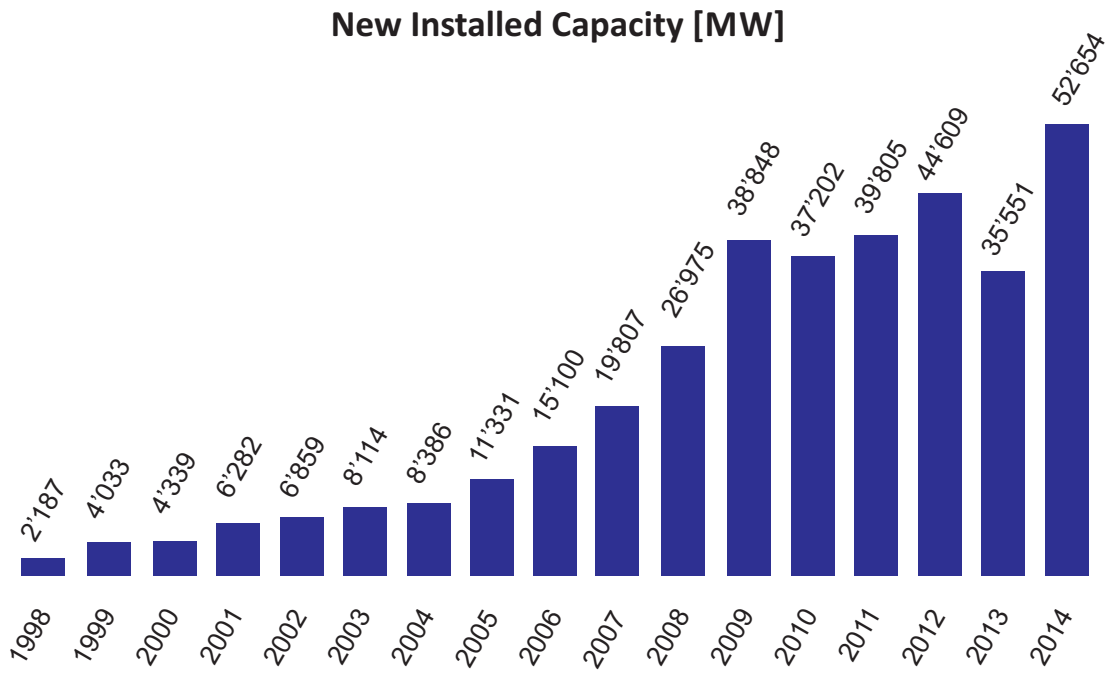


Figure 3: Global Wind Energy Capacity Installation Trends 1998-2014



Growth of Pakistan's Wind Energy Market

Pakistan has been an early starter in formulating renewable energy policy and establishing dedicated institutions. The country was also among the founding members of the International Renewable Energy Agency (IRENA); an intergovernmental agency dedicated for the promotion of renewables worldwide. "Policy for the Development of Renewable Energy for Power Generation" (hereinafter referred as RE Policy 2006) was introduced as early as 2006. The policy introduced a combination of fiscal and non-fiscal incentives to encourage private sector investments in various forms of RETs for power generation. The enabling environment created through this policy was successful in attracting dozens of investors willing to invest in wind and solar PV projects. A comparative analysis of Pakistan's RE market promotion incentives with world's leading markets has shown that the necessary incentives had been put in place.[9]

The investors found these incentives attractive enough and more than 40 Letters of Intent (LoI) have been issued for wind power projects so far. However, the completion of projects and their interconnection to the grid still remains in infancy. It is encouraging to note that more than 250 MW of installed capacity has been interconnected to the grid as of October 2015 and an additional 479 MW capacity is expected to complete construction and would require interconnection facilities by the end of 2016. The wind energy market has achieved momentum lately, and is progressing in the right direction. Table 1 enlists the projects that have achieved their commercial operations dates and are interconnected to the grid.[10] Table 2 contains information about projects that have achieved their financial close and are in construction phase.[11]

Table 1: Wind Energy market - Installed Capacity

Project Name	Installed Capacity	COD
Zorlu Energy Pakistan Ltd.	56.4	Jul-13
FFC Energy Ltd.	49.5	May-14
Foundation Wind Energy - I	50	Apr-15
Foundation Wind Energy - II	50	Dec-14
Three Gorges Wind Farm Pakistan (Pvt) Ltd.	49.5	Nov-14
Total Installed Capacity	**255.4**	

Table 2: List of Wind Energy Projects Under Construction

Project Name	Installed Capacity (MW)	Expected COD
Sapphire Wind Power Company Limited	50	Dec - 15
Metro Power Company Limited	50	Aug - 16
Yunus Energy Limited	50	Jun - 16
Master Wind Energy Pvt. Limitied	50	Jun - 16
Tapal Wind Energy Pvt. Limited	30	Jun - 16
United Energy Pakistan Pvt. Limited	99	Jun - 16
Hydro China Dawood Power Pvt. Limited	50	Jun - 16
Tenaga Generasi Limited	50	Jun - 16
Gul Ahmed Wind Power Limited	50	Jun - 16
Total	**479**	

[9] (Malik & Gsaenger, Scaling-up Wind Power Deployment in Pakistan: Barriers and the Way Forward, 2014)
[10] (Alternative Energy Development Board, 2015)
[11] *ibid*

Purpose of the Study

The World Wind Energy Association (WWEA) and Heinrich Böll Stiftung, Pakistan (hbs) joined hands and thoroughly investigated the growth of wind energy market in the country during the period 2006-2014. The consortium also consisted of the Alternative Energy Development Board (AEDB), who co-organised an international conference in the country to highlight the potential and challenges for wind energy resource development. The activity was concluded with a comprehensive policy paper that identified the nature of various barriers and proposed several policy tools to mitigate them effectively and efficiently.[12] All stakeholders, public and private alike, unanimously stressed on the need to develop a follow up mechanism that could map the growth of wind energy market and keep highlighting the issues that could be faced by the market at various stages of development.

This is not only needed to identify nature and seriousness of barriers but also to assist public policymakers in making more informed decisions. In addition, the methodology devised by WWEA follows an inclusive approach that consolidated the responses of key stakeholders thus adds more value through offering a broader perspective. For instance, some government officials cited higher cost of renewables as a key challenge that restricts renewables to win much-needed support from the highest level of decision making within the government. However, it is important to see if fast decreasing cost of renewables has successfully won such support.

Moreover, Pakistan's wind energy market, like any other market elsewhere, has been going through a learning curve. It has not yet received a certain level of maturity where the government would hold the position as a regulator and let the market function itself. It is rather experiencing a phase where more market players are entering the market, however, government's continuous support is required all along. Primarily, due to the fact that the power sector is highly regulated and its transmission and despatch business is exclusively owned by government-owned entities. Therefore, the government need not only to introduce policy tools but also ensure that resources are being mobilised to sufficiently cater the grid integration needs of these projects. The scale of operational market is nearly 250 MW; however the additional 450 MW of installed capacity would require advanced level of operational efficiencies and technical knowledge. The nature of challenges and capacities would also differ at that stage. This research also focuses on the current and future capacity needs of government and private sector officials.

Another important purpose of this study is to highlight the importance of participatory policy-making in Pakistan's power sector. It is often noted that government decisions are taken without giving due importance to the concerns of other stakeholders. This practice does not fit well with the democratic constitution of the country that requires prior consultations for decision-making. This study offers a platform to different stakeholders to raise their concerns and offer perspective for the solution of barriers they face for the projects. It is, undoubtedly, government's job to evaluate its policy decisions and make them more effective. However, other stakeholders need to offer their feedback and make their voices heard. This study also serves the purpose of that feedback loop.

Research Methodology

The research methodology applied in this study follows the approach adopted for the policy paper co-published by WWEA and hbs in 2014. Since this is a follow-up research, the scope of this study is limited and fewer research tools have been applied, due to the time and resource constraints but also as it seemed sufficient to get a

[12] The policy paper co-published by WWEA and hbs can be accessed at the link: http://www.wwindea.org/wp-content/uploads/2014/10/Policy-Paper-Final.pdf

comprehensive picture of the current status. Moreover, literature review was comprehensively conducted and it is believed that qualitative and quantitative research methodology would suffice the need of analysis for this research.

For this research all wind energy project developers in Pakistan were contacted. The respondents were interviewed individually. Therefore, the number of respondents was, largely depending on the availability of higher management and their ability to schedule interview meetings.

The questionnaire developed for this research is based on the barriers identified in the previous study and includes questions on the future needs of public and private sector officials. The following barriers were identified as most critical for the questionnaire:

1. Grid interconnection
2. Operational efficiency of government agencies
3. Policy and regulatory framework
4. Financial barriers

For this research, it is assumed that these barriers pose risks to the market growth in the country. In line with this assumption, the respondents were asked to assign risk scores to these barriers from a scale 0-4:

Risk Score	Risk Level
0	Non-existent
1	Existing but insignificant
2	Moderately risky
3	High risk
4	Very high risk

The World Bank follows a similar scaling technique, with four scales, in a study inquiring private infrastructure investors' preferences about different factors.[13]

These questions were followed by open-ended questions seeking respondent's feedback about the nature of these barriers and proposed mitigating tools. In addition, open-ended questions were asked from the respondents to identify capacity development needs relating wind resource forecasting, RE costing, and financial closure procedures of projects. Public sector officials were asked open-ended questions to identify the challenges to renewable energy promotion and reflect on their present and future capacities to better equip themselves to cater the needs of wind energy market. It is believed that these perspectives would help WWEA and hbs to devise future strategy to engage different stakeholders and help enhance capacities. Successful implementation of this strategy could leave long lasting impacts and would help wind energy market grow in the country.

To **analyse the data** collected from respondents, statistical tools are employed for quantitative part and the qualitative responses are interpreted in policy suggestions. Arithmetic Mean of each barrier's risk-score was calculated. This analytical technique was replicated/adopted from a study conducted by the World Bank.[14]

[13] *Cf. (Lamech & Saeed, 2003)*
[14] *ibid*

Section B: Findings and Discussion

The following sections discuss the private and public sector perspectives separately.

Private Sector Perspective

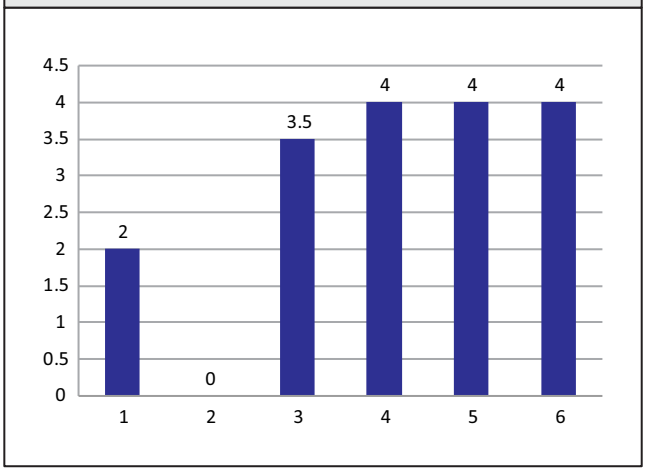
The private sector perspective comprises quantitative and qualitative analysis conducted on the basis of survey responses. A total of six senior officials managing wind energy projects were interviewed. The risk scores assigned to different barriers are summarised below thus offering a relative comparison.

a. Grid Infrastructure:

Four among six private sector respondents have rated unavailability of grid infrastructure as highly risky. The respondents also included project developers who have completed their projects and are interconnected to the grid. In their views, interconnection facilities are not sufficient due to the inability of existing infrastructure to offer evacuation facilities around the year. It was shared that continuous tripping and forced plant shutdowns by power purchaser are causing serious challenges for smooth functioning of the power plants.

Figure 4 summarises the responses relating availability of grid infrastructure and interconnection facilities. In previous study, insufficiency of grid infrastructure was rated as the most serious barrier. It seems that there has been very little progress made on this front. One respondent whose project is connected to the grid stated that lack of grid availability for upcoming projects can be categorised as extremely risky (score 4), whereas for the interconnected plants it is highly risky (score 3). This distinction underlines the importance of not only grid enhancement for new projects but also reinforcement of the existing infrastructure. The project manager who believes that the grid infrastructure does not pose any challenge to their project has been assured by the National Transmission and Despatch Company (NTDC) Ltd that the project will get interconnection facilities as soon as it completes construction. When compared with the perspectives of other project developers, especially, those who have completed their projects and face continuous tripping and enforced shut down issues, grid infrastructure does not show an encouraging picture.

Figure 4: Risk Score of Grid Availability and Interconnection Facilities



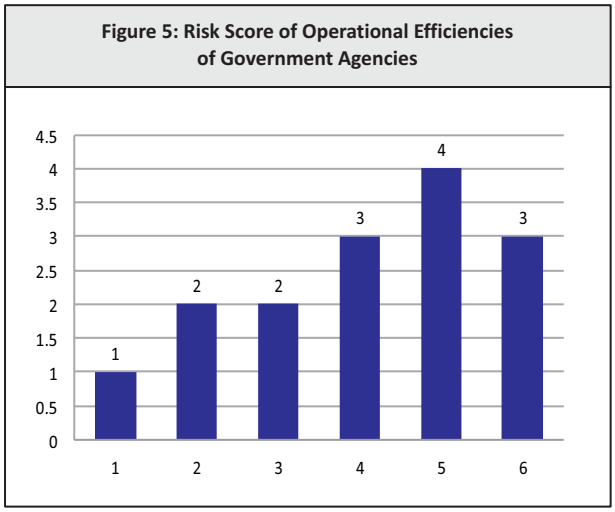
b. Operational Efficiency:

Figure 5 consolidates the responses about the operational efficiency of government agencies. This barrier includes technical knowledge of federal and provincial government offices, level of coordination between these agencies and operational efficiency. The risk scores assigned to this barrier show a mixed response, however, it can still be categorised as high risk barrier that poses serious challenges to market growth. One of the respondents who has rated it extremely risky and noted that in the absence of operational efficiencies in different government offices, wind energy sector cannot grow at all. Majority of the respondents noted that the government officials have acquired sufficient level of sector-specific knowledge, however, they lag behind when it comes to processing any requests etc. The barrier was identified among the leading reasons for slow

growth of wind energy market in the country. It was proposed that the government should devise mechanisms to ensure operational efficiencies in its agencies. The present status and feedback gathered from project developers illustrate that no growth had been made in this regard as well. It is noteworthy to mention that with LOIs issued for solar power projects, there is an urgent need to ensure standardised operating procedures in public offices and ensure their effective implementation.

Although RE Policy 2006 had laid down the foundation of enabling environment for private sector participation in RE sector, multiple government decisions, taken in the past and recently, have not always been welcomed by investors. Many investors believe that government's policies lack consistency and often endanger implementation of their projects or their commercial viability. Such a decision was taken by the National Electric Power Regulatory Authority (NEPRA) in 2014 when the authority announced that it would not entertain tariff applications for wind power beyond 500 MW of total installed capacity. The decision was reversed later on, but had severally impacted investors' belief in the market. Very recently, the government has announced a ban on new LOIs for renewable energy projects without citing any solid reason for this decision. These decisions, taken neither in consultation with key stakeholders, nor in line with the immediate needs of the country, have been seriously hampering the growth of the wind energy market.

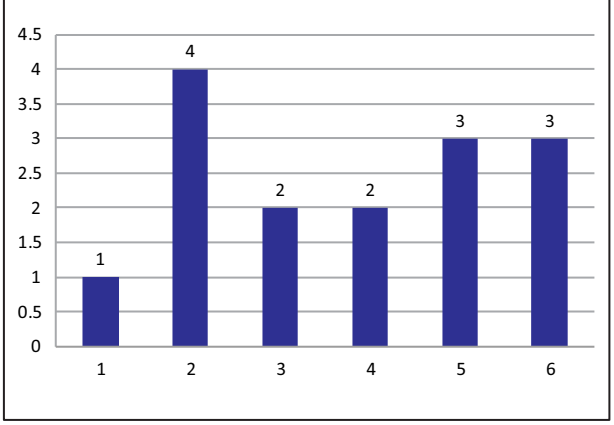
Figure 5: Risk Score of Operational Efficiencies of Government Agencies



c. Regulatory and Policy Decisions of the Government

Figure 6 illustrates the responses accumulated relating regulatory and policy decisions of the government. All respondents believe that this barrier exists in the market and it needs to be eliminated through making government policies more inclusive and consistent. Three out of six respondents noted that the risk score for this barrier is “high” enough that it can seriously jeopardise their efforts to develop their projects.

Figure 6: Risk Score of Regulatory and Policy Framework Decisions



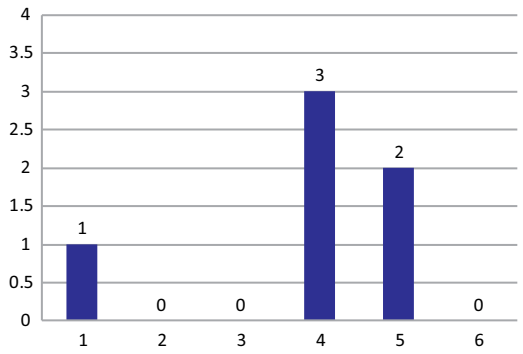
d. Availability of Finance

Availability of finance for a growing market is essential. It is encouraging to see that most of the developers do not find it a serious challenge for their projects. It can be seen in Figure 7 that half of respondents believe that this barrier is non-existent in the country. It may however be interpreted very carefully. Many project developers in the country are business conglomerates that can attract private finance source with much ease. Project financing is not very popular form of financing in the country yet and most of the funds are allocated based on balance sheet financing. The problem does exist for small projects or for investors that do not have a long credit history in

the country or have entered the market to attract funds exclusively for renewable energy projects. Having said this, it is commendable to note that more than 470MW capacity of wind energy projects has achieved financial close through attracting funds from domestic and international financial markets. It shows growing confidence of private investors/ financiers in the market.

The highest risk score assigned for this barrier is 3, high risk. The respondent believed that the terms of financing are not competitive with other sectors of the economy and it is necessary that financial institutions offer similar financing terms for renewables.

Figure 7: Risk Score of Availability of Finance

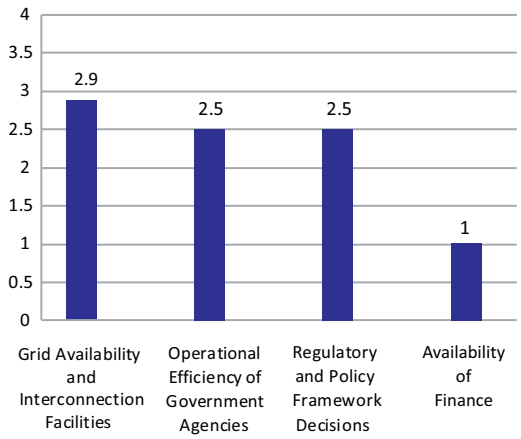


Comparative analysis of the barriers:

Having analysed these barriers individually, it is also important to make a comparative analysis of these barriers.

Figure 8 offers an overview of such analysis. Average Mean of risk scores of all barriers was calculated and a relative comparison is made. This approach helps policy makers prioritise their mitigation actions and prioritise allocation of their limited resources. Previous study had shown that grid infrastructure was the most serious challenges which remain the case today as well. Average risk score assigned to unavailability of grid is 2.9 that can be interpreted as high risk. This barrier is followed by uncertainties relating policy decisions and operational efficiencies. The average risk score of these two barriers is 2.5 each. The score can be interpreted as critical enough to hamper the growth of the sector in the medium and long run.

Figure 8: Comparative Analysis of Market Barriers



The availability of finance has been identified as a risk that exists in the market, but does not have potential to present significant impact on market growth. It can be concluded from this analysis that the government must mobilise resources to meet the infrastructure needs of the sector at earliest. A strategy followed to make government policies more reliable and consistent needs to be followed along with an honest and strong political will to support renewable energies in the country. The following sections would further reflect on policy tools that need to be developed by the government to mitigate these b arriers.

Public Sector Perspective

The public sector perspective on renewable energy deployment remains divided. These differences relate to the cost of renewables and their ability to meet the energy demand in the country that is suffering from chronic power outages. Public sector respondents comprised federal and provincial government officials representing NEPRA, AEDB, Planning Commission of Pakistan, NTDC, Central Power Purchase Agency (CPPA-G) Ltd., and Government of Sindh.

The government officials were asked open-ended questions to reflect on the challenges wind power sector is facing in the country. The barriers identified largely validate the previously identified barriers. These include (perceived) higher cost of wind power projects, intermittent behaviour, availability of funds to develop grid infrastructure, limited capacities of federal and government agencies, and lack of coordination between different departments.

Concerns relating high cost of renewables have been noted frequently while interviewing public officials. The Regulator and Planning Commission believe that renewables do not offer a cost effective solution to overcome country's ongoing energy crisis. For renewables to win support from government's highest level of decision making, costs in Pakistan should reflect the trends in international markets that have been consistently decreasing. In line with efforts to reap the benefits of decreasing costs, NEPRA has recently lowered the upfront tariff for future wind power projects to PKR10.60 per kilo Watt hour (KWh) for foreign financing. It is also believed that there is still room to decrease the tariff further. The Planning Commission, during one of the NEPRA hearings, also made a comment that IRENA's costing report show that tariff for wind power projects in different parts of the world were as low as $6-8 cents/kWh. The numbers quoted at such forums are correct and the cost of wind power has become competitive with fossil fuels, including natural gas, in many parts of the world. However, macroeconomic stability in countries such as India, South Africa, and Brazil is better than that of Pakistan. This in return helps those countries attract more investors and make their RE markets more competitive. In addition, policy tools introduced in these countries also differ. South Africa, for example, has introduced auctioning for RE projects. This tool has helped them bring down RE tariff in successive bidding processes.

The views of AEDB officials differ with those of regulator and planning commission. Having agreed to the base-load concerns, AEDB officials believe that there is potential and techniques to mitigate this intermittency as it is being done in countries such as Germany and Denmark. The most serious challenge noted in this regard is political will of the government and its eagerness to exploit renewable energy potential. A ban on the issuance of new LOIs has been imposed recently which has caused uncertainty in the market. Lack of sufficient grid infrastructure is also believed as a major issue.

Reflecting on the grid issues, NTDC is of the view that availability of sufficient financial resources is a major challenge. Developing grid and offering interconnection facilities can be made possible if these funds are made available. The cost of developing grid in the Sindh province is also higher because of unfavourable soil conditions. The official highlighted efforts to raise funds from bi- and multi-lateral development partners to initiate grid construction for upcoming wind power projects.

Section C: Conclusion

The quantitative and qualitative analysis when put together gives us a better understanding of the market growth and nature of challenges faced by it.

Mapping the Growth: A Comparison

Private sector perspective validates the concerns that were noted last year. There is no doubt that more projects have achieved financial close and are going through construction phase, but the challenges related to grid infrastructure could result in catastrophic consequences if not resolved immediately. The absence of sufficient interconnection facilities could lead to the stage where installed capacity would stand still regardless of their ability to generate power.

Similarly, regulatory and policy framework decisions were noted among serious barriers and the situation has not improved yet. It seems naïve on the part of the government that on one hand it is struggling to overcome the demand supply gap,

whereas, on the other hand, it is doing very little to foster smooth and effective completion of these projects. In addition, different decisions taken from time to time cast serious doubts on government's intentions and priorities.

Another barrier that remains unimproved is operational efficiency of various government agencies and departments. Reading respondents' reflections in line with the dire need to add more capacities for power generation, gives an impression that the government's efforts to improve sector's condition could fail grossly. Many government offices struggle to ensure good level of governance or operational efficiency. However, critical nature of the power sector and its importance in fuelling economic growth in Pakistan should have enabled it to win support of government and public offices. Unfortunately, the trend speaks otherwise.

The market has faced relatively fewer problems to attract necessary finance. It is, however, necessary to understand that both availability of finance and the terms of finance have to be considered carefully. It is a fact that the cost of funding in Pakistan is high. And, if the government is eager to reduce the cost of renewables it should develop such financial tools that can effectively overcome investment risks and ensure availability of funds at better conditions. For this purpose, policymakers should consult WWEA's analysis and recommendations for creating more favourable, less risky investment climate through mobilising investment guarantees from the Green Climate Fund.[15]

While comparing the nature and seriousness of the barriers identified last year and analysed through this research, it can be concluded that there has been no significant progress. The grid infrastructure was identified as the most serious problem followed by a lack of coordination between government agencies, inconsistent government policies, and limited avenues for financing. The same pattern can be observed in this analysis. Lack of strategic coherence in government's policies and an inability to address valid concerns of the private sector investors cannot help the country to progress.

Need for Capacity Building

Since WWEA-hbs kick-started their partnership to diagnose the challenges of wind energy market in the country, it was stressed by various stakeholders including public and private sector that this contribution should go beyond policy research. In line with those expectations and to identify the needs of the sector it was agreed to map capacity needs of the sector to develop future strategy for the partners. During the stakeholder consultations, all respondents representing public and private organisations were asked to reflect on their capacities and if there is any need to develop them further. The response remained highly encouraging. All respondents highlighted the need for capacity development for the public and private sectors. Some of the most frequently noted areas include:

- Ability to effectively manage high level of RE integration
- Project costing techniques that offer better understanding for RE costs and for tariff determination
- Better understanding of financial modelling techniques for financial close

The power purchaser has been dealing with 250MW of installed capacity, however, once all projects reach their commercial operations date (COD), it would become a serious challenge for grid operator to ensure smooth functioning of the whole system. It is, therefore, necessary that project developers' and purchaser's capacities for better coordination and forecasting production estimates are improved.

[15] (Malik, Dabla, & Gsaenger, 2014)

Section D: Policy Implications

The preceding sections reflect that there is a serious lack of strong political will that can ensure planning/restructuring of the sector and scale-up wind energy deployment. In the absence of such efforts there is little hope that renewables can play their role in combating energy crisis and climate change in the country. Therefore, it is utmost necessary that the government announces a clear policy for RE development that must be backed by its actions.

As noted earlier, grid development remains a key challenge. It remains there not only for upcoming projects but also for those connected to the grid. Therefore, on one hand, the government has to develop new infrastructure; on the other hand, it has to reinforce and upgrade the existing network. It was informed that government is negotiating the terms of financing with a bilateral development bank. The funds will be allocated to develop grid for upcoming projects which sounds encouraging. The question remains, however, that how effectively NTDC can secure these funds and can start grid construction. This initiative must be backed by the Ministry of Water and Power and the importance of offering grid facilities for several hundred MWs of wind capacity must be taken into account.

The policy paper, co-published by WWEA and hbs in November 2014, offers an insight into the tools that can be employed by the government including standardising procedures, availability of finance, engaging bi- and multi-lateral institutions. It is believed that the recommendations are valid till to date and offer an opportunity for the government to heed the advice. In addition, it is necessary that capacity building programmes are designed and implemented for all stakeholders representing public official, private sector, civil society, academia to name a few. When tailored in line with the needs of the sector, these initiatives would be able to optimise their outcomes.

In the wake of agreement reached at COP21 to limit the rise in global temperatures to less than 2°C through cutting carbon emissions and achieve greenhouse gas neutrality, the role of renewables and urgency to phase-out fossil fuels have become even more important – Paris has defined renewables as the new normal. It is, therefore, necessary that governments and private investors make necessary investments in renewable energy market to develop available resources, innovations, research and development (R&D), and education. A 100% renewable energy future can be ensured through a comprehensive strategy for scaling up renewables and encouraging investments and innovations in energy efficiency and energy storage techno-logies.

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