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An overview of implemented renewable energy policy of Pakistan

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ABSTRACT

After initiation of renewable energy policy in 2006, yet, it could not be executed the green path for sustainable energy development in Pakistan. Currently, the share of non-hydro (big hydro projects) renewables is less than 4% (less than 900 MW) of total installed electricity capacity against the medium term plan of having minimum capacity of 9700 MW in 2030. With several strategies and goals established in place to support the development of renewables, however, it is not well organized and also ill-managed to find the effective renewable energy mix for the country according to targets. This study aims to analyze that whether targets of renewable energy technology (RETs) deployment will be met under the current regime. A cross-country analysis of renewable energy status reveals the workable instruments to increase the growth of RETs amongst developed and developing nations. It is clearly evident that without supplementary and policy instruments, these ambitious targets cannot be achieved. The strong political and financial commitments are necessary to accomplish the green pathway, as governments are more tilted towards thermal power generation to overcome the huge electricity demand-supply gap.

1. Introduction

Energy is considered to be the vital building block for the social and economic development of any country and it is a crucial input to strengthen the economy of a country by all means. Admittedly, Energy's demand in every sector of a developed and underdeveloped country is pivotal heavily. Undoubtedly, no country, at present, can accelerate towards success without maintaining the demand and supply efficiently. So in order to deal with energy shortage and constantly rising environmental pollution, renewable energy sources are now believed to be the future of providing world's energy demand. Each developed and developing country is shifting its reliance on renewable sources to fulfill their energy needs. For this sole purpose these countries have established manufacturing facilities to develop and produce renewable related equipment domestically. Moreover, the implemented renewable energy policies in these countries can play a meritorious role to develop these renewable industries effectively and in a sustainable way. According to new statistics of 2015, the current installed capacity of renewable power generation accounted about 147 GW [1].

Fig. 1 is showing the share of energy produced from renewable resources globally. But in Pakistan the situation is alarming and only 60% population of this country is connected with grid in this modern era [2]. Currently, the country is facing 3–5 GW of power supply shortage. Therefore, the country is facing the severe energy crisis.

The occurrence of regular power outages almost affected the economy, the livelihood of people and explicitly the growth of the country [3]. The demand of energy consumption per capita has been increased remarkably from 445.3 kgoe in 2000 to 481.62 kgoe in 2011 [4]. While the copious renewable sources like solar, wind and biomass need special attention and dedicated infrastructure to exploit properly.

Pakistan is listed among those countries that are facing energy shortfalls. Access to electricity is evidently impossible by less than half of country's population; whereas, majority belonging to rural areas has no or poor access to electricity. Attempts to diminish dependence on fossil-fuel through escalating the percentage of renewable energy in the energy supply frameworks have met with little achievement so far. Pakistan depends on fossil-fuels as its chief source in order to meet energy deficiency. Although a process has been initiated to move towards renewable options but the overall mechanism is still in developing phase.

The government of Pakistan introduced its first ever renewable energy policy to promote the adoption of renewable energy technologies (RETs) in 2006. The objective of this policy is to shift country's energy mix from conventional to alternative sources by utilizing indigenous renewable source and raise awareness in public generally. Conversely, this policy undergoes through a number of challenges and achieves partial success. The kind of challenges and issues, confronted by this policy, must be isolated and addressed in a proper manner to

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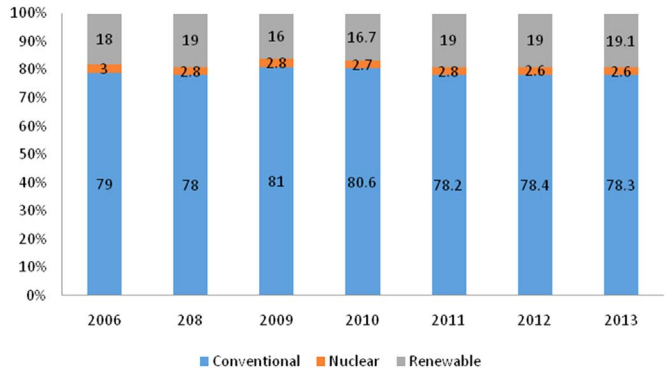

Fig. 1. Share of energy produced from renewable resources globally.

pave the way forward for a sustainable green future of renewable energy in Pakistan.

The electricity from the hydro is the only sustainable energy source in Pakistan which this country has been exploiting for power generation for many decades. At present, almost 80% of electricity generation in Pakistan is produced from Crude oil followed by Hydel energy 11% Coal 6% LPG 1% and Nuclear energy 2% as shown in Fig. 2 [5].

The instituted renewable energy policy in 2006 has sparked up a major attraction in renewable power generation in early two years but after this, RE policy could not be able to deliver much in this regard. There is a massive potential for RETs growth to fulfill the space between energy supply and demand in Pakistan, which is an important feature from the foreign and local investment point of view. The projects related to renewable energy have the supreme ability to deliver uninterruptable supply of energy at affordable cost, provide social and economic benefits, reduce GHGs emission and bring overall positive change in the local climate [6].

Renewable energy projects are often decentralized in their nature and possess the utmost potential to supply electricity to the distant and hilly areas of the country, in this way not only poverty is reduced but it also eliminates the need to collect and burn wood fuel as well. So electricity from renewable sources is a true savior for woods and an alternative for the people whose living is solely on forest timber [7]. Alternative energy sources are abundant and widespread in the country. If these sources are utilized efficiently, they can meet the growing energy needs effectively. These sources are discussed in detail below.

The geographical location of Pakistan makes it ideal place to develop and install projects related to solar. It receives 15.5×10^{14} kW h of solar irradiance, annually. The expected annual power generation capacity from solar photovoltaic cells to be 1600 GW and it could become a major power generation source by using solar in near future [8]. The potential of wind is heavily found in southern parts of this country. The average wind speed in coastal region of Sindh and Baluchistan is to

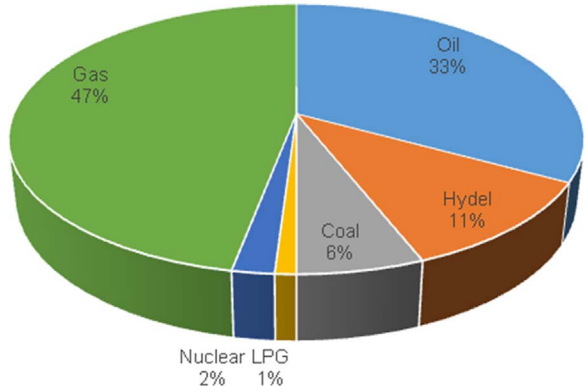

Fig. 2. Energy mix of Pakistan [Source Energy Year Book].

Table 1
Top ten countries generating electricity from wind [source GWEC].

Country	MW	%Share
PR China	145,362	33.6
USA	74,471	17.2
Germany	44,947	10.4
India	25,088	5.8
Spain	23,025	5.3
United Kingdom	13,603	3.1
Canada	11,205	2.6
France	10,358	2.4
Italy	8958	2.1
Brazil	8715	2.0
Rest of the world	67,151	15.5
Total Top 10	365,731	84.5
World Total	432,883	100

be 6–8 m/s. The projected annual power generation capacity from wind is to be 122.7 GW. Although this figure is not big as compared to solar but its importance cannot be denied [9]. The power generated from hydel sources serves as backbone in the country's electricity structure. The total installed capacity of hydel sources is 6600 MW and the estimated potential is to be 41,500 MW [10].

Unquestionably, Pakistan is a land enriched with renewable sources and if these sources are utilized properly, can fulfill the dire need of energy. This thoughtful discussion on this subject arise a question here, if there exists an enormous potential of alternative energy sources in the country, why there has been such little and lazy progress in this matter? The feasible and technical study of alternative energy sources gives less insightful information about the accomplishment of renewable project development in Pakistan. For example, Pakistan is capable of generating more electricity from widespread wind sources at greater level in comparison with India, despite this fact, no significant work has been done so far to harness this source properly. While India has become the fourth largest nation to install and operate projects related to wind sources as shown in Table 1 [11].

Actually, it does not matter how much strong feasibility report of such projects present, it will be of no use until a robust policy specifically addressing the renewable energy exists to strengthen the developments. To fulfill the said purpose, the Government of Pakistan instituted it first energy policy in 2006. The implemented renewable energy policy although has provoked some progress in renewable filed, but this policy almost achieves partial response to impress public. The time-consuming growth of RETs can be ascribed by many factors, in Pakistan; there is a lack of sound infrastructure and supportive machinery which actually plays an important role for the development of these projects effectively. Moreover, lack of stronger competition with conventional power producers also hinders the success rate. To give this nation a strong and bright future of renewable energy sources, the government needs to take more mature and long lasting policy decision, which could pave the way forward for a sustainable energy future of Pakistan. Although, the kind of numerous challenges this policy is facing today, it must be firmly addressed and thoroughly recognized. This study intends to examine the overall strengths and weaknesses of renewable energy (RE) policy, its numerous challenges, and also to discuss fully insightful information that can put Pakistan to the path of sustainable energy future.

The structure of rest of the paper is as follows. In Section 2, a brief review of renewable energy policies implemented in other leading nations, particularly, European countries is presented. Section 3 provides an overview of Renewable Policy Mechanisms in Pakistan. The RE Policy strengths and challenges have been analyzed in Section 4. Section 5 contains up-to-date information about renewable energy purely from the context of Pakistan, its impact in present and future, from limitations to practically achieving renewable energy and also addresses the possible measures to remove such limitations. The