



Energy crisis and potential of solar energy in Pakistan



Hafiz Bilal Khalil*, Syed Jawad Hussain Zaidi

Department of Electrical Engineering University of Gujrat, Pakistan

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ABSTRACT

Energy is the basic need of modern life. Pakistan is an energy deficient country. Energy crisis is making bad impacts and destroying the economy. The current study investigates the relationship between the energy and demand supply in Pakistan. The purpose of this research is to evaluate the real reasons behind the current energy crisis. We want to find supplementary and alternate energy sources to cut down the load on the national energy mix. We select different areas and conduct our research and find the best possible renewable energy sources. In this paper we proposed the solution and best available indigenous resource in energy demanding areas.

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1. Introduction

Increasing consumption and demand for energy shows that energy will be one of the major problems in the world [1]. Alternative and renewable resources of electrical energy are required to jam-pack this demand. Pakistan is facing an energy deficiency, and most of the northern areas are still not electrified. Energy supply and demand gap is very large. Due to an energy shortfall urban areas are facing 10–12 hours load shedding while in rural areas electricity remains unavailable for 16–18 hours [9,13]. Some indigenous source like hydro-power and thermal power are in progress and not sufficient to overcome the energy shortfall. Pakistan has limited fossil fuel resources and needs to import fossil fuel. But the poor economy does not allow importing fossil fuel on a large scale. Pakistan is situated in the utmost solar

isolation area in the Earth [6]. To overcome the energy shortfall in Pakistan it is necessary to expand native energy resources like hydropower, solar and wind.

The potential of renewable energy resources can be used to electrify the off-grid areas in the western deserts and northern regions. Instead of electricity produced, solar energy also has some applications such as solar cookers and solar water heaters [7]. In addition, this study describes the role of R&D institutions of Pakistan to defeat this issue and promote solar energy technologies. Utilization of this economical renewable energy source requires some significant efforts.

European Union (EU) has made the new rule that being a member of EU each country should produce at least 22.1% of their energy from best alternative energy sources. Pakistan can also fulfill its need by following this rule and can be an environmentally friendly nation.

2. Geography of Pakistan

Latitudes and longitudes of Pakistan are 24° to 27°N and 61° to 76° E respectively. It is divided in 5 provinces namely Khyber

* Corresponding author. Tel.: +92 333 4287281.

E-mail addresses: engr.bilalkhalil@yahoo.com (H.B. Khalil), 10mseejzaidi@seecs.edu.pk (S.J.H. Zaidi).

Pukhtoon kha (KPK), Punjab, Baluchistan, Sind and Gilgit Baltistan. Some major areas and cities are shown in Fig. 1.

3. Real reasons

In Pakistan during the last ten year period energy demand has increased significantly, since policy failures supply has failed to match this augmentation [10]. The energy sector has been in swearing condition for many years. A main organization water and power development authority (WAPDA) was established in 1967 to deal with the power sector, it serves 88% electricity consumers of Pakistan [13]. Development of water and hydro-power resources is the main objective of WAPDA (Fig. 2). To fulfill the energy demands of the country that the department has an ambitious plan; Vision 2025 (divided in three phases). Under this plan total a of 23 hydro-power projects would be completed. But unfortunately some major projects are not completed till 2012 due to financial and political reasons (Figs. 2–15).

WAPDA was restructured in 2007 to remove inefficiencies and overcome the energy crisis. Now the process of distribution of electricity is divided into ten distribution companies (DISCOs). For the generation of electricity Four Generation companies (GENCOs) are working. Look after of 220 KV and 500 KV transmission lines and grid stations owned by the WAPDA are the responsibility of National Transmission and Dispatch Company (NTDC). WAPDA still controls thermal generation and hydropower development. While Pakistan electric power company (PEPCO) is managing the transition of WAPDA to corporate structure and promoting IPPs.

Private power and infrastructure board (PIIB) was established in 1994 after the extension in ministry of water and power. Independent power producers were introduced in this power policy to enhance the generation capacity and in 2002 policy further incentive was offered to the power sector [12]. A drawback of this policy is as most of the independent power plants run on furnace oil and only a limited number of plants operated on

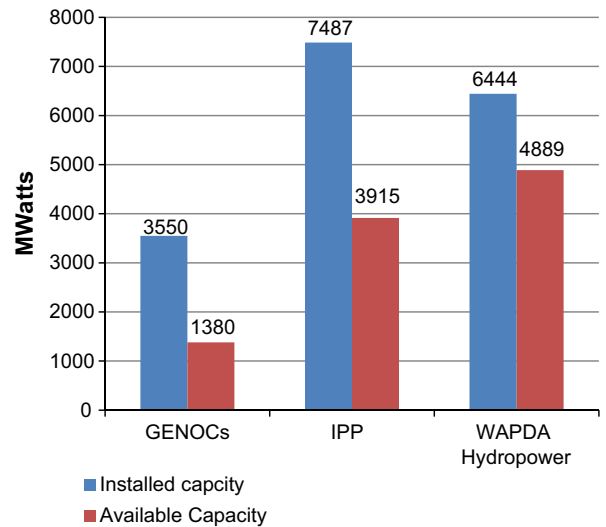


Fig. 2. Power generation by various sectors.

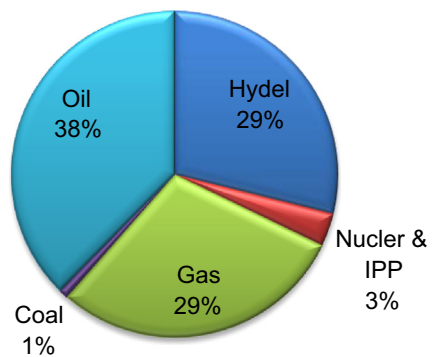


Fig. 3. Energy production by renewable resources.

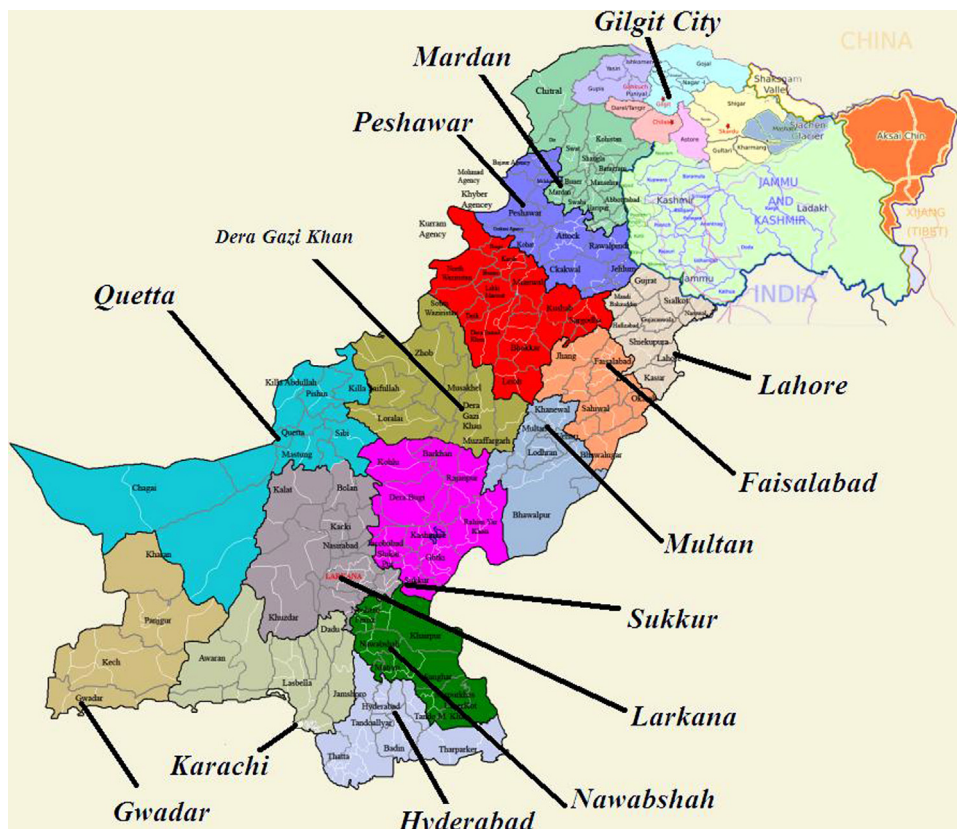


Fig. 1. Geographic Map of Pakistan.

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