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Policy Analysis of Thermal Power Generation in Pakistan

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***Abstract*—** Provision of affordable and environmental friendly energy is a national concern. Pakistan is not endowed sufficiently with energy resources and has to import energy resources from the gulf countries mainly from the kingdom of Saudi Arabia. Energy policy has been the less researched field in Pkaistan. It is believed to be a ministerial subject with least or no input from other stakeholders like academia, industry and general populace. Under this research we have conducted a detailed survey amongst all the above mentioned stakeholders. The survey comprised of the following five aspects, that were focused in detail i.e. thermal power generation capability and suitability with refrence to Pakistani energy and climate scenarios, legislation capability and local capacity, social awareness and subsidy, energy efficiency and energy audit, industry academia collaboration. Regular policy making was started in mid 1990s. before that there has been no regular power policy and major mpart of the electric power came through the hydel power generation. Since only hydel was not enough to cater to the needs of a growing economy, injection of thermal became necessary. Afterwards i.e the first formal power policy of 1994 the power generation shifted more towards thermal power mode and by this day Pakistan has 62% of power generating from thermal power i.e. fossil fuels like oil, coal and natural gas. Pakistan is one of the most seriously affected country with climate change effects. Climate change effects and availability of power should be traded off to have a workable solution.

***Keywords*—** thermal power, power policy, climate change, fossil fuels, Stakeholders.

I. INTRODUCTION

Pakistan has been under severe energy crisis since early 1990. A need for a workable power policy was felt at this moment. Before the stated period the energy mix of the country abundantly consisted of hydel and less thermal. From that time onwards the energy mix became more oil dependent and less hydel or renewable. By now Pakistan is fulfilling 64% of energy needs via thermal power generation.

In 1947 for a population of 31.5 million Pakistan had 60 MW of generation i.e. 4.5 kWh of consumption per capita. In the year 1952 the government of Pakistan (GoP) had acquired major shareholding of the Karachi electric supply company (here after KESC) which was responsible for generation distribution and transmission of electrical power to all the commercial, domestic, and industrial facilities. In the year 1958 water and power development authority (hereafter WAPDA) was created which helped reach the power generation to 119MW. By now the country had entered into the development phase. The authority of power development was then undertaken by WAPDA. It had many hydel and thermal power generating units, transmission and distribution to cater to the needs of a fast growing demand, under its control.

After five years of operation the total capacity of the power generation rose to 636 MW from 119MW. This increase in the provision of electricity had a very positive impact on the overall life style of the country, mechanized agriculture, industrialization took pace and overall life quality improved. The increase in power generation kept the pace up and by the year 1970 the total generation capacity had reached to 1331MW by installing different thermal and hydel power generation plants. This increase in power generation kept on increasing and every time supply exceeded one step ahead of the demand until year 1990-91, when the power generation touched 7000MW. But in the years to come after 1990 supply lost the pace to demand and there started the gap between demand and supply. The demand was growing consistently with 9-10% annually. In early 90s peak demand exceeded supply by 15-25% resulting in load shedding of about 1500-2000MW [1]. At this moment power policy 1994 was announced and from this time onward the power parity shifted from hydel to thermal. This shift had profound effects on the state of economy and energy market.

II. NEED FOR POWER POLICY

To overcome the growing demand of power, need was felt for a workable policy that could help reduce/eliminate the gap between demand and supply. An energy task force was created in 1993 to come up with a policy which could eliminate power shortage in the minimum possible time [2]. This policy stressed upon the inclusion of private investment into the power sector. Since thermal power generation plant installation takes relatively less time in setting up so it attracted more investment relative to hydel power generation, hence disturbing the hydel

thermal parity. This was the time more thermal power was injected into the country power mix.

First formal power policy of Pakistan was introduced 25 years ago i.e. in 1994. That time 40% of the population had access to electricity and the total capacity stood at 10800MW. That time the load-shedding was weather dependent as in summers it was relatively in check due to high amount of availability of water in the rivers. The power policy adopted in 1994 envisaged 8% annual increase in demand meaning 54000MW would be needed by the year 2018 [2].

Power policy 1998 envisaged a competitive power market in Pakistan. This policy laid down a base for restructuring and privatizing thermal power plants, power transmission, and power distribution of the public sector utilities (WAPDA/KESC). National electric power regulatory authority (NEPRA) was created under power policy 1998. As per the policy once NEPRA becomes fully operational the power sector will become more competitive [3].

Another power policy came in 2002 where again the privatization and decentralization of power systems with separate generation, transmission and distribution exists. More private ownership and management were envisaged under this policy draft [4].

To meet the current and future needs of the country the Government of Pakistan came up with an ambitious power policy 2013. Policies are always made with a positive and constructive intent, what hampers the achievements of those policies is its implementation in true letter and spirit. Power policy 2013 identified four major challenges i.e. demand-supply gap, inefficiencies in distribution and transmission systems, highly expensive generation electricity, and subsidies and subsequent circular debt.

To achieve the long term vision and provide a sustainable power supply to common citizens of Pakistan the policy 2013 set nine goals to achieve i.e. creating power generation capacity, promoting a culture of conservation, inexpensive electric supply to domestic, commercial and industrial facilities, minimize pilferage and adulteration of fuel, world class efficient generation, a cutting edge transmission, minimize financial losses, and improve the governance of all the federal and provincial ministries and regulators [5].

III. PAKISTAN ENERGY SCENARIO

Pakistan is facing serious energy crisis since long. In 2011 Pakistan had a short fall of 4000-5000 MW in summer while 2000-3000 MW in winters. Also there is a about 2 billion cubic foot shortfall in energy [6]. Curerently Pakistan is also facing serious climate change effects. Currently thermal power generation also adds to this serious issue since there are toxic gases in the emission of thermal power plants.

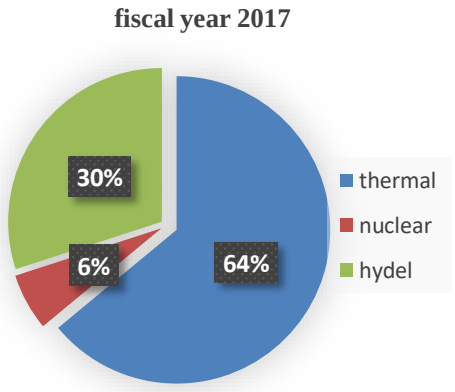

Figure.1 Pakistan energy mix

As depicted by the picture above the energy mix is heavily dependant on fossil energy fuels which are mainly to be imported from the gulf countries like KSA, Qatar and UAE. In order to invoke public, academia and investers perspective a detailed survey has been conducted to address the concerns of all the stakeholders.

IV. THERMAL ENERGY SUITABILITY

As per the survey conducted and in relation to the Pakistan energy enviromnet a response was recorded regarding the suitability of thermal power generation. Such response would give us an insight and a future road map whether to continue with thermal power genertation or if not where we should invest our energy efforts.

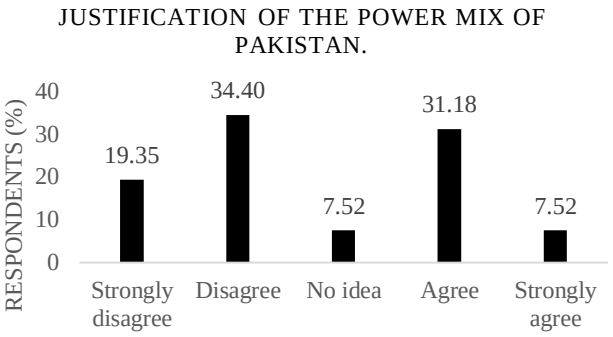

Figure. 2 Power mix Justification

As its obvious from the responses there is quite a parity between those who agree and those who does not. Since it could not be decided on the basis of this very response so we shall have to look somewhere else i.e. acceptability.

V. RENEWABLE ENERGY FUTURE AND ACCEPTABILITY

Renewable energy is a bussing word every where. It is enviromentall very compitable but not yet mature enough to cater to all the needs and without thermal power it can not cater to the needs of all the customers. It is indeed an environmentally accepted but it need to be improved further to replace all the thermal power with renewable energy. As long

as the acceptability is concerned it is hugely accepted and this is obvious from the over whelming response of the repondents

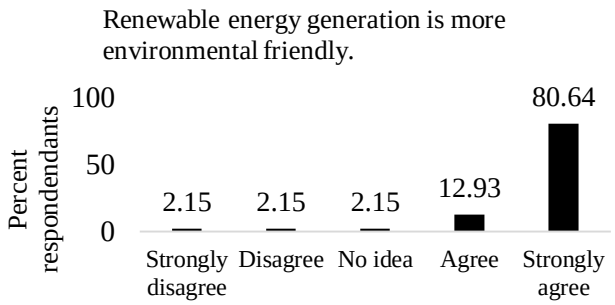

Figure. 3 Renewable energy acvironmental friendliness

From this response it is easy to predict the future of clean renewable technologies in coming time. Times when availability of energy and climate would equally matter then it would be renewable to fit into the market and fulfill the needs alongwith least harm to the environment.

SWOT Analysis of renewable energy in Pakistan

Strengths

i. Pakistan has got an overall sunny climate.
ii. Pakistan being 7th most affected country by the climate change makes it a valuable spot for injecting more renewable energy into her energy mix.
iii. With the help of Chines technology much of the renewable energy devices like solar cells are locally manufactured here in Pakistan.
iv. Globally climate change is hot issue and discussed at higher level and it has got even more centralized position after KYOTO protocol and Paris climate change agreement, this encourages further inclusion to power mix.
v. Exclusive renewable energy policy is 2019 to be announced soon.
vi. Pakistan envisaging complete phase-out of thermal power plants by 2040.

Weaknesses

i. Solar is not a reliable source for sustainable power supply.
ii. With ever increasing power deficit Pakistan energy sector cannot afford directing more funds towards a non-reliable energy source.
iii. Enough skilled workforce is not yet available and thus causes a huge loss to the national exchequer, Quaid e Azam solar park is one such example.

Opportunities

i. In Pakistan there are huge opportunities available for renewable energy provided its geography and climate.
ii. Pakistan being adversely affected would pay more attention to renewable environmental friendly technologies.

Threats

i. The ever increasing gap between demand and supply is a big threat to inclusion of renewable energy as it's not yet capable enough to suffice the need of the market.
ii. In order to sell back the electricity generated at homes or other facilities to the national grid requires net metering which is not yet introduced in Pakistan.

VI. Thermal Power Relaibilty

As thermal power is incredibly reliable and currently 80% of the global energy needs are fullfiled via thermal power generation[7].

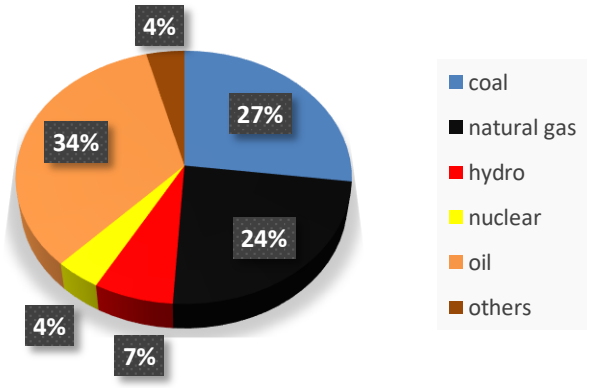

Figure. 4 World total primary energy consumption by fuel in 2018

Same response was recorded from the questtionaire respondents. Henced thermal is largely reliable and peak loads can only be met with thermal power generation.

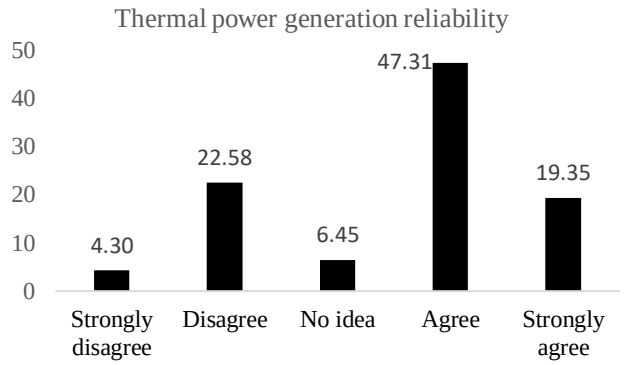

Figure. 5 Thermal Power generation reliability

SWOT Analysis of Thermal power

Since major part of our power comes from thermal sources like fossil fuels which include oil and gas and coal. Pakistan is a country blessed with huge reserves of coal which accounts for sixth largest globally. Such huge amount of coal gives thermal power generation a huge boost in order to arrest our energy deficit. Thermal power got its boost from power policy 1994 and the parity between thermal and hydel got unequal. Policy 1994 encouraged private investment in power sector and the investor finding the thermal power generation to be more and quick rewarding invested in thermal power sector in the

form of IPPs and public private partnerships. Here we are presenting a SWOT analysis of thermal power with contemporary climate change scenario.

Strengths

i. Globally no source is more reliable than thermal power. Major part i.e. around 80% of the global power around the world is produced thermally.
ii. As far as Pakistan energy environment is concerned which is heavily energy deficient only thermal energy inclusion can alleviate the issue.
iii. Since Pakistan is heavily blessed with coal reserves it is our extreme hard luck that despite the huge resources we still lack hundred percent energy access. Had this much energy resource in any other country, they would be exporting electricity.
iv. Pakistan is an under developed country which has the highest need of energy, and which can be achieved only with thermal power generation.
v. Under CPEC Pakistan has signed multiple MOUs with partner country china for power generation and recently Thar coal based two power generating units have been commissioned, each 660MW.

Weaknesses

i. Thermal power is regarded to be dirty i.e. polluting the environment. This makes this type of power generation less competitive.
ii. Fluctuations of fossil fuels in international market makes it an expensive fuel to generate power.
iii. Expensive fuel has resulted in accumulation of a mammoth of circular debt which is nearly RS 900 billion.

Opportunities

i. The major opportunity in this sector is the huge presence of coal reserves in the country which makes is a viable source for power generation.
ii. The deficit in demand-supply is itself a bigger opportunity as in a short span of time the gap can be bridged only via thermal; power generation.
iii. We have countries like Afghanistan and India, where too power shortage is a problem and we have a bigger opportunity exporting them electricity provided the political landscape allows it.

Threats

i. The major threat comes to thermal power generation from the proposed policy to oust it completely in 2040.
ii. The animosity between environment and thermal power generation makes it the last choice for many
iii. The power generated via thermal process is relatively expensive to the power generated via hydel.
iv. A threat to thermal power can also be envisaged from the survey we conducted, where we asked them whether they would like more inclusion of thermal power in their mix or not. The responses came mostly in the negative, which means the general public also does not want it anymore.

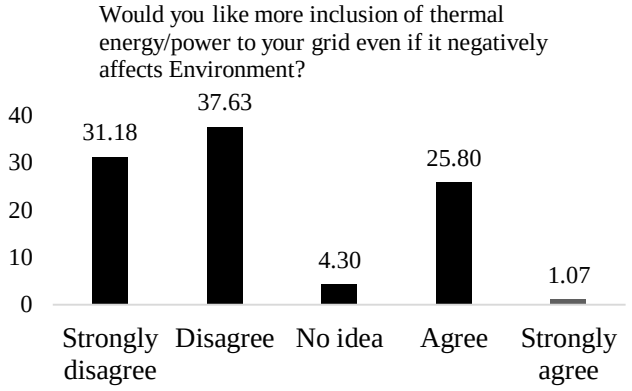

Figure.6 thermal power inclusion into power mix

Moreover, when we asked them about technologies having low carbon foot print, again the responses were overwhelming and almost all of the respondents either agreed or strongly agreed for advocating the inclusion of technologies that can lower the carbon from an already overburden upper atmosphere.

CONCUSLION

Based on the responses recorded from the diffderent respondents like academia, investors, government and common people there is huge likelihood that there is no immediate replacement fro thermal power but alongside it would be detremintal both for ec onomy and climate to go with thermal for long time. There should be timely replacement of thermal power generation with renewable technologies like solar, hydel, solar and wind. This will trade-off the harsh effects pof thermal power generation with provision of electricity across the board.

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REFERENCES

[1] M. A. Javaid, S. Hussain, Z. Arshad, Ma. Arshad, and M. Idrees, “Electrical Energy Crisis in Pakistan and Their Possible Solutions,” Int. J. Basic Appl. Sci. IJBAS-IJENS, vol. 11, no. 5, pp. 5–38, 2011.
[2] “75Aceb87369D3C696Ad46C349Aaa8D5B4Ec1D7C3.Pdf.” .
[3] S. No, Government of Pakistan Notification. 2004.
[4] “Policy For Power Generation Projects Year 2002,” Policy, 2002.
[5] J. Vinanchiarachi, N ational P ower P olicy, 2013th ed., no. September. government of pakistan, 2013.
[6] muhammad adnan, “Energy crisis in Pakistan and its issues,” 2011.
[7] “world energy usage by fuel,” 2018. [Online]. Available: https://en.wikipedia.org/wiki/World_energy_consumption.