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Pouring Oil on Fire

Pakistan has been blemished with an energy crisis for decades which has always translated into electricity demand supply imbalances. In the backdrop of a severe energy crisis it is no surprise that today the country is facing an acute electricity shortage. This has not only adversely affected the life of domestic consumers but has significantly decreased the performance of the industrial units including the export oriented industries - Textiles, cement, chemicals and steel industry have all suffered severely at the hands of electricity shortage.

This report will begin with a brief review of the energy sector before examining the misbalanced equation of energy resources used for electricity generation in the country. It will then move forward to address the need to reduce the weight of oil in the total energy mix in the wake of rising international oil prices and thereby develop more cost effective methods of generating electricity.

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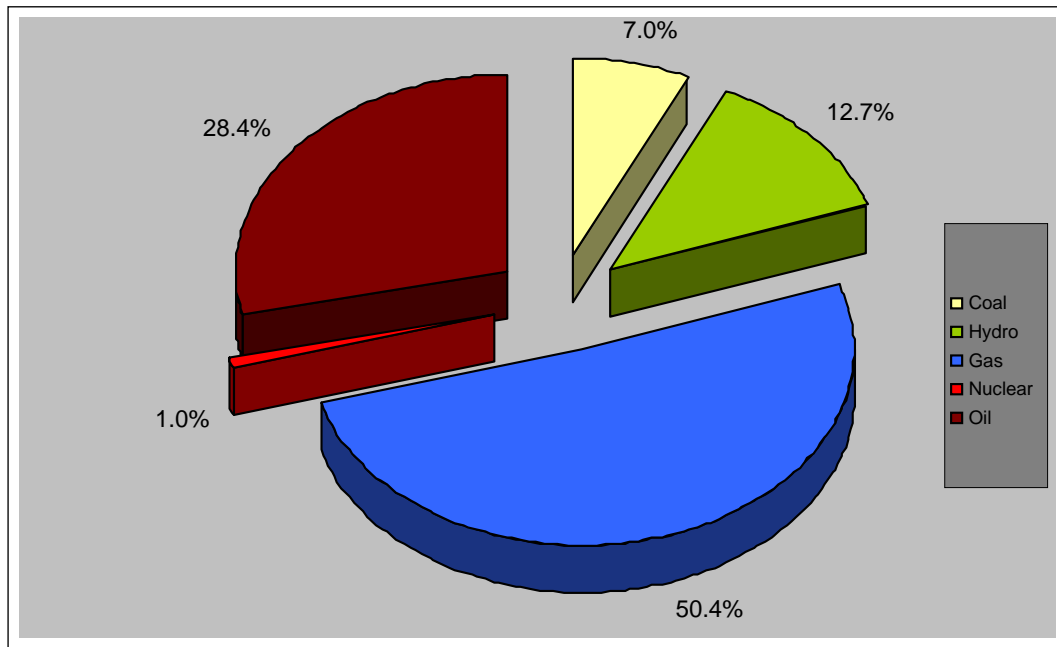
Energy – Abundant yet Scarce!


Availability of modern commercial energy is essential to economic and social development and accordingly to the survival of civilization. Hence in a growing economy like ours the demand for reliable, affordable and clean energy is growing exponentially. It is estimated that the energy demand of the economy will increase by 96% by the end of FY 2014-15 and over 250% by FY 2024-25.

What is interesting to note is the fact that our country possesses abundant energy resources. It has considerable oil, gas and coal reserves; tidal, solar and hydel potential. Despite this the country has been subjected to energy demand suppurration for many years due to limited supplies and lack of adequate infrastructure development for provision of energy to the economy. During the early 1980s, domestic supply of energy was meeting nearly 86% of the total domestic energy demand, while a gap of 14% was being bridged through imports. Ever since the demand-supply gap set out widening and reached to almost 47% by the year 2000.

And today the economy is in the grip of the worst energy crisis ever as the present level of energy supply in the country is far short of that which is necessary to sustain the rate of industrial growth and satisfy growing consumer requirements. The country domestically meets barely 30% of the total energy demand.

Figure 1: Primary Energy Supplies by Source





Natural Gas, Oil, Hydro Energy, Coal and Nuclear Energy are the primary sources of energy in our economy. It can be inferred from Figure 1 that Natural Gas and Oil constitute for more than half of the total energy supply. Though at the current levels all Natural Gas consumed is produced locally, a major component of oil consumed is imported and hence forms a significant portion of our total import bill. With the international prices of oil crossing USD 100 a barrel mark, the oil import bill of the country has already exceeded USD 6 billion while the government continues to subsidize the price of oil to consumers to protect them against international price hike. Subsequently the government has incurred huge expenditure on its part, facing an ever increasing fiscal deficit. Despite this most of the population today lack access to modern energy services and this lack of sustained and affordable energy to the economy presents an impediment to economic and social growth. Furthermore with the demand of energy expected to increase in huge proportions in the coming months, the scenario is likely to worsen.


This calls for deployment of every indigenous source of energy present within the economy in order to reduce dependence on imported energy. Additionally a more balanced approach to the planning of the energy mix is required whereby sources of energy other than the expensive oil like coal or alternative energy must be tapped. For it is certain that local resources and renewable energies, together with improved efficiency throughout the whole production, supply and use chain are needed to improve energy security of the economy.

From hereon this report will focus on the prevailing electricity crisis, the cardinal element of the energy crisis in the country, and the resulting need to balance the current energy mix.

Power – An Essential Commodity

As mentioned earlier, Pakistan has been blemished with an energy crisis for decades which has always translated into electricity demand supply imbalances. Hence in the backdrop of a severe energy crisis it is no surprise that today the country is facing an acute electricity shortage.

Electricity shortage coupled with a gas shortage is already reflected in the declining manufacturing output. During the first half of FY 2007-08 the sector grew 4.46% on year compared with a 4.49% gain in the same period a year earlier. The decline is more evident if the monthly data is examined. The manufacturing output fell 4.7% in Nov alone and another 4.12% in Dec. Decline was witnessed particularly in the textiles, cement, chemicals and steel industry and subsequently accounted for the rather slow performance of the exports.



With a 12.5% growth target set for the manufacturing sector and a 19% of GDP target for exports, it is imperative now for the government to correct for any electricity shortages to be able to at least be close to its year end targets. Though we recognize that the manufacturing sector faces other severe challenges in the form of increased interest rates and rising cost of inputs, a rectification for an electricity shortage is crucial not just for the industry but to elevate the standard of living of all individuals.

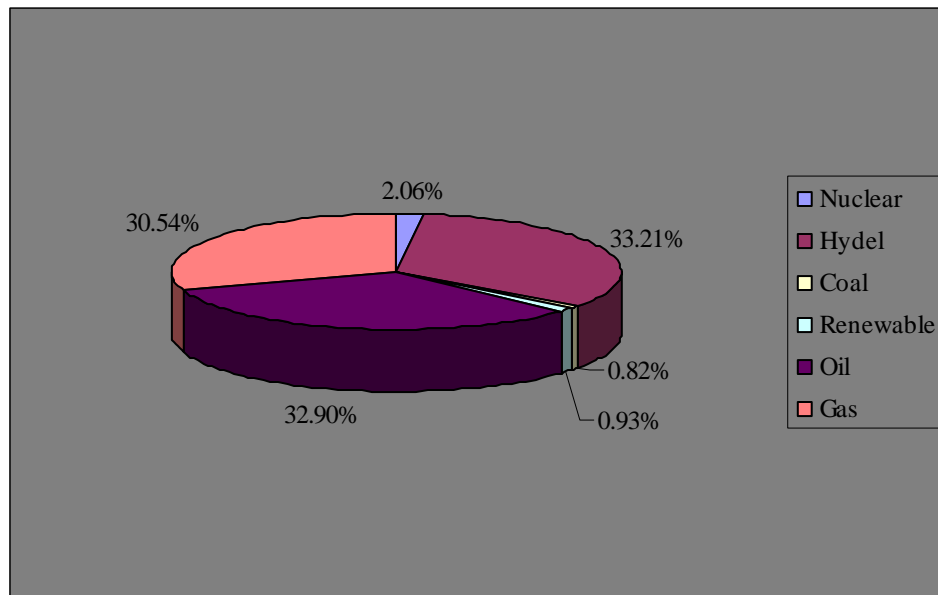
Ingredients in the Wrong Proportion – An Expensive and Unpleasant Meal!

Two vertically integrated entities are primarily responsible for electricity generation, transmission and distribution in Pakistan; The Water and Electricity Development Authority (WAPDA) which provides over 58% of the total electricity generated in the country and the recently privatized Karachi Electric Supply Corporation (KESC) which provides electricity to the metropolitan city of Karachi and its adjacent areas. In addition to this in recent years the total electricity generation capacity has been effectively enhanced with the induction of Independent Electricity Plants (IPPs). The contribution of IPPs was most significant when with their inception they allowed the economy to meet its electricity demands in late 1980s and early 1990s. However with the demand of the economy for electricity increasing persistently and the economy already slumping into a severe electricity crisis, IPPs alone cannot do much good.

The economy currently has over 19,389 MW of installed generation capacity. Thermal Plants account for around 65% of this capacity while hydroelectricity and nuclear electricity encompass 33% and 2% of this capacity respectively. On the other hand the total demand is calculated at 20, 511 MW. However it must be noted that the supply demand gap is likely to be much larger than what is calculated, if one accounts for the transmission and distribution losses. Figure 2 represents existing structure of electricity generation in Pakistan.

It can be inferred from the figure that Gas, Oil and Hydel energy are the main resources for electricity generation in the economy while Coal and Renewable energy contribute barely 2% towards electricity generation. This is a rather distressing picture if we consider the high costs of producing electricity from oil. Since production of crude is stagnant in our economy, oil is imported. Currently crude oil is trading in the international market at USD 102 a barrel and thus importing oil in such huge quantities necessarily means a depletion of foreign exchange reserves of the country.

Figure 2: Electricity Generation by Source




On the other hand the country has abundant reserves of coal which is the cheapest source available to produce electricity, yet the share of coal in the energy mix for electricity generation is negligible. Contribution of Renewable energy is also next to a bare minimum when the other emerging economies of the world are increasing moving towards exploration and utilization of alternative energy sources. Therefore to increase electricity generation to meet the growing demands of domestic and industrial units it is more important to balance the current energy mix equation in favor of resources that are more cost efficient. This essentially means switching to more cost efficient resources like the coal fired system and alternate energy resources like wind and nuclear energy while also enhancing electricity generation through conventional hydel power plants.

Balancing the Mix: Meeting Power Demands

Coal – The Cheap Diamond

As mentioned earlier, coal is a very cheap resource for generating electricity. It is no surprise therefore to see the share of coal in total electricity generation of many developed and developing economies increase manifold in recent years. In the neighboring economy of India the share of coal is as high as 70% in electricity generation while China has also been investing increasingly in coal based energy projects. Currently China is producing more than half of its electricity through thermal electricity stations run by coal.



However the share of coal reserves in total electricity generation in Pakistan is minimal despite the country having huge coal reserves. Pakistan has the fourth largest coal reserves in the world. All the four provinces are abundant in coal, with the country possessing over 186 billion tons of coal reserves. Out of this 175 billion tons of reserves are found in Thar, Sindh. Thar has one of the world's largest lignite deposits discovered by the Government of Sindh in 1992, spread over more than 9,000 sq km. These deposits alone can meet the country's electricity demand for centuries.

The huge coal reserves in our country have the potential to generate thousands of megawatt electricity through coal based thermal electricity plants. It is estimated that 2% of the coal reserves have the capacity to generate approximately 20,000 MW of electricity for nearly 40 years. Hence the current and anticipated rising oil as well as gas prices and the subsequent shortfall of electricity call for an increase in effective utilization of indigenous coal for energy and electricity generation.


Hydel Power – Much need to be done!

Currently the hydel power plants generate as much as 33% of total electricity consumed in the economy. However the country has vast hydel resources which have the capacity to yield over 42,000 MW of electricity according to various studies while barely 15% of the country's hydel resources have been tapped in the last six decades by constructing reservoirs, barrages and dams. Hence there still exists huge potential for enhancing electricity generation from hydel resources.

Several hydel projects have been initiated while the existing projects restructured in the recent years including construction of new multi-purpose dams and raising the height of existing Mangla Dam. However in order to tap its hydel resources the country does not necessarily need to invest in more projects like that of Kalabagh and Bhasha Dam which require huge capital investment and take over a decade to complete. Instead hydel resources can be utilized most effectively by developing micro hydel plants over several of the small and large rivers located particularly in the Mountainous Northern half of the country. There is abundance of perennial streams, waterfalls and canals in these areas which can be successfully exploited to generate electricity and mechanical electricity by developing micro hydro electricity plants. The technology needed for the process is fairly simple and needs low capital investment. These plants will not only produce low cost hydel electricity but can be utilized for development and uplift of far-flung, isolated and remote areas of the country.

Nuclear Energy and Renewable Energy Resources - The Sun and Wind

As can be seen in figure 2, renewable energy resources contribute less than 1% towards electricity generation in the country. Renewable energy resources like solar energy and wind energy are in fact effective resources for enhancing electricity generation. Solar



energy is however not as common in world today and is a rather expensive proposition. Nevertheless desert like areas present the most apt regions for generation of solar energy which are common attribute of Pakistan's geography. Thar for example is a good location for solar energy generation and therefore this is a resource that can be explored in the coming years.


Wind energy too can effectively enhance electricity generation as many countries are exploring this option. For example, India has increasingly shifted towards building wind turbines to increase the share of wind in total energy mix. Wind energy in fact accounts for 3% of the total electricity produced in the country. Though in our economy currently no substantial development has been seen with regards to utilization of wind energy the power sector under the Alternative Energy Development Board expects to build additional capacity of 150 MW by launching a Wind Mill Project (150 MW) in the coming year. Additionally it is expected to build several micro wind turbines in remote areas for electricity generation. Only the coming months will tell if these projects are implemented successfully.

Finally another important resource for electricity generation is nuclear energy. Nuclear energy accounts for approximately 2% of total electricity generation in the country while efforts are being taken to increase this share. The nuclear power plant of KANUPP, the first ever nuclear plant of the country has been refurbished for life extension of 15 years and is currently producing 100 megawatts of electricity. Furthermore feasibility studies for two nuclear power plants at Karachi (KANUPP-2 & 3) are completed and a site selection study of six other sites for nuclear power generation is also underway. Nevertheless the scope of increasing share of nuclear energy in the energy mix equation is limited as any exploration of this resource is vulnerable to international debates.

The Dark Clouds – Are they here to Stay?

In recent months electricity shortages in Pakistan have increased to 3 to 3.9 GW from the usual 2 GW. This emerging worrisome electricity shortage for the country underlines the urgent need for effective initiatives for capacity building to enhance the supply of electricity from all possible sources.

Though construction of some major power plants has been initiated in recent years by the government to enhance electricity supply to the economy, it is distressful to note that most of these are oil based thermal plants. Currently the energy mix equation for electricity generation is already highly skewed towards utilizing oil as a resource. With international oil prices skyrocketing, these power plants even if increase the supply of electricity will do so at a high cost, further increasing the pressure on the current account and foreign exchange reserves of the country.



What instead is needed is utilization of cheaper resources for electricity generation. As argued earlier, coal is the most significant resource for this purpose due to its cheap cost and abundant presence. Nevertheless no new substantial steps have been taken to put this resource to use as the issue of offering a suitable tariff to any investor interested in development of country's coal reserves has not been resolved. Since investors would need to commit themselves for a long term, they demand a competitive upfront tariff and therefore National Electric Power Regulatory Authority faces increasing pressure to offer a competitive and upfront tariff to electricity generated through coal. This has further added to slowing down the process.

However recognizing the urgent need to tackle the electricity crisis, the new government has claimed that it is likely to prioritize the use of country's sizable coal reserves for domestic electricity generation. It is also equally important to enhance electricity generation by hydel resources which currently possess a huge potential which has not been tapped. It is only efforts to increase the proportion of these resources simultaneously which will determine if the economy will be saved in the long run from the dark clouds of the electricity crisis, looming over the heads.

Economic Snapshot

Fiscal year 07-08														
	Units	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan
<u>Inflation</u>														
Headline Inflation	%	6.64	7.39	7.67	6.9	7.4	7.0	6.4	6.5	8.4	9.3	8.7	8.8	11.9
Core inflation	%	5.3	5.72	5.42	5.2	4.7	5.1	6.0	6.0	6.1	6.5	6.9	7.2	7.8
Food inflation	%	8.7	9.99	10.74	9.4	11.3	9.7	8.5	8.6	13	14.7	12.5	12.2	18.2
Non-food inflation	%	5.2	5.59	5.54	5.2	4.7	5.1	4.9	4.9	5	5.4	5.9	6.3	7.3
<u>T-bill (Wgt Avg)</u>														
3 month	%	8.64	8.64	8.65	8.69	8.69	8.69	8.69	9.05	9.05	9.05	9.05	9.09	9.09
6 month	%	8.81	8.81	8.82	8.9	8.9	8.9	8.9	9.12	9.12	9.12	9.21	9.29	9.29
12 month	%	9.00	9.01	9.01	9.08	9.10	9.16	9.16	9.39	9.39	9.39	9.4	9.49	9.44
<u>External Sector</u>														
Export	Mln US\$	1,227	1,421	1,536	1,446	1,540	1,583	1,434	1,475	1,463	1,593	1,524	1,500	1,634
Import	Mln US\$	2,100	2,103	2,070	2,159	2,190	2,373	2,423	2,206	2,150	2,555	2,864	2,910	3,271
Trade balance	Mln US\$	(873)	(682)	(534)	(713)	(650)	(790)	(989)	(731)	(687)	(962)	(1340)	(1410)	(1637)
<u>Remittances</u>	Mln US\$	391	457	520	513	537	505	495	489	516	580	505	479	557
<u>Forex Reserves</u>	Mln US\$	13,212	13,378	13,624	13,661	13,778	15,182	15,723	16,106	16,145	16,354	15,807	15,604	15,074



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