

Energy crisis of Pakistan and attenuation prospects

by Dr. H.R. Sheikh, Professor Emeritus, Textile Institute of Pakistan.

Electricity supply shutdowns and load-shedding started in Pakistan in the eighties due to shortage of electric power as compared to demand. The gap between supply and demand for electric power has existed ever since. Public and private sector electric supply companies, including WAPDA have been compelled to adopt load-shedding as a regular practice. The gap between supply and demand crossed 1500 MWH in 2007. According to the statistics of PPIB website the gap will rise to about 5500 MWH by 2010. In the meantime load-shedding has become a chronic problem. All major cities of the country are daily subjected to load-shedding for a period of five to seven hours. Small cities, towns and villages are facing load-shedding up to 12 hours every day. The energy crisis across the country is worsening and possibility of an immediate solution seems to be remote.

The fundamental questions which arise are as to why the public sector agencies, the Planning Commission, Alternative Energy Development Board (AEDB), National Electric Power Regulatory Authority (NEPRA), National Transmission and Dispatch Company (NTDC) have allowed the power supply and demand gap to become massive? Why has the potential of indigenous energy sources not been exploited and utilized to the full extent?

Recently, highly informative papers on the subjects of energy crisis, renewable energy, nuclear energy and thermal energy have appeared in the media, written by experts, such as Dr. Mirza Ikhtiar Baig, Mr. Tariq Iqbal Khan, Syed Imran Shah and Mr. Ashfaq Bokhari. The causes of the development of energy crisis in Pakistan, practical solutions and future prospects have been discussed in detail in these papers. The basic ideas put forward by these experts are reported briefly as follows:

1. Coal, Gas and Petroleum

At present the contribution of coal to power generation in Pakistan is only about 0.13%. This is inspite of the fact that vast reserves of coal totalling about 185 billion tons, out of which 175 billion tons located in Thar desert region discovered in 1992 as reported by Geological Survey of Pakistan can be developed and used as fuel for power generation for at least another 200 years has remained un-utilized so far.

This clearly demonstrates lack of planning and foresight on the part of the concerned public sector agencies. In contrast, the contribution of coal as fuel for power generation is about 40 to 60% to the total global energy generation. China produces about 75% of its electricity from coal and consequently is the largest consumer of this fuel in the world. Similarly, the consumption of coal in electricity plants in Britain has been steadily rising over the past six years and has exceeded the consumption of gas.

Prior to the formation of new democratic government natural gas and oil were preferred as fuel for power generation. In 2007 the contribution of these fuels to total power generated was 36.51% and 28.59% respectively i.e. about 65%. The existing reserves of natural gas in Pakistan are not likely to last for more than twenty years. The plans of Pakistan to import gas through cross-border pipelines have not been successful.

The gas pipeline route from Turkmenistan must pass through Afghanistan which is a war-torn hostile country

and, therefore, the project is impractical. The snag in the case of Qatar was about laying of the pipeline on sea bed. The global experience about gas pipelines passing through deep sea bed is that such projects are uneconomical in the long run. Similarly no final decision has so far been taken with reference to the route of Iran – Pakistan – India (IPI) gas pipeline.

The law and order situation does not permit laying of the pipeline through Balochistan as the existing Sui gas pipelines have been blown up many times.

Alternative plan to lay 54 inch pipeline through coastal area involves building many bridges which would be exposed to damage by flash floods as would be the coastal highways. Thus the cost of the project would escalate substantially so that the bridges can withstand flash floods.

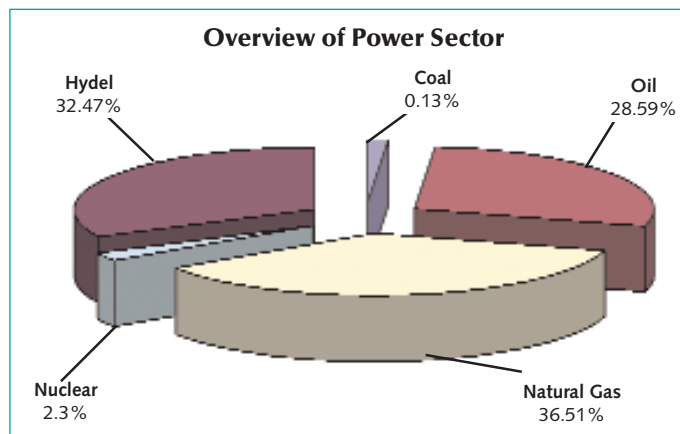
As far as oil is concerned, Pakistan has been importing crude oil and refined petroleum products for generation of electricity for more than a decade. Last year the oil import bill crossed seven billion dollars. Currently, the international oil price is about \$118 per barrel and the oil import bill is likely to reach \$11 billion by the end of current fiscal year. It is obvious that import of oil for energy generation is a constant heavy burden on foreign exchange reserves which have dropped down from \$16.48 billion in November 2007 to \$13.84 in March, 2008.

Depletion of 16% in foreign exchange reserves in a short period of about 4 months calls for development of plans for exploitation of coal reserves on priority basis. The latest thinking is in favor of commercial exploitation of coal by both public and private sector enterprises.

Public sector will be engaged in coal mining for which the government has set up **Thar Coal Mining Company**. The power production from coal will be the exclusive domain of the private sector. The new democratic government intends to embark on a 100 day crash programme to tackle critical deficits in vital sectors including power. However, the Planning Commission anticipates that a period of two to three months will be required to complete procedural formalities before international bids are invited

for setting up coal fired power plants. Nevertheless, the urgency of reducing dependence on imported oil, development and commercial exploitation of coal as a fuel for power generation cannot be over emphasized.

It is frustrating to note from media reports that 23 new projects with cumulative power generation of 5,129 MWH have been planned by the concerned government authorities based on oil and gas as fuel.



Power Demand Position			
Year (Year ending 30 th June)	Firm Supply (MW)	Peak Demand (MW)	Surplus/ (Deficit) (MW)
2003	14,336	12,800	1,536
2004	15,046	13,831	1,215
2005	15,082	14,642	440
2006	15,072	15,483	(411)
2007	15,091	16,548	(1,457)
2008	15,055	17,689	(2,634)
2009	15,055	19,080	(4,025)
2010	15,055	20,584	(5,529)
❖ By year 2010 additional power required will be 5529 MW.			
❖ The additional power generation will need an investment of about 5 billion dollars for five years (2006-2010).			

The implementation of these projects will impose unbearable burden on the foreign exchange reserves, power cost per unit will be very high and the exercise will be counter-productive. Instead of wasting time on implementation of these expensive power projects, the Government of Pakistan must concentrate on development of Renewable Energy Resources simultaneously with the development and exploitation of coal as fuel for power generation.

2. Renewable Energy Resources

The Renewable Energy Resources are hydel, wind and solar power. The hydel power source contributes about 33% to total power generated in Pakistan. The work for development of wind and solar power is at present in the planning stages. The prospects of development of these resources are discussed below:

2.1. Hydel Power

The Hydel Power potential available in Pakistan is in the range of 42000 to 45000 MWH, average may be reckoned at 43,500 MWH. At present hydel power source is being utilized at about 5280 MWH, i.e. about 12% of the potential available. This is due to non-construction of any new dam since the completion of Ghazi Brotha, Simli and Khanpur dams in 1983. After the completion of Tarbella dam, height of Mangla dam was, however, raised to increase its storage capacity. Meanwhile, sedimentation has taken place and storage capacity of existing dams has declined by about 28%. In sharp contrast China, Turkey, Iran, Japan and India are building 95,51, 48, 40 and 10 new dams respectively.

However, development of hydel power source is now receiving attention by the concerned public sector agencies. The plan of WAPDA under Vision-2025 Policy involves 14 new projects during the next 17 years with total capacity of 20,770 MW to be set up at a total cost of \$6.5 billion and sponsoring of 22 hydro projects with cumulative power generation of 5,720 MWH.

The total power generation by these 36 projects is estimated approximately as 26,500 MWH. The utilization of the hydel power source is expected to rise from 12% at present to about 75% after the completion of these projects. Some of these projects are also expected to provide water storage facilities and improve water supply situation during periods of drought. The energy crisis prevailing in Pakistan calls for expeditious implementation of these projects in order to prevent industrial production losses, resultant escalation in cost of production, loss of exports and increase in the agony of citizens especially during summer months because of electric shut-downs and prolonged periods of load-shedding.

2.2. Wind Power

At present power grids connected wind form for power generation does not exist in Pakistan inspite of the huge wind power potential available. A detailed study has been conducted by the National Renewable Energy Laboratory (NERL), Pakistan Meteorological Department in collaboration with the USAID.

The study has highlighted the potential wind corridors in Southern Sindh, Baluchistan and NWFP.

The coastal areas of Sindh (Keti Bander – Gharo) were found to have greater wind power potential as compared to those of Baluchistan covering an area of 9,700 square kilometers.

The gross wind power potential of the area is reported to be 43000 MW. However, there are many obstacles in the exploitation of the potential to the full extent. Some of these obstacles are unsatisfactory law and order situation, lengthy procedure of lease of land to prospective investors and unattractive terms and conditions stipulated in the power purchase agreement by the Government of Pakistan (GoP).

Under the Renewable Energy Policy of the GoP announced in December, 2007 about 700 MWH of Wind energy would be harnessed by 2010. As reported by PPIB the demand for electric power is expected to rise to 20,584 MWH by 2010 and therefore, 700 MWH of wind energy will contribute only about 3.5% to the total requirement.

In sharp contrast, the capacity of wind power projects already installed in the world is reported to be 95000 MWH which is expected to be enhanced to about 185,000 MWH by 2020. The wind power generation in USA is currently 19,000 MWH. USA plans to double wind power generation every year. Similarly, Europe is concentrating on the development of the share of renewable energy to 20% of its total generation by 2020 with wind power generation as priority area.

China and India are also focusing on the development of wind power and plan to install wind power plants of 5,000 MWH total capacity each 2010. The rush for the development of wind power generation all over the world is because it is an ideal renewable energy source, pollution free, infinitely sustainable and cheap. The GoP should also consider provision of incentives and attractive terms to foreign investors from China, Holland and Germany in order to achieve satisfactory growth rate in wind power generation.

2.3. Solar Energy

Although no estimates are available, yet the potential for solar energy generation in Pakistan is considerable. For generation of power involving solar radiations, the two main techniques are namely, Solar PV technology [PV] and Concentrated Solar Power technology [CSP].

Name of Project	Installed Capacity (MW)
Neelum Jhelum Hydropower	969
Kohala Hydropower (AJK)	740
Dasu Hydropower (N.A)	2712
Pattan Hydropower (N.A)	1172
Thakot Hydropower (NA)	1043
Bunji Hydropower (NA)	1500
Chokothi (Jhelum River)	139
Naran (NWFP)	219
Azad Pattan (Jhelum River)	222
Matiltan (NWFP)	84
Taunsa Hydropower	120
Total	8,920