

Pakistan's Energy Security Challenge: Some Observations and Thoughts

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1. ENERGY SECURITY

1.1. Energy security has become the burning topic of the day both in country specific and international terms. Many consider that the new alignments in geopolitics are strongly influenced by the search for energy security which may be defined as “dependable and affordable energy necessary for an economy.” It is even claimed that in terms of strategic importance energy security is second only to food security. Given the shortage of energy we are facing and the national debate on its cost and affordability, there is no doubt consensus that we have an Energy Crisis in the country and our Energy Security is at risk.

1.2. The Issues

The national debate on the energy sector has turned into a blame game where every one is finger pointing. It is interesting how every player has a solution dependent on actions by others.

The first step to solving a problem is to recognise and accept the problem, something we have been unwilling to do in the energy sector for sometime. To understand the problem and its genesis we need to understand: (i) the fuel /primary energy side; (ii) availability of financial resources; (iii) importance of demand side management; and (iv) the need to look at energy in an integrated fashion.

1.3. The Issue of Fuel/Primary Energy

Pakistan's energy sector has been too dependent on its domestic gas as the primary source of energy. Unfortunately the pricing for this precious resource was not based on economic principles of scarcity and optimal allocation, which resulted in its under pricing, misuse and misallocation. This also created a barrier for the entry of other alternate fuels such as coal and adversely affected exploration and production activities in the country. Pakistan was never a gas surplus country as is obvious from the institution of gas quotas and the need for import of fuel oil beyond that produced by the domestic refineries.

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There was a lack of true recognition that we were running out of domestic gas. No real alternative was put in place. Further when the expected gas import schemes did not materialise we did not take corrective actions. But again, largely the debate is focused on talks of our large hydro potential and Thar coal, which are projected as the solution. The nation needs to understand why they are not happening. The problem needs to be understood and identified for possible solution.

In the primary energy/fuel sub sector the cost for hydropower specially from the multipurpose dams needs a revaluation. In particular we need to factor in the cost of thermal power that has to be built to back up the hydropower as well as the true cost of financing. Unless we get our economic costs right we will continue to have difficulty in accepting the cost of developing domestic coal and alternate energy .

The current power crisis is in reality a fuel side crisis.

1.4. Fuel and Primary Energy Security

Therefore we need to strengthen our options for fuel /primary energy supply. This should include development of domestic resources like Thar coal and enhanced exploration for fossil fuels within the country. At the same time like other nations we need to invest abroad to secure long term supplies/contracts for coal and LNG (Light Natural Gas). We have been facing difficulties in accessing LNG supplies because we did not act in time. OGDC (Oil and Gas Development Company) should gear itself up for seeking the desired reserves abroad. Also, as part of the Security strategy we need to allocate our domestic resources where we get the maximum economic benefit. We already have in country a reasonable fertiliser manufacturing base. For future expansion we could invest abroad in fertiliser plants and reserve our own gas for the power sector.

In the hydropower sector we need to give higher importance to developing the run of the river potential as well as on smaller schemes on the irrigation systems.

1.5. The Energy Mix

Table 3

Energy Mix Plan Projections

	Current		Short Term		Medium Term				Long Term			
	2004		2010		2015		2020		2025		2030	
Total MTOE	50.8		79.39		120.18		177.35		255.37		361.31	
Oil	15.20	30%	20.69	26%	32.51	27%	45.47	25.7%	57.93	22.7%	66.84	18.5%
Natural Gas	25.45	50%	38.99	49%	52.98	44%	77.85	44%	114.84	45%	162.58	45%
Coal	3.30	6.5%	7.16	9%	14.45	12%	24.77	14.0%	38.28	15%	68.65	19%
Hydro	6.43	12.7%	11.03	13.9%	16.40	13.6%	21.44	12.1%	30.50	12%	38.93	10.8%
Renewable	0.00	0.0%	0.84	1.1%	1.60	1.3%	3.00	1.7%	5.58	2.2%	9.20	2.5%
Nuclear	0.42	0.8%	0.69	0.9%	2.23	1.9%	4.81	2.7%	8.24	3.2%	15.11	4.2%

The above table from the Planning Commission's Medium Term Strategic Framework (MTDF) gives a good analysis of the sources of Pakistan's energy and also how this mix should change between now and 2030 to enhance its security through diversity . It shows that we are overly dependent on imports. We should shift our reliance increasingly to domestic sources though imports in absolute terms may increase.

2. FINANCIAL RESOURCES

2.1. The above Energy Mix projection is central to the Energy Security Plan which is part of the MTDf. However, there seems to be a disconnect between the projected plan and the country's resources. For the power sector alone, these investment requirements are estimated at US\$ 150 billion for the additional 143,310 MW of installed capacity. Total oil and gas related investments up till 2015 for in Pakistan are estimated at US\$ 16 billion. Further financing requirements for meeting its renewable energy development targets up to 2015 are estimated to be US\$ 2.2 billion. All of these are huge expectations which might not be very realistic.

2.2. The State also provides vast subsidies to the sector. In 2007, the subsidy to the power sector alone exceeded US\$ 1.3 billion.

2.3. Enhancing the financial health of the sector is central to ensuring Energy Security. This is only possible if the government exhibits the political will to address the underlying problems.

The necessary steps include :

- (i) Realistic tariffs reflecting cost.
- (ii) Targeted subsidies compared with indirect and cross subsidies.
- (iii) Securitising existing assets.
- (iv) Active public private partnerships.
- (v) Private sector to have a role where it has a comparative advantage.

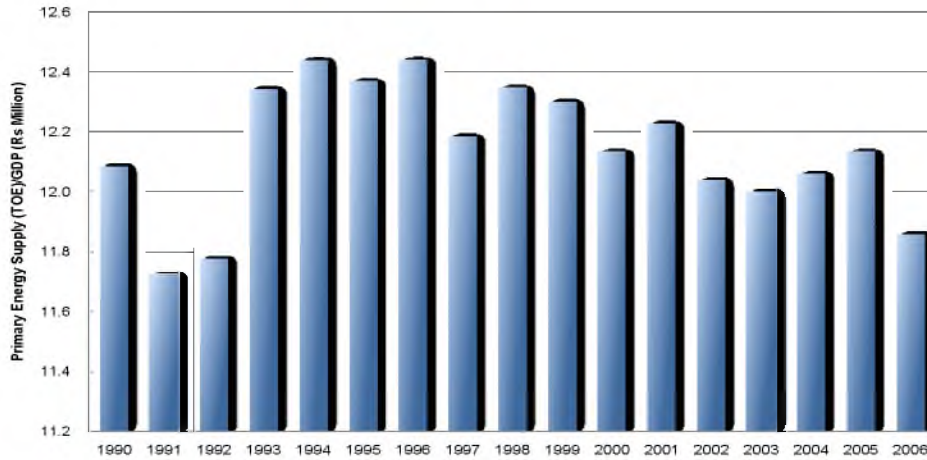
The current tendency to run down the private sector based on distorted comparison of cost of delivery between and public and private sector must stop. The comparison must take into account reliability of delivery and true financing cost of the public sector projects. This decision making could be facilitated by looking at the economic cost of un served energy.

Failures, if any, in the private investments and public-private partnerships are a result of governance and structural weaknesses. These can be addressed

3. DEMAND SIDE MANAGEMENT

3.1. The major emphasis so far in the national debate has been on the supply side. However, we need to address both supply and demand side, which includes both Energy Efficiency and Energy Conservation (EEEC). In overall economic terms, EEEc normally represents a 'least-cost' development strategy. Last few megawatts of power, from new generators and transmission lines, is more expensive than the cost from existing plants and lines, so reducing demand through EEEc measures is more cost-effective than expanding supplies. Energy efficiency and conservation can not only reduce the large financial outlays required for developing additional energy supplies in the future, but can also help minimise uneconomical 'excess' standby capacity required to cater to peak loads, reduce subsidy requirements, and defer transmission system expansion needs, thereby saving public funds and increasing returns on energy infrastructure investments.

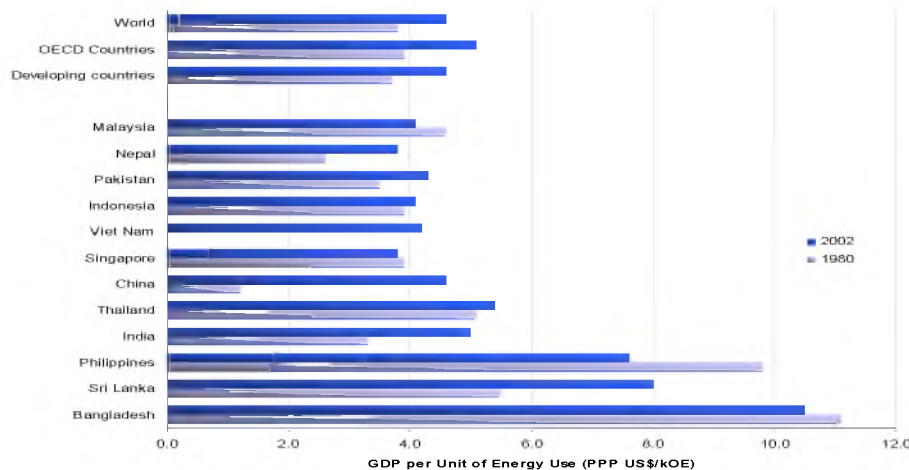
Energy Intensity in Pakistan, 1990-2006



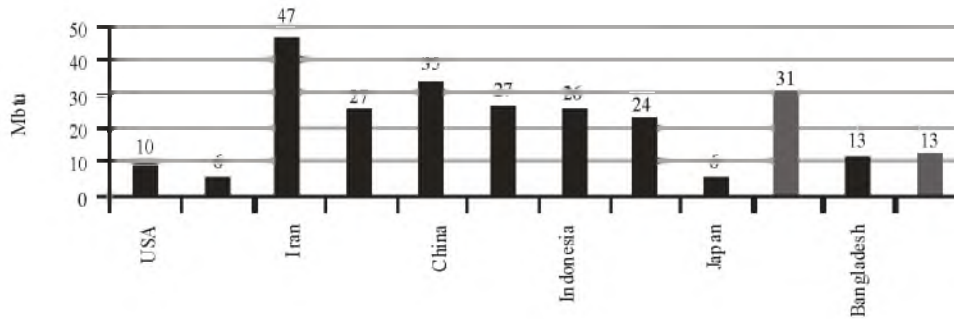
Sources: *Pakistan Economic Survey* and *Pakistan Energy Yearbook*, Government of Pakistan, Islamabad: 1990-2006.

3.2. If we look at the Energy intensity in Pakistan, it is presently not falling rapidly enough, especially when compared to other emerging economies, notably China and India. . Our ratio of growth in energy to growth in GDP is still higher than One. Our industry also cannot keep asking for subsidies on energy. They need to improve efficiency too reduce consumption per unit of output. If we compare our energy intensity with others it becomes evident that we cannot remain competitive unless we improve our productivity and efficiency. For example we use double the energy in steel making as compared with the developed world. How can we compete!

Increase in Energy Productivity Developing Asia, 1980-2002



Source: *Human Development Reports*. United Nations Development Programme (UNDP), New York: 2006. (<http://hdr.undp.org/statistics/data>).



3.4. The above figure re emphasises the need to address Efficiency of Energy Use. It is apparent that per Unit of GDP, energy utilisation by developing countries is high as compared to the developed countries. This is due to the following reasons:

- (1) Due to the Economic Mix: In developed countries a higher share of value added and service sector in the economy results in a lower use of energy per unit of GDP. The developing world has a higher share of “dirty” industries which are energy intensive.
- (2) Inefficient production processes and high energy consuming equipment and losses as well as poor demand side management in the developing world.

Therefore, in order to preserve our economic growth trends and improve its share in the global market, Pakistan will have to target significant reduction in its average energy intensity by adopting efficient energy use and reducing system-wide and end-use waste.

3.5. Estimated Potential for Sector wise EEEEC in Pakistan

- Industry 15-25 percent
- Transport 15-20 percent
- Agriculture 15-20 percent
- Buildings 20-30 percent
- Average 15-25 percent

Source: ENERCON, National Energy Conservation Centre, Islamabad.

3.6. Areas of Potential EEEEC in Energy Delivery

There needs to be a reduction in Transmission and Distribution (T& D) losses, which are currently at 26 percent. If only we have a 10 percent reduction, then its impact is about 1500 MW saving Which translates to a higher net availability and lower cost. Similarly a 5 percent reduction in UFG (unaccounted for Gas) can result in additional availability of 150 MMSCFD (Million Standard Cubic Feet per Day) which could fuel 750 MW of additional power generation at low cost . Improving thermal efficiency at the current plants could produce more power at lower cots. Guddu power station runs on gas with an efficiency of 29 to 30 percent whereas modern CCGT (Combined Cycle Gas Turbine) plants have efficiency of up to 55 percent. So a new 700 MW plant could pay itself back on savings in gas consumption alone.

There is a need for introduction of Time of Day (TOD) metering to help in peak shaving. Consumers need to get the right signal through realistic pricing. It will encourage energy conservation by forcing them to look at switching load to non peak time, improve insulation and energy conservation in buildings and use of alternatives such as solar water heating.

3.7. The case of CFLs (Compact Fluorescent Lamps)

As part of demand side management many countries have started actively supporting the use of CFLs and some have announced legal frameworks for phasing out the incandescent lamp. A study¹ shows that if a CFL of 14 W be given to each domestic consumer of less than 100 Kwh (12 million of them in the country) it would save 546 MW of peak load. This would make available this peak time energy to activities with higher economic value. Further it would represent a saving of \$ 710 million in new generation capital cost and \$ 0.76 million in saving in Government of Pakistan subsidy based on 2000 hours of running over the life of the CFL . In addition the lower electricity bill for the consumer provides him extra cash for other essential needs. It is understood that Pakistan, like other countries is actively developing a program to enhance use of CFLs .

4. ENERGY MANAGEMENT—AN INTEGRATED LOOK

Pakistan's energy planning and management are fragmented. Historically we have looked at fuel/petroleum, electricity, water etc in silos rather than taking an integrated look at energy. The GoP agencies responsible for the energy sector are also organised along these line. As a result we have not always looked at the least economic cost of delivery of the whole energy chain.

Piecemeal look at energy prices and policies have resulted in economic distortions. This has been further aggravated by the desire to use the sector as a major source of revenue . A typical example is the piecemeal strategy on CNG promotion and pricing and the taxation structure on petrol versus diesel which has negatively impacted the refining sector as it creates product demand imbalance vis a vis capacity. It has also affected the balance of payments by pushing up imports of diesel and below cost exports of naphtha and encouraged smuggling of petrol causing an overall economic loss. The total impact of costs on the economy, tax revenues and subsidies need to be evaluated in an integrated manner.

Product pricing which does not reflect true economic cost has to a certain extent affected development of our indigenous resources such as coal as well as enhanced Extraction and Production (E & P) activity in the country.

Again, as a result of piecemeal look at the cost of delivery, power plants based on imported oil have been and are being located upcountry rather than at the coast as a result of which oil is carted up country overloading transport infrastructure and resulting in increased true cost of energy delivery.

The economic costs/benefits of the whole chain need to be fully understood before allocation of resources and subsidies. It is important that an Economic analysis must precede financial decisions. Hopefully the Integrated Energy Model being developed by the Planning Commission will prove to be a useful tool in addressing some of these issues.

¹Implementing Energy Efficiency in Pakistan. The Asian Development Bank, 2007.

5. GOING FORWARD: SUGGESTIONS

(i) We need to do integrated energy planning and do true economic pricing of different options of energy resources and supplies; (ii) it must be recognised that best theoretical options may not be the true realistic options. Plans should be based on economic and financial realities. Project short listing should be of “do able” projects that takes into account the economic and financial realities and the “bankability” issues; (iii) the planners and strategists need to link their Energy Strategy with the overall economic and financial strategy; (iv) EEEEC needs to be given the importance it deserves rather than lip service only. Supply side alone will never be able to meet the energy demand of Pakistan; (v) O&M of existing assets needs to be a high priority. It makes no sense to add new capacity while we keep loosing capacity of existing assets; (vi) invest in primary energy assets both domestically and abroad; (vii) projects of run of the river hydropower plants and small hydropower plants on the irrigation system deserve more attention; and (viii) improve the financial health of the sector.