

Potential for Growth and Private Participation in the Energy Sector of Pakistan

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INTRODUCTION

Energy Supply Mix

Situated in the South Asian region, Pakistan is a low income developing country. With an area of about 800,000 sq. kms and a population of 120 million, the country has a GNP per capita of US \$ 400 with a GDP growth rate of about 6.1%. The growth in production coupled with high population growth is putting enormous pressure on energy supplies. The current rise in annual commercial energy demand, which constitutes about two-thirds of total energy consumed, is about 6.5%. The present primary commercial energy supplies of about 33 million TOE per annum comprises Oil (40%), Gas (38%), Coal (6%), Hydro (15%) and Nuclear (0.4%). The imported energy, mostly oil, comprises some 33% of the total.

Historical Pattern.— The pattern of commercial energy supply in Pakistan has undergone considerable change during the last four decades. Oil and coal were the only fossil fuels used in the country in the early 1950s and they together accounted for 99% of the primary energy supplies, of which 80% was imported energy. Following the development of natural gas reserves at Sui in the mid-1950s, natural gas has gradually substituted for coal and oil and now meets about 40% of the energy requirements. Further, the construction of two large hydro-electricity dams at Mangla and Tarbela has led to increasing the share of hydro from a meager 1% in the early 1950s to around 15% now. Thus, through recourse to indigenous resources of gas and hydro, Pakistan has succeeded in reducing its energy import dependence from nearly 80% in the early 1950s to about 33% now.

Sectoral Consumption.— Industry (38.8%) is the largest commercial energy consuming sector of the economy, closely followed by Transport (33%). The rest include Domestic (18.5%), Agriculture (3.9%) and Commercial (2.9%) sectors. Natural gas is the predominant fuel in the industrial sector while the transport sector almost entirely comprises liquid fuels.

In the domestic sector, natural gas is the most important fuel which is now available in almost all the major towns and cities of the country. Electricity has a large consumption in the agricultural sector, mainly utilized in operating the irrigation tubewells while some large engine driven ones consume oil. A large portion of natural gas is consumed in non-energy fertilizer production for which mainly the low-btu gas from the giant Mari field has been allocated.

Oil Supplies.— The weakest link in the energy supply system of Pakistan has been the supply of oil from indigenous resources. The share of indigenous oil in total oil consumption of the country remained in the range of 10-15 percent until early 1980s. However, this share has now increased to a level of nearly 22% owing to much increased petroleum exploration and development activity during the last ten years. Still, the oil import bill is a major strain on Pakistan's economy and has been syphoning off a large portion of its export earnings thereby causing serious balance of payment difficulties. The softening of oil prices in the international market since 1986 had provided some relief but the events in 1992 in the Persian Gulf have made the oil market, once again, highly uncertain. The annual oil import bill for the financial year 1992-93 was US \$ 1.56 billion.

Electricity.— The present installed power generation capacity is about 10,500 MW, consisting of 43.7% hydro, 54.3% thermal oil and gas, 0.7% coalfired and 1.3% nuclear. This installed capacity is insufficient to meet the peak demand as the hydro generation capability undergoes large seasonal variations and reduces considerably when the reservoir water levels get low. Still, the share of hydro in total power generation is close to one-half, while the other half is generated essentially by thermal plants. The country has only one nuclear power plant of 137 MW capacity, whose contribution to present electricity generation is about 1%. The share of oil, which dominated the power generation activity in the 1950s decreased to a level of 34% in the 1970s, mainly because of rapid hydro development and use of natural gas for power generation. However, it has since been increasing again, partly due to slowing down of hydro development and delays in construction of nuclear power plants and partly

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because shortage of natural gas supplies has forced switching over of some of the gasfired plants to oil-fired in addition to building of new oil based plants during the last 10 years.

INDIGENOUS ENERGY RESOURCES

Fossil Fuels

The current remaining proven fossil fuel reserves of Pakistan are:

Oil:	200 million barrels	=	27 million TOE
Gas:	23 TCF	=	460 million TOE
Coal:	734 million tonnes	=	328 million TOE
Total:		=	815 million TOE

About 800,000 square kilometers area in Pakistan consists of sedimentary basins (onshore: 600,000 sq.km., offshore: 200,000 sq.km.). The speculative ultimately recoverable petroleum resource potential of this area, corresponds to 40 billion barrels (5.5 billion TOE) of oil and about 200 TCF (4.5 billion TOE) of gas. The total oil and gas reserves discovered so far correspond to about 1% of the above estimated oil potential and about 15% of the gas potential. The relatively high size of gas resource discovery is due mainly to three major fields Sui: (192 million TOE), Mari (108 million TOE) and Qadirpur (89 million TOE) which were discovered in 1952, 1957 and 1990 respectively. From 350 exploratory wells drilled in Pakistan, there have been 90 discoveries giving a success ratio of 1:3.9.

The coal so far found in Pakistan is generally of poor quality with high sulphur, ash and moisture content. The total measured coal reserves are 734 million tonnes but a huge potential of 180 billion tonnes has recently been estimated in Thar area in southern part of the country which has greatly increased interest in exploiting these untapped indigenous resources. The government is considering proposals for inviting foreign participation in mine development as well as power generation projects based on efficient extraction and utilization technologies of Thar coal deposits.

Hydro Power

Pakistan has an identified hydro power potential of about 30,000 MW of which some 4,626 MW has already been developed, while an additional 6,000 MW is under development or in advanced planning stages. It is expected that the hydro capacity will reach a level of

7,000 MW by the turn of the century and 12,000 MW by the year 2010. There will be considerable difficulties in further expansion of hydropower. This is because the most attractive sites have already been developed and the cost of construction of new dams is increasing with increasing complexity of dams at less favorable sites. Further, in most cases new sites are far away from demand centers, thereby necessitating huge additional investment in transmission lines and, still having their generated electricity subject to substantial transmission losses. In view of these and other constraints (e.g. dislocation of people, submergence of agricultural land etc.), it would be unrealistic to assume that much more than half of the remaining hydro potential in the country will be exploited over the next several decades.

The growth rate of electricity demand in Pakistan has been very high; 18.7% per annum during 1960s, 8.4% during 1970s and 9.5% p.a. during the 1980s. The income elasticity of electricity demand averaged about 1.6 during the last 20 years. This trend of significantly higher growth in energy and electricity consumption compared to the growth in GDP is expected to continue for some time in view of the present energy-intensive phase of our development.

ENERGY INFRASTRUCTURE

Oil Infrastructure

Pakistan not only lacks sufficient availability of indigenous energy resources but also an adequate infrastructure to cater for ever increasing energy demand. On the petroleum side, even if the high cost of liquid fuels import is met, necessary infrastructure needs to be augmented which would include upgradation of necessary handling, storing and transporting facilities. This is estimated to cost around US \$ 20 billion.

A number of projects have already been identified by the recently commissioned National Task Force on Energy. These include bringing onstream a number of oil & gas fields to augment domestic petroleum supplies which could not be developed earlier on account of a variety of reason such as unfavourable investment/pricing regime, noncommitment on the part of project sponsors etc.

On the refining and products sides, programme to revamp the existing refineries is to be undertaken. These refineries, although being quite old now, are considerably overutilized due to burgeoning gap between their inbuilt throughput capacity and steep rise in POL product demand in the market. Another project to establish a hydrocracker unit to cater for transport sector fuels (which is incidentally the largest commercial energy

consuming sector of the economy) will soon be brought into production. Still, the extremely limited total domestic refining capacity puts an additional limit to viable augmentation of domestic crude supplies. Two new oil refineries are, therefore, planned with a large part of investment envisaged from abroad.

The existing pipeline network to transfer POL products up-country is seriously hampered by limited capacity putting enormous load on rail or road transportation which are both unsafe and environmentally non-prudent. An extensive programme of looping and extension of existing network is envisaged. Also, to avoid increased congestion on the existing oil terminals at the port, new terminals are needed at the earliest to streamline POL and crude movement into and out of the country.

There is a glaring shortfall on the upcountry storage capacity to be able to store sufficient reserve to dampen any prolonged interruption of supplies. The present storage needs to be expanded as soon as possible to deal with commercial logistic requirement. The Government is also planning to build a strategic reserve to deal with any critical supply crisis such as the one faced during the Gulf war.

Gas Infrastructure

Pakistan takes pride in the considerable gas infrastructure that is available which is unique among the developing countries. This has enabled domestic gas to provide for more than a third of the total energy demand. Large unsatisfied demand even from the existing customers, let alone the tremendous pressure from the prospective ones, has forced government to prioritize its usage barring large bulk consumers such as cement plants and introducing load shedding. This shows the tremendous potential that exists in this sector and calls for an urgent need to expand the national/regional transmission system capacity as well as bringing new gas sources onstream, even if it means importing gas from the neighbouring sources such as the Middle East or the CIS.

Privatization in Petroleum Sector

To increase the participation of private sector, the public sector exploration/production company OGDC, pipeline company PARCO, the refinery NRL, the oil marketing company PSO, and the two gas utilities SNGPL and SSGC are to be privatized through dilution of government shareholding in these entities to less than 50%. In addition government's participation in other private sector entities like POL, PPL, PRL etc. is also to

be reduced. This means that the private sector is expected to play a leading role in the development of the petroleum sector in near future.

Power Infrastructure

On the power sector side, the situation is even more critical. With the existing shortage in demand standing at about 15 to 35% of the system peak demand, the economy is suffering some US\$ 150 million to almost US\$ 500 million every year in direct and indirect economic losses. With the demand growth rate of about 8.8% annually, the system would need some 7,000 MW during the next five years to overcome only the critical existing shortages. The government, therefore, intends to reduce the supply-demand gap by improving the sectoral efficiency. This will include control over the growth of unproductive component of demand, discourage wasteful and expensive consumption patterns, and energy loss reduction from the present 23% for WAPDA and 34% for KESC, besides a number of other operational improvements. Still, an addition of some 5,000 MW would be required. This would entail an expenditure of about US \$ 10 billion. The public sector is planned to bear half of this expenditure while the rest is expected to come from the private sector.

NEW POLICY INITIATIVES

The government has announced in March 1994, an elaborate package of motivational incentives to attract and retain private sector's interest in the development of the energy sector. The recently formulated package of incentives as recommended by the National Task Force on Energy and incorporated in both the petroleum policy and the power policy, contain a number of steps and measures which will go a long way in boosting private sector interest and efforts. These are contained in two documents, namely; "Petroleum Policy 1994" and "Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan, 1994" published respectively by the Ministry of Petroleum & Natural Resources and the Ministry of Water and Power, Government of Pakistan. What follows has been summarized from these two documents.

Petroleum Sector Incentives

In the area of oil & gas exploration, three exploration zones have been defined based on the risks and costs involved. The government's working interest as well as

determination of income tax etc. shall be based on the particular zone involved. On the pricing side, a number of reforms have been announced. Gas price has been delinked from fuel oil and is now based on a basket of crude oil, eliminating discretionary/negotiable discounts and with predetermined premiums based on the respective zone, crude oil price has been linked to Arabian/Persian Gulf oil with delivery to nearest refinery. All duties and surcharges on the import of equipment and material involved in exploration and production operations have been abolished and a separate amount equivalent to only 3% of the imports will be charged on annual deferred basis after commercial discovery.

On the gas development side, liberal approach has been adopted for the producing company to line up its own customers. Gas imports will be encouraged over coal or oil due to environmental reasons as well as large investments already made in building up the reticulation system. A formula for bulk purchase of gas is to be announced to encourage private sector participation in natural gas distribution.

On the petroleum products side, a minimum rate of return (ROR) of 25% is guaranteed for new refineries based on indigenous crude. Also, the income earned from non-refinery operation, can now be retained by them. Regarding logistics, a throughput charge equal to railway freight is to be offered to white oil pipeline projects. For the black oil pipeline projects, a 25% ROR shall be allowed in case railway freight is found to generate less than it. Similarly, the commission of oil marketing companies is to be reviewed annually to provide consistent incentive for investment in storage, logistics and allied facilities.

Power Sector Incentives

Regarding the various incentives being offered in the power sector, the recently announced policy contains a two pronged strategy which is based on:

1. Demand side management (DSM), including reduction in power losses and improving operational efficiency.
2. Promoting private sector role in power generation.

Considering various steps announced in implementing DSM, the bulk industrial users of electricity are being offered time-of-use pricing and the agricultural tubewells are to be offered off-peak supply at discounted rates. Similarly, the operational losses of the two utilities are being curtailed by giving them an elaborate schedule to gradually reduce their losses thereby yielding an additional 500-550 MW onstream.

In order to encourage private power generation, the policy announced an internationally competitive bulk tariff of 6.5 cents/KWh for 10 years. A premium of 0.25 cent/KWh will be given on projects above 100 MW commissioned by 1997. The sponsors have been allowed exemption from various taxes and duties and are free to repatriate their earnings. On the regulatory side, one window operation is being promoted with the formation of a dedicated Private Power Board to deal with private power entities. A Private Sector Energy Development Fund (PSEDF) has been established with assistance from the World Bank, the USAID and other multilateral lending agencies, to provide upto 40% of the capital costs of private sector projects, currently at a fixed rate of 14% and a maturity period of upto 23 years. The companies can obtain Foreign Exchange Risk Insurance (FERI) on standard terms from the State Bank of Pakistan on foreign currency loans contracted by them providing complete financial security.

The private power purchase agreement with the state power utility shall be provided for long term implementation, typically for 15 - 30 years with proper guarantees from the Government of Pakistan. The private power generators are free to arrange for their fuel supply sources, either locally or internationally. In case the fuel is to be supplied by a local public sector organization, the performance of the supplier shall be guaranteed by the Government under the terms of the Fuel Supply Agreement.

A separate Statutory Revisionary Order (SRO) is being issued for private power plants to put together various earlier as well as new regulations and directives in a consolidated manner to facilitate understanding and streamline implementation.

The government is also giving special incentives to those industrial units who opt for self power generation. A legislation along the lines of the Public Utility Regulatory Policy Act (PURPA) of USA is being enacted to encourage small to medium scale power production in the industrial sector. The surplus power produced by these industrial units shall be guaranteed purchase by the government on special rates depending upon time of the day and season, or the producer may opt for an as available-as-needed type of arrangement at 80% of bulk tariff rate. For industries in rural areas and away from national grid, special package will be offered to the unit to provide localized electricity distribution.

INVESTMENT REQUIREMENTS

The total investment requirement to undertake these infrastructure and capacity building projects in the entire energy sector comes out to about US\$ 23.3 billion during a five year period as calculated by the Task Force on

Table 1. Summary of recommended energy sector investments (1993-98).

(Million US\$)

Description	Public Sector	Private Sector	Total	Description	Public Sector	Private Sector	Total
POWER				OIL & GAS			
Generation				Exploration & Development			
- WAPDA	3,272	0	3,272	- OGDC	1,104	0	1,104
- KESC	148	0	148	- DG(PC)	106	1,148	1,253
- Private	0	3,335	3,335	- Sub Total:	1,210	1,148	2,358
- Sub Total:	3,420	3,335	6,755	Refineries			
EHV Transmission & Grid Stations				- New Refineries			
- WAPDA	1,103	0	1,103	- Revamp of existing	30	80	110
- KESC	33	0	33	- Sub Total:	517	1,930	2,447
- Sub Total:	1,136	0	1,136	Oil Pipelines & Storage			
Secondary Transmission & Grid Stations				- Pipelines			
- WAPDA	615	0	615	- Storage	917	63	980
- KESC	560	0	560	- Sub Total:	1,238	970	2,208
- Sub Total:	1,175	0	1,175	Gas Transmission & Distribution			
Distribution & ELR				- SNGPL			
- WAPDA	131	0	131	- SSGCL	323	177	500
- KESC	256	0	256	- Gas Import	0	4,262	4,262
- Sub Total:	387	0	387	- Sub Total:	558	5,111	5,669
DSM & Operational Efficiency Programmes				- TOTAL OIL & GAS			
- WAPDA	435	0	435		3,523	9,158	12,681
- KESC	65	0	65	COAL			
- Sub Total:	500	0	500	- GSP	73	0	73
Rural Electrification				- (Exploration & Surveys)			
- WAPDA	521	0	521	- PMDC	83	0	83
- KESC	0	0	0	- (Mine Development)			
- Sub Total:	521	0	521	- TOTAL COAL	156	0	156
- TOTAL POWER:	7,139	3,335	10,474	GRAND TOTAL			
					10,818	12,493	23,311

Energy. This will include about \$ 12.8 billion in the Petroleum & Coal Sector and \$ 10.5 billion in the Power Sector.

In oil and gas, the public sector is to spend a total of \$ 3.5 billion while the private sector is expected to contribute about \$ 9.2 billion. A major investment is needed in the area of gas transmission, mainly for regional pipeline project for gas imports (\$ 4.3 billion). In the electricity development, the total public sector outlay shall be around \$ 7.1 billion while the private sector is expected to invest about \$ 3.3 billion, which will mainly be in the area of power generation. The break down of these investment needs is given in Table 1.

ENERGY EFFICIENCY

Energy efficiency has become a key global issue in recent years because of worldwide scarcity of physical and financial resources, its impact on overall GDP growth rate, and concerns about global warming and greenhouse effect. Increase of energy efficiency will form one of the top priorities for the medium to long term planning horizon. Policy recommendations in this regard include rationalization of consumer connection policy and energy pricing, enactment of energy efficiency legislation, and introduction of a transport policy which promotes the use of energy-efficient modes of public transport (mass transit system and railways).

HUMAN RESOURCE DEVELOPMENT

The energy sector is one of the largest employers of technical trained and skilled manpower in the country. Estimates of new job opportunities in energy sector over

the next five years, including utilities, services, manufacturing sector, contractors and general industry are estimated at around 90,000 engineers, technicians and para professionals. These include some 25,000 new public and private sector job opportunities in the power sector.

To ensure successful implementation and operation of the recommended energy sector programme, steps will be taken by energy sector organizations and utilities for overhauling their training programmes, institutional reinforcement of the units responsible for training, and upgrading their training centre facilities. Simultaneously these organizations will establish a working relationship with engineering universities and polytechnic institutes so that their educational programmes can be tailored to the qualitative and quantitative requirements of the energy sector.

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