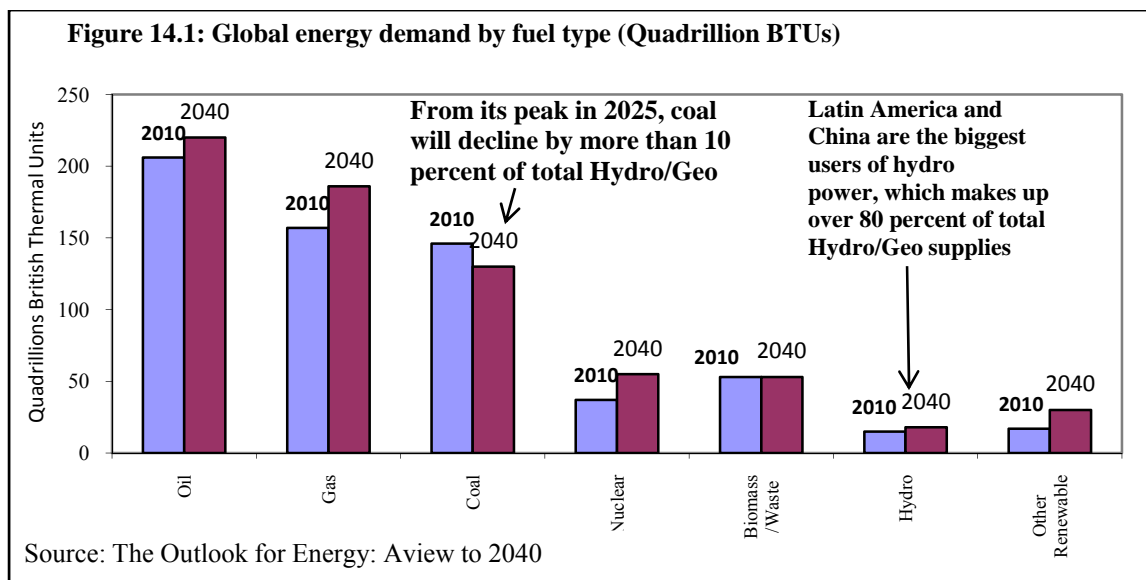


Energy

Energy is considered to be the lifeline of economic development. For a developing economy with a high population growth rate, it is important to keep a balance between energy supply and emerging needs. If corrective measures are not effectively anticipated significant constraints start emerging for development activities.

The rise in global energy demand has raised questions regarding energy security and increased the focus on diversification, generation and efficient allocation. The answer lies in the

attainment of optimal energy mix through fuel substitution by promoting energy efficiency and renewable energy and interregional co-operation. However, oil and natural gas will continue to be the world's top two energy sources through 2040; accounting for about 60 percent of global demand. Gas being the fastest growing major fuel source over this period is expected to grow at 1.6 percent per year from 2010 to 2040 as estimated by "The Outlook for Energy: A View to 2040" is given in Figure-14.1.



Pakistan's economy has been growing at an average growth rate of almost 3 percent for the last four years and demand of energy both at production and consumer end is increasing rapidly. Knowing that there is a strong relationship

between economic growth and energy demand, the government is making all possible efforts to address the challenges of rising energy demand (Box-1).

Box- 1**Reforms of Present Government addressing Energy Crises****Oil Sector Reforms**

The Federal Government, in pursuance of its deregulation policy, has deregulated prices of Motor Spirit (MS), High Octane Blending Component (HOB), Light Diesel Oil (LDO), Jet Propellant 1 (JP1), Jet Propellant 4 (JP4) and Jet Propellant 8 (JP8) w.e.f. June 1st, 2011. Refineries and Oil Marketing Companies (OMCs) are allowed to fix and announce their ex-refinery price and ex-depot prices of above mentioned products on monthly basis. Under the deregulation framework POL prices have been linked with Pakistan State Oil (PSO) actual import price. In case of non availability of PSO import prices, the refineries will fix their ex-refinery price as per existing Import Parity Pricing (IPP) formula.

Gas Sector Reforms

To mitigate the gas shortage, government has designed different policies not only for exploration of new local gas reserves but also for import of gas like Liquefied Natural Gas (LNG) most mentionable are Liquefied Petroleum Gas (LPG) Policy 2011 and Liquefied Natural Gas (LNG) Policy 2011.

Coal Sector Reforms

Federal and Provincial Governments are endeavoring to harness the huge coal resources of Thar by utilizing it as a source of energy for power generation through international investment.

As part of promotional activity to increase the share of coal, the Government of Sindh has leased out a coal block for an integrated mining project to many companies like M/s Engro Powergen (Pvt.) Limited, M/s Cougar Energy UK limited, M/s Oracle Coalfield Plc, UK, M/s Bin Daen Group, UAE and M/s China National Machinery Import & Export Corporation of China (CMC) for coal mining and installing coal-fired power plant

Power Sector Reforms

Government of Pakistan (GoP) initiated structural reforms in the power sector under the Power Sector Reform Plan (2010) finalized by Cabinet Committee on Restructuring (CCOR). Implementation of Power Sector Reform Plan 2010 has been expedited and upgraded under the Power Sector Recovery Plan 2011. The plans are based on the following key pillars: Improved governance structure: b) Supportive legal framework c) Financial sustainability; (d) Supply side management; (e) Demand side management and f) Promote private sector participation in the sector.

Power Sector Subsidy

The timely payment of tariff differential subsidy (TDS) is being ensured along with subsidies for KESC and FATA on monthly basis. All subsidy claims till December 2011 (Rs.56 billion) have been disbursed. GoP started 2012 with no outstanding claims of TDS against any power sector company. For 2012, overall subsidy is estimated to be Rs.91 – 125 billion. Monthly financial planning is being implemented for smooth financial flow. General Sales Tax (GST) exemption withdrawn for lifeline and agriculture consumers (Rs. 10 billion budgeted by GoP for 2012). GoP aims to phase out subsidies to power sector which have cost rupees one trillion in last 4 years.

Resolution of Circular Debt

Circular debt refers to the unpaid bills by Pakistan Electric Power Company (PEPCO) to key players especially Oil companies, Gas companies, Independent Power Producers (IPPs) and Water and Power Development Authority (WAPDA).

Stock Issue <ul style="list-style-type: none"> • Recovery of receivables of Distribution Companies (DISCOs) of Rs. 354 billion (Feb 2012) is essential to clear the circular debt against payables of Rs. 398 billion (April 2012). • Unpaid power tariff differential subsidy (Rs. 301 billion) until 30 June 2009 picked up by GoP through Power Holding Private Limited (PHPL) company. Stock of Rs. 120bn of outstanding tariff differential subsidy (TDS) for FY10 was picked up by the Federal Government in May 2011. • Debt swap of Rs. 150 billion has been done which covers sizeable proportion of circular debt. 	Flow Issue <ul style="list-style-type: none"> • Efforts for 100 percent recovery of current bills are underway along with disconnection of defaulters after 45 days (reduced from 90 days) without any exemption/discrimination. A total of 210,301 disconnections carried out during July-Feb 2012. • Two months security deposit shall be paid by new and defaulting consumers to get a reconnection. • Refund of General Sales Tax (GST) on uncollected bills of more than 180 days has been approved
Supply Side Management <ul style="list-style-type: none"> • 3,400 MW has been added since 2008. • Most efficient plants are being dispatched to maintain to conserve fuel. • Economic dispatch to conserve fuel is being implemented. • Gas Supply to Karachi Electric Supply Corporation (KESC) has been increased to improve fuel mix and ensure maximum supply. • Change Combined Cycle plants to coal (24 months). • Mangla raising project is completed and the project is also inaugurated. • Diamer Bhasha Dam of 4,500MW generation capacity inaugurated • 1400MW Tarbela 4th extension initiated. 	Demand Side Management <ul style="list-style-type: none"> • Lines losses reduced from 20.4 percent (FY10) to 19.6 percent (FY11). Loss mapping in each Distribution Companies (DISCOs) is in progress to exactly pin-point the losses and their sources to achieve the target of 18.7 percent losses in FY12. • Load Management conservation measures to save about 1000MW put in place. • Promote Private Sector Participation in the Sector • Expression of Interest (EOI) for private bidders issued for O&M contracting for Generation Companies (GENCOs). • GoP in the process of finalizing Operations and maintenance (O&M) contracting wherever required for Distribution Companies (DISCOs). • Work on coal fired plants has been expedited.

During 2011-12, energy outages in Pakistan continued to be the dominant constraint in its growth. Yet, traces of energy supply shortages can be traced to the independence of the country. Till the 1980s less than two-third of the energy requirements were met through its own domestic resources. In the 1990s Pakistan was still engaged in various efforts to bridge the wide gap between increasing demand and limited energy supply. Further in the early 2000s, the energy sector (especially its sub sector electricity) received greater attention because of the faster rate of growth in its demand. By 2011-12, electricity and gas shortages are considered to be the primary cause of constrained production activities in a number of industries. Energy intensive industries (Petroleum, Iron and Steel, Engineering Industries and Electrical) shaved off 0.2 percentage points from real GDP growth in 2010-11 and in 2011-12. Also, the estimated cost of power crises to the economy is

approximately Rs.380 billion per year, around 2 percent of GDP, while the cost of subsidies given to the power sector to the exchequer in the last four years (2008-2012) is almost 2.5 percent of GDP, (Rs. 1100 billion). The liquidity crunch in the power sector has resulted in under utilization of installed capacity of up to 4000MW. It has also affected investment in power sector.

Flood was one of the factors which caused electricity and gas shortage as it damaged the distribution network (i.e., 90 percent of distribution transformers to the petroleum and gas fields). "The total damage to the energy sector was of Rs 1.2 billion (US\$ 14.2 million) according to Asian Development Bank Report, "2011 Pakistan Floods; Preliminary Damage and Needs Assessment". Lower accumulation of water reserves in dams along with high international prices of oil has compounded the pressure on

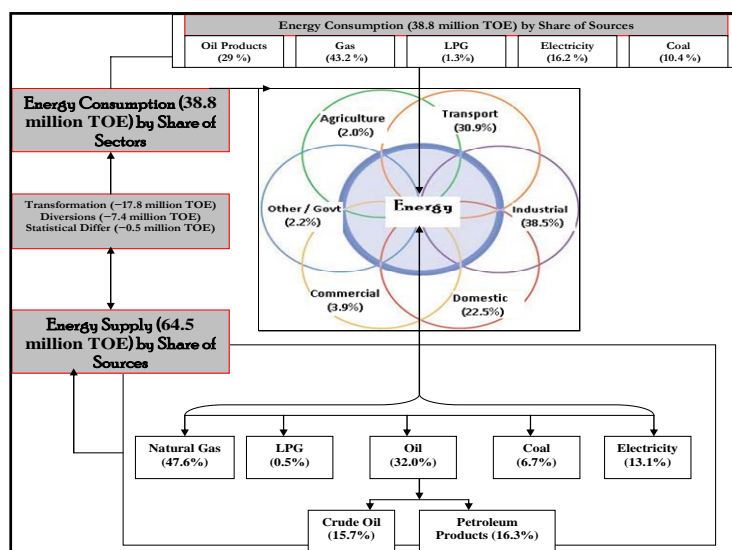
electricity as there is still significant share of oil (furnace) in electricity generation (about 35.1 percent) which is vulnerable to the international prices. Further the oil refineries have also been running below capacity, thus constraining the supply of oil and other fuels. Likewise, in the gas sector, Pakistan faced severe shortages that exceeded approximately 2 billion cubic feet per day as local production was unable to keep pace with the requirements of the country. This was due mainly to the depletion of existing resources, unfavorable law and order situation and lukewarm interest of exploration and production companies etc. However, the geographical location of the country makes it a favourable potential market for the import of natural gas from its neighboring countries like Iran, India and Turkmenistan. The government has, therefore, taken the initiative to import gas from these countries. The initial projects in this regard are Iran-Pakistan Pipeline and Turkmenistan-Afghanistan-Pakistan-India gas pipeline. To mitigate the energy crisis, the government has notified the Liquefied Natural Gas (LNG) Policy 2011 which encourages private parties to develop LNG projects and sets them free to participate in any segment of the LNG value chain. In order to solve issues in power sector, the government has decided to construct five multi-purpose water

storages in the country during the next 10 -12 years. The Diamer Basha Dam Project - the world's highest Roller Compacted Concrete Dam - is the most mentionable achievement. Also Pakistan is one of the beneficiaries of Tetra-partner power import project under the head of Central Asia-South Asia (CASA-1000) electricity trade.

To ensure energy security and sustainable development in the country, the government is also taking all possible measures to diversify its energy mix. In this the regard government has given due attention to fast track the development of Alternative / Renewable Energy (ARE) resources in the country. The Alternative Energy Development Board (AEDB) has updated the Renewable Energy (RE) Policy, 2006, in consultation with the provinces and other stakeholders. The policy includes all (Alternative Renewable Energy (ARE) technologies including Wind, Solar, Hydro, Biogas, Cogeneration, Waste-to-Energy, and Geothermal; providing extremely attractive financial and fiscal incentives to both local and foreign investors while offering them a level playing field. It is expected that with the approval of the policy and government's keen interest in energy sector, the situation will improve significantly in near future.

Pakistan's Energy Sector¹

Figure 14.2: Pakistan's Energy Sector Consumption and Supply 2010-11²



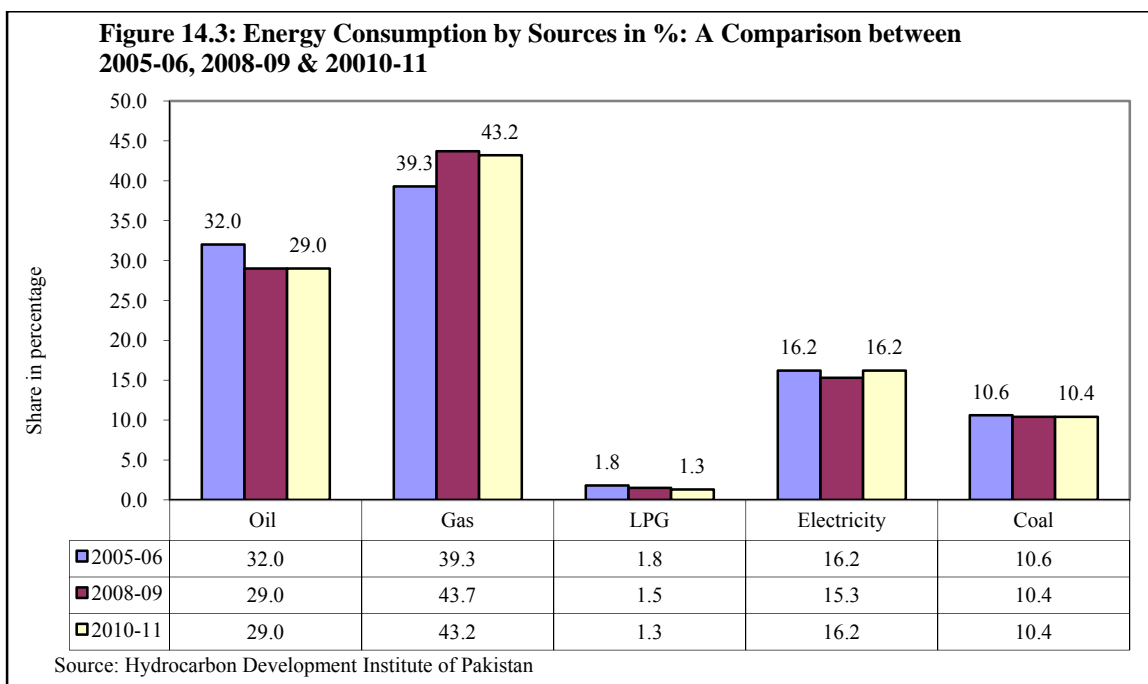
¹ Data on variables of energy is given on calendar year instead of fiscal year

² TOE (tonne of oil equivalent) is a unit of energy. It is considered as an amount of energy released by burning one tonne of crude oil approximately equal to 42 GJ. [1 TOE = 41.868 GJ = 11, 630 Kilowatt Hours = 39.683 million Btu]

14.1 Energy Consumption

Pakistan's total energy consumption stood at 38.8 million tonnes of oil equivalent in 2010-11. The relative importance of the various sources of energy consumption of Liquid Petroleum Gas (LPG), electricity and coal has been broadly similar since 2005-06. The share of gas consumption stood at the highest equal to 43.2 percent of the total energy mix of the country,

followed by oil (29.0 percent). As shown in Fig-14.3, the major consumption source of natural gas witnessed an increase in share by almost 4 percentage points during 2010-11 compared to 2005-06. This is due to the substitution effect to a cheaper source from an expensive source. Since oil is the more expensive fuel because of Pakistan's imports at the high international prices the share of oil consumption declined by 3.0 percentage points during the period under review.



The consumption of petroleum products showed a continuous declining trend since 2001-02. However due to positive changes in years 2004-05, 2007-08 and 2009-10, the overall average for last ten years became positive 1.1 percent per annum. The long term trend suggests that composition of

annual energy consumption is shifting from petroleum products to other energy sources due to volatile prices of oil. Thus consumption of gas, electricity and coal has increased at an average of 5.1 percent, 4.8 percent and 7.7 percent per annum for last ten years as shown in Table 14.1.

Table:14.1: Annual Energy Consumption

Fiscal Year	Petroleum Products		Gas		Electricity		Coal	
	Tonnes (000)	Change (%)	(mmcf)	Change (%)	(Gwh)	Change (%)	M.T* (000)	Change (%)
2001-02	16,960	-3.9	824,604	7.4	50,622	4.2	4,409	9.0
2002-03	16,452	-3.0	872,264	5.8	52,656	4.0	4,890	10.9
2003-04	13,421	-18.4	1,051,418	20.5	57,491	9.2	6,065	24.0
2004-05	14,671	9.3	1,161,043	10.4	61,327	6.7	7,894	30.2
2005-06	14,627	-0.3	1,223,385	5.4	67,603	10.2	7,714	-2.3
2006-07	16,847	15.2	1,221,994	-0.1	72,712	7.6	7,894	2.3
2007-08	18,080	7.3	1,275,212	4.4	73,400	0.9	10,111	28.1
2008-09	17,911	-0.9	1,269,433	-0.5	70,371	-4.1	8,390	-17.0
2009-10	19,132	6.8	1,277,821	0.66	74,348	5.7	8,139	-3.0

Table:14.1: Annual Energy Consumption

Fiscal Year	Petroleum Products		Gas		Electricity		Coal	
	Tonnes (000)	Change (%)	(mmcft)	Change (%)	(Gwh)	Change (%)	M.T* (000)	Change (%)
2010-11	18,887	-1.3	1,240,671	-2.91	77,099	3.7	7,717	-5.2
Avg. 10 years		1.1		5.1		4.8		7.7
July-Mar								
2010-11(e)	13,802	—	939,950	—	56,194	—	5,850	—
2011-12**	13,879	0.6	957,275	1.8	54,595	-2.8	4,730(e)	-19.1

Source: Hydrocarbon Development Institute of Pakistan

*: Million Ton —: Not Available

e: Estimated **: Consumption of electricity for AJK and KESC for the months Jan to Mar 2012 is not available

14.2-a Petroleum Product

During the first three quarters of current fiscal year the overall consumption of petroleum products increased to 13,879 million tonnes in the period July-March 2011-12 compared to 13,802 million tonnes in corresponding period of 2010-11 thus posting a positive growth of 0.6 percent. The major decline was in the agriculture sector (40.8 percent) followed by the government sector (20.3 percent). Similarly the power sector and household sector had also shown negative growth in the consumption of petroleum products for the period under discussion posting -5.2 percent and -8.0 percent respectively. Although petroleum products

considered as necessary inputs of the power sector, yet the negative growth in power as well as household sector can be attributed to changes in demand behavior toward relatively cheaper alternatives. The industry sector had shown positive growth of 24.2 percent in the consumption of petroleum products during the period of July-March 2011-12 when compared with July-March 2010-11, mainly due to recovery in economic activity. The transport sector usually consumes high quantity of petroleum products but surprisingly this sector showed a relative small growth of 3.5 percent during the period under consideration.

Table 14.2: Consumption of Petroleum Products (000 tonnes)

Year	House holds (000 tonnes)	Change (%)	Industry (000 tonnes)	Change (%)	Agriculture (000 tonnes) (a)	Change (%)	Transport (000 tonnes)	Change (%)	Power (000 tonnes)	Change (%)	Other Govt (000 tonnes)	Change (%)	Total 000 tonnes
2001-02	335	-25.7	1,612	-16.2	226	-11.4	8,019	-1.7	6,305	-2.8	464	24.7	16,960
2002-03	283	-15.5	1,604	-0.5	197	-12.8	8,082	0.8	6,020	-4.5	266	-42.7	16,452
2003-04	231	-18.4	1,493	-6.9	184	-6.6	8,464	4.7	2,740	-54.5	309	16.2	13,421
2004-05	193	-16.5	1,542	3.3	142	-22.8	9,025	6.6	3,452	26	317	2.6	14,671
2005-06	129	-33.2	1,682	9.1	82	-42.3	8,157	-9.6	4,219	22.2	359	13.2	14,627
2006-07	106	-17.8	1,596	-5.1	97	18.3	7,982	-2.1	6,741	59.8	325	-9.5	16,847
2007-08	121	14.1	1,071	-32.9	109	12.7	9,384	17.6	7,084	5.1	311	-4.5	18,080
2008-09	97	-19.5	969	-9.5	70	-36.2	8,837	-5.8	7,750	6.9	367	18.2	17,911
2009-10	90	-7.5	985	1.6	58	-16.9	8,861	0.3	8,814	16.4	323	-12.0	19,131
2010-11	85	-5.6	1,355	37.6	41	-29.3	8,892	0.3	8,139	-7.7	374	15.8	18,887
Avg. 10 years		-14.6		-2.0		-14.7		1.1		6.7		2.2	
July-Mar													
2010-11	67.3	-	919.2	-	35.8	-	6,599.1	-	5,913.4	-	267.4	-	13,802
2011-12*	61.9	-8.0	1,141	24.2	21.2	-40.8	6,832.9	3.5	5,608.8	-5.2	213.1	-20.3	13,879

Source: Hydrocarbon Development Institute of Pakistan

(a) High Speed Diesel (HSD) consumption in agriculture is not available separately and is included under transport sector. Agriculture sector represents only Light Diesel Oil (LDO)

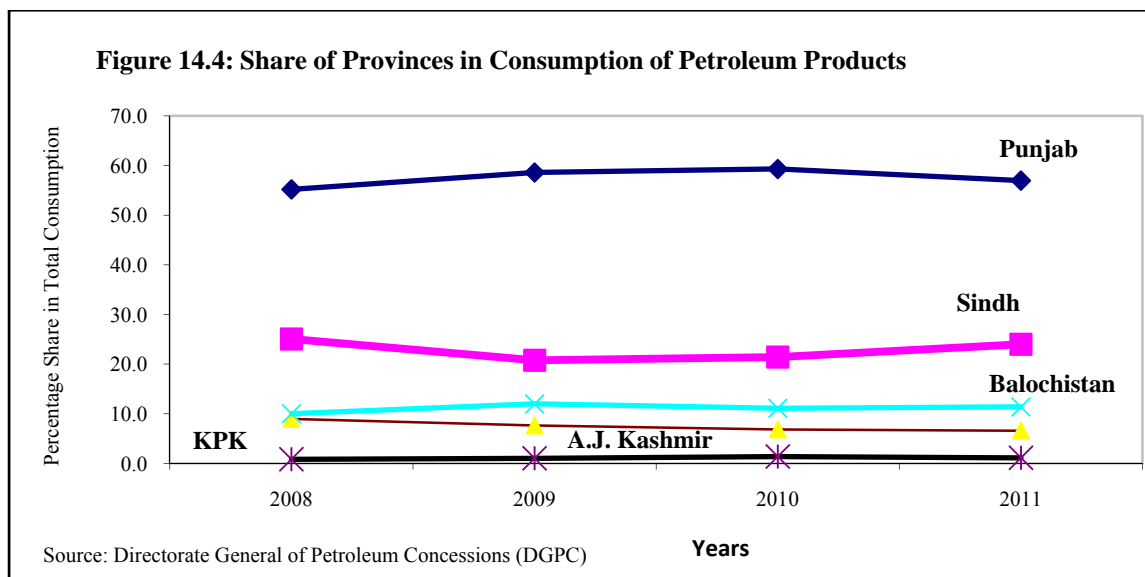
*: Oil/POL product consumption for the month March 2012 is missing

The share of Punjab in consumption has declined from 59.3 percent during the last fiscal year to 57

percent in 2010-11. There was an increase in the share of Sindh to 24 percent this year as compared

to 21.4 percent last year. The share of Balochistan and Khyberpakhtunkhwa (KPK) remained constant over the last four years with Balochistan having a

relatively higher share than KPK in the consumption of petroleum products as is evident from the figure below



14.2-b Natural Gas

The consumption pattern of gas by different users since 2001-02 is presented in Table 14.3. The analysis of the sectoral consumption of gas indicates that during July-March 2011-12, the consumption of gas in the cement sector was 1.4 billion cubic feet compared to 0.6 billion in the corresponding period during 2010-11 thus posting a positive growth of 133 percent during the period under review. The industrial sector experienced a

decline in consumption of gas and posted a negative growth of 12.5 percent during 2010-11. This sector also showed negative growth of 6.8 percent during July-March 2011-12 when compared to the same period during 2010-11. The transport sectors is the most significant sector; posting a positive growth in gas consumption of 14.2 percent during 2010-11 as compared with 2009-10 and a positive growth of 10.8 percent during July-March 2011-12 as compared with the same period during 2010-11.

Table 14.3: Consumption of Gas (Billion Cft)

Year	Household	Change (%)	Commercial	Change (%)	Cement	Change (%)	Fertilizer	Change (%)	Power	Change (%)	Industrial	Change (%)	Transport (CNG)	Change (%)	Total
2001-02	144	2.1	22	4.8	7	0.0	178	1.7	315	12.1	151	8.6	7	66.6	825
2002-03	154	6.9	23	4.5	3	-57.1	181	1.7	336	6.7	165	9.3	11	53.6	872
2003-04	155	0.6	24	4.3	8	166.7	185	2.2	470	39.9	193	17.0	16	40.1	1,051
2004-05	172	11.0	27	12.5	13	62.5	190	2.7	507	7.9	226	17.1	24	54.1	1,161
2005-06	171	-0.6	29	7.4	15	15.4	198	4.2	492	-3.0	279	23.5	39	59.1	1,223
2006-07	186	8.8	31	6.9	15	0.0	194	-2.0	434	-11.8	307	10.0	56	45.2	1,222
2007-08	204	9.7	34	9.4	13	-15.1	200	3.1	430	-1.0	323	5.1	72	27.6	1,275
2008-09	214	4.9	36	4.8	7	-42.6	201	0.5	404	-6.0	319	-1.1	88	22.5	1,269
2009-10	219	2.4	37	4.1	2	-73.4	220	9.4	367	-9.2	334	4.5	99	12.2	1,278
2010-11	232	5.9	36	-1.3	1	-27.8	228	3.6	337	-8.0	292	-12.5	113	14.2	1,241
Avg. 10 years		5.2		5.7		2.9		2.7		2.8		8.1		39.5	
July-Mar															
2010-11(P)	185.9	-	27.2	-	0.6	-	166.9	-	254.4	-	223.6	-	81.4	-	940.0
2011-12(P)	205.4	10.5	29.4	8.1	1.4	133.3	159.0	-4.8	263.5	3.6	208.5	-6.8	90.2	10.8	957.3

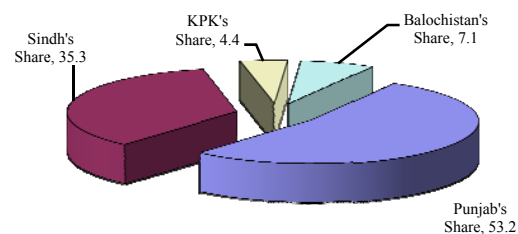
Source: Hydrocarbon Development Institute of Pakistan
P: Provisional

Like petroleum products, the share of Punjab in the consumption of natural gas in 2010-11 is higher (53.2 %) followed by Sindh (35.3%). Balochistan and KPK respectively have smaller shares of 7.1 percent and 4.4 percent.

14.2-c Electricity

The electricity consumption during 2010-11 was 77,099 GWh as compared to 74,348 GWh in 2009-10, however during the period July-March 2011-12 its consumption decreased to 54,595 GWh from 56,194 GWh in corresponding period 2010-11 posting a decrease of almost 3 percent. During July-March 2011-12 agriculture, commercial, industrial and household sector also show negative growth of -13.6, -11.9, -10.1 and -7.0 percent respectively (Table 14.4).

Figure 14.5: Share of Provinces in Consumption of Natural Gas



Source: Directorate General of Petroleum Concessions (DGPC)

Table 14.4: Consumption of Electricity by Sectors

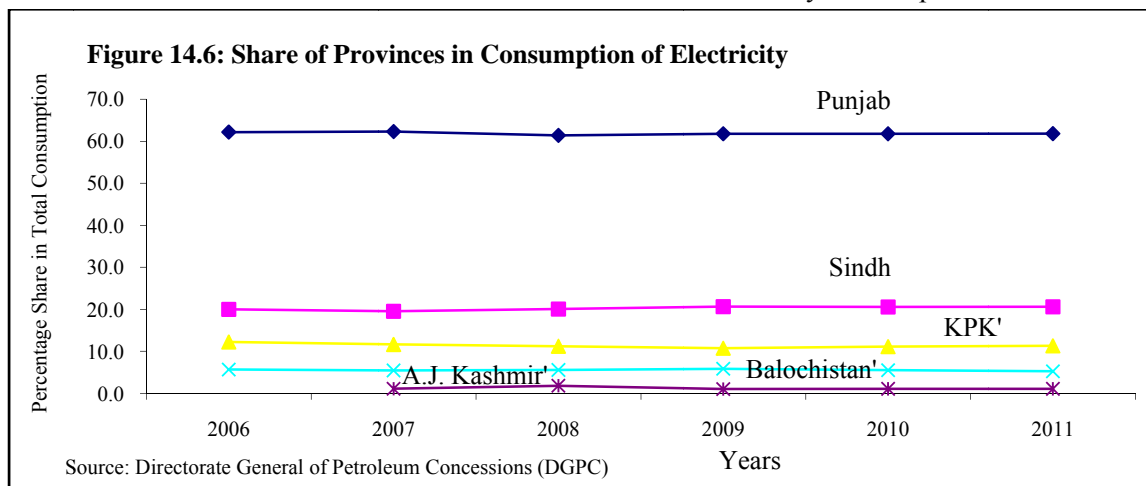
Year	Traction	Household		Commercial		Industrial		Agriculture		Street Light		Other Govt.		Total (GWh)
		GWh (000)	Change (%)	GWh (000)	Change (%)	GWh (000)	Change (%)	GWh (000)	Change (%)	GWh	Change (%)	GWh (000)	Change (%)	
2001-02	11	23.2	1.8	3.0	7.1	15.1	5.6	5.6	14.3	212	-0.5	3.5	0.0	50622
2002-03	10	23.6	1.7	3.2	8.5	16.2	7.3	6.0	7.1	244	15.1	3.4	-2.9	52656
2003-04	9	25.8	9.3	3.7	15.6	17.4	7.4	6.7	11.7	262	7.4	3.7	8.8	57491
2004-05	12	27.6	7.0	4.1	10.8	18.6	6.9	7.0	4.5	305	16.4	3.8	2.7	61327
2005-06	13	30.7	11.2	4.7	14.6	19.8	6.5	7.9	12.9	353	15.7	4.0	5.3	67603
2006-07	12	33.3	8.5	5.4	14.9	21.1	6.6	8.2	3.8	387	9.6	4.4	10.0	72712
2007-08	8	33.7	1.2	5.6	3.7	20.7	-1.9	8.5	3.7	415	7.2	4.5	2.3	73400
2008-09	5	32.3	-4.2	5.3	-5.4	19.3	-6.8	8.8	3.5	430	3.6	4.3	-4.4	70371
2009-10	2	34.2	5.9	5.6	5.7	19.8	2.6	9.7	10.2	458	6.5	4.5	4.7	74348
2010-11	1	35.9	5.0	5.8	3.6	21.2	7.1	9.0	-7.2	456	-0.4	4.8	6.7	77099
Avg. 10 years			4.7		7.9		4.1		6.4		8.1		3.3	
July-March														
2010-11 (e)	-	25.8	-	4.2	-	15.8	-	6.6	-	321	-	3.5	-	56,194
2011-12*	1	24.0	-7.0	3.7	-11.9	14.2	-10.1	5.7	-13.6	323	0.6	6.7	91.4	54,595

Source: Hydrocarbon Development Institute of Pakistan

(e): Estimated *: The electricity consumption data of AJK and KESC for the month January to March 2012 is not available

The share of the provinces in electricity consumption for the last four year is shown in the figure below. It shows that this share has remained

almost constant in all provinces over time. On average Punjab has 62 percent, Sindh 20.2 percent, KPK 11.4 percent and Balochistan 5.5 percent share in electricity consumption.



14.2-d Coal

Pakistan has huge coal resources estimated at over 185 billion tonnes; including 175 billion tonnes, identified at Thar coalfields in the Sindh province. Pakistan's coal generally ranks from lignite to sub-bituminous. The major user of coal are the cement sector and brick kilns; about 60 percent of total coal was consumed by cement while 39 percent

was consumed by the brick kiln industry during the period 2010-11. The longer term trend analysis shows that for the last ten years, on average, the cement sector and brick kilns have been the highest consumers of coal. The reason for the high share of consumption of coal in the cement industry is due to switching over to coal from furnace oil which has increased the utilization of indigenous as well as imported coal (Table 14.5).

Table 14.5: Consumption of Coal by Sectors

Year	Household		Power		Brick Kilns		Cement		Total (000 metric tonnes)
	(000 metric tonnes)	Share (%)	(000 metric tonnes)	Share (%)	(000 metric tonnes)	Share (%)	(000 metric tonnes)	Share (%)	
2001-02	1	0.0	249	5.7	2,578	58.5	1,581	35.9	4,409
2002-03	1	0.0	204	4.2	2,607	53.3	2,078	42.5	4,890
2003-04	1	0.0	185	3.0	2,589	42.7	3,289	54.2	6,065
2004-05	—	—	180	2.3	3,907	49.5	3,807	48.2	7,894
2005-06	—	—	149	1.9	4,222	54.7	3,343	43.3	7,714
2006-07	1	0.0	164	2.1	3,278	41.5	4,451	56.4	7,894
2007-08	1	0.0	162	1.6	3,761	37.2	6,187	61.2	10,111
2008-09	1	0.0	113	1.3	3,275	39.0	5,002	59.6	8,390
2009-10	—	—	126	1.5	3,005	36.9	5,008	61.5	8,139
2010-11(P)	—	—	97	1.3	3,004	38.9	4,617	59.8	7,717
Avg. 10 years		0.0		2.5		45.2		52.3	
Jul-Mar									
2010-11	—	—	44.6		3,305.5		2,500.0		5,850.0
2011-12(P)	—	—	56.0	25.6	2,274.0	-31.2	2,400.0	-4.0	4,730.0

Source: Ministry of Petroleum Natural Resource & Hydrocarbon Development Institute of Pakistan

—: Not available P: Provisional

14.3 Supply of Energy

Primary energy supply has increased by 2.3 percent during current year when compared with last year. The availability of energy per capita in

2011 remained 0.372 TOE compared to 0.371 TOE in 2010 posting a positive growth rate of 0.16 percent (Table 14.6). Due to population growth rate of almost 2 percent, the balance between energy supply and emerging needs was outset.

Table 14.6: Primary Energy Supply and Per Capita Availability

Year	Energy Supply		Per Capita	
	Million TOE	Change (%)	Availability (TOE)	Change (%)
2001-02	45.07	1.5	0.32	-1.25
2002-03	47.06	4.4	0.32	0.00
2003-04	50.85	8.1	0.34	6.25
2004-05	55.58	9.3	0.36	5.88
2005-06	58.06	4.5	0.37	2.78
2006-07	60.62	4.4	0.38	2.70
2007-08	62.92	3.8	0.39	2.63
2008-09	62.55	-0.6	0.38	-2.56
2009-10	63.09	0.9	0.36	-5.26
2010-11	64.52	2.3	0.36	0.00

Source: Hydrocarbon Development Institute of Pakistan.

—: Not Available estimated

Analysis of the composition of final energy supplies in the country suggests that the supply of coal during last ten years grew at an average rate of 7.5 percent per annum followed by gas, electricity,

petroleum products and crude oil with average growth rates of 5.7 percent, 3.4 percent, 2.1 percent and 0.4 percent, respectively.

Table 14.7: Composition of Final Energy Supplies

Year	Crude Oil		Petroleum Products		Gas		Electricity		Coal	
	Million Barrels	Change (%)	(Mln.T.)	Change (%)	(bcf)(a)	Change (%)	(000Gwh)(b)	Change (%)	(Million Tonnes)	Change (%)
2001-02	75.2	2.1	18.1	1.6	923.8	7.7	72.4	6.3	4.4	7.3
2002-03	76.0	1.1	17.5	-2.9	992.6	7.4	75.7	4.6	4.9	11.4
2003-04	80.3	5.7	14.9	-14.9	1,202.7	21.2	80.9	6.9	6	22.4
2004-05	85.3	6.2	16.2	8.3	1,344.9	11.8	85.7	5.9	7.9	31.7
2005-06	87.5	2.6	16.5	2.2	1,400.0	4.1	93.8	9.5	7.7	-2.5
2006-07	85.3	-2.5	18.6	12.9	1,413.6	1.0	98.4	4.9	7.9	2.6
2007-08	90.5	6.1	19.8	6.1	1,454.2	2.9	95.9	-2.5	10.1	27.8
2008-09	86.1	-4.8	19.8	0.1	1,460.7	0.4	91.8	-4.3	8.4	-16.8
2009-10	76.8	-10.9	20.2	1.9	1,482.8	1.5	95.6	4.1	8.2	-2.4
2010-11	75.3	-1.9	21.3	5.5	1,471.6	-0.8	94.7	-0.9	7.7	-6.1
Avg. 10 Year		0.4		2.1		5.7		3.4		7.5
July-Mar										
2010-11(e)	56.6	-	16.0	-	1,110.0	-	69.0	-	5.9	-
2011-12 (e)	53.9	-4.9	14.8	-7.8	1,164.9	4.9	64.8	-6.1	4.7	-20.3

Source: Hydrocarbon Development Institute of Pakistan (HDIP)

(a): Billion cubic feet, (b): Giga Watt hour, (e): Estimated

*: Coal and electricity data is estimated on the basis of six months

**: Hydel generation for the month of March 2012 is missing. Thermal Generation from WAPDA for the months of Feb to Mar 2012 is missing

The main hurdle in the supply of energy was accumulation of the massive circular debt. The major problems which cause accumulation of circular debt were the partial transfer of tariff as determined by National Electric Power Regulatory Authority (NEPRA), heavy line losses (present level of line losses are almost 20 percent), incomplete corporatization, weak governance and costly fuel mix putting an extra financial burden on meeting the cost of fuel oil due to constant increase in the oil prices, etc. The government has made all possible attempts to address this issue. The government has transferred bank loan liabilities of Rs 216.0 billion (as of 30-06-2009) and Rs. 85.114 billion from the books of power companies and placed these amounts with the Power Holding (Pvt) Ltd (PHPL) in November, 2011. The government has repaid these loans to the bank along with markup.

- ▶ During 2010-11 the Finance Division released Rs. 65 billion as well as Rs. 120 billion as tariff subsidy to Pakistan Electric Power Company (Pvt) Ltd (PEPCO) over and above the budgetary allocation to overcome its operational shortfall and relax the Circular Debt.
- ▶ With the approval of the Cabinet, funds amounting to Rs. 142.0 billion have been raised from the banks in March 2012 and paid to Independent Power Producers (IPPs) by PEPCO. Another transaction for raising funds to the tune of Rs. 20 billion is in process for payment of overdue of Independent Power Producers (IPPs) / Gas Companies/ Pakistan State Oil (PSO) etc to overcome/reduce the Circular Debt.
- ▶ The power sector was allowed to transfer the cost of power to the consumers through the

tariff increases of 6%, 12% and 6% at the start of the three quarters on 1st Jan, 1st April and 1st October 2010.

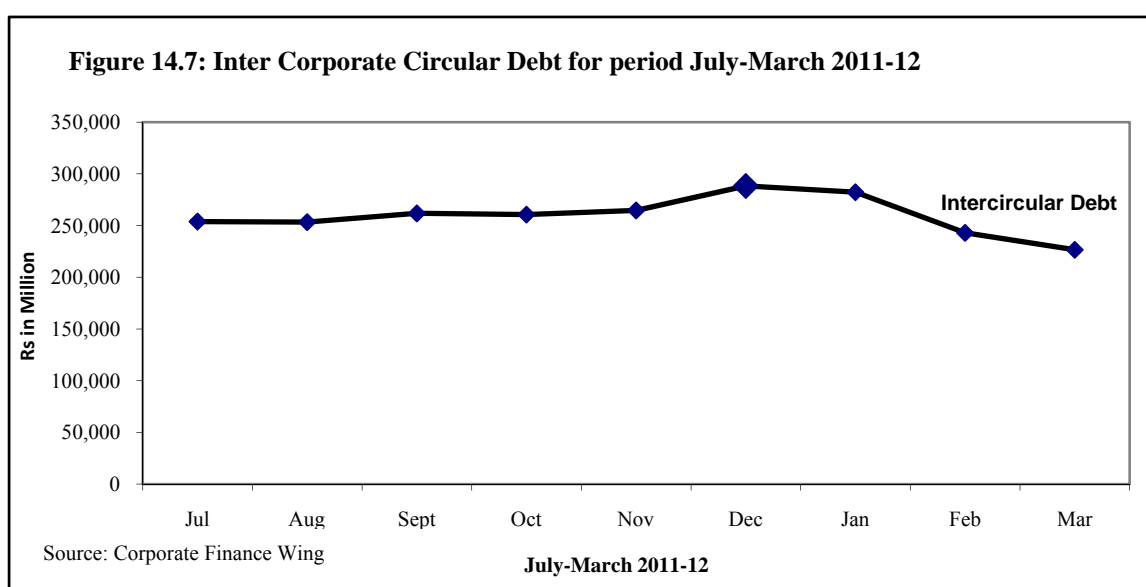
► To enable the Power Sector to meet its cash shortfall, the following Tariff Differential Subsidies have been released during the period:

Table 14.8: Tariff Differential Subsidies (Rs. in billion)

2008-09	2009-10	2010-11	2011-12 (upto Mar-12)
109.173	178,841	346.096	93.250

Source: Corporate Finance Wing

Because of the policy implementation by the government the inter circular debt has shown a declining trend over the period July-Mar 2011-12 as shown in figure below:



14.3-a Crude Oil

The total supply of crude oil for the fiscal year 2010-11 was 75.3 million barrels, equal to 10.1 million TOE, out of which 68.1 percent was imported and 31.9 percent was locally extracted. The balance recoverable reserves of crude oil in the country as on December 31st, 2011 have been estimated at 247.53 million barrels in the country. The average crude oil production during July 2011 to Mar 2012 remained 66032 barrels per day as against 65997 barrels per day during the corresponding period of last year, showing an increase of 0.05 percent. During the period under review, 39669 (60 percent) barrels per day were

produced in northern region and 26364 (40 percent) barrels per day in southern region, as against 34762.28 (53 percent) barrels and 31234.22 (47.33 percent) barrels produced per day respectively in the same period last year. During July 2011 to March 2012, production of crude oil has increased by 14.11 percent from northern region whereas production decreased in southern region by 16 percent, as compared to same period last year overall 0.05 percent oil production increased in the country. The company wise detail of production of crude oil during July-March 2011-12 and corresponding period of the last fiscal year is as given below:

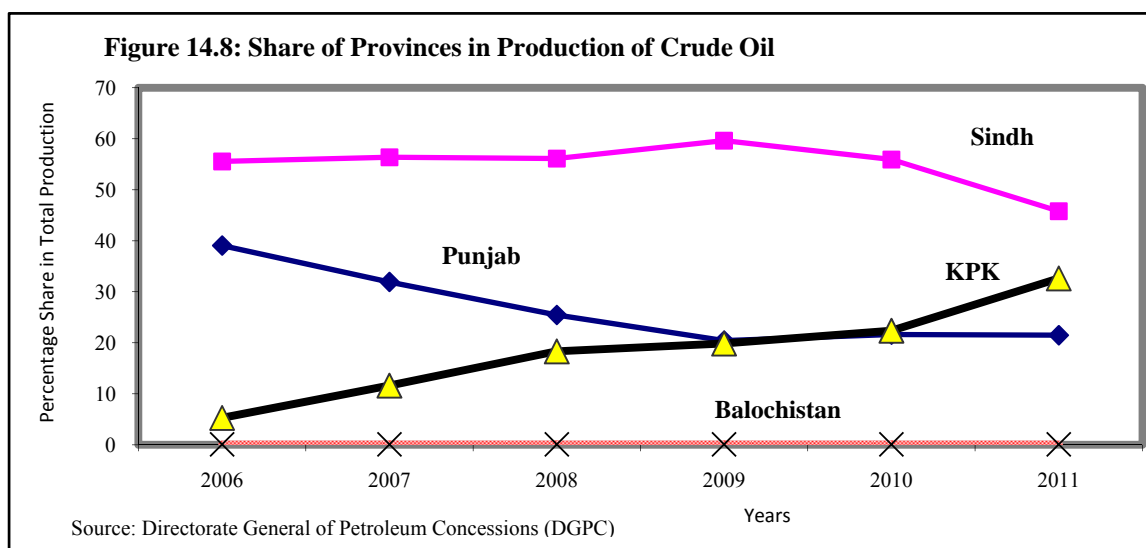
Table 14.9: Production of Crude Oil (BOPD)

Region	2010-11	July-Mar	July-Mar	Change (%)
		2010-11	2011-12	
Northern Region	35,367.74	34,762.28	39,668.59	-1.71
Dewan Petroleum (Pvt) Ltd	207.38	211.21	193.48	1.85
Oil & Gas Development Company Limited (OGDCL)	18,526.47	18,236.27	21,036.58	-1.57
Orient Petroleum International Inc (Opil)	680.38	658.18	886.16	-3.26
Pakistan Oilfields Limited (POL)	3,327.12	3,401.00	2,844.97	2.22
Pakistan Petroleum Limited (PPL)	5,138.52	4,925.16	6,130.21	-4.15
MOL Pakistan Oil & Gas Co	7,487.87	7,330.47	8,411.34	-2.10
Mari Gas Company Limited (MGCL)	–	–	165.84	–
Southern Region	30,498.44	31,234.22	26,363.50	2.41
Oil & Gas Development Company Limited (OGDCL)	18,315.59	18,615.34	16,498.27	1.64
BP Pakistan Exploration & Production Inc (BP)	8,362.90	8,625.89	6,646.82	3.14
Pakistan Petroleum Limited (PPL)	1,140.31	1,233.66	402.24	8.19
BHP Petroleum Pakistan (BHP)	2,169.09	2,228.26	2,306.30	2.73
OMV (Pakistan) Exploration (OMV)	52.16	54.28	49.23	4.06
eni Pakistan Limited (eni)	332.98	355.34	327.89	6.72
Mari Gas Company Limited (MGCL)	17.55	7.30	63.46	-58.40
Petroliaam Nasional Berhad (PETRONAS)	107.86	114.15	69.29	5.83
Total:	65,866.18	65,996.50	66,032.09	0.20

Source: Ministry of Petroleum & Natural Resources

The share of Sindh in the total production was 46 percent during 2010-11 with a declining trend seen over the last four years. Initially the share of Punjab in the production of crude oil declined in 2009 after which it has become almost static. The share of KPK in crude oil production increased

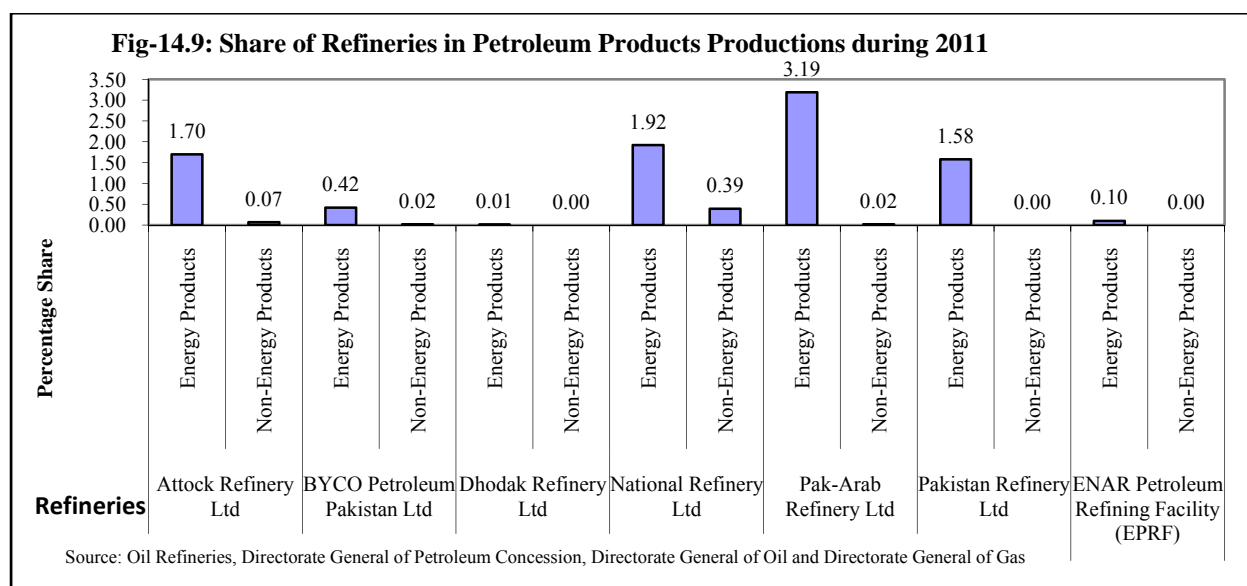
from 5.3 percent in 2005-06 to 32.6 percent which is the second highest amongst the provinces in 2010-11. Balochistan's share remained very small and constant at around 0.1 percent during the last four years as shown in the figure below:



14.3-b Petroleum Products

Petroleum products are produced from the processing of crude oil at petroleum refineries and the extraction of liquid hydrocarbons at natural gas processing plants. These products are further classified into Energy and Non-Energy products. Energy products include Motor Spirit, Kerosene, High Octane Blending Component (HOBC), High Speed Diesel Oil (HSD), Light Diesel Oil (LDO), Furnace Oil (FO), Aviation Fuels, Naphtha and Liquefied Petroleum Gas (LPG), while Non-Energy products include Lube Oil, Solvent Oil, Mineral Turpentine (MTT), Jute Batch Oil (JBO), Asphalt, Process Oil, Benzene Toluene Xylene (BTX), Wax and Sulphur etc. During 2011 the

total production of petroleum products (energy and non-energy) remained 9.40 million tonnes compared to 9.53 million tonnes during 2009-10; thus posting a negative growth of 1.36 percent. Out of 9.40 million tonnes 8.91 million tonnes are energy products while 0.49 million tonnes are non-energy products. In these products diesel has the highest share of 34.9 percent followed by Furnace Oil (FO) having 25.9 percent. Motor Spirit and High Octane Blending Component (HOBC) together have 13.3 percent while Aviation Fuels, Naphtha and Liquefied Petroleum Gas (LPG) hold 8.8 percent, 8.6 percent and 1.9 percent respectively. Non-Energy products together have 5.3 percent share in the total production of petroleum products.



The total import of petroleum products were 12.37 million tonnes while total export of petroleum products were 1.57 million tonnes in 2010-11. This is shown in Table 14.10. During the period July-

March 2011-12 there was a negative growth of 27 percent in the export of petroleum products and a positive growth of 37.7 percent in the import of petroleum products.

Table 14.10: Imports and Exports of Petroleum Products (Million Tonnes)

Imports		Exports	
Products	Quantity in million Tones	Products	Quantity in million Tones
100 Octane Aviation Fuel (100LL)	0.80	Naphtha	0.79
High Speed Deisel (HSD)	3.78	High Speed Deisel (HSD)	0.12
High Sulphur Furnance Oil	5.60	Jet Propellant (Aviation Fuel) JP-1	0.64
Low Sulphur Furnance Oil	1.06	Furnance Oil	0.004
Motor Spirit	1.13	Motor Spirit	0.02
Total	12.37	Total	1.57

Source: Hydrocarbon Development Institute of Pakistan

14.3-c Natural Gas

The consumption of increasing natural gas is rapidly. As on December 31st 2011, the balance recoverable natural gas reserves have been estimated at 24.001 Trillion Cubic Feet. The average production of natural gas during July-March 2011-12 was 4236.06 million cubic feet per day (Mmcfd) as against 4050.64 (Mmcfd) during the corresponding period of last year, showing an

increase of 4.57 percent. Natural gas is used in general industry to prepare consumer items, to produce cement and to generate electricity. In the form of CNG, it is used in transport sector and most importantly to manufacture fertilizer to boost the agricultural sector. Currently 27 private and public sector companies are engaged in oil and gas exploration & production activities. Company wise total natural gas production is as under:

Table- 14.11: Production of Natural Gas (Mmcfd)

Company	2010-11	July-Mar	July-Mar	Change (%)
		2010-11	2011-12	
BHP Petroleum Pakistan (BHP)	392.13	399.77	446.08	11.58
eni Pakistan Limited (eni)	478.24	486.89	468.88	-3.70
Dewan Petroleum (Pvt) Ltd	28.56	28.88	27.09	-6.20
Hycarbex-American Energy, Inc	–	–	6.36	–
Mari Gas Company Limited (MGCL)	509.86	502.02	552.68	10.09
Oil & Gas Development Company Limited (OGDCL)	862.12	853.74	1,026.18	20.20
OMV (Pakistan) Exploration (OMV)	443.52	446.43	402.32	-9.88
Orient Petroleum International Inc (Opil)	13.38	13.01	17.44	34.05
Pakistan Oilfields Limited (POL)	21.23	21.46	20.59	-4.05
Pakistan Petroleum Limited (PPL)	760.36	765.58	786.33	2.71
Tullow Oil Plc (Tullow)	0.38	0.50	–	–
Petroleum Exploration (Pvt) Limited (PEL)	26.87	27.57	24.43	-11.39
BP Pakistan Exploration & Production Inc (BP)	176.83	189.61	130.50	-31.17
Petrolia Nasional Berhad (PETRONAS)	13.24	13.52	12.94	-4.29
MOL Pakistan Oil & Gas Co	305.04	301.85	313.78	3.95
Total:	4,031.76	4,050.83	4,235.60	4.56

Source: Ministry of Petroleum & Natural Resources

Historically, indigenous natural gas is one of the types of fuel used by thermal power plants while the other type of fuel being imported is furnace oil. With the significant increase in international prices of furnace oil, initially the power sector retained the lion's share in the allocation of natural gas. However, the gas companies did not sign long-term agreements with the public sector utilities and subsequently, the allocation of gas to the public sector plants were allocated on as-and-when-available basis. This pattern continued for a considerable period up to the mid eighties. However, with the passage of time, natural gas became a scarce resource because of major use in the domestic, fertilizer and transport sectors. Thus

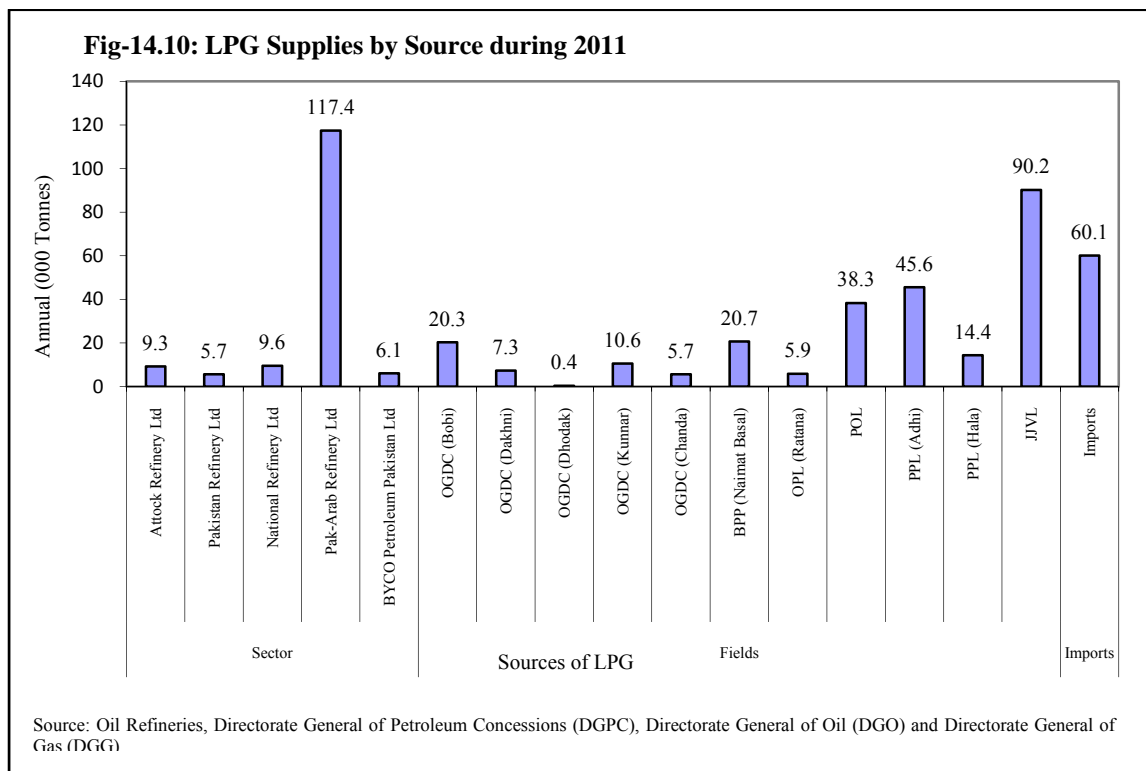
the allocation of natural gas for the power sector has declined significantly.

(i). Liquefied Petroleum Gas (LPG):

LPG currently contributes only 0.5 percent to the total primary energy supply in the country. However, 87 percent of its demand is met through local production. The rest is imported. This lower share is mainly due to local supply constraints and the higher price of LPG in relation to competing fuels like fuel wood, dung etc. Currently, in Pakistan, out of 27 million households, approximately 6 million are connected to the natural gas network while the rest are relying on LPG and conventional fuels such as coal, firewood, kerosene, biomass etc. LPG has thus

become a popular domestic fuel for those who live in areas where the natural gas infrastructure does not exist. The annual total supply of LPG remained 467,476 tonnes; 1, 281 tonnes were produced daily during 2012, out of this 46 percent

is produced in the private sector while 54 percent is produced in the public sector. The three main sources of LPG are; refineries 32 percent, gas producing fields 55 percents and imports 13 percent. The details are given in the figure below:



(ii).Compressed Natural Gas (CNG):

CNG as an alternative fuel for automobiles was introduced in 1992 to reduce the dependency on expensive imported fuel and to protect the environment. During the past few years, a tremendous growth in this sector was witnessed on account of the price differential between CNG and petrol which led to increase in conversion of vehicles into CNG. As a result to meet the growing demand a significant increase in CNG stations was witnessed. According to an estimate presently there are 3,331 CNG stations operating in the country.

(iii).Liquefied Natural Gas (LNG):

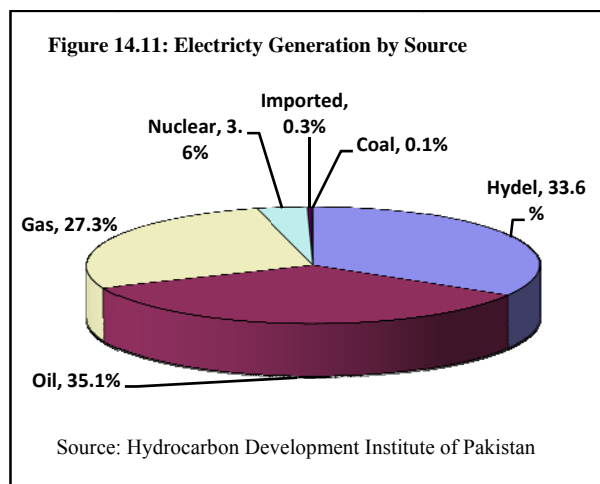
Realizing the widening gap between demand and supply of natural gas the government is encouraging LNG import through the private sector. Various investors have shown an interest.

In this regard OGRA has issued provisional licenses for construction of a LNG terminal, operation, sales and marketing of Regassified liquid natural gas (RLNG) / Liquid natural gas LNG. It is expected that RLNG volume of 1400 MMscfd will be added to the system. In Pakistan import of LNG is considered to be beneficial for power companies as these companies are importing considerably more expensive furnace oil as input for power. In this context, the government has signed a Memorandum of Understanding (MoU) with Qatar for the import of 500 mmcfd and is exploring other avenues with Algeria and Malaysia which are prospective suppliers of LNG.

14.3-d Electricity

During 2010-11, electricity generation was 94,653 GWh. The contribution of Hydel in electricity generation increased to 33.6 percent in 2010-11 as

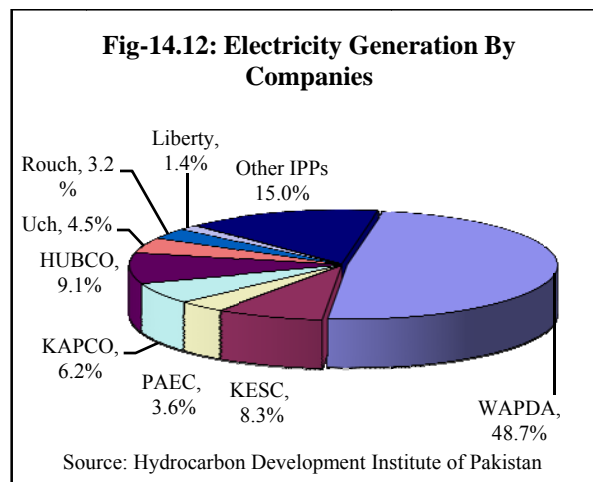
compared to 29.4 percent in 2009-10. Since oil became an expensive input, its share in electricity generation declined to 35.1 percent as compared to almost 38 percent last year. The same was the case for gas. Its share was 27.3 percent as compared to 29.4 percent of last year. The share of coal remained stagnant at 0.1 percent. The electricity generation by source and company is shown below:



Power generation is provided by three sources thermal, hydel and nuclear. There are 13 hydroelectric facilities with installed capacity 6,481 MW are owned and operated by the Water and Development Authority (WAPDA) while thermal power plants are owned by both public and private companies. The public sector operates 13 thermal plants with installed capacity of 4,900 MW. About one third of power generation (5,987 MW) is provided by private sector companies (Independent Power Producers IPPs). Also, KESC operates plants with total capacity of 1,955 MW. Out of the total 19,252 MW of the national installed generation capacity, dependable generation is about 17,523 MW in the summer and about 14,640 in the winter, depending on the annual hydrology.

During 2010-11, the Water and Power Development Authority (WAPDA) remained the main contributor to electricity generation with 48.7 percent coming from this source. Karachi Electricity Supply Corporation (KESC), Pakistan Atomic Energy Commission (PAEC), Kot Addu

Power Company (KAPCO) and the Hub Power Company (HUBCO) have 8.3, 3.6, 6.2 and 9.1 percent, respectively. Independent Power Producers (IPPs) have contributed almost 25 percent as shown in the figure below:



According to National Transmission and Dispatch Company Ltd, during July-March 2011-12, demand was 18,860 MW and supply remained 12,755 MW thus creating a deficit of almost 6,000 MW. The solution to electricity or power crisis can be addressed in short-term, medium-term and long-term. In short-term various technical and administrative measures must be implemented to improve operational and managerial efficiency. In this context for recoveries and theft control, the government has adopted strict measures like legislation of high penalties on electricity theft, requisitioning of rangers/ frontiers corps to assist in theft control and recoveries, prepaid meters for government departments, curbing of bogus bills by Distribution Companies (DISCOs) audit and vigilance and monitoring of load management activity. Likewise, in order to better utilize hydropower resources in the country, Water and Power Development Authority (Wapda) has awarded a Rs164 million contract to consulting firms MWH (USA) and Nespak (Pakistan) to carry out a feasibility study to upgrade the 1,000-MW (megawatts) Mangla Power Station. Besides upgradation of Mangla Power House, 22-MW Jabban Power House is also being rehabilitated at a cost of Rs. 3.7 billion. In addition, the contract for rehabilitation and upgradation of 243-MW Warsak Power House will also be finalized shortly.

Also Laraib Energy Limited (“Laraib”) is the owner and developer of 84 MW hydroelectric powers generating complex known as the New Bong Escape Hydroelectric Power Complex (the “Project”) on the Jhelum River in Azad Jammu and Kashmir (AJ&K). The Project has the distinction of being Pakistan and AJ&K’s first hydropower IPP. By developing a bankable framework this trendsetting project has paved the way for rapid and full scale development of Pakistan and AJ&K’s hydropower potential. Finally, the United States and Pakistan signed implementation agreements to upgrade three Pakistani thermal power stations at Jamshoro, Muzaffargarh, and Guddu. The rehabilitation, commissioned by the Pakistani companies, will restore approximately 305 MW of lost power generation capacity and bring a measure of relief to the people of Pakistan over the course of the next 12 months.

14.3-e Nuclear Energy

Pakistan Atomic Energy Commission (PAEC) is responsible for planning, construction and operation of nuclear power plants in the country. PAEC is currently operating three nuclear power plants i.e. Karachi Nuclear Power Plant (KANUPP) and Chashma Nuclear Power Plant Unit-1 and 2 (C-1 & C-2). The construction of two more units C-3 and C-4 of being 340 MW each is in progress.

KANUPP, located at Karachi, completed its design life of 30 years in 2002. After refurbishments and safety retrofits, it is now operating on extended life. C-1 located at Chashma is performing very well since its commercial operation. Third nuclear power plant that is also located at Chashma being an improved version of C-1 had also started commercial operation on 18 May 2011, three months ahead of its schedule. Performance of the operating nuclear power plants of Pakistan is shown in the Table 14.12:

The under construction nuclear power plants C-3 and C-4 are of 340 MWe each. The first concrete of these plants has been poured and commercial operation of C-3 and C-4 is expected in 2016 and 2017, respectively.

The government has mandated to Pakistan Atomic Energy Commission (PAEC) for the installation of 8,800 MW nuclear power capacities by the year 2030. Technical and engineering infrastructure is in place to provide technical support to existing, under construction and future nuclear power plants. It also has a network of in-house educational and training institutions that encompass all major facets of nuclear science and technology.

Table 14.12: Performance of the Operating Nuclear Power Plants in Pakistan

Plants	Gross Capacity (MW)	Grid Data	Commercial Data	Electricity sent to Grid	
				July-March 2012 (million KWh)	Lifetime (billion KWh)
KANUPP	137*	18-Oct-71	7-Dec-72	329.1	12.07
C-1	325	13-Jun-00	15-Sep-00	1477.3	22.17
C-2	325	14-Mar-11	18-May-11	1790.7	2.22

Source: Pakistan Atomic Energy Commission

* KANUPP re-licensed at 98 MW (gross) after completing design life

14.3-f Coal

Pakistan has huge coal reserves which are estimated at over 185 billion tonnes; including 175 billion tonnes identified at Thar coalfields in Sindh province. Pakistan’s coal generally ranks from lignite to sub-bituminous. The total production of coal during 2010-11 was 7.7 million tonnes as

compared to 8.1 million tonnes in 2009-10; showing a negative growth of 5.1 percent. In 2010-11 the import of coal was 4,267 million tonnes compared to 4,658 million tonnes in 2009-10; a decline of 8.4 percent. The long trend shows that there was an increase of production of coal; an average 7.7 percent change occurred in last ten years.

Table 14.13: Production of Coal, Share and Percentage Change

Fiscal Year	Imports		Domestic Production		Total	
	Tones (000)	% Share	Tones (000)	% Share	Tones (000)	% Change
2001-02	1,081	24.5	3,328	75.48	4,409	9.0
2002-03	1,578	32.3	3,312	67.73	4,890	10.9
2003-04	2,789	46.0	3,275	54.01	6,064	24.0
2004-05	3,307	41.9	4,587	58.11	7,894	30.2
2005-06	2,843	36.9	4,871	63.14	7,714	-2.3
2006-07	4,251	53.9	3,643	46.15	7,894	2.3
2007-08	5,987	59.2	4,124	40.79	10,111	28.1
2008-09	4,652	55.4	3,738	44.55	8,390	-17.0
2009-10	4,658	57.2	3,481	42.77	8,139	-3.0
2010-11	4,267	55.3	3,450	44.71	7,717	-5.2
Avg. 10 years		46.3		53.7		7.7
July-Mar						
2010-11	3,500e	59.8	2,350e	40.2	5,850e	—
2011-12	2,700c	57.1	2,030c	42.9	4,730c	-19.15

Source: Hydrocarbon Development Institute of Pakistan

e: Coal data is estimated on the basis of six months

c: Coal import is estimated on the basis of six months data while the production from FATA is not available

The Federal and Provincial governments are endeavoring to harness the huge coal resources of Thar by utilizing these as a source of energy for power generation through international investment. As part of the promotional activity to increase the share of coal, the Government of Sindh has leased out a coal block for an integrated mining project. The details are as under:-

1. Government of Sindh has entered into a joint venture with M/s Engro Powergen (Pvt.) Limited for Coal Mining in Block-II and established a Company under Companies Act, 1984 viz. “Sindh Engro Coal Mining Company” for development of coal mines and installing 600-1000 MW Power Plant
2. M/s Cougar Energy UK limited has been allocated Block-III in Thar coalfield for extraction of under ground Coal Gasification and establishing a 400 MW power plant
3. M/s Bin Daen Group, UAE has been allocated Block-IV in Thar coalfield for coal mine and installing 1000 MW Power Plant
4. One block has been allocated to Planning Commission of Pakistan for a Pilot Project of

50 MW based on Underground Coal Gasification Project in Block-V

5. M/s Oracle Coalfield Plc, UK has been allocated Block-VI in Thar coalfield for developing coal mine and installing power plant of 300 MW extendable up to 1000 MW
6. M/s China National Machinery Import and Export Corporation of China (CMC) conducted a feasibility study for 400 MW integrated coal mining and coal fired power plant at Sonda-Jerrick in district Thatta
7. The Government of Sindh is entering into a Joint Venture with M/s Al-Abbas Group company and allocated an area in Badin coalfield for developing coal mine and installing Coal-fired Power Plant of 300-600 MW

14.4 Performance of Major Oil and Gas Companies

- During 1st July 2011 to 31st March 2012, so far eight (8) oil and gas discoveries have been made in the country. Details are as under:

Table 14.14: Oil and Gas Discoveries during July-March 2011-12

Discovery	Discovery Date	Status	Company	Total Depth in Meters	Current Production	
					Oil (BOPD)	Gas (Mmcfd)
Mulaki-1	July-11	Oil & Gas	United Energy Pakistan (UEP)	2,080.0	92.26	14.68
Maru South-1	August-11	Gas	Oil and Gas Development Company Limited (OGDCL)	720.0	–	–
Halini-1	October-11	Oil	Mari Gas Company Limited (MGCL)	5,350.0	649.29	–
Zin X-1	December-11	Gas	Oil and Gas Development Company Limited (OGDCL)	2,300.0	–	–
Gharo-1	February-12	Oil	United Energy Pakistan (UEP)	1,334.7	501.74	0.04
Mohano-1	February-12	Oil	United Energy Pakistan (UEP)	1,727	187.65	0.07
Suleman-1	March-12	Gas	Oil and Gas Development Company Limited (OGDCL)	4,575	–	–
Pir Apan-1	March-12	Gas	United Energy Pakistan (UEP)	2,155	327.28	10.6
Total					1758.22	25.39

Source: Ministry of Petroleum & Natural Resources

- ▶ The Councils of Common Interest (CCI) approved Tight Gas (Exploration & Production) Policy, 2011 that offers 40 percent higher price than the price announced in Exploration & Production Policy, 2009, with an incentive of additional 10 percent price if the discoveries are made within a period of 2 years to attract exploration companies to invest in tight gas fields. Tight gas reserves are estimated at 24 trillion cubic feet. Initially 100-150 Mmcfd would be added depending on its success rate.
- ▶ Economic Coordination Committee (ECC) has approved Low BTU Gas Pricing Policy, 2012.
- ▶ Petroleum Policy 2009 is reviewed and Petroleum (Exploration & Production) Policy, 2012 is being promulgated shortly.
- ▶ The Ministry of Petroleum & Natural Resources is also working on Shale Gas Policy

to encourage the investors to exploit these reservoirs.

14.4-a Oil and Gas Development Company Limited (OGDCL):

OGDCL is the local market leader in terms of reserves, production and acreage. It is the first Pakistani Exploration and Production Company to list its shares on the London Stock Exchange. Equipped with a forward looking professionally developed Business and Strategic Plan, competent professionals to implement the same and robust balance sheet OGDCL is ready to take on the challenges of an internationally listed company. OGDCL had spaded 7 wells (1 Exploratory / Appraisal & 6 Development wells) during the period July to December 2011. In the previous year during the corresponding period 7 wells (2 Exploratory / Appraisal & 5 Development wells) were spaded. The details of the Oil, Gas, LPG and sulphur's production is given below:

Table 14.15: Physical Performance of OGDCL

S. #	Name of Activity		July-Dec	July-Dec	Change (%)
			2010	2011	
1	Total		7	7	—
	i	Exploratory Wells	2	1	
	ii	Development / Appraisal Wells	5	6	
2	Production				
	i	Oil (Barrels)	6,656,408 (36,176)	6,611,728 (35,933)	-0.7
	ii	Gas (MMcft)	152,934 (831)	158,933 (864)	3.8
	iii	LPG (MT)	21,646 (118)	17,613 (96)	-22.9
	iv	Sulphur (MT)	12,435 (67.5)	12,750 (69.2)	2.5

Source: Ministry of Petroleum & Natural Resources (MP&NR), Oil & Gas Development Company Ltd (OGDCL)
 Figures in braces show daily average production

14.4-b Oil & Gas Regulatory Authority (OGRA):

The Oil and Gas Regulatory Authority (OGRA) is mandated by the government to regulate the oil and gas sector to promote competition and attract investment. In March 2006, it was also given the task to compute and notify prices of petroleum products as per the Federal Government approved formula. OGRA computes and notifies ex-refinery price of High Speed Diesel (HSD) and Superior Kerosene Oil (SKO) including ex-depot prices of SKO and IFEM (In land Freight Equalization Margin) on monthly basis. Furthermore, OGRA has been assigned to monitor the pricing of petroleum products. OGRA has also been assigned to submit quarterly reports on pricing of petroleum products indicating the trend in international markets and petroleum products pricing announced

by Oil Marketing Companies (OMCs)/refineries along with analysis/findings and suggestions, if any, on regular basis to ECC.

14.4-c Sui Northern Gas Pipelines Limited (SNGPL):

During 2010-11 SNGPL earned a profit after tax of Rs. 2,361 million and paid an amount of Rs. 1,228 million in corporate taxes. During the current year SNGPL extended its transmission network to a length of 7,613 Km.

14.4-d Sui Southern Gas Company Limited (SSGCL):

SSGCL earned a profit after tax of Rs. 4,795 million during 2010-11. During the current year SSGCL extended its transmission network to a length of 3,337 Km.

Table 14.16: Physical Performance of SNGPL and SSGCL

S. No	Name of Activity	2010-11 SNGPL	2010-11 SSGCL
1	<u>Sector-Wise Gas Consumption (mmcf)</u>		
	Power	321	218
	Fertilizer	116	66
	Cement	2	2
	CNG/Transport	231	80
	General Industry	302	202
	Commercial	72	28
	Domestic	416	231
	Total	1,460	827
2	<u>New Connections (Nos.)</u>		
	Domestic	256,172	120,159
	Industrial	231	179
	Commercial	1,246	844
	Total	257,649	121,182

Source: Sui Northern Gas Pipeline Ltd (SNGPL), Sui Southern Gas Pipeline Ltd (SSGC)

14.5 Performance of Power Sector Authorities

14.5-a National Electric Power Regulatory Authority (NEPRA)

The National Electric Power Regulatory Authority is exclusively responsible for regulating the electric power services and safeguarding the interests of investors and consumers. NEPRA grants licenses for generation, transmission and distribution of electric power; determines tariff rates, charges and other terms and conditions for supply of electric power; prescribes and enforces performance standards and addresses the complaints of electricity consumers. As a regulator NEPRA extends advice/recommendations to the concerned entities, including the government, to make the power more efficient and sustainable. During the period July-December 2011, NEPRA announced the Upfront Tariff for Wind Power Producers. Upfront tariff for coal based technologies is also in the pipeline and will be announced after consultations with the Private Power and Infrastructure Board (PPIB). NEPRA processed 25 applications for grant of generation licenses for power plants with a cumulative capacity of approximately 600 MW; out of which 15 were granted generation licenses while the others were at an advanced stage of processing and

expected to be finalized soon. Besides these, one distribution license was also granted. Since NEPRA determines electricity tariffs in accordance with the Tariff Standards and Procedure Rules, 1998 during the period July-December 2011, 13 tariff determinations and 149 tariff adjustments were issued relating to different Generation Distribution Companies.

Pursuant to amendment in Section 31 of NEPRA Act (XL of 1997), through promulgation of Ordinance No.XVIII of 2009 dated July 31, 2009, Ordinance No.XXIX of 2009 dated November 26, 2009 and Ordinance No.XIV of 2010 dated April 20,2010, NEPRA was mandated to determine the overall electricity tariff on a quarterly basis and intimate the same to the Federal Government for notification in the official Gazette. The ordinance lapsed in August 2010. Thereafter, tariff determination on an annual basis and adjustment on account of variation in fuel cost component of consumer-end-tariff is being determined by NEPRA on a monthly basis in pursuance of the Finance Bill 2008. The status of complaints during July-December 2011 has been summarized below:

Table 14.17: Physical Performance of NEPRA (July – December 2011)

DISCOS	Complaint Sent to DISCOS	Redressed by DISCOS	Under Process	Consumer advised to approach DISCOS	Total Disposed off	Total Complaints
	(1)	(2)	(3)	(4)	(5) = (2) + (4)	(6) = (1) + (4)
PESCO	80	64	16	31	95	111
IESCO	29	29	0	29	58	58
GEPCO	11	10	1	6	16	17
FESCO	24	23	1	22	45	46
LESCO	37	34	3	62	96	99
MEPCO	167	162	5	116	278	283
HESCO	105	103	2	56	159	161
QESCO	1	1	0	3	4	4
KESCO	59	59	0	52	111	111
SEPCO	15	14	1	69	83	84
Total	528	499	29	446	945	974

Source: National Electric Power Regulatory Authority (NEPRA)

14.5-b Water and Power Development Authority (WAPDA)

The installed capacity in the PEPCO system is 20,986 MW as of June 2011; with hydro 6627 MW and thermal 14,359 MW. The hydropower capacity accounts for 31.6 percent, thermal 65.3 percent and Nuclear 3.1 percent. Of this 4829 MW is owned by ex-WAPDA GENCOs, 448 MW by rental, 650 by PAEC and rest by IPPs. There is 55-MW of isolated generation capacity in Pasni and Punjgoor areas. WAPDA is executing, on priority basis, the projects such as 969 MW-Neelum Jhelum, 1410 MW-Tarbela 4th Extension, 7100 MW-Bunji, 4320 MW-Dasu, 740-MW Munda Dam and most mentionable 4500 MW-Diamer Bhasha Dam

projects, to cope with the increasing demand of power. Almost 96 percent work on the main dam at Mangla, spillway and allied facilities had been completed and resettlement work is in progress. Likewise 99.7 percent work on Satpara and 72.1 percent on Gomal Zam dam had been completed.

In an attempt to reduce the energy crises, Prime Minister Yousaf Raza Gilani laid the foundation stone of the Diamer Bhasha Dam in Gilgit-Baltistan on October 18, 2011. The dam is being built about 40 kilometres from Chilas on the Indus River and will have a capacity of producing 4,500 megawatts of electricity. Some salient features of the dam are given in Box-2:

Box-2 (Diamer Basha Dam Project)

Project

The project is located on Indus River, about 315 km upstream of Tarbela Dam, 165 km downstream of Gilgit and 40 km downstream of Chilas. The proposed dam would have a maximum height of 270 m, and impound a reservoir of about 7,500,000 acre feet ($9.25 \times 10^9 \text{ m}^3$), with live storage of more than 6,400,000 acre feet ($7.89 \times 10^9 \text{ m}^3$). Mean annual discharge of Indus River at the site is 50,000,000 acre feet ($6.2 \times 10^{10} \text{ m}^3$).

Salient Features

- Total installed capacity 4500 MW
- Availability of about 6,400,000 acre feet ($7.89 \times 10^9 \text{ m}^3$) annual surface face water storage for supplementing irrigation supplies during low flow periods.
- Reduction of dependence on thermal power, thus saving foreign exchange.
- Creation of massive infrastructure leading to overall socio-economic uplift of the area and standard of living of people.
- Minimum operation level having expected length equal to 1060 m.



i). Electricity Generation & Power Transmission

Due to alarming increase in fuel prices, the need for cheaper hydro power has gained more importance. Unfortunately the composition of electricity generation shows that the hydro

potential has not been utilized fully. The hydro potential which is located in the north is still largely untapped. The hydro generation accounted for 31.9 percent during July-March 2011-12 accounted 33 percent in total electricity generation while during 2011-11 it came up to 35.6 percent compared to 31.9 percent during 2009-10. The

trend of hydro-thermal energy generation for the last five years is given in the following table.

Table 14.18: Electricity Generation

Year	Hydro (Gwh)	% age	Thermal (Gwh)	% age	Total (Gwh)	% Change
2006-07	31,942	36.4	55,895	63.6	87,837	6.8
2007-08	28,667	33.2	57,602	66.8	86,269	-1.8
2008-09	27,763	32.9	56,614	67.1	84,377	-2.2
2009-10	28,492	31.9	60,746	68.1	89,238	5.8
2010-11	32,259	35.6	58,316	64.4	90,575	1.5
July-Mar						
2010-11	24,105	36.0	42,823	64.0	66,928	—
2011-12	22,411	33.0	45,534	67.0	67,945	1.5

Source: Pakistan Electric Power Company (Pvt) Limited (PEPCO), National Transmission & Distribution Company Limited (NTDC)

Total energy includes import from Iran, Gwh : Giga watt hours

To carry power from power generation station to the consumers' network, the role of transmission and primary lines network is very essential. Not only the length of network-lines is important but the transformation capacity of the grid-stations is also of equal value. The length of transmission lines was 7367 KM for 220kV and 23995 KM for 132-kV level at the end of June 2010. This has gone up to 7427 KM for 220 kV and 26321 KM for 132 level at the end of June 2011, showing a combined increase of 2386 KM.

The transformation capacity of 220 kV substations was 15014 MVA³ at the end of June 2010, which as 16494 MVA by the end of June 2011 showing an increase of 1480 MVA. It has further gone up 17671 MVA by the end of December 2011

showing an increase of 1177 MVA over June 2011. Similarly, the 132 kV transformation capacity which was 26569 in June 2010 has gone up to 30137 MVA by June 2011 and up to 31016 MVA by the end of December 2011 thus showing an appreciable increase of 4447 MVA over June 2010 figures.

ii). Growth in Consumers.

The number of consumers has been increasing due to rapid expansion of electric network to villages and other un-electrified areas. During July-March 2011-12 the number of consumers has been increased to 20.85 million as compared to 20.12 million in the comparable period of last year. The trend of increase in number of consumers during the last five years is given in the following table:

Table 14.19: Number of Consumers

Year	Domestic	Commercial	Industrial	Agriculture	Others	Total
2006-07	14,354,368	2,151,971	233,162	236,255	10,798	16,986,554
2007-08	15,226,711	2,229,403	242,401	245,640	11,211	17,955,366
2008-09	15,481,734	2,256,837	250,593	254,891	11,504	18,255,559
2009-10	16,673,015	2,362,312	263,507	271,268	12,122	19,582,224
2010-11	17,322,140	2,421,221	273,067	280,603	12,452	20,309,483
July-March						
2010-11	17,157,541	2,404,136	270,445	279,021	12,354	20,123,497
2011-12	17,808,962	2,466,049	284,049	282,639	12,745	20,854,444

Source: National Transmission & Dispatch Company Ltd, Water & Power Development Authority

³ MVA is MegaVolt Ampere. To convert it into MW one should know the power factor of the system because $MVA = PF \times MW$. However, if the PF is unity then $MVA = MW$. A PF of UNITY suggests that the load is purely resistive with neither capacitive nor inductive components in the load or source. Of course this can mean such components have been balanced artificially.

iii). Village Electrification

The village electrification program is an integral part of the total power sector development program in order to provide basic necessity of life to all the people of Pakistan, raise the productive capacity and socio-economic standards of the population living in rural areas.

Table 14.20: Village Electrification

Year	Addition During the Year	Progressive Total	Growth (%)
2006-07	14,203	117,456	-
2007-08	10,441	127,897	8.9
2008-09	9,868	137,765	7.7
2009-10	15,062	152,827	10.9
2010-11	11,705	164,532	7.7
July-Mar			
2010-11	7,283	160,110	-
2011-12	6,558	171,090	6.9

Source: Water and Power Development Authority

Between the period 30th June 2011 to March 2012, 6,558 was the progressive number of electrified villages. The trend of village electrification during past 05-years period is provided in Table 14.20:

iv). Electricity Consumption by Economic Group

The consumption of electricity by economic group identifies the domestic sector as the largest user for the past many years. Even during the current year 2011-12, the consumption pattern, more or less, remained the same with domestic share of 43 percent, industrial 26 percent and agricultural about 12 percent. During July-March 2011-12, consumption of electricity has increased in every economic group including domestic, commercial, industrial and public lighting which is a positive indication. The consumption trend of electricity by economic group for the past 05-years is given below:

Table 14.21: Consumption of Electricity by Economic Group

(Million Kwh)

Year	Domestic	Comm- ercial	Industrial	Agri- culture	Public Lighting	Bulk Supply	Traction	Supply to KESC	Total
2006-07	28,990	4,290	17,603	8,097	316	3,267	12.0	4,905	67,480
2007-08	28,751	4,358	17,299	8,380	340	3,332	8.0	4,072	66,540
2008-09	27,787	4,203	16,035	8,695	347	3,198	5.0	5,014	65,284
2009-10	29,507	4,466	16,371	9,585	372	3,367	2.3	5,208	68,878
2010-11	30,973	4,683	17,700	8,847	3,644	3,644	2.0	5,449	74,942
July-Mar									
2010-11	22,691	3,450	13,255	6,485	261	2,680	0.5	3,976	52,799
2011-12	23,137	3,483	14,023	6,298	280	2,716	0.5	4,319	54,257

Source: National Transmission & Dispatch Company Ltd, Water & Power Development Authority

v). Power Losses

The National Transmission & Dispatch Company Limited (NTDC) and Distribution Companies (DISCOs) have invoked various technical and administrative measures to improve operational and managerial efficiency to reduce power losses. The measures have given positive signs resulting in the reduction of power losses and increase in revenue. Certain measures such as renovation, rehabilitation, capacitor installation and strengthening the distribution system network are a continuous process for controlling/reducing wastage of power/energy. The Transmission and Distribution losses for the past five years are given

below which indicate steady trend of efficiency increase:

Table 14.22: Transmission & Distribution Losses of Net System Energy

Year	Transmission & Distribution (T & D) Losses (%)
2006-07	21.5
2007-08	21.3
2008-09	21.1
2009-10	20.9
2010-11	20.8
July-Mar	
2010-11	19.8
2011-12	19.5

Source: National Transmission & Dispatch Company Ltd, Water & Power Development Authority

14.5-c Private Power and Infrastructure Board (PPIB)

The Private Power and Infrastructure Board (PPIB) is a ‘One Window’ facilitator to the private investors in the fields of power generation on behalf of the Government of Pakistan (GoP). PPIB is currently processing thirty eight (38) multiple fuel (Oil, Coal, Gas, Cogeneration and Hydel) Independent Power Producer (IPP) projects with a cumulative capacity of around 10,457 MW. Out of these thirty eight projects, a total of twelve (12) new IPPs having a cumulative capacity of over 2400 MW have been commissioned since March 2009; while other companies are aggressively working to achieve the financial close/commissioning of their respective projects.

The year wise actual/expected capacity additions of IPPs upto year 2019 are as follows:

Table 15.23 Actual/expected capacity additions of IPPs upto year 2019	
Year	(MW)
Project already commissioned	2,409
2013	459
2014	126
2015	529
2016	552
2017	1,682
2018	4,152
2019	548
Total	10,457

Source: Private Power and Infrastructure Board

14.5-d Karachi Electric Supply Company Limited (KESC)

The Karachi Electric Supply Company Power Utility has posted earnings before Interest, Tax, Depreciation and Amortization (EBITDA) of Rs. 5.0 billion compared to Rs. 2.7 billion during the same period last year. This growth has largely been driven by the improvement in Transmission and Distribution (T&D) losses; which have come down to 29.6 percent - a reduction of 1.6 percent Year on Year and 2.9 percent on Quarter on Quarter basis. This was also made possible with the improvement in efficiency of the generation fleet through investment in state of the art new plants. During the 3rd Quarter of 2012, all the three Gas Turbines each of 116 MW of the Bin Qasim Power Station-

II (BQPS-II) 560 MW combined cycle plant have been successfully commissioned and the steam turbine will be successfully operative shortly which will further boost up the profitability of the Company and take the overall KESC generation fleet efficiency to 40 percent.

14.6 Alternative Sources of Energy

The government in its bid to diversify its energy mix, has been giving due attention to fast track the development of Alternative / Renewable Energy (ARE) resources in the country. With this very objective in view the Government of Pakistan in May 2010 gave the Alternative Energy Development Board (AEDB) the mandate to implement Alternative / Renewable Energy (ARE) commercial projects on its own or through joint venture or partnership with public or private sector entities in addition to its mandates under the ordinance. Along with the AEDB, the Pakistan Council of Renewable Energy Technologies (PCRET) has also been acquiring and updating know how for the promotion and mass propagation of Renewable Energy Technologies in the field of Solar, Micro-hydel, Wind etc. The main function of PCRET is to develop, acquire, adapt, promote and disseminate Renewable Energy Technologies in the country.

Measures taken by AEDB during this fiscal year

AEDB initiated a number of supportive measures that were required to be taken for laying a strong foundations of the ARE sector in Pakistan. In this regard:

- ▶ New wind corridors in areas outside Sindh have also been identified. Resource assessment of these corridors is underway and a number of wind measuring masts are being installed in all four provinces.
- ▶ National Grid Code for wind power projects has been amended. Grid Integration Plan 2010 -2015 for wind power projects is developed by AEDB to support National Transmission and Dispatch Company (NTDC).
- ▶ Regional Environmental Study has been conducted by AEDB to support wind power

projects. Guidelines for environmental assessment have also been developed.

- ▶ Asian Development Bank has been taken on-board to provide guarantee to the wind power project developers in order to mitigate the country risk.
- ▶ Local manufacturing of micro wind turbine has been started. Manufacturing for large wind turbines is also being initiated. The turbine towers for the first project are being manufactured in Pakistan.
- ▶ Issues related to financing of projects have been resolved and now leading financing agencies like International Finance Corporation (IFC), Asian Development Bank (ADB), Organization of the Petroleum

Exporting Countries (OPIC) and Economic Cooperation Organization (ECO) Trade Bank etc. are offering financing to wind power projects in Pakistan.

Measures taken by Pakistan Council of Renewable Energy Technologies (PCERT) during this fiscal year

The Council had also strived to strengthen its developmental efforts by introducing various projects in the public sector for the development and promotion of suitable technologies to produce materials and devices in the field of Renewable Energy despite the number of hurdles in the development and promotion of renewable energy technologies. Some of the notable projects and their status are as under:

Table 15.24: Projects by Pakistan Council of Renewable Energy Technologies (PCERT)

No.	Type	Present Status	Target 2011-15	Target 2016-20
1.	Micro-hydel Plants (MHP) in Gilgit Baltistan, AJK & Khyber Pakhtunkhwa and Canal-falls	485 units generating 8 MW (electrifying 70,000 houses)	5 MW (electrifying 25000 houses)	20 MW (electrifying 100,000 Houses)
2.	Biogas Plants Cooking, lighting Irrigation and power generation	4000 units. Producing 18000 M ³ /day	50,000 units. Producing 0.300 million M ³ /day	50,000 units. Producing 0.300 million M ³ /day
3.	Solar Water Heaters Manufacturing through private sector with PCRET Technical services	Designed & developed 05 different models of SWH for commercialization.	10,000 units (125-260 liters each)	25000 units 125-260 liters/day
	Solar Dryers Manufacturing through private sector with PCRET Technical services	Designed & Developed 03 different models of 20,100 & 500 Kg capacities	50,000 units	100,000 units
	Solar Cooker Manufacturing through private sector with PCRET Technical services	Designed & developed box and dish type solar cookers for commercialization	100,000 units	200,000 units
4.	PV Modules Production Manufacturing through private sector with PCRET Technical services	Developed Solar Cell production capacities up to pilot scale.	5 MW	20 MW
5.	Wind Turbines 100% subsidy	155 units of 0.5-10 KW capacity electrifying 1600 houses.	1000 units 10 MW electrifying 50,000 houses	1000 Nos. 10 MW electrifying 50,000 houses

Source: Pakistan Council of Renewable Energy Technology (PCERT)

(i) Mega Wind Power Projects

In addition to the above mentioned projects, AEDB also issued Letters of Intent (LoIs) to 43 IPPs pursuing development of wind power projects. Land was allocated to 19 IPPs for 50 MW wind power projects each in Gharao Keti Bander Wind Corridor. Projects with a cumulative capacity of approx. 950 MW are at various stages of development on these lands.

(ii) Biodiesel

Main achievements in this fiscal year are:

- ▶ Pilot Energy plantations for Biodiesel cultivated on 650 acres under study;
- ▶ Biodiesel production initiated with PSO;
- ▶ First Biodiesel refinery with the capacity of 18,000 Tons / annum Capacity has been set up at Karachi.
- ▶ SRO 474(1)2008 exempts custom duties and sales tax on Biodiesel production equipment and material.
- ▶ Amendments in OGRA Ordinance for Bio fuels pricing approved.

- ▶ Proposal for undertaking a feasibility study to set up 10,000 tons per annum Biodiesel production facility is in search of funding.
- ▶ Barriers to implementing Biodiesel Policy identified at the National Stakeholders Conference. Task force for barrier removal established.
- ▶ Registration of Jatropha seeds under process

(iii) Biogas Projects

Pakistan produces a huge amount of municipal waste (up to 50,000 tons / day) and agricultural waste in the form of Biogas, Cotton Sticks, and Rice Husk etc. Converting this waste into energy can generate up to 5,000MW of power. Pakistan offers lucrative opportunities in this sector in which a number of projects are already being implemented.

So far Pakistan Council of Renewable Energy Technologies (PRET) has installed 4015 biogas plants (with net generation capacity of 17980 M³/day) on cost sharing basis throughout the country. During the period in reference, 234 biogas plants have been installed. PCRET has installed 1000 biogas plants of 5 cubic meters each with annual production of 1.941 Million cubic meter gas, 1.567 Million kg of manure and 4.7 Million kg of carbon dioxide abatement. In addition the Council has installed 30 commercial size biogas plants ranging from 50-250 M³ by executing technological support for irrigation and power generation.

A World Bank funded project for carrying out a detailed study for Biomass / Waste-to-Energy projects in 20 cities of Pakistan has been initiated. Another Waste to Energy Study, funded by U.S Trade and Development Agency (USTDA) is being carried out for Karachi to generate 5-10MW power.

AEDB has issued a LoI to set up a 12MW Biomass to Energy power project in Sindh, based exclusively on Biogas / Agricultural Waste. The project is jointly sponsored by investors from US and local entrepreneurs, the SSJD Bio Energy. Another LoI has been issued to M/s Lumen Energia Pvt Ltd. to set up a 12MW power plant at Jhang based on agricultural waste like cotton stalk,

rice husk, sugarcane trash, biogas, wheat chaff and other crops as multi-fuel sources. AEDB has issued a letter of intent to M/s Pak Ethanol (Pvt) Ltd. to set up a 9 MW biogas power project at Pak Ethanol (Pvt) Ltd, Matli, and Sindh.

(iv) Small Hydro

Productive Use of Renewable Energy (PURE) Project is being implemented to install 103 hydro power plants in Khyber Pakhtunkhwa (KPK) and Gilgit Baltistan (GB), with the total cost of US\$ 19.5 million. Another project for 250 plants is under preparation for the same areas. Eight hydro projects have been initiated under the Renewable Energy Development Sector Investment Program (REDSIP) with the support of the Asian Development Bank (ADB). These projects are being implemented in KPK and Punjab with an estimated cost of US \$ 290 million. Another 2 small hydro power projects have been initiated under REDSIP. The Government of Punjab has issued LOIs to private investors for establishment of 10 small hydro projects with a cumulative capacity of 142MW at different locations in Punjab. AEDB has initiated a program with the assistance of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) support to assist the provinces to solicit private investments in small hydro sector; under this program pre-feasibility study for 25 hydro sites in AJK, Sindh, Punjab and KPK with the cumulative capacity of 284.14MW has been completed. Public sector Hydro power projects are initiated in (a) KPK (worth US\$ 150.99 Million, of 17.0MW, 36.6MW and 2.6 MW), (b) Punjab (worth US\$ 138.74 Million, of 5.38MW, 4.04MW, 2.82MW, 4.16 MW and 7.64MW) and (c) Gilgit Baltistan (worth US\$ 71.12 Million, of 26MW and 4MW)

(v) Solar

In Solar Energy, 6 LOIs for cumulative capacity of 148 MW On-Grid Solar PV power plants have been issued by AEDB. Additionally 3 LoIs of 70 MW capacities have been issued by Punjab Power Development Board (PPDB). The sponsors are preparing feasibility studies. Solar Village Electrification Program was initiated under the Prime Minister's directive. Three thousand Solar Home Systems have been installed in 49 villages of district Tharparkar, Sindh. Another 51 villages

in Sindh and 300 villages in Balochistan have been approved for electrification using solar energy and will be implemented shortly. AEDB is also doing the Parliamentary Sponsored Village Electrification Program and has so far prepared and submitted 27 feasibilities for approval. Funds for three schemes have so far been released under People Work Programs-II PWP-II and the schemes are being implemented.

These government's policies aim to meet the demand fully with an emphasis on exploration of indigenous resources including hydel, coal, domestic gas and renewable and imported energy in a timely manner. Sectoral deficiencies are being improved. Institutions are strengthened and private sectors' involvement is being enhanced to promote the culture of public private partnership leading to lessen the burden on public resources. In this context the government held two National Energy Conferences in 2011 and 2012. To address the present energy crises the following recommendations were made:

- ▶ Equitable load shedding among all provinces.
- ▶ Reduction in number of working days for government offices along with implementation of street-light conservation plan as recommended by the Ministry of Water and Power.
- ▶ Closing down of all commercial centers throughout the country at 8pm except for weekends. For saving energy the government has decided to have different office hours during winter and summer time.
- ▶ Allocation of additional gas to the power sector (ideally 207mmcf/d giving 1000MW)
- ▶ Subsidy for solar agri tube wells through easy financing

- ▶ The government will also cut power supply to advertisement billboards and would replace all the regular bulbs with energy-savers.
- ▶ To ensure the smooth supply of power the government will allocate additional gas to power companies.
- ▶ To limit the use of energy by government offices, prepaid meters in all federal and provincial government buildings will be installed. Also cases related to power thefts will be registered and immediate action against the culprits will be taken. Provinces to help in prompt registration of FIRs, designating special magistrates and nominating focal persons. e.g., Home Secretary at the provincial and the District Coordination Officer (DCO) at the district level for expeditious disposal of electricity theft cases.
- ▶ Upfront tariff for all types of fuels by NEPRA and tariff increase of 12 percent
- ▶ Expedite conversion of steam based IPPs/GENCOS to coal

Conclusion

Energy needs are indelibly linked to Pakistan's economic and sustainable growth capabilities. Pakistanis have been increasing in demand across the various areas of energy sources. With a growing economy and the desire for vast production and consumption across the country, the energy demands remain high. With energy shortages as a main challenge, the government is working tirelessly to ensure such problems are remedied. Given the need for energy, the Government of Pakistan is doing the utmost to promote renewable energies, various energy sources and energy efficiency. There are various projects that speak to the endless possibilities of building up Pakistan's renewable energy sources. These hope to continue and expand in coming years