

# Energy

One of the opportunity costs of civilization is increase in the amount of consumption of energy per capita per year. Many alternative sources of energy are still being researched and tested but technologies are continually being developed and enhanced to improve energy sources. Still oil and natural gas will continue to be the world's top two energy sources accounting for about 60 percent of global demand. World liquid fuels consumption grew from 88.4 million barrels per day (bbl/d) in 2011 to reach 89.0 million barrels per day (bbl/d) in 2012 thus posting a growth of 0.8 percent. Energy Information Administration (EIA) expects growth will be higher over the next two years because of a moderate recovery in global economic growth. The world consumption will grow by 0.9 million barrels per day (bbl/d) in 2013 and by 1.2 million barrels per day (bbl/d) in 2014. EIA estimates that global liquid fuels consumption outpaced production in the first quarter of 2013 resulting in an average draw in global liquid fuel stocks of 1.2 million barrels per day (bbl/d), which is much higher than the average 0.3 million barrels per day (bbl/d) drawn over the last 5 years. In case of the Brent crude oil spot price, EIA projects that it will fall from an average of \$112 per barrel in 2012 to annual averages of \$106 per barrel and \$101 per barrel in 2013 and 2014, respectively. This decline in prices is also due to increase in supply of liquid fuels from non-OPEC countries. Still energy price forecasts are highly uncertain. Thus for developing a secondary source of energy especially electricity researches has started focusing on attainment of optimal energy mix through fuel substitution by renewable energy.

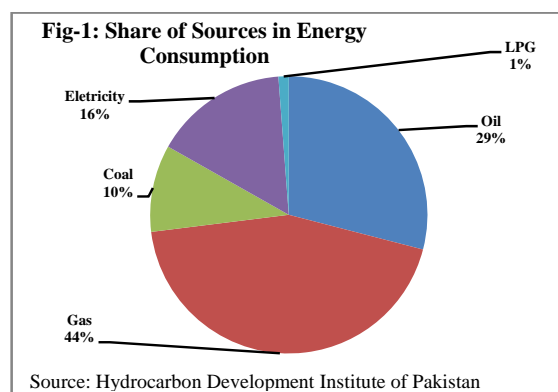
In Pakistan oil and gas are two key components of energy mix contributing almost 65 percent (oil 15% and gas 50%) share to the 64.7 million TOE<sup>1</sup> of energy supplies during 2012 while share of coal and nuclear is almost 7 percent and 2 percent, respectively. Pakistan is one of the largest consumers of gas in the region while Pakistan's proven coal reserves are the world's sixth largest.

<sup>1</sup>TOE (ton 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]

Thus the government intends to increase the share of coal in the overall energy mix. There is a claim that coal quality is inferior and having low BTU (British Thermal Unit), however, in this era of modernization, technology and boilers are available that can burn any kind of coal, still there is need of true economic cost of measurement. However, there is no doubt that the strategic location of country has the attraction and significance as an attractive market and transit route for energy, therefore merits the investor friendly policies.

## Pakistan's Energy Sector

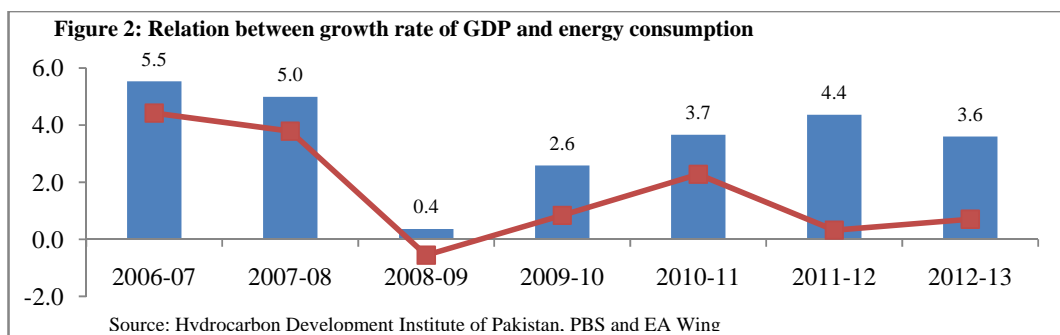
During calendar year 2012, net primary energy supply remained 64, 727 thousand TOEs compared to 64,522 thousand TOEs last year thus posting growth of 0.32 percent, however, on average the growth rate of net primary energy supply remained 1.8 percent for last six years. The final energy use during current year became 40, 026 thousand TOE as almost 29 percent (18,462 thousand TOEs) were used in transformation while 10 percent (6,239 thousand TOEs) were used in diversion which include 3 percent transport and distribution losses (1,999 thousand TOE). When compared with final energy use last year there is 3.1 percent growth, as last year it was 38,842 thousand TOEs, however, on average the growth rate of final energy use remained 2.9 percent for last six years. Statistics on energy consumption by source revealed that gas and oil had largest share as shown in following figure:



Energy outages hampered economic growth of Pakistan for last few years. Further since early

2000s, the energy sector (especially its sub sector electricity) received greater attention because of the faster rate of growth in its demand. The government put all efforts to resolve the issue still the crisis is not over. As the crisis has affected every one, thus resolving energy crisis got immediate priority in manifestos of all political parties which competed in

the election 2013. There is no doubt that there exists high correlation between growth rate of GDP and that of energy consumption as evident from Figure 2. It can be revealed that periods of high growth rate of energy consumption was followed by high growth rate of GDP, conversely periods of lower growth in energy consumption caused lower growth in GDP.



Circular debt, weak financial position of energy companies, falling gas production, high dependence on oil/gas (over 80%), low exploitation of indigenous coal and hydel resources and unutilized power generation capacity are some of the significant constraints leading to severe energy shortages.

## Pakistan Energy Sources:

### 14.1 Oil (Petroleum Product)

The total oil resource potential is 27 million barrels with production of 66,032 barrels per day. There are almost thirteen companies involved in crude oil production. Among these thirteen, Oil and Gas Development Company Limited of Pakistan have the highest share almost 57 percent as 38,284 barrels per day is produced during 2012. United Energy Pakistan (UEP), Pakistan Petroleum Limited (PPL) and MOL Hungarian Oil and Gas Company (MOL) contributed almost 10 percent each whereas Hycarbex from USA has yet to start its production. There is refining capacity of 14 million tonnes and seven oil refineries are operating in the country, however Dhodak refinery remained shutdown during 2012 due to depletion of wells. Due to massive domestic demand of oil, a large quantity of crude oil is imported every year. 24, 573 thousand barrels (67,140 barrels per day) of crude oil is extracted or produced locally while almost double of it that is 47, 104 thousand barrels was imported during 2012. Likewise 8,395 thousand tonnes of petroleum was produced domestically while 11, 507 thousand tonnes was imported. Thus in 2012 this raised the import bills to US \$ 10,292 million. High Sulphur Furnace Oil (HSFO), High Speed Diesel (HSD) and

Motor Spirit has the highest share in above mentioned import bills having share of 48, 32 and 16 percent, respectively. 49 percent of High Sulphur Furnace Oil (HSFO) is imported from UAE, while 27 and 12 percent is respectively imported from Saudi Arabia and Kuwait. Almost 93 percent of High Speed Diesel (HSD) is imported from Kuwait while 72 percent Motor Spirit is imported from UAE, 12 percent from Oman and 10 percent from France. Since 2001-02, the consumption of petroleum products shows a continuous declining trend. The longer term trend suggests that composition of annual energy consumption is shifting from petroleum products to other energy sources due to volatile prices of oil. Since FY03, oil import bill has increased by 27% p.a. In FY11 alone oil bill was to the tune of US\$12 billion.

During FY 12 the import bill of petroleum group was US \$ 15.2 billion. If to look it in quantity terms it was 19.2 million metric tons including 13.2 million metric tons of petroleum products and 6.0 million metric tons of petroleum crude. However, during July-March FY13, it posted a negative growth of 0.53 percent due to fall in quantity (negative 0.18 percent). The main reason attributed to decline is declining prices of petroleum products globally and fall in consumption of oil/petroleum products.

The main users in the consumption of petroleum products are transport and power which jointly have almost ninety percent share in total consumption as shown in Table 14.1. The reason being almost 65 percent electricity is generated by thermal while fuel (Furnace Oil and Diesel Oil) consumption for

thermal power generation is 52 percent.

**Table 14.1: Supply and Consumption of Oil / Petroleum Products**

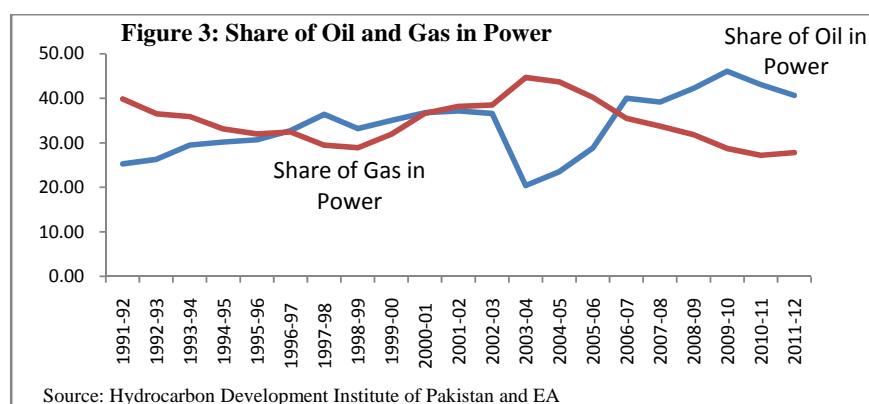
Fiscal Year	Oil / Petroleum Products										
	Supplies (Growth Rates)				Consumption						
	Oil		Petroleum Product		Oil / Petroleum Products						
	Crude Oil Imports	Local Crude Extraction	Imports	Production	Total Consumption Growth Rate	Household	Industry	Share in Total Consumption (%)			
2001-02	-1.00	10.01	-10.03	8.29	-3.90	2.0	9.5	1.33	47.28	37.18	2.73
2002-03	1.02	1.13	-6.49	0.62	-3.00	1.7	9.8	1.20	49.13	36.59	1.62
2003-04	9.88	-3.55	-38.72	7.22	-18.42	1.7	11.1	1.37	63.07	20.41	2.30
2004-05	6.00	6.60	9.79	7.54	9.31	1.3	10.5	0.97	61.51	23.53	2.16
2005-06	3.90	-0.76	5.87	0.23	-0.30	0.9	11.5	0.56	55.77	28.84	2.45
2006-07	-4.49	2.84	38.63	-1.75	15.18	0.6	9.5	0.58	47.38	40.01	1.93
2007-08	6.95	4.01	8.34	4.27	7.32	0.7	5.9	0.60	51.90	39.18	1.72
2008-09	-4.31	-6.13	10.52	-8.61	-0.94	0.5	5.4	0.39	49.34	42.27	2.05
2009-10	-14.54	-1.36	12.07	-8.47	6.81	0.5	5.1	0.30	46.32	46.07	1.69
2010-11	-3.34	1.41	10.67	-0.94	-1.28	0.5	7.2	0.21	47.08	43.09	1.98
2011-12	-8.19	2.21	-6.98	-5.79	-1.10	0.4	7.6	0.12	49.61	40.66	1.58
Jul-Mar											
2011-12	NA	NA	NA	NA		0.4	8.2	0.15	49.23	40.41	1.54
2012-13	NA	NA	NA	NA	-10.04	0.5	7.5	0.14	49.57	40.82	1.53

Source: Hydrocarbon Development Institute of Pakistan

NA: Not Available

Gas supply is considered as a cheaper substitute of oil in generation of power especially when the country has to import oil to meet domestic demand. Although gas could be substituted for being cheaper than oil yet share of oil in power has increased after

2006. The government has the stance that gas should be provided to fertilizer companies to reduce the import bill by increasing domestic production of fertilizer.



## POL Pricing

In March 2006, OGRA 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/ex-depot price of Superior Kerosene Oil (SKO) and IFEM (In Land Freight Equalization Margin). Furthermore, OGRA also monitor the pricing of petroleum products and submit quarterly reports on pricing of petroleum products indicating the trend in international markets and petroleum products pricing determined by Oil Marketing Companies (OMCs)/refineries along with analysis/findings and suggestions, if any on regular basis to ECC.

## 14.2 Natural Gas

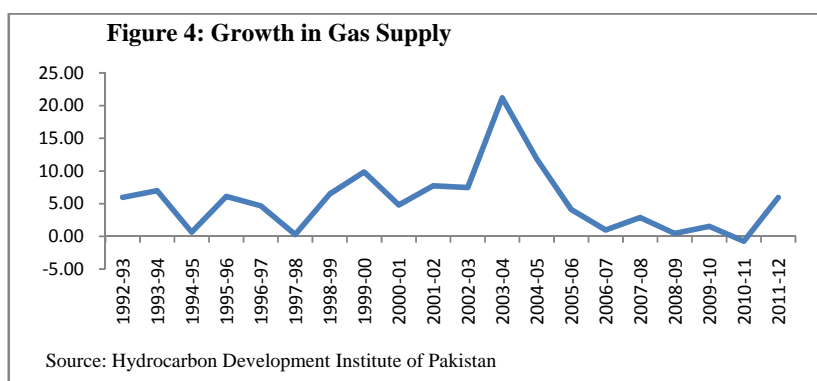
Pakistan being the larger consumer of the gas has total resource potential of 282 trillion cubic feet with recoverable reserves 24 trillion cubic feet and production of almost 4 billion cubic feet per day. During 2012 total production remained 1,559 billion cubic feet that is equivalent to 32 million TOE which shows a growth of 6 percent when compared to last year in billion cubic feet while in TOE it shows a growth of 4.5 percent. There are 146 non-associated gas fields while 44 associated gas fields operating under 15 companies. The detail of the company having major share in supply of gas is given below:

**Table 14.2: Supply of Gas from Company**

Name of the Company having highest share	Share in Gas Production	Numbers of Field Location for both non-associated and associated				
		Punjab	Sindh	KPK	Baluchistan	Total
Oil and Gas Development Company Limited	24.79	12	51	2	5	70
Pakistan Petroleum Limited (PPL)	18.09	1	4	0	1	6
Mari Petroleum Company Limited	13.21	0	5	0	1	6
ENI	11.31	0	3	0	0	3
BHP Billiton Petroleum (Pakistan) Pvt Ltd	10.39	0	1	0	0	1

Source: Hydrocarbon Development Institute of Pakistan

Pakistan's power sector is heavily depended on gas. Reduction of gas has crippled its performance. The country is witnessing gas shortage due to misallocation of natural gas and low growth in its supplies as shown below:



During July-March FY 13, gas supplies remained 1,139,253 million cubic feet as compared to 1,164,915 million cubic feet last year indicating a negative 2.2 per cent.

Efficient allocation of domestic gas supplies is of utmost importance. The government has formulated a Gas Allocation and Management Policy, 2005 which highlights a merit order in low gas supply scenario. However, actual gas allocation has been blatantly violated by the gas companies since 2005. Gas allocation since 2005 is violating Gas Policy as the Merit Order envisaged in the policy was not followed. According to Gas Allocation Policy 2005 industry & CNG were fourth on priority list, generally became the largest beneficiary of incremental gas supplies from FY05-11. Even fertilizer sector witnessed an increase in gas allocation with 46% share in the incremental gas supplies. Power sector was the major loser during this period, where gas was actually diverted from the

power to other sectors with absolute reduction of 33% in gas allocation during the period. Low gas supplies have been substituted by expensive oil imports. Thus the reduction of gas compensated with increased furnace oil generation. Pakistan's Gas allocation is in contrast to regional peers. Power sector gas allocation in India and Bangladesh is on an upward trend In FY05 India allocated 39% (1,171 mmcf) of gas to power. In FY12, gas allocation increased to 53% (2,652 mmcf). India produces bulk of its power from coal (69%), while gas has a small share of 12% in power sector. Still almost half the import of LNG is also dedicated to the power sector. Likewise, in Bangladesh from FY05 to FY11, power sector has witnessed an absolute increase of 42% in gas allocation from 578 mmcf in FY05 to 823 mmcf in FY11.

The consumption pattern of gas by different users since 1992-93 is presented in Table 14.3:

**Table 14.3: Consumption of Gas in Sectors (Shares and Growth rates)**

Fiscal Year	Households		Commercial		Cement		Fertilizer		Power		Industry		Transport (CNG)		Total Growth
	Share	Growth	Share	Growth	Share	Growth	Share	Growth	Share	Growth	Share	Growth	Share	Growth	
1992-93	14.8	7.1	2.8	9.7	2.3	1.3	23.4	17.9	36.5	-3.6	20.1	7.7	0.0	24.0	5.1
1993-94	15.0	8.8	2.8	6.4	1.8	-14.5	26.2	20.8	35.9	5.8	18.3	-2.3	0.0	38.7	7.7
1994-95	17.7	17.7	2.9	5.4	1.2	-33.9	25.9	-1.9	33.1	-8.4	19.0	3.4	0.0	9.3	-0.7
1995-96	18.9	13.5	2.9	5.6	1.3	12.5	25.8	6.1	32.0	3.0	19.1	6.8	0.0	225.5	6.6
1996-97	19.3	4.9	3.1	8.5	1.5	15.2	25.2	0.1	32.4	4.0	18.5	-0.8	0.1	134.0	2.6
1997-98	22.1	16.5	3.1	2.0	2.0	38.7	24.3	-1.8	29.5	-7.7	19.0	4.4	0.1	36.9	1.7

Gas (mm cft)

	Gas (mm cft)														
	Households		Commercial		Cement		Fertilizer		Power		Industry		Transport (CNG)		Total
1998-99	20.7	-2.1	3.4	14.4	1.3	-33.9	26.3	13.3	28.9	2.6	19.1	5.4	0.3	345.3	4.6
1999-00	19.7	6.3	3.0	1.1	1.2	7.1	24.9	5.8	31.9	23.8	18.9	11.1	0.3	11.2	12.0
2000-01	18.3	0.7	2.7	-5.0	0.9	-18.5	22.8	-1.0	36.6	23.7	18.0	2.7	0.6	82.3	7.9
2001-02	17.5	2.3	2.7	7.3	0.9	1.2	21.5	1.3	38.2	11.9	18.4	9.3	0.9	66.6	7.4
2002-03	17.6	6.5	2.6	2.9	0.4	-51.2	20.7	1.7	38.5	6.6	18.9	9.0	1.3	53.6	5.8
2003-04	14.8	1.1	2.3	6.2	0.7	123.8	17.6	2.6	44.7	40.0	18.4	17.2	1.5	40.1	20.5
2004-05	14.8	10.9	2.3	12.4	1.2	73.6	16.4	2.7	43.7	8.0	19.5	16.9	2.1	54.1	10.4
2005-06	14.0	-0.6	2.4	7.6	1.3	14.6	16.2	4.1	40.2	-3.1	22.8	23.3	3.2	59.1	5.4
2006-07	15.2	8.4	2.6	7.2	1.2	-4.2	15.8	-2.3	35.5	-11.8	25.1	10.0	4.6	45.2	-0.1
2007-08	16.0	10.0	2.7	8.1	1.0	-13.3	15.7	3.3	33.7	-0.9	25.3	5.2	5.6	27.6	4.4
2008-09	16.9	4.9	2.8	4.8	0.6	-42.6	15.8	0.5	31.8	-6.0	25.1	-1.1	7.0	22.5	-0.5
2009-10	17.2	2.5	2.9	4.0	0.2	-73.4	17.2	9.5	28.7	-9.2	26.1	4.5	7.7	12.2	0.7
2010-11	18.7	5.9	2.9	-1.3	0.1	-29.1	18.4	3.8	27.2	-8.0	23.5	-12.5	9.1	14.2	-2.9
2011-12	20.3	12.8	3.1	8.7	0.1	-8.1	16.4	-7.3	27.8	6.2	23.0	1.5	9.2	5.3	3.8
Jul-Mar															
2011-12 P	21.5	10.5	3.1	8.1	0.1	150	16.6	-4.8	27.5	3.6	21.8	0.0	9.4	10.8	1.8
2012-13 P	23.2	3.9	3.3	1.9	0.1	-60.0	15.2	-12.1	27.5	-3.7	22.6	0.0	8.2	-16.2	-3.7

Source: Hydrocarbon Development Institute of Pakistan

Overall there was negative growth in the consumption of gas during Jul-March 2012-13. The analysis of the sectoral consumption of gas indicates that during July-March 2012-13, the highest share in consumption of gas remained in power sector (27.5 %) followed by industry (22.6 %). As the government accorded priority to provide gas to household, the share of household in gas consumption remained 23.2 percent. However, the trend of providing gas to power sector is declining since 2005-06 except in 2012 there was positive growth of 6 percent. The transport sectors is the other significant sector that posted a positive growth in gas consumption of 5.3 percent during 2011-12, however, during July-March 2012-13 negative growth of 16 percent has been witnessed in this sector. Although its share in total consumption of gas has increased from 0.6 percent to 9 percent in last ten years, but now due to load management its growth is declining. Over the time period the share of fertilizer has declined but still its share is significant (16%), however there was negative growth of 7 percent in 2012 when compared with last year. During July-March 2012-13, its growth further declined to 12 percent.

During July 2012 to February, 2013, the two Gas utility companies (SNGL & SSGCL) have laid 14 Km Gas Transmission Network, 4326 Km Distribution and 831 Km Services lines and connected 261 villages/towns to gas network. During this period, the gas utility companies have invested Rs. 1513 million on Transmission Projects Rs. 11,925 million on Distribution Projects and Rs.1,898 million on other projects bringing total investment to about Rs. 15,336 million. During this period, 237588 additional gas connections including 236997 Domestic, 221 Commercial and 370 Industrial were provided across the country. It is

expected that gas will be supplied to approximately 39,000 new consumers and about 350 new towns/villages will be connected to the gas network during the fiscal year 2013-14. Gas utility companies have planned to invest Rs. 17437 million on Transmission Projects, Rs. 27,265 million on Distribution Projects and Rs. 11,165 million on other projects bringing the total investment of Rs. 55,867 million during the fiscal year 2013-14.

#### **Compressed Natural Gas (CNG):**

The government has been promoting use of Compressed Natural Gas (CNG) to reduce pollution and to improve the ambient air quality. During past few years CNG Industry has observed a tremendous growth. Today Pakistan is the world leading CNG user country with more than 2.7 million NGVs (Natural Gas Vehicles) plying on the roads. The choice of conversion is mainly due to the fact that price of CNG is significantly less than petrol price. Currently more than 3,395 CNG stations are operational in the country fulfilling the fuels need of the NGVs.

#### **Liquefied Petroleum Gas (LPG):**

Liquefied Petroleum Gas (LPG) is a colorless and environmental friendly mixture of inflammable hydrocarbons. It contributes to about 0.5% of country's total primary energy supply mix. Use of LPG as a domestic fuel is being encouraged. It halts deforestation in the areas where supply of natural gas is technically not viable. The government has approved the PLG (Petroleum & Distribution) Policy Guidelines, 2013, which aims to enhance availability of LPG through LPG imports and indigenous production. To encourage imports, the government has charged Petroleum Levy on

indigenous LPG production as provided in the Petroleum Products (Petroleum Levy) Ordinance, 1961. However, the said levies as well as few other provisions of LPG Policy have been challenged in the Lahore High Court and litigation is in progress.

### **Liquefied Natural Gas (LNG):**

In order to encourage LNG import to bridge widening gap between gas demand and supply, the government has notified LNG Policy, 2011. In line with said objectives, ECC of the Cabinet on October 3, 2012 have approved following LNG import projects;

### **Two Long Term Integrated Projects**

- ▶ SSGCL will seek proposal for delivery of 400 MMCFD Re-gasified Liquefied Natural Gas (RLNG) under two separate projects through open competitive bidding under PPRA Rules. The selected party will perform all activities i.e. securing LNG supply, marine transportation and establishment of LNG terminal and injection of RLNG into SSGCL's network.
- ▶ The bids will be evaluated based on the gas price at SSGC delivery point. The contract will be for 15 years with 5 years price review clause.
- ▶ **Fast Track LNG Import Project**  
M/s SSGCL's subsidiary company (M/s SSGCL LPG Company) will act as Special Purpose Vehicle (SPVs) to secure LNG supply. To receive the LNG, the LNG terminal will be set up at the existing LPG Terminal site(s) to reduce commission time.
- ▶ M/s SSGC sought open competitive bids for supply of 400 MMCFD RLNG on long term basis under 1st phase. The bids have been received and evaluated by SSGC and their LNG consultant (M/s QED). After receipt of project award recommendations of SSGC's Board of Directors, the matter would be submitted to ECC for final approval of project award.
- ▶ M/s SSGCL have also sought bids for 2nd phase of import of 400 MMCFD RLNG. The last dates for submission of bids have been extended to 31st May, 2013. However, the fast track project has been put on hold to avoid confusion in the procurement of long term LNG.

Meanwhile, Supreme Court of Pakistan took a suomoto notice of the LNG import Project(s) based on news reports in press dated 09-03-2013. So far two hearings have been held on 11-03-2013 and 18-03-2013. The Court has directed to stay the proceedings at all forums till the decision of the case.

Cabinet, while considering a separate proposal for import of LNG from Qatar on government to government basis have decided that SSGC shall negotiate with Qatar gas to finalize the terms and conditions of LNG sales and purchase agreement on government to government basis. Moreover, setting up to the LNG terminals shall be decided by Board of Directors of SSGC.

### **Natural Gas Pricing**

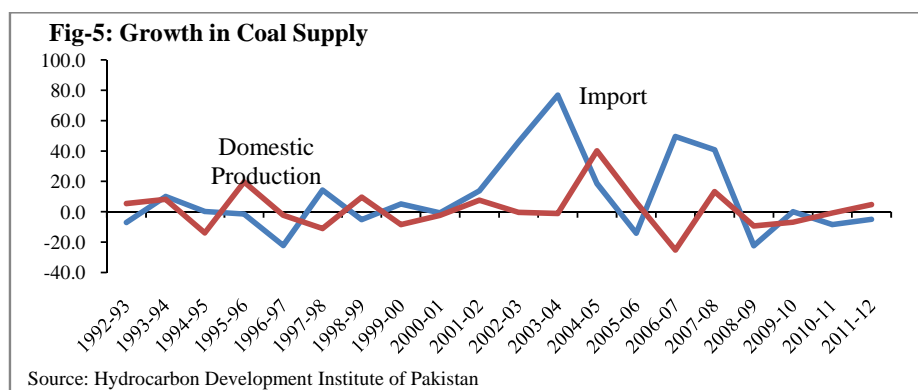
The Oil and Gas Regulatory Authority (OGRA) determines the gas prices to the extent of revenue requirements (prescribed prices) of the gas companies whereas the consumer's sale prices are fixed by the federal government under the OGRA Ordinance 2002, Revenue requirement consists of the following three components (1) cost of gas (2) operating cost and (3) return on assets in the accordance with the federal government's policy guidelines which is currently 17.5% in case of SNGPL and 17.0% in case of SSGCL. The federal government under Section 9(3) of the Ordinance advises the sale prices for each category of consumers which are then notified by OGRA in the official gazette.

### **CNG Pricing**

OGRA also determines and notifies the maximum sale price of CNG to be charged by the CNG station from the consumer for vehicular use other mobile use under Rule 13 of the CNG (Production and Marketing) Rules 1992

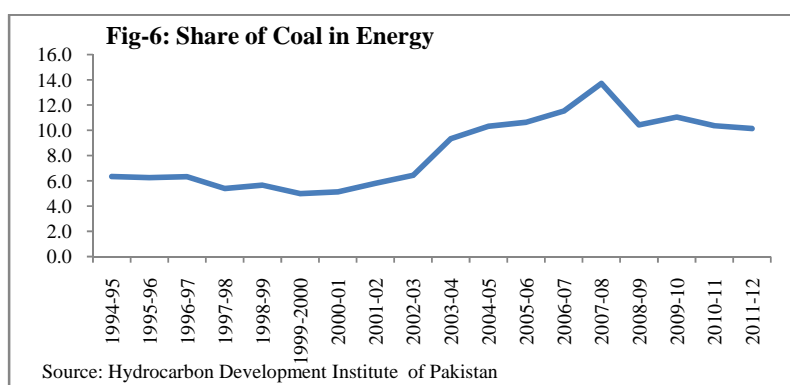
### **14.3 Coal**

Pakistan has huge coal resources estimated at over 186 billion tonnes; including 175 billion tonnes, identified at Thar coalfields. Pakistan's coal generally ranks from lignite to sub-bituminous, therefore, to cater domestic demand almost 4 million tons of coal is imported.



It can be seen from the figure that on average import of coal remained more than domestic production which support the claim that domestic resource is of inferior quality having low BTU and it is better to

import rather than processing it because of high cost. However, share of coal in energy has started declining since 2007-08 as shown below:



The major users of coal are the cement sector and brick kilns; about 58 percent of total coal was consumed by cement while 41 percent was consumed by the brick kiln industry during 2012. 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. However, during current year some positive growth has been witnessed in consumption of coal in power sector (Table 14.4).

**Table 14.4: Consumption of Coal (Share and Growth rates)**

Year	Share in Total Consumption				Growth Rates				Total
	House hold	Power	Brick Kilns	Cement	House hold	Power	Brick Kilns	Cement	
1992-93	0.1	1.4	98.5	..	-52.9	18.2	5.4	..	5.4
1993-94	0.1	1.2	98.7	..	3.1	-6.6	8.4	..	8.2
1994-95	0.1	1.3	98.6	..	-3.0	-6.7	-14.0	..	-13.9
1995-96	0.1	11.0	88.9	..	-3.1	..	7.9	..	19.6
1996-97	0.3	9.9	89.8	..	212.9	-11.8	-1.4	..	-2.3
1997-98	0.1	11.0	89.0	..	-76.3	-1.5	-12.0	..	-11.1
1998-99	0.0	12.0	88.0	..	-43.5	19.9	8.4	..	9.6
1999-00	0.0	11.0	89.0	..	-23.1	-16.2	-7.4	..	-8.5
2000-01	0.0	5.1	70.2	24.7	0.0	-40.9	0.7	..	27.7
2001-02	0.0	5.7	58.5	35.9	10.0	21.2	-9.2	58.1	9.0
2002-03	0.0	4.2	53.3	42.5	0.0	-18.4	1.1	31.5	10.9
2003-04	0.0	3.0	42.7	54.2	-9.1	-9.2	-0.7	58.3	24.0
2004-05	..	2.3	49.5	48.2	..	-2.7	50.9	15.7	30.2
2005-06	..	1.9	54.7	43.3	..	-17.1	8.1	-12.2	-2.3
2006-07	0.0	2.1	41.5	56.4	..	10.1	-22.4	33.2	2.3
2007-08	0.0	1.6	37.2	61.2	0.0	-1.5	14.7	39.0	28.1
2008-09	0.0	1.3	39.0	59.6	-20.0	-30.6	-12.9	-19.2	-17.0
2009-10	0.0	1.5	36.9	61.5	..	11.6	-8.2	0.1	-3.0



**Table 14.4: Consumption of Coal (Share and Growth rates)**

Year	Share in Total Consumption				Growth Rates				Total
	House hold	Power	Brick Kilns	Cement	House hold	Power	Brick Kilns	Cement	
2010-11	0.0	1.3	38.9	59.8	..	-23.1	-0.1	-7.8	-5.2
2011-12	0.0	1.4	40.5	58.1	..	8.4	3.5	-3.5	-0.6
<b>Jul-Mar</b>									
2012-13	0.0	1.3	47.1	51.5		7.1	-7.4	-4.2	-5.6

Source: Hydrocarbon Development Institute of Pakistan

#### 14.4 Nuclear Energy

Pakistan Atomic Energy Commission (PAEC) is responsible for planning, construction and operation of 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 is in progress.

KANUPP, located at Karachi, completed its design life of 30 years in 2002. After necessary refurbishments and safety retrofits, it is now operating on extended life. KANUPP, generated highest ever electricity in a calendar year in 2012, in its 40-years history. C-1 and C-2 located at Chashma are performing very well. C-1 achieved record of continuous operation of 239.13 days in July 2012. Performance of the operating nuclear power plants of Pakistan is shown in the Table 14.4:

The commercial operation of the under construction nuclear power plants C-3 and C-4 of 340 MW each, is planned in December 2016 and October 2017, respectively. At present, the construction activities are three months ahead of the schedule. Dome on C-3 containment was placed successfully on March 6, 2013.

The government has mandated Pakistan Atomic Energy Commission (PAEC) for the installation of 8,800 MW nuclear power capacities by the year 2030. PAEC has technical and engineering infrastructure 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 14.5: Performance of the Operating Nuclear Power Plants in Pakistan**

Plants	Gross Capacity (MW)	Grid Data	Commercial Data	Electricity sent to Grid	
				July-March 2012-13 (million KWh)	Lifetime (billion KWh)
KANUPP	137*	18-Oct-71	7-Dec-72	399	12,574
C-1	325	13-Jun-00	15-Sep-00	1,474	24,295
C-2	325	14-Mar-11	18-May-11	1161	3,872

Source: Pakistan Atomic Energy Commission

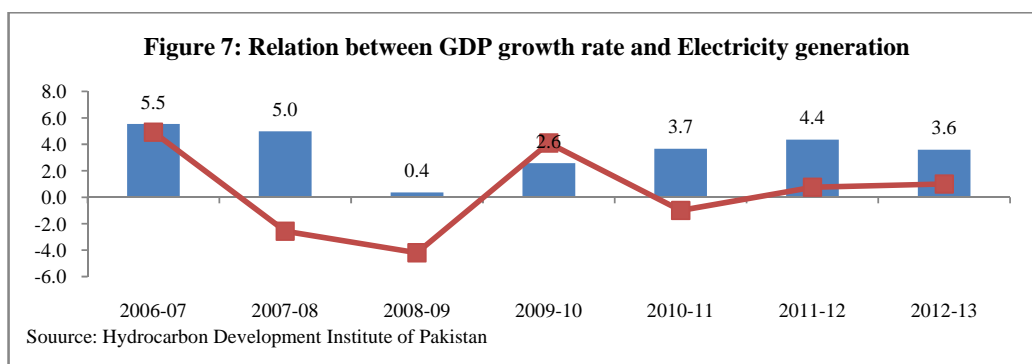
\* KANUPP re-licensed at 98 MW (gross) after completing design life

#### 14.5 Electricity

Electric Power is the secondary source of energy being derived from natural physical form of energy. It is formed by converting some other form of energy. A number of challenges and crisis are being faced by this sector. Some improvement was witnessed but could not correspond to the desired demand. There is claim that financial and technical issues are involved in resolving this crisis. To bring some improvement in the output capacities and performance of generation companies (GENCOs), international donor agencies have been providing technical and financial support to GENCOs in their rehabilitation efforts, however expected results would be confirmed when some of these on-going projects are completed. Similarly, rehabilitation for

additional capacity of hydropower plants with the help of international donor agencies would be completed over next couple of years. National Transmission and Dispatch Company plans to add 6100 MVA of new 500/220 kV grids over the next two years. Similarly it has planned to add 6400 MVA of new 220/132 kV grids over next three years. NTDC has also initiated reinforcement and extensions in two of its 500/220 kV and six of its 220/132 kV Grid stations. However, the critical issue is that according to NTDC, the annual electricity demand growth rate is forecasted to hover around 5 to 6 percent over next ten years. With current position of expansion, it seem that crisis will not be over which in turn will effect economic growth of the country.





There exists a strong relationship between GDP growth and electricity growth as shown in figure above. It can be easily deduced that periods of low or negative electricity growth have witnessed low GDP growth rate, while periods where electricity growth picked up there is increase in GDP growth rate.

Pakistan's electricity generation is highly dependent on imported oil as almost \$ 14.5 billion worth of oil is imported each year, the bulk of which is used for

electricity generation. Thus pronounced shift from hydro to thermal generation, and more recently from natural gas to fuel oil as the primary fuel for electricity generation have caused fuels crisis in Pakistan's power sector. Further these trends have contributed to an increase in power supply costs. Thus there is need of immediate shifting of fuel mix from expensive to cheaper. It can be seen from the following table that Pakistan has larger share of oil in electricity generation:

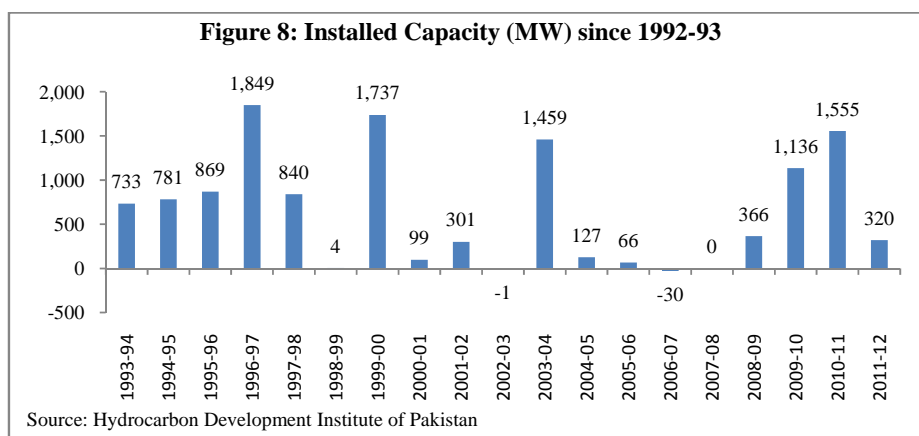
**Table 14.6: Comparison of electricity generation by sources**

2012	Gas	Oil	Coal	Hydle, Nuclear or import
India	9.2%	0.8%	71.0%	19.0%
Bangladesh	73.0%	20.4%	3.4%	3.2%
Pakistan	29.0%	35.0%	0.1%	35.7%

Source: Economic Survey of India, Bangladesh and HDIP

The generation capacity also could not be operated at full due to constraints in fuel availability and timely payments. Even it is a claim that no sizeable

capacity in the power sector was added during last 10 years, barring the 3,377 MW added since 2008-09 as evident from the figure given below:



This addition also could not bring a positive impact on reduction in load shedding because of financial constraints and lukewarm performance of the Public Sector GENCOs. Consequently, the country experiences extreme shortages, both in winter due to low hydel availability and in summer due to higher

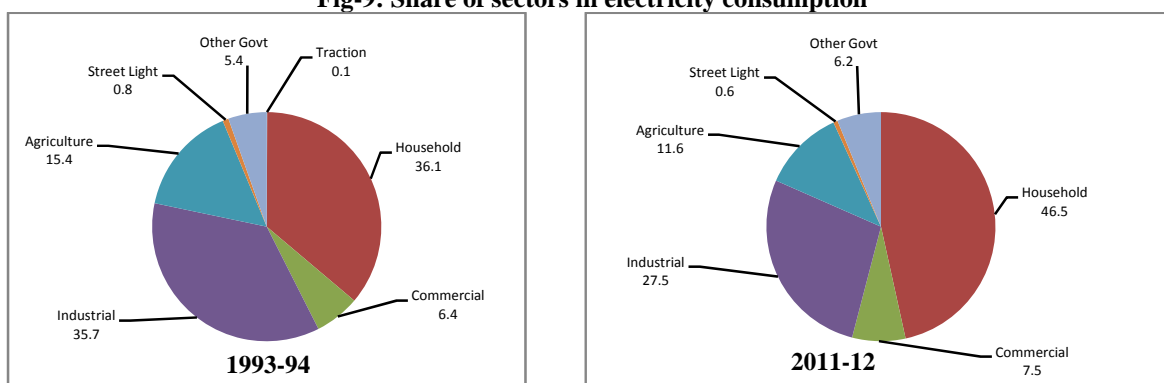
air conditioning demand (5000 + MW). Significant capacity needs to be added but this capacity should be affordable, sustainable and in line with a least cost generation. The quickest options are to 'squeeze' the most out of existing capacity, which means essentially efficiency improvement across the

power production/supply chain and continued and emphasized conservation both for gas and electricity.

However, leakages in the fuel oil delivery and usage system need to be plugged to lower the cost of generation as well as to increase generation. An improvement of 5 to 10 % can be achieved if implementation is followed. Similarly gas reserves need to be exploited on a fast track basis with accelerated addition of reserves through increased exploration.

The consumption of electricity during 2012 remained 76,761 GW has compared to 77,099 GWh in 2011, while during the period July-March 2012-13 its consumption increased to 57,754 GWh from 56,930 GWh in corresponding period 2011-12 posting a positive growth of 1.4 percent. In the total consumption of electricity the share of household, commercial and other government sector has increased while share of industrial and agriculture sector has decreased over 1993-94 to 2011-12 as shown in figure 9:

**Fig-9: Share of sectors in electricity consumption**



Source: Hydrocarbon Development Institute of Pakistan

**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 31.5 percent, thermal 65.4 percent and Nuclear 3.1 percent. Of this 4829 MW is owned by ex-WAPDA GENCOs, 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 and 4500 MW Diamir Basha hydropower projects.

**(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 fully utilized. The hydro potential which is located in the north require long transmission lines to carry power to the load centers. The hydro generation accounted for 31.9 percent during July-March 2011-12. During FY 2012-13 (upto March, 2013) it contributed 33.67 percent of the total generation. The trend of hydro-thermal energy generation for the last five years is given in the following table.

**Table 14.7: Electricity Generation**

Year	Hydro (Gwh)	% age	Thermal (Gwh)	% age	Total (Gwh)	% Change
2007-08	28,667	33.2	57,602	63.6	86,269	6.8
2008-09	27,763	32.9	56,614	66.8	84,377	-2.2
2009-10	28,492	31.9	60,746	67.1	89,238	5.8
2010-11	32,259	35.6	58,316	68.1	90,575	1.5
2011-12	28,543	31.9	61078	64.4	89721	-1.1
<b>July-Mar</b>						
2011-12	22,411	33.0	45,534	67.0	67945	1.5
2012-13	22,273	-0.1	43,874	66.3	66147	1.5

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

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 7427 KM for 220kV and 26321 KM for 132-kV level at the end of June 2011. This has gone up to 7947 KM for 220 kV and 28347 KM for 132 level at the end of June 2012, showing a combined increase of 566 KM.

The transformation capacity of 220 kV substations was 15014 MVA at the end of June 2010, which was 16494 MVA by the end of June 2011 showing an

increase of 1480 MVA. It has further gone up 18044 MVA by the end of June 2012 showing an increase of 1550 MVA over June 2011. Similarly, the 132 kV transformation capacities which were 26569 in June 2010 has gone up to 30137 MVA in June 2012.

#### (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. As of March 2013, the number of consumers has been increased to 21.704 million. The trend of increase in number of consumers during the last five years is given in the following table:

**Table 14.8: Number of Consumers**

Year	Domestic	Commercial	Industrial	Agriculture	Others	Total
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
2011-12	17,978,395	2,482,702	286,401	286,287	12,826	21,046,611
<b>July-March</b>						
2011-12	17,808,962	2,466,049	284,049	282,639	12,745	20,854,444
2012-13	18,5623,80	2,534,957	294,660	297,932	13,163	21,703,092

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

#### (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 people of Pakistan, raise the productive capacity and socio-economic standards of the population living in rural areas.

**Table 14.9: Village Electrification**

Year	Addition During the Year	Progressive Total	Growth (%)
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
2011-12	10,268	174,800	6.2
<b>July-Mar</b>			
2011-12	6,558	171,090	6.9
2012-13	8,995	183,795	7.4

Source: Water and Power Development Authority

Between the period 30<sup>th</sup> June 2012 to March 2013, 8995 was the progressive number of electrified villages. The trend of village electrification during past 05-years period is provided in Table 14.9:

#### (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 2012-13, the consumption pattern, more or less, remained the same having domestic share of 43 percent, industrial 26 percent and agricultural about 11 percent. The consumption trend by economic group for the past five years is given below:

Year	Domestic	Commercial	Industrial	Agriculture	Public Lighting	Bulk Supply	Traction	Supply to KESC	Total
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	374	3,644	2.0	5,449	71,672
2011-12	30,391	4,563	18,402	8,414	360	3,553	1.0	5,684	71,368
<b>July-Mar</b>									
2011-12	23,137	3,483	14,023	6,298	280	2,716	0.5	4,319	54,257
2012-13	22,987	3,359	14,016	5,780	279	2,835	0.3	4,092	53,348

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

#### (v) Power Losses

The PEPCO and DISCOs have invoked various technical and administrative measures to improve operational and managerial efficiency to reduce power losses. These measures have given positive signs resulting in reduction of power losses and increase in revenues. Certain measures such as renovation, rehabilitation, capacitor installation and strengthening the transmission/distribution network are a continuous process to control/reduce/wastage of power/energy. The Transmission and Distribution losses for the past five year are given below which indicates a steady trend of efficiency improvement:

**Table 14.11: Transmission & Distribution Losses of Net System Energy**

Year	Transmission & Distribution (T & D) Losses (%)
2007-08	21.3
2008-09	21.1
2009-10	20.9
2010-11	20.8
2011-12	20.5
<b>July-Mar</b>	
2011-12	19.5
2012-13	19.3

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

#### 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. PPIB is currently processing thirty eight (38) multiple fuel (Oil, Coal, Gas and Hydel) based Independent Power Producer (IPP) projects with a cumulative capacity of around 11,583 MW. Out of these thirty three projects, a total of thirteen (13) new IPPs having a cumulative capacity of around 2,614 MW have been commissioned during the tenure of the previous democratic government, 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 2020 are as follows:

**Table 14.12: Actual/expected capacity additions of IPPs upto year 2020**

Year	(MW)
Project already commissioned	2614
2013	404
2014	163
2016	134
2017	247
2018	230
2020	3800

Source: Private Power and Infrastructure Board

#### 14.6 Alternative Sources of Energy

The government of Pakistan (GoP) has been taking all possible measures to ensure energy security and sustainable development in the country. The government in its bid to diversify its energy mix, has been giving due attention towards fast track development of Alternative / Renewable Energy (ARE) resources in the country.

Alternative Energy Development Board (AEDB), under the Ordinance was mandated to implement policies, programs and projects through private sector in ARE sector; assist and facilitate development and generation of ARE to achieve sustainable economic growth; encourage transfer of technology and develop indigenous manufacturing base for ARE Technology; and promote provision of energy services that are based on ARE resources. In May, 2010, AEDB was given the mandate to implement 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. AEDB has updated the Renewable Energy (RE) Policy, 2006, in consultation with the provinces and other

stakeholders. The RE Policy, 2006 was focused only on Solar, Wind and Hydro; whereas, ARE Policy, 2012 includes all ARE technologies including Wind, Solar, Hydro, Bagasse, Cogeneration, Waste-to-Energy, Geothermal, providing extremely attractive financial and fiscal incentives to both local and foreign investors while offering them a level playing field.

The Policy invites investment from private sector for i) Independent Power Projects (IPPs) for sale of power to the grid only; ii) Grid spillover power projects for self-use and sale to utility; iii) Captive power projects for self or dedicated use; and iv) Isolated Grid Power Projects.

### Supportive Measures

AEDB initiated a number of supportive measures that were required to be taken for laying a strong foundations of the ARE sector in Pakistan; these include:

- ▶ New wind corridors in areas outside Sindh have also been identified. Resource assessment of these corridors 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 NTDC.
- ▶ Regional Environmental Study has been conducted by AEDB to support wind power projects. Guidelines for environmental assessment have also been developed.
- ▶ Trainings & capacity building of partner departments like NTDC, NEPRA, PMD, DISCOs, Provincial Government Departments, etc. have been arranged by AEDB.
- ▶ MoU between General Electric (GE)& Government of Pakistan has been signed that includes execution of wind power projects and setting up of manufacturing facility with in the country.
- ▶ 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. World leading WTG manufacturers are also in talks with local investors and agencies to start full scale manufacturing facilities.

- ▶ Issues related to financing of projects have been resolved and now leading financing agencies like IFC, ADB, OPIC, ECO Trade Bank etc. are offering financing to wind power projects in Pakistan.
- ▶ There existed a shyness in adopting ARE technologies applications amongst the people, as these are new in the country. AEDB initiated mass campaign to create awareness of these technologies with support of media and stakeholders. A number of international and national level exhibitions were organized, road shows arranged, talk shows / seminars / conferences were arranged to attract entrepreneurs for investments and consumers to buy the ARE equipment.

As a result of the government's will to develop ARE sector and the AEDB's extensive and untiring efforts, the country has made significant progress in the development of a considerable base of ARE technologies in the country, especially Wind, Solar, Biomass, Waste to Energy, Small / Mini / Miro Hydro, Biodiesel.

### WIND

AEDB issued LOIs to 46 IPPs pursuing development of wind power projects. Land allocated to 21 IPPs for 50 MW wind power projects each in GharaKetiBander Wind Corridor. Projects with a cumulative capacity of 1050 MW are at various stages of development on these lands, the details of which are as under:

- ▶ One project of capacity 50 MW in Jhampir developed by M/s Fauji Fertilizer Company is completed and providing electricity to National Grid (HESCO) since December 2010.
- ▶ One project of capacity 56.4 MW developed by M/s ZorluEnerji Ltd (Turkish company) has been completed and will achieve commercial operation soon.
- ▶ 2x50 MW wind power project by M/s Foundation Wind Energy I&II Ltd are under construction.

NEPRA announced an Upfront Tariff in October 2011 which expired in December 2012. NERPA has now announced a new upfront tariff for 500 MW wind power project in April 2013.

It is expected that 1000-1200 MW wind power projects would be added to the national grid by 2015 if land is allocated to the new projects.

**SOLAR**

In Solar Energy, 16 LOIs for cumulative capacity of 343 MW On-Grid Solar PV power plants have been issued. Four (4) companies have submitted the feasibility studies of their projects and one feasibility study is approved by AEDB. Other sponsors are at the stage of preparation of feasibility studies

Solar Village Electrification Program was initiated under PM’s directive. 3000 Solar Home Systems have been installed in 49 villages of district Tharparkar, Sindh. Another 51 villages in Sindh and 300 villages in Balochistan are approved for electrification using solar energy and will be implemented on release of funds.

AEDB is also doing Parliamentarian Sponsored Village Electrification Program and has so far prepared and submitted 39 feasibilities for approval

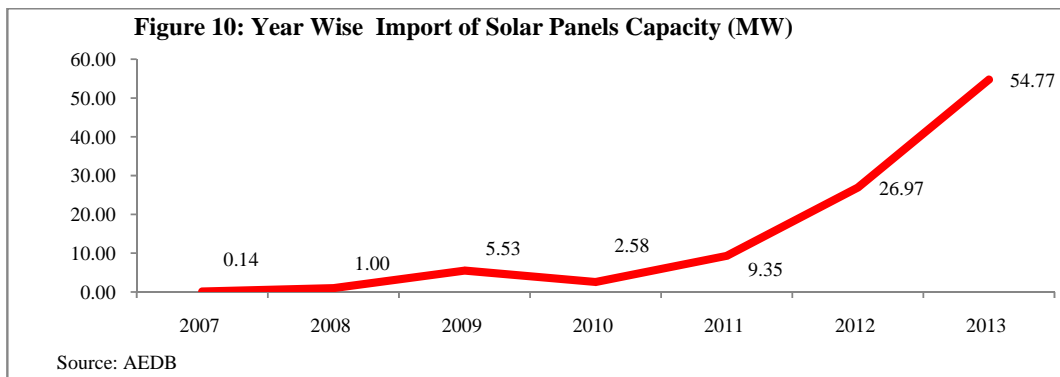
and release of funds. Funds for 04 schemes have so far been released under PWP-II and the schemes have been implemented.

Separate pilot programs have been initiated under World Bank assistance to study the technical, financial and social viability for conversion of electric / diesel driven tube-wells / dug-wells with solar energy and replacement of conventional water heater with Solar Water Heaters.

**Import of Renewable Energy Equipment**

a) Import of Solar Panels / Solar Modules

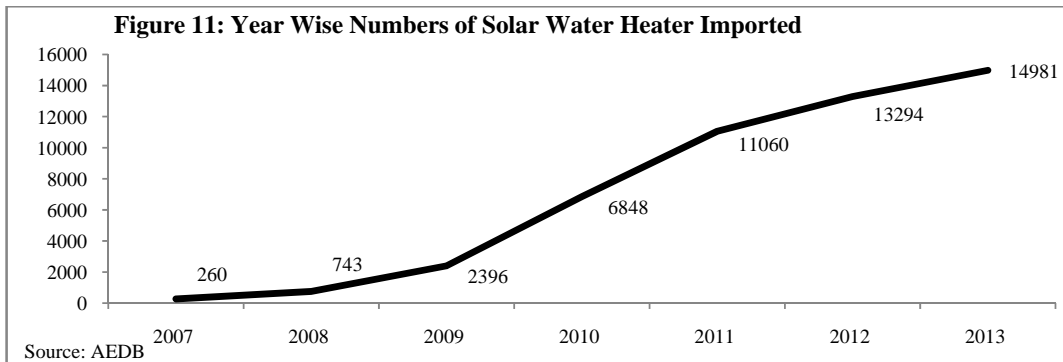
AEDB in light of SRO 575(1)12006 issued duty exemption certificates for a large number of solar panels / solar modules to private sector companies for installation / generation of almost 54.77 MW of energy in the country. These solar panels / solar modules are deployed all over the country.



**b) Import / Installation of Solar Water Heaters**

AEDB issued tax exemption certificate for import of almost 15000 units of Solar Water Heaters in the

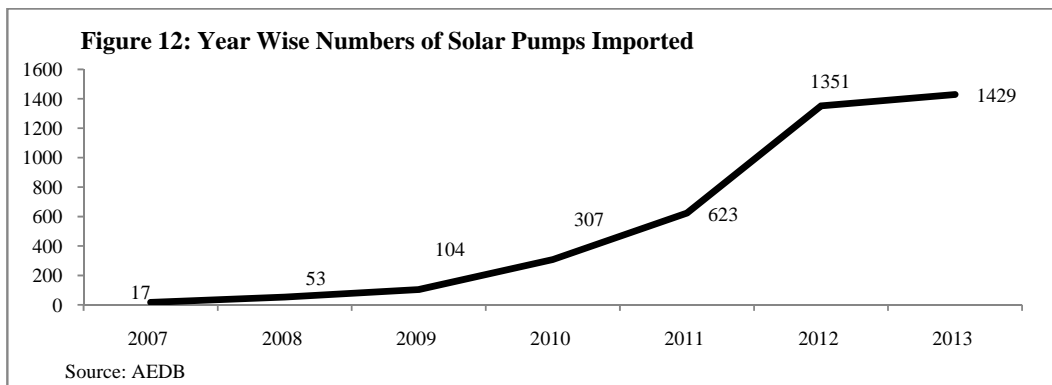
country. These heaters are deployed all over the country especially in Balochistan, GilgitBaltistan, Khyber Pakhtunkhawa and Northern Punjab.



### c) Import / Installation of Solar Water Pumping Systems

AEDB also issued tax exemption certificate for import of about 1429 units of Solar Water Pumping

System in the country. These water pumping systems are installed for community drinking and agriculture purpose all over Pakistan.



### BIOMASS / WASTE-TO-ENERGY

Pakistan produces huge amount of municipal waste (up to 50,000 tons / day) and agricultural waste in the form of Bagasse, Cotton Sticks, and Rice Husk etc. Converting this waste to 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.

A World Bank funded project for carrying out detailed study for Biomass / Waste-to-Energy projects in 20 cities of Pakistan has been initiated. Another Waste to Energy Study, funded by 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 Bagasse / 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 an 12MW power plant at Jhang, based on Agricultural Waste like cotton stalk, rice husk, sugarcane trash, bagasse, 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 09 MW biogas power project at Pak Ethanol (Pvt) Ltd, Matli, Sindh.

- ▶ **14000** biogas plants are being installed through RSPN with the cost of Rs. 356 Million (Dutch Grant) in the country.

- ▶ **09** RDF / WTE plants are in various stages of implementation

Efforts are under way to convert all agro based industry on biomass generated power a few kino factories consuming 250-500Kw each, have already been converted partially / fully on biogas.

There are 85 sugar mills in Pakistan, possessing cumulative potential to generate up to 3000MW of power through bagasse. Status of Sugar Mills Waste to Energy projects is as under:-

- ▶ 27MW of Biomass / Waste to Energy plant operational at Al-Moiz Industries, D. I. Khan.
- ▶ 07MW of Biogas / Waste to Energy project operational at Shakarganj Sugar Mills, Jhang;
- ▶ 14 New Waste to Energy Projects (213 MW) awarded Generation License by NEPRA.

### SMALL / MINI / MICRO 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.

08 hydro projects have been initiated under the Renewable Energy Development Sector Investment Program (REDSIP) with the support of Asian Development Bank (ADB). These projects are being implemented in KPK and Punjab with an estimated cost of US \$ 290 Million. Another 02 small hydro power projects have been initiated under REDSIP.



PC-I for these projects have been approved. Loan approval from ADB is awaited.

The Government of Punjab issued LOIs to private investors for establishment of 10 small hydro projects with a cumulative capacity of 142MW at different location in Punjab. AEDB is providing support to the private investors for the realization of their respective projects. AEDB is building capacities for private sector investment in KPK and Punjab through SHYDO, KPK (22 projects, 92MW) and PPDB, Punjab (30 projects, 240 MW).

AEDB initiated a program with the assistance of GIZ support to assist the provinces solicit private investments in small hydro sector; under this program pre-feasibility studies 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 initiated in:

- ▶ KPK ( worth US\$ 150.99 Million, of 17.0MW, 36.6MW and 2.6 MW)
- ▶ Punjab ( worth US\$ 138.74 Million, of 5.38 MW, 4.04 MW, 2.82 MW, 4.16 MW and 7.64 MW)
- ▶ GilgitBaltistan ( worth US\$ 71.12 Million, of 26 MW and 4 MW)

## **BIODIESEL**

- ▶ 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 exempt custom duties and sales tax on Biodiesel production equipment and material.
- ▶ Amendments in OGRA Ordinance for Biofuels pricing approved.
- ▶ Proposal for undertaking a feasibility study to set up 10,000 tons per annum Biodiesel production facility awaits funding.
- ▶ Barriers to implementing Biodiesel Policy identified at National Stakeholders Conference. Task force for barrier removal established.
- ▶ Registration of Jatropa seeds under process.

## **Developing ARE Sector through Facilitation**

### **1. International Collaboration**

Capacity building of public and private sector agencies undertaken with assistance of international

agencies (Training, Project Development, CDM, Installation of Wind Measuring Masts, Upgrading Test Facilities, Environmental Impact Assessment, development of EIA Guidelines, Socio-economic Assessment of rural areas for off-grid electrification, Identification of Appropriate Technologies etc.).

### **2. Main Streaming the Provincial Government**

- ▶ Provincial governments represented on the AEDB Board under AEDB Act, 2010; these are now a full Member of the AEDB Board, which takes all major decision on ARE sector development in the country.
  - ▶ Provincial governments are Member of the Renewable Energy Policy, 2010;
  - ▶ Viewpoints of provincial governments being included in the ARE Policy through consultative process.
  - ▶ Joint Monitoring of ARE Projects are undertaken with provinces;
  - ▶ Regular meetings with the Departments of provincial governments for RE Projects progress monitoring and review.
  - ▶ Technical Assistance for project preparation in provinces obtained from the ADB (Punjab US \$ 5 Million, KPK US 5.0 Million, Sindh & Balochistan US \$ 1.2 Million).
  - ▶ Training and up gradation of provincial departments.
- ### **3. Developing Private Sector**
- ▶ Over 160 new companies are providing are services in the sector.
  - ▶ 03 New ARE Associations have been established.
  - ▶ Solar Water Heaters being manufactured in Pakistan.
  - ▶ Micro Wind Turbines are now being manufactured in Pakistan (AEDB provided them licenses in March, 2010).
  - ▶ Many components of Heat Pumps are also being manufactured in Pakistan.
  - ▶ Biogas services being provided in the private sector.
  - ▶ 04 companies have been assembling solar panels locally.
  - ▶ Many companies are assembling energy efficient lights (LED Lights) locally.