

NEED OF ENERGY INPUT FOR ECONOMIC DEVELOPMENT AND PROSPERITY OF PAKISTAN: AN ANALYTICAL STUDY FROM 1990-91 TO 2002-03

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Abstract

This research paper entitled "Need of energy input for economic development and prosperity of Pakistan: Analytical study from 1990-91 to 2002-03" evaluates the statement that energy is the most important input for economic development and for the prosperity of Pakistan. The organization of the paper is as follows: Section 2 discusses the energy consumption in Pakistan like petroleum consumption, gas consumption and electricity consumption. Section 3 describes primary energy supply and per capita availability. Section 4 investigates the position of liquefied petroleum gas (LPG) and compressed natural gas (CNG). Section 5 focuses on coal in energy mix. Finally, section 6 draws conclusions and puts forth suggestions.

Introduction

Energy demand for Pakistan exceeds its indigenous supplies. With a population of 151.60 million people growing at 2.2 per annum and an economy of Rs.903 billion, the country has just managed ever increasing supplies of energy for its socio-economic needs during 2003-04. ¹ During the last 57 years of its existence, Pakistan's energy supplies have increased 40 times. Energy is our main source of development. Without proper management, Pakistan's growth is becoming stagnant. At present, over a

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billion people in the industrialized countries use some 60 percent of the world commercial energy supply, while 5 billion people living in the developing countries consume the 40 percent.² Many of these people live in the developing countries and a large number of them are poor. The poor, in particular, need to be provided with a minimum amount of energy at affordable price. To achieve this goal, the energy needs to be produced and supplied at least cost. Infact, efficient energy use plays an important role in the social and economic development.

This study reveals that energy is the most important input for economic development and for the prosperity of Pakistan. Primary energy consists of petroleum, natural gas, coal, hydroelectric power, nuclear electric power and electricity generated from geothermal, solar, wind and waste sources.³ The past decade has witnessed a worldwide revival of interest in renewable energy technologies. The importance of this resource as clean, abundant, and competitive fuel has not been established. Renewable energy sources include small hydel energy, solar energy, wind energy, biomass energy and geo-thermal energy, etc. Between 1992 and 2001 the world's total output of primary energy increased at an average annual rate of 1.6 percent. World primary energy production increased from 351 quadrillion British Thermal Units (btu) in 1992 to 403 quadrillion (btu) in 2001.⁴ The share of the Organization for Economic Corporation Development (OECD) countries in production of primary energy was estimated at 40 percent in 2001.⁵

Primary commercial energy supplies increased by 4.0 percent in Pakistan during 2002-03. Compared to 1.8 percent in the previous year and reached 4 7.1 million tons of oil equivalent mainly due to an increase in natural gas, hydel power, and coal at rates of 1.4, 0.8 and 0.3 million tons respectively. However, the supply of oil decreased by 0.4 million tons equivalent in 2002-03 due to a decline in the import of furnace and high speed diesel oil. The cement industry has started using coal, both local as well as imported to replace natural gas and furnace oil.⁶ There is a need to create an environment for the improvement of the energy sector in our country in order to introduce competition, so that energy can be made accessible, affordable, and reliable to the people. The available geological data shows adequate mineral potential in Pakistan for the conversion of some of the identified minerals deposits into resources. This provides an impetus to utilize these endowments for national economic revival, and socio-economic uplift, especially in the far-flung rural areas of the country.⁷

Energy Consumption in Pakistan

The average energy consumption of the petroleum products showed an upward trend, increasing by 4.1 percent per annum during the last thirteen years from 1990-91 to 2002-03.

The consumption of the gas was up by 3.7 percent per annum, electricity by 4.8 percent, and coal by 2.2 percent. The annual trend of energy consumption since 1990-91 to 2002-03 is shown in Table -I

Table 1: Annual Energy Consumption

Year	Petroleum products (000 tons)	Change %	Gas (mmeft)	Change %	Electricity (GWH)	Change %	Coal (000 M.T)	Change %
1990-91	9,961	----	465,338	-----	31,534	----	3,054	-----
1991-92	10,983	10.3	486,631	4.6	33,878	7.4	3,099	1.5
1992-93	12,012	9.4	511,526	5.1	36,493	7.7	3,267	5.4
1993-94	13,225	10.1	550,769	7.7	37,381	2.4	3,534	8.2
1994-95	13,960	5.6	546,788	-0.7	39,619	6.0	3,043	-13.9
1995-96	15,601	11.8	582,868	6.6	41,924	5.8	3,638	19.6
1996-97	15,606	.0	597,799	2.6	42,914	3.4	3,553	-2.3
1997-98	16,624	6.5	607,890	1.7	44,572	3.9	3,159	-11.1
1998-99	16,647	0.1	635,832	4.6	43,296	-2.9	3,461	9.6
1999-00	17,768	6.7	714,744	12.4	45,586	5.3	3,168	-8.5
2000-01	17,648	- 0.7	774,410	8.3	48,584	6.6	3,095	-2.3
2001-02	16,960	-3.9	824,604	6.0	50,622	4.2	3,492	12.8
2002-03	16,452	-3.0	872,264	5.8	52,656	4.0	3,768	7.9
Total	193,447	-----	8171,463	-----	549,059	-----	43,331	-----
Average	1265.5	-----	628574.08	-----	42235.308	-----	3333.153	-----
(+) (-) over the period	65.16	-----	87.45	-----	66.98	-----	1136.6	-----

Source: Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing Islamabad p.160

It is evident from Table-I that the consumption of gas, electricity and coal during the year 2002-03 increased by 5.8 percent, 4.0 percent and 7.9 percent respectively when compared with 2001-02. However the consumption of petroleum products has declined by 3.0 percent in 2002-03 when compared with 2001-02.

Petroleum Products

The consumption of petroleum products during the first three quarters of the current fiscal year by household, industry, agriculture, power sector exhibited sharp decline to the extent of 19.3 percent, 14.2 percent, 5.6 percent and 62.4 percent, respectively. The decrease in the use of petroleum products was mainly on account of the availability of alternative and relatively cheaper fuels in the form of natural gas and LPG and the replacement of fuel oil with coal and gas in the cement industries and power generation. Availability of sufficient water in reservoirs helped generate more hydel electricity and as such the reliance of fuel and oil base thermal electricity decreased.⁸

Study reveals that, accordingly, the imports of fuel oil declined. However transport and other government sectors have recorded an increase in the consumption of diesel and JP-1. The annual growth in the consumption of petroleum products by major sectors and their relative shares since 1990-91 to 2002-03 are shown in Table-II.

Table-II: Consumption of Petroleum Products (000 tons)

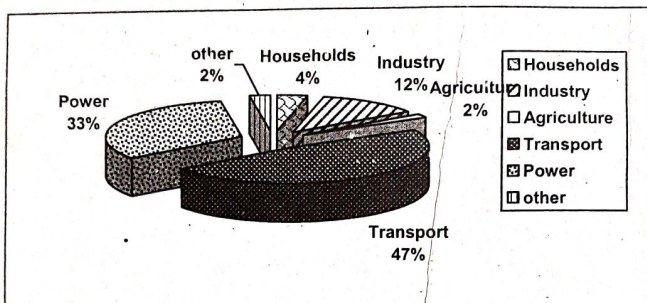
Year	House holds	Industry	Agriculture	Transp ort	Power	Others	Total
1990-91	944	1148	265	4,841	2,434	328	9961
1991-92	614	1369	281	5,619	2,775	325	10983
1992-93	622	1480	287	6,107	3,158	358	12012
1993-94	590	1653	308	6,414	3,902	358	13225
1994-95	585	1889	269	6,646	4,215	356	13960
1995-96	596	2416	250	7,136	4,786	417	15601
1996-97	510	2141	269	7,172	5,110	404	15606
1997-98	499	2081	245	7,364	6,054	381	16624
1998-99	493	2140	249	7,864	5,526	3775	16647
1999-00	477	2116	293	8,308	6,228	346	17768
2000-01	451	1924	255	8,158	6,488	372	17648
2001-02	335	1612	226	8,019	6,305	463	16960
2002-03	283	1664	197	8,082	6,020	226	16452
Total	6,669	23,573	3,394	91,730	63,001	4750	193447
Average	538.38	1813.3	261.07	7056.15	4846.23	365.38	14880.5
(+) (-) over the period	70.02	39.72	-25.66	66.94	147.32	19.14	65.164
Share of each	3.618	12.185	1.754	47.418	32.567	2.455	100

Source: Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing, Islamabad, pp.160-161

It is evident from the above Table-II that transport sector was the largest user of petroleum products accounting for 47.41 percent share followed by the power sector 32.567 percent, industry 12.185 percent,

household 3.618 percent and other government 2.455 percent and agriculture 1.8 percent share (see fig: I).

Figure-I: Consumption of Petrol Products (000 tons)



Consumption of Gas

Nature has been very kind to Pakistan in providing large reserves of natural gas. It is a cheaper substitute of coal and other energy resources. Its reserves have been discovered at various regions of Punjab, Sindh and Balochistan. The recoverable reserves of natural gas from the dry gas fields and associated gases from the oil fields are estimated at 28.4 trillion cubic feet on April 1, 2004.⁹

This study reveals that households, commercial and power sector registered a sharp rise in the consumption of gas; by power sector specially, the increase rose by 20.2 percent. While households consumption grew by 11.8 percent followed by the commercial sector 11.8 percent, fertilizer 6.1 percent and industrial sector 5.2 percent.¹⁰ The relative shares of gas consumption by various users during the last thirteen years are shown in Table-III.

Table-III: Consumption of Gas (percentage) (Billion cft)

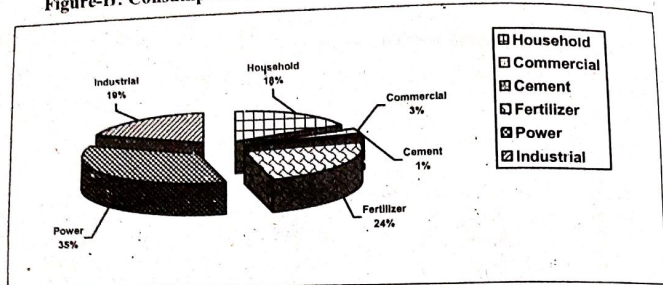
Year	Household	Commercial	Cement	Fertilizer	Power	Industrial	Total
1990-91	67	12	13	108	176	89	465
1991-92	71	13	12	101	194	96	487
1992-93	76	14	12	119	187	103	511
1993-94	82	15	10	144	198	101	550
1994-95	97	16	7	142	181	104	547
1995-96	110	17	8	150	186	111	582
1996-97	115	18	9	150	194	110	592
1997-98	134	18	12	148	179	115	607
1998-99	131	21	8	167	184	121	632
1999-00	139	22	9	177	230	135	712
2000-01	141	21	7	175	288	139	771
2001-02	144	22	7	178	315	151	817
2002-03	154	23	3	181	336	165	862
Total	1461	233	117	1940	2848	1540	8139
Average	112.38	17.92	09	149.23	219.08	118.46	626.08
% (+),(-) over the period	129.85	91.66	76.92	67.59	90.90	85.39	85.37
Share of each sector	17.95	2.87	1.44	23.84	34.99	18.92	100.0

Source: Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing, Islamabad. p.162

It is clear from Table-III and Fig: II that the power sector has emerged as the largest consumer of gas 34.99 percent, followed by fertilizer sector 23.84 percent, industries 18.9 percent, household 17.95 percent, commercial 2.87 percent and cement 1.44 percent.

Figure-II: Consumption of Gas

(Billion cft)



It may be noted that the share of the power sector in consuming gas has been rising continuously, since 1998-99. The power sector is gradually reducing its dependency on the imported fuel oil because of escalating prices.

Electricity Consumption

Total installed capacity of electricity (hydel and thermal) has shown a significant increase of 3.40 percent in the year 2002-03 when compared with 2001-02. During 2002-03 GWH electricity had been generated 52656 GWH. The total installed capacity of WAPDA stood at 11,436 MW during July-March 2003-04, of which hydel accounts for 58.6 percent or 6,696 MW, thermal accounts for 41.4 percent or 4740 MW. The number of villages electrified has increased to 78820 during July-March, 2003-04 from 73,807 in 2002-03 showing an increase of 6.8 percent.¹¹

In Pakistan, on average the household sector has been the largest consumer of electricity accounting for 41.644 percent of total electricity consumption followed by industries 30.78 percent agriculture 13.99 percent, other government sector 7.42 percent, commercial sector 5.52 percent and street lights 0.583 percent.¹² It is also clear that a substantial increase in the consumption of electricity has been witnessed during the last thirteen years. The following Table-IV and Fig: III shows the position of electricity consumption from 1990-91 to 2003-04.

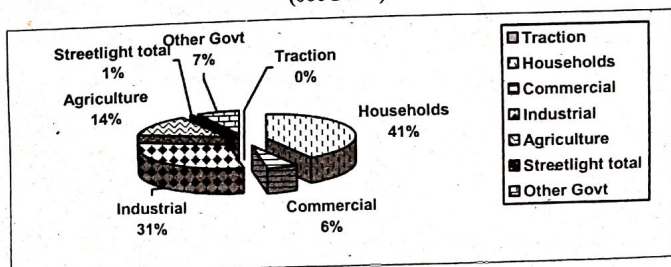
Table-IV: Electricity Consumption

(Gwh)

Years	Traction	House hold	Commercial	Industrial	Agriculture	Street light total	Other Govt.	Total
1990-91	33	10,409	2,072	11,229	5,620	----	2,171	31,534
1991-92	29	11,458	2,143	12,289	5,847	----	2,112	33,878
1992-93	27	13,170	1,726	13,043	5,635	297	2,594	36,492
1993-94	27	14,080	1,786	12,637	5,772	298	2,781	37,381
1994-95	22	15,579	1,941	12,528	6,251	324	2,974	39,619
1995-96	20	17,125	2,190	12,183	6,696	378	3,332	41,924
1996-97	18	17,758	2,241	11,982	7,086	390	3,439	42,914
1997-98	16	18,750	2,334	12,297	6,937	387	3,851	44,574
1998-99	15	19,394	2,409	12,061	5,620	224	3,573	43,296
1999-00	15	21,455	2,544	13,202	4,540	239	3,591	45,586
2000-01	13	22,765	2,774	14,348	4,929	213	3,546	48,588
2001-02	11	23,210	2,951	15,141	5,907	212	3,490	50,922
2002-03	10	23,624	3,218	16,181	6,016	244	3,363	52,656
Total	256	228777	30,329	169121	76856	3206	40817	549362
Average	19.69	17598.2	17598.23	13009.31	5912	2466	3139.76	42258.6
% (+), (-) over the period	69.69	127.88	52.38	43.75	7.05	-17.81	54.90	----
Share of each sector	0.046	41.64	5.52	30.784	13.99	0.583	7.429	100

Source: Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing-Islamabad. p.163

Figure-III Consumption of Electricity by sectors (000GWH)



Primary Energy Supply and Per-capita Availability

The annual trends of primary energy supplies and their per-capita availability-

-lity measured in tons of oil equivalent (TOE) from 1990-91 to 2003-04. The supply of primary energy increased from 28.469 million TOE in 1990-91 to 47.061 million TOE in 2002-03, thus registering an increase of 65 percent¹³ in 13 years are shown in Table-V.

Table-V: Primary Energy Supply and Per-capita Availability

Year	Energy Supply Million TOE	% Increase %Decrease	Per-Capita Availability TOE	% Increase % Decrease
1990-91	28.469	-----	0.253	-----
1991-92	30.475	7.0	0.264	4.4
1992-93	32.953	8.1	0.278	5.4
1993-94	34.778	5.5	0.286	2.9
1994-95	36.062	3.7	0.290	1.2
1995-96	38.746	7.4	0.304	4.9
1996-97	38.515	-0.6	0.295	-0.3
1997-98	40.403	4.9	0.302	2.5
1998-99	41.721	3.3	0.305	1.0
1999-00	43.223	3.6	0.314	2.9
2000-01	44.456	2.9	0.317	0.9
2001-02	45.237	1.8	0.316	-0.3
2002-03	47.061	4.0	0.322	1.9

Source: *Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing Islamabad, p.165*

It is depicted from Table-V the percent per-capita availability increased from 0.253 TOE to 0.322 TOE and increase of 27.3 percent over the same period. Because of the increase of primary energy supplies, per-capita availability recorded arising trend over the decade of the 1990's, which greatly helped consumers meet their ever-growing annual demand for energy. The energy supplies during the first 9 months of the current fiscal year increased from 34.412 million TOE to 36.732 million TOE or by 6.7 percent. However, the per-capita availability has increased by 4.8 percent. The supply of primary energy by various sources of energy as well as their rates are increased.¹⁴

Liquefied Petroleum Gas (LPG) and Compressed Natural Gas (CNG)

In Pakistan the use of Liquefied Petroleum Gas (LPG) as a domestic fuel is being encouraged to stop deforestation in areas where the supply of natural gas is technically or operationally not feasible. At present about 1000 tons per day of LPG is being produced locally, which is being marketed by 22 companies. Work on the Jamshoro LPG, an extraction

project has been initiated involving an investment of US \$ 31 million and is expected to be completed by October 2004 where about 450 metric tons of LPG will be produced and employment opportunities for about 2000 people will be made available. The productions of LPG will therefore increase by 45 percent, which will meet the energy needs of about 500,000 households through the country.¹⁵

Study reveals that the use of Compressed Natural Gas (CNG) in the automotive sector is being encouraged to reduce the pressure on petroleum import and to improve the environment. These efforts have resulted in the issuance of more than 1300 licenses for the installation of CNG stations during the period of July-March 2003-04. Over 200 provisional permissions licenses for setting up CNG stations have been issued and approximately 500 stations have been established in different parts of the Pakistan, providing 4000 jobs. An investment of about Rs.10 billion has already been made in the CNG sector and more than 250 stations are under construction in the private sector. By March 2004, over 450,000 vehicles were converted from petrol to CNG compared to 300,000 vehicles last year, showing an increase of 50 percent. The use of this indigenous fuel will help in saving foreign exchange and reducing the pollution level from the country.¹⁶

Coal in Energy Mix

The government of Pakistan had decided to enhance the share of coal in the overall energy mix from 5 percent to 20 percent by the end of next decade. The cement industry is also in the process of switching over to indigenous coal from furnace oil that would save 50 percent of foreign exchange being spent on the import of coal. It would also generate demand for about 2.5 million tons coal per annum by 2010. Most of the energy consumed in the cement industry is now being generated by coal. In view of the anticipated shortfall in electricity and other energy resources during the next 10 years the maximum utilization of this coal would be required in power generation and gasification. A Chinese company is in the process of commissioning a feasibility study of a 600 MW power plant in the first stage. On completion of the study the block will be offered for international investment. On another evaluated coal block, the government of Sindh has entered into an agreement with an Australian company to develop insitu gasification and the commissioning for a 1200 MW power generation plant.¹⁷

Coal briquettes are one of the cheapest sources of fuel and Thar coal can also be utilized for making coal briquettes on a commercial scale to supply to industries as well as for domestic consumption. There is sufficient demand in the country for coal briquette given the existing high prices of other conventional fuels. The total national coal production from existing coal mines varies from 3.5 to 4 million per annum and about 90 percent of this production is consumed in the brick kiln industry¹⁸ the evidence is given in the Table-VI and Fig: IV

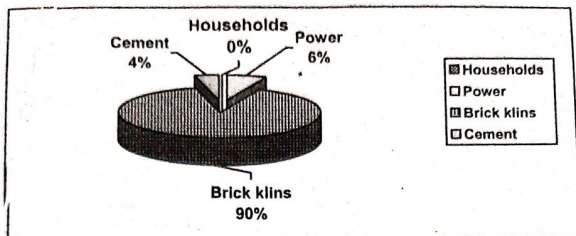
Table-VI: Commercial Energy Consumption (000 metric tons)

Year	Household	Power	Brick kilns	Cement	Total	% increase (+) %decrease (-)
1990-91	3.8	24.6	3,025.5	-----	3053.9	-----
1991-92	6.8	39.5	30,52.4	-----	3098.7	1.467
1992-93	3.2	46.7	32,16.6	-----	3266.5	5.42
1993-94	3.3	43.6	3487.0	-----	3533.9	8.19
1994-95	3.2	40.7	2998.9	-----	3042.8	-13.89
1995-96	3.1	398.9	3235.8	-----	3637.8	19.55
1996-97	9.7	351.9	3191.3	-----	3552.9	-2.33
1997-98	2.3	346.5	2809.9	-----	3158.7	-11.10
1998-99	1.3	415.3	3044.8	-----	3461.4	9.58
1999-00	1.0	348.1	2818.8	-----	3167.9	-8.48
2000-01	1.0	205.8	2837.9	50.0	3094.7	-2.13
2001-02	1.1	249.4	3077.5	664.0	3992.0	28.99
2002-03	1.1	203.6	2606.9	957.2	3768.8	-5.59
Total	40.9	2714.6	39403.3	1671.2	43830	-----
Average	3.146	208.815	3031.023	557.066	3371.54	-----
Share of each sector	0.0933	6.193	90.0	3.813	100.00	-----

Source: Economic Survey 2003-04, Government of Pakistan, Finance Division, Economic Advisor's Wing Islamabad. p.117

Figure-IV Commercial Energy Consumption

(000 metric tons)



It is evident from Table-VI and fig: IV that the coal production increased by 23.4 percent in the year 2002-03 when compared with 1990-91. Out of its 90 percent of this production is consumed in brick kiln industry, 6.193 percent power sector, 3.813 percent cement sector and 0.0933 percent consumed by household.

Conclusion and Recommendations

The primary energy consists of petroleum, natural gas, coal, and hydroelectric power etc. The Primary commercial energy supplies increased by 4.0 percent during 2002-03. Compared to 1.8 percent in the 2001-02 and reached 47.1 million tons of oil equivalent mainly due to an increase in natural gas, hydel power and coal at rates of 1.480 and 0.3 million tons respectively. The supply of oil declined by 0.4 million tons of oil equivalent in 2002-03 due to decline in the import of furnace and high speed diesel oil.

In Pakistan cement industry has started using coal, both local and imported to replace the gas and oil.

The overall production of crude oil has also declined to 3.00 million barrels during 2002-03 when compared with 2001-02. Sector wise consumption of petroleum products reveals that on average, the transport sector consumed 41.76 percent of the petroleum products followed by the power sector 32.56 percent, industry 12.185, households 3.61 percent, other government 2.45 percent and agriculture 1.75 percent during the period from 1990-91 to 2002-03.

The production of gas has increased to 862 billion cft during 2002-03 compared to 817 billion cft during the period of 2001-2002. According to

the share percent the power sector consumed 34.99 percent of natural gas followed by fertilizer 23.84 percent, industrial 17.95 percent, commercial sector 2.8 percent and cement sector 1.44 percent during the period from 1990-91 to 2002-03.

On an average, the household sector has been the largest consumer of electricity, share for 41.6 percent followed by industries 30.78, agriculture 13.99 percent, other government sector 7.24 percent, commercial 5.52 percent and street lights 0.583 percent.

Liquefied petroleum gas LPG is being encouraged to stop deforestation in areas where the supply of natural gases uses technically or operationally is not feasible. Present by about 1000 tons per day of LPG is being produced locally, which is being marketed by 22 companies.

More than 1300 licenses for the installation of CNG stations have been issued. Of which 500 CNG means 38.5 percent stations have been actually established in different parts of the country compared to 362 up to 2002-03, an increase by 38 percent up to March 2004, 450,000 vehicles have also been converted to CNG.

The total national coal production from existing coal mines varies from 3.5 to 4 million per annum and 90 percent of this production is consumed in the brick kiln industry, followed by 6.193 percent by power sector, 3.813 percent by cement sector and 0.0933 percent by household. Coal briquettes are the cheapest source of fuel and Thar coal can be utilized for making coal briquettes on a commercial scale to supply industries and for the domestic purpose.

It is finally recommended that the Pakistan's economic situation demands for maximum utilization of hydro power, fuel switching from oil to natural gas and indigenous coal, establishment of area-specific decentralized rural energy systems based on available resources including renewable, and search for more oil and gas. Private sector development and market driven strategies could help in achieving the national goal of self-reliance in energy for development.

References

1. Government of Pakistan (2003-04) *Economic Survey*, Finance Division, Economic Advisor's Wing, Islamabad. pp., 161-181
2. Government of Pakistan (2002-03) *Economic Survey*, Finance Division, Economic Advisor's Wing, Islamabad. pp., 209-217
3. *Hydrocarbon Development Institutional of Pakistan* (2002-03) Islamabad. pp., 7-9

4. Hilal A. Raza (2002) *Exploitation and use of energy resources of Pakistan*. *Pakistan Journal of Hydrocarbon research*, Islamabad. Vol. 17. Vo.1. pp., 5-9
 5. Government of Pakistan (2001) *Ministry of Petroleum and Natural Resources*, Energy sector, Islamabad. p.,4
 6. Hilal A. Raza Riaz Ahmed and Haseeb (2001) *Energy Resource of Pakistan*, *Pakistan Journal of Hydrocarbon on Research*, Islamabad. pp12-15.
 7. Shafi M. (2001) *The Energy Challenge for Tomorrow*, Mineral of Pakistan, Government of Pakistan, Ministry of Petroleum and Natural resources. Issued by the Director General, Geological Survey of Pakistan. pp., 9-12.
 8. Government of Pakistan (2003-04) *Economic Survey*, Finance Division Economic Advisor's Wing, Islamabad. pp.,160-161
 9. *Fuels and Minerals in Pakistan (2003-04) / History of Exploration*, Development Planning Series, Islamabad. p.,6
 10. Government of Pakistan (2003-04) *Economic Survey*, Finance Division Economic Advisor's Wing, Islamabad. p., 162
 11. Government of Pakistan (2003-04) *Ministry of Petroleum and Natural Resources*, Energy Sector, Islamabad. pp.,12-16
 12. Government of Pakistan (2003-04) *Economic Survey*, Finance Division Economic Advisor's Wing, Islamabad. p.,163
 13. Ibid.,165
 14. Ibid., 166
 15. Fuel and Minerals in Pakistan (2003-04) *History of Fuel and Minerals Exploration*, Development Planning Series, Islamabad. pp., 7-25
 16. Government of Pakistan (2003-04) *Economic Survey*, Finance Division Economic Advisor's Wing, Islamabad. p.,166-171
 17. Ibid., pp., 173-174.
 18. Ibid., pp., 117.
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