

## STATUS OF PETROLEUM SECTOR IN PAKISTAN - A REVIEW

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*Pakistan economy is growing steadily. This growth demands higher energy consumption and consequently putting high pressure on countries economy. Pakistan mainly depends upon oil and gas resources to fulfil energy requirements. Indigenous resources of Oil are not enough to quench energy thirst of the growing economy. As a result Pakistan has to import large quantity of oil and oil based products from Middle East countries. Gas reserves in the country are enough for current gas requirements. So natural gas is playing a key role in power sector. Currently in oil upstream and down stream sector there are some local and international companies involved and government of Pakistan is establishing such policies that it can attract more international investors in this sector but the rapid pace of change, high degree of uncertainty and unstable political situation of the country present significant challenges and risk to foreign investment. Objective of this paper to highlight the present status of petroleum industry in Pakistan and its future prospects keeping in view the internal fluid situation and geopolitical condition of the region.*

*Key words: Hydrocarbon, Compressed Natural Gas, Pakistan*

The opinions and statements in this article are those of the author alone and do not, in any way, reflect the official policy or position of his government or employer

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### *Abbreviation*

POL	Pakistan oil field LTD
BP	British Petroleum
BOPD	barrels of oil per day
PARCO	Pak-Arab Refinery Limited
ARL	Attock Refinery Limited
PRL	Pakistan Refinery limited
DRL	Dhodak Refinery Limited
LDO	Light Diesel oil
LSDO	Low speed diesel oil
CNG	Compressed natural gas
JP	Jet propellant (jet Fuel)
MS	Motor Spirit
HOBC	High octane blending component
SKO	Superior kerosene oil
FO	Furnace oil
TCF	Trillion cubic feet

## 1. Energy Overview

Pakistan's economy is growing at a very steady rate and this growth is demanding higher energy consumption and thus putting a huge pressure over countries limited energy resources. Oil, Natural gas and hydro are the three primary energy resources of the country which are being exploited for fulfilling energy demands of the economy. But due the limited reserves of oil and gas with in the country and political nature of hydel energy, has forced country to import large quantity of oil and oil related products from Middle East especially from Saudi Arabia. Share of the natural gas in countries energy use is the largest about 50 percent of the total energy consumption and with in coming years without higher production and critical situation of current Gas reserves country has to look towards imported gas from some neighbouring countries to fulfil its increasing gas requirements. Although country is blessed with a huge potential of hydel energy yet due to local political situation this is not being exploited to its full extent. Below is primary energy over view of the country [EIA 2006].

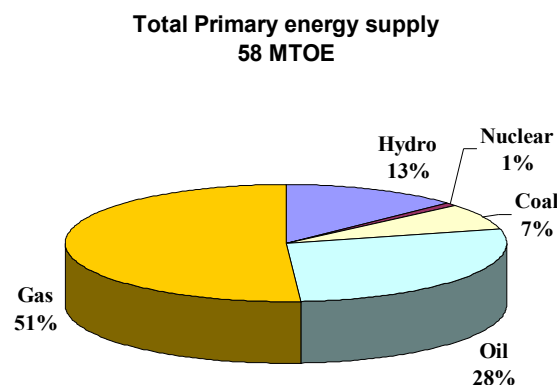


Figure 1. Pakistan energy balance 2006-07  
Source: Pakistan energy year book 2006-07

Reserves to production ration of Pakistan's energy resources are describes below. Depletion of oil and gas resources are expected to be with in 14 and 21 years respectively while Pakistan has huge quantity of low grade Coal which contains high content of sulphur due to which it has to import Coal for neighbouring country while 16 percent of hydel power is yet to be realized

So Oil and Gas are the dominant sectors as far as energy resources are concerned. Their past, present and future will be discussed in detail here. Table gives reserve to production ratio of countries energy resources [Ministry of Petroleum].

Table 1

## Energy reserves of Pakistan

<b>Fuel</b>	<b>Annual production</b>	<b>Reserve to production ratio</b>
Oil	23.94 Mbbbl	14
Gas	1.40 Tcf	21
Coal	4.59 M tons	678
<b>Hydro</b>	<b>16% realized</b>	

## 2. Pakistan's Oil Sector

According to *Oil and Gas Journal (OGJ)*, Pakistan had proven oil reserves of 300 million barrels as of January 2006. The majority of produced oil comes from proven reserves located in the southern half of the country, with the three largest oil-producing fields located in the Southern Indus Basin. Additional producing fields are located in the Middle and Upper Indus Basins [EIA, 2006].

### 2.1 Background

Pakistan has been considered a petroleum province. First well was drilled in 1866 at Kundal in the upper region of Indus valley. Shallow wells were drilled in the following years, and from 1886, small scale production of oil started in Khattan (Balochistan). In 1915, the first series of commercial oil discovery was made in the Potwar basin (Punjab). In 1960's Oil and Gas Development Company Limited (OGDCL) was created by the Government of Pakistan, which provided successful track in discovery of oil and gas reserves with in the country. After the oil crisis in 1973, a number of impressive discoveries were made both by the private sector and OGDCL. In June, 2006, initial recoverable gas reserves were estimated at 52 TCF of which 33 TCF remain to be produced; oil reserves are much more modest with initial recoverable reserves of 844 million bbl and a remaining balance of 309 million bbl [EIA, 2006].

Table 2

## Pakistan's Oil sector overview

Potential (expected)	Discoveries	Produced	Untapped Potential	Refinery Capacity	Crude Oil Production 2004-05	Crude Oil Import 2004-05	Oil & Gas Wells Upto 30 <sup>th</sup> June 2005
27 billion barrels	844 million barrels	535 million barrels	26.222 billion barrels	12.82 million tones / year	24.12 million barrel	8.28 million tones	620 Explored
100 %	3%		97 %		(18% of demand)	(82% of demand)	180 Discovered

Source: Minisrty of Petroleum and natural resources Pakistan

## 2.2 Current Supply and Demand Situation of Oil Sector

Since the late 1980s, Pakistan has not experienced many new oil fields coming online. As a result, oil production has remained fairly flat, at around 60,000 barrels per day (bbl/d). During the first eleven months of 2006, Pakistan produced an average of 58,000 bbl/d of crude oil. However, Pakistan has ambitious plans to increase its current output to 100,000 bbl/d by 2010. Due to Pakistan's modest oil production, the country is dependent on oil imports to satisfy domestic oil demand. As of November 2006, Pakistan had consumed approximately 350 thousand barrels of oil and various petroleum products, of which, more than 80 percent was imported. The majority of oil imports come from the Middle East, with Saudi Arabia as the lead importer [EIA, 2006], [World Bank Report].

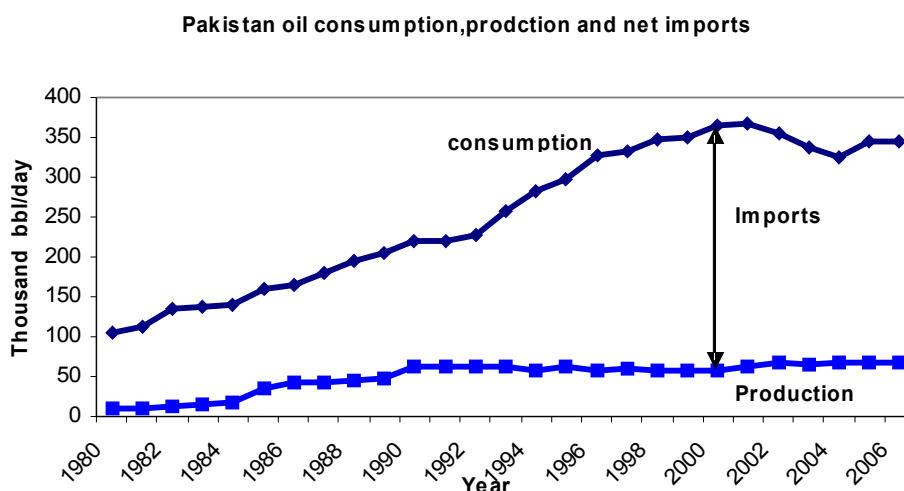


Figure 2. Supply, demand and import of oil  
 Source: *Pakistan energy year book 2006-07*

In recent years, the combination of rising oil consumption and flat oil production in Pakistan has led to rising oil imports from Middle East exporters. In addition, the lack of refining capacity leaves Pakistan heavily dependent on petroleum product imports. Natural gas accounts for the largest share of Pakistan's energy use, amounting to about 50 percent of total energy consumption. Pakistan currently consumes all of its domestic natural gas production, but without higher production Pakistan will need to become a natural gas importer. As a result, Pakistan is exploring several pipeline and LNG import options to meet the expected growth in natural gas demand. Pakistan's electricity demand is rising rapidly. According to Pakistani government estimates, generating capacity needs to grow by 50 percent by 2010 in order to meet expected demand [World Bank Report].

### 2.3 Oil Consumption by User Sector

In Pakistan transport sector in the biggest user of the petroleum products which accounts about 48 percent followed by power generation which uses about 36 percent, and industrial sector which has a share of 12 percent while remaining is shared by the residential sector.

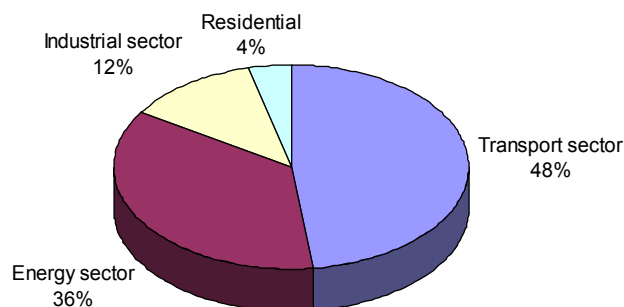


Figure 3. Major oil consumers

Source: *Pakistan energy year book 2006-07*

### 3. Pakistan Oil Sector Organization

Oil sector of the country is organised and regulated by ministry of petroleum and natural resources created in 1977. Ministry offers oil concession through open tendering systems and by private negotiations. To boost the oil sector and to encourage it, ministry offers various taxes and royalties payment incentives to oil companies working in the country. There are almost four major national oil companies currently involved in the sector, namely Oil and Gas development corporation limited (OGDCL), Pakistan petroleum limited (PPL), and Pakistan state oil company limited and Pakistan oilfields limited (POL). All these four companies are joint ventures and partnership between different international companies and some domestic firms. Major international oil companies currently involved in the business in country are BP (UK), ENI (Italy) OMV (Austria) and Orient petroleum (Canada)

Share of government in upstream, downstream and oil marketing companies is explained below in table [OCAC, World Bank Report].

Table 3

## Share of Government in Oil Sector

Name	Business	Direct & indirect Share holding
Oil & Gas Development Co Ltd	Exploration &	100%
Pakistan Petroleum Ltd.	Production	93.4
Mari Gas Co. Ltd.		40.00%
Pakistan Oilfields Ltd.**		11.00%
National Refinery Ltd.	Oil Refining	55.00%
Attock Refinery Ltd.**		26.00%
Pak-Arab Refinery Co. Ltd.		60.00%
Pakistan State Oil Co. Ltd.	Oil Marketing and Distribution	55.22%

Source: Ministry of Petroleum and natural resources Pakistan

### 3.1 Upstream Sector

Pakistan has long been considered a petroleum province – the first well was spudded in 1866 at Kundal in the upper Indus region. Shallow wells were drilled in the following years, and from 1886, small scale production of oil started in Khattan (Balochistan). In 1915, the first of a series of commercial oil discoveries was made in the Potwar basin (Punjab) the initial discoveries were made by private companies, in the early 1960's, the Oil and Gas Development Company Limited (OGDCL) was created, which developed a successful track record in discovering oil and gas reserves [OCAC], [World Bank Report].

#### 3.1.1 Major Companies and Their Share

State-owned Oil and Gas Development Company (OGDC) is the leading upstream oil company in Pakistan and is on the government short-list for near-term privatisation. Current oil production is just over 41,000 barrels per day (b/d), plus 8.8bn cubic metres (bcm) per annum of gas. OGDC carries out exploration and development activities on its own as well as in joint ventures with other oil companies. It owns 100% of seven concessions and has non-operating working interests in another seven concessions operated by other companies.

Pakistan Petroleum Limited (PPL) is engaged in the exploration, prospecting, development and production of oil and natural gas resources

In Pakistan, BP focuses primarily on exploration and production through BP Pakistan Exploration and Production. BP in Pakistan normally works with state run oil company OGDC. BP has a share of 43 % in total oil discovery of Pakistan [World Bank Report].

**Table 4**

**Companies involve in upstream sector**

No:	Company	Total	Wells (Province wise)			Production (BOPD*)
			Sindh	Punjab	Balochistan	
1	Oil & Gas Development Co.	21	11	10	-	20430.25
2	Orient Petroleum Inc.,	3	-	3	-	1061.09
3	Pakistan Oilfields Ltd.	9	-	9	-	10711.3
4	Pakistan Petroleum Ltd.	4	-	3	1	4290.71
5	BHP billiton.	1	1	-	-	1695.52
6	BP Pakistan E & P	43	43	-	-	25877.21
7	Lasmo Oil Company Ltd.	2	2	-	-	401.08
	<b>Total</b>	<b>83</b>	<b>57</b>	<b>25</b>	<b>1</b>	

Source: Oil Companies Advisory Committee (Pakistan)

\*BOPD: Barrels of oil per day

### 3.2 Down Stream Sector in Pakistan

Net oil imports of Pakistan are projected to rise in coming years as demand for these products are very high and production capacity is very low at a constant rate. Demand for refined petroleum products also exceeds domestic oil refining capacity, so nearly half of Pakistani oil imports are refined products. Some figures below give some picture of production and consumption of refined oil products [World Bank Report].

### 3.2.1 Supply and Demand of Downstream Products

Share of the petroleum products is about 40 percent of the current energy consumption in Pakistan. This consumption has grown sharply during 1980s at rate of almost 7 percent per annum but it has shown a decreasing trend during 1990s and later it gained the pace during 2004-2005 at about 10 percent per annum.

The consumption of the petroleum products during 2003-04 was about 14 MTOE. This sharp decline in the consumption as compare to previous years was due to the decreasing demand of Furnace oil (FO). As furnace oil is being used for thermal power generation and these thermal power plants were being converted to Gas systems and also the availability of hydro power during these years caused lower demand of Furnace oil. This demand is expected to increase about 17 percent during 2010-11. It is expected to further increase to around 19 million tonnes by the year 2017-18. Local refinery production during 2003-04 was about 10.27 MTOE. The deficit products import were 5 MTOE in 2003-04 while it will remain about 5-6 million tons per annum up to year 2010-11. It is expected to increase to a level of around 8.0 million tons per annum by the year 2017-18 [EIA 2006, OCAC, World Bank Report].

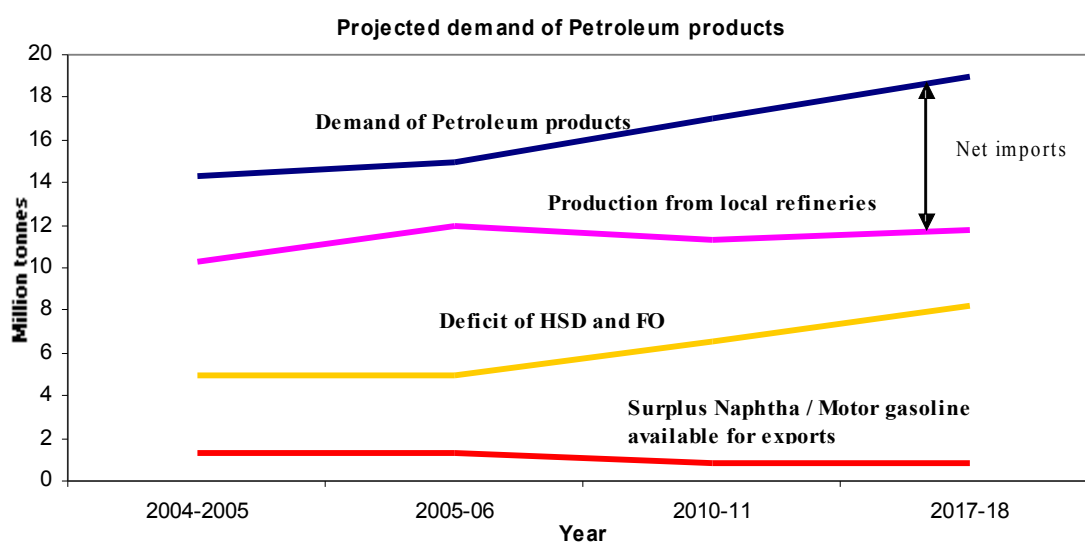


Figure 4. Projected demand of Petroleum Refining Sector

Source: Oil Companies Advisory Committee Pakistan (OCAC)

In total Pakistan has three older hydro skimming refineries and one mid country refinery named Pak-Arab Refinery (PARCO) which started its operation in year 2000 and a Bosicor Pakistan Limited which started its operation in 2003. Together the major five refineries have a total capacity of 12.82 million tones per annum, and processed 11.33 MMT of crude in the year 2004-05. Share of each refinery in countries refinery capacity is explained below with total capacity of 12.8 MTOE per year. According to figures from ministry of petroleum, in the year 2004-05 refineries have processed about 26 percent local crude oil and 76 percent imported crude oil which is explained in figure below [World Bank Report].

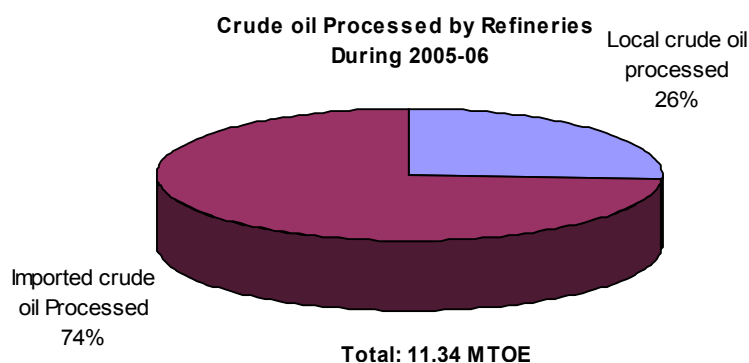


Figure 5. Crude oil processed by refineries during 2005-06

*Source: Oil Companies Advisory Committee Pakistan*

### 3.2.2 Major Refineries and Their Capacity

Currently there are about five major refineries operating in Pakistan, which are explained below:

- Pak. Arab Refinery (PARCO) with refining capacity of 4.50 MTO (2005-06);
- Attock Refinery (ARL) with refining capacity of 1.80 MTO (2005-06);
- National Refinery (NRL) with refining capacity of 2.70 MTO (2005-06);
- Bosicor Pakistan Limited (BPL) with refining capacity of 1.50 MTO (2005-06);
- Pakistan Refinery Limited (PRL) with refining capacity of 2.20 MTO (2005-06);
- Dhodak Refinery Limited (DRL) with refining capacity of 0.12 MTO (2005-06).

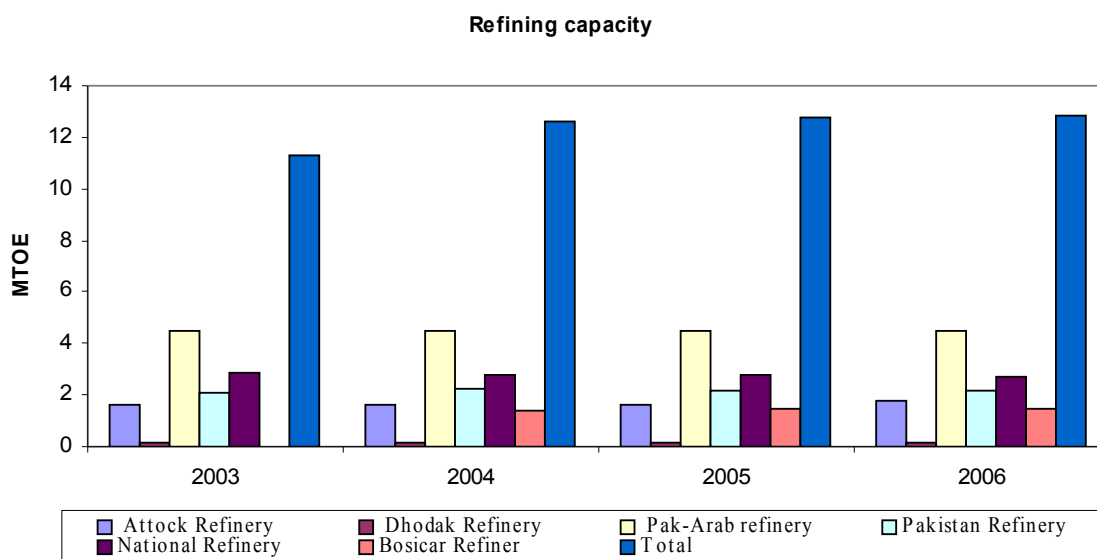


Figure 6. Capacity of major refineries  
Source: Oil Companies Advisory Committee Pakistan

The refineries produce a full range of products, including lube base oils and asphalt. However, only 60 percent of their production is HSD and FO, resulting in a significant mismatch between refined product output and market profile. Pakistan exports surplus gasoline and naphtha, and is self-sufficient in other petroleum products, such as kerosene and aviation fuels [Ministry of Petroleum Pakistan].

In the figure below percentage part of each refinery is described:

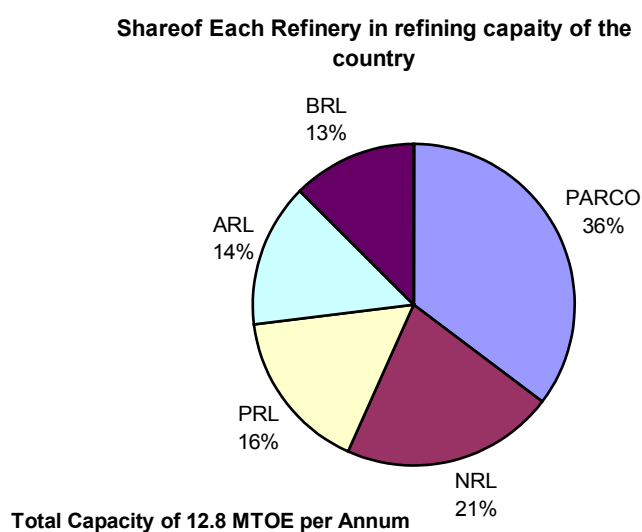


Figure 7. Share of each Refinery in current production  
Source: Oil Companies Advisory Committee Pakistan

### 3.2.3 Consumption of Refined Petroleum Products and Their Future

Oil consumption of different energy products is dominated by Gasoline and Fuel oil. Gasolin in Pakistan consists of High speed diesel (HSD) and Light speed diesel oil (LSDO). While fuel oil is normally used in terms of furnace oil which is being used for thermal power generation projects

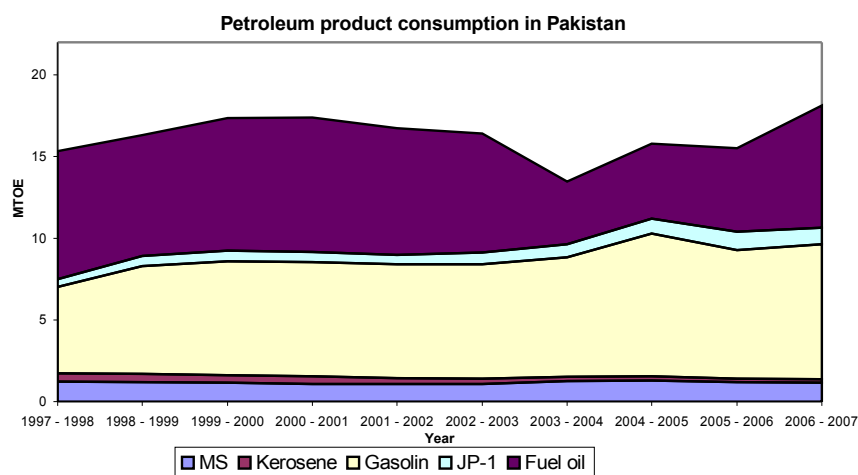


Figure 8. Product wise consumption in Pakistan  
 Source: Oil Companies Advisory Committee Pakistan

Transport sector and agricultural sector are the two major users of Gasoline. Transport sector include both private and commercial types. In the recent years a high amount of subsidy was being provided by the government of Pakistan over gasoline due to which its consumption has increased .but in the recent scenario increase in oil prices in international market has also effected Pakistan economy due which government is no more in a position to provide same amount of relaxation on gasoline as before some years due to which government is gradually reducing the subsidy levels as result Gasoline prices are increasing locally also and effecting the consumption. Secondly government is promoting the compressed natural gas (CNG) sector in Pakistan and both encouraging and forcing the transport sector to convert on CNG. This indicates that in the coming years Pakistan will see reduced consumption of Gasoline products. But there is no alternative of Gasoline in Agriculture sector and as a result, this sector is facing extreme difficulties due to rise of Gasoline process.

Furnace oil or fuel oil is normally used for production of Electricity via thermal power plants. As 1999-2004 Pakistan has surplus of electricity and during this period most of the oil based power plants were converted to Natural Gas based systems so there was decline in Furnace oil consumption. But at the moment country is facing extreme energy crisis and government is Planning for short term power generation plants that are oil based and also encouraging independent power producers to invest in the country. As all the new thermal power plants are oil based and also country has now very limited natural gas resources the consumption of furnace oil will also increase in the coming years [World bank report].

Future demand of different petroleum products is explained in the table below (figures in 1000 tons).

Table 5

#### Long Term Petroleum product projection

<b>Product</b>	<b>2004-05</b>	<b>2008-09</b>	<b>2010-11</b>	<b>2013-14</b>	<b>2017-18</b>
100 LL	2.5	2.5	2.5	2.5	2.5
JP-1	749.4	806.4	835.4	879.4	934.4
JP-4	150	150	150	150	150
MS	1125.7	1218.5	1267.8	1345.3	1456.2
HOBC	15	15	15	15	15
SKO	300	300	300	300	300
HSD	7297.2	8133.3	8628.6	9428.7	10612.1
LDO	275	275	275	275	275
FO	4993	5383	5492	5465	5545
<b>T o t a l</b>	<b>14907.8</b>	<b>16283.7</b>	<b>16956.3</b>	<b>17860.9</b>	<b>19290.2</b>

*Source: Oil Companies Advisory Committee Pakistan*

### 3.2.4 Future Refinery Projects

There are several projects that the government of Pakistan is undertaking to meet the increasing oil product demand of the country .A few of which are explained below

#### 3.2.4.1 Pak-Iran Refinery Project

As refinery products are not fulfilling the countries demand so Government of Pakistan is planning new Refinery projects one of them is Pak-Iran Refinery project. The governments of both countries are discussing over possible construction of six million tons coking refinery close to Hub near Karachi. It will be able to process the

Iranian crude oil and 60 percent of its production will be HSD. But still there are discussions going on and it is hoped that it will be finalised till the end of 2008.

#### **3.2.4.2 Khalifa Coastal refinery (KCR)**

An investment company of United Arab Emirates have planned to establish an oil refinery in coastal area of Balochistan named Khalifa Coastal Refinery (KCR). Till now this will be largest investment in oil and gas sector in Pakistan. This refinery will have the capacity of producing 35 to 45 million barrels per year of HSD. KCR will not only help in meeting the increasing demand of the petroleum products in the country but also help in developing the several downstream industries in a modern way. The refinery will be completed and accomplished till the first quarter of 2011.

#### **4. Conclusions**

Import of the crude oil and oil based product put a lot of burden on the countries economy. There are currently five major oil refineries operating in the country which are not able to fulfil the demand requirements, hence the government should take some vital steps in policy matters so that it can attract more foreign investors not only in downstream sector but also in upstream sector.

Indigenous resources of gas, coal and hydro should be properly utilised for power generation. These resources should be actively promoted to reduce dependence on imported crude oil, and to reduce heavy burden on foreign exchange resources.

In addition if the government takes bold and firm steps to improve hydel power generation, then it not only adds higher value to power sector, but also shows its impact on oil import budget. This will also help in supplying the power at cheaper rate for both industrial and residential sectors

Consumption of HSD in the country has grown dramatically due to lower prices and lower taxes while gasoline experiences higher taxes and higher prices. Promotion of CNG has also affected the motor gasoline market in recent years. The government should rationalize taxes and prices of transport fuels to reduce the differential between motor gasoline and diesel prices and to rationalize price of CNG and motor gasoline.

Due to Indigenous reserves of Natural gas in the country government should encourage the transport sector to switch over to CNG. As transport sector is the main user of High speed diesel (HSD) and conversion of HSD to CNG will reduce import bill of the country. Refineries face severe problems in transportation of oil from ports. More options of transportation of crude from ports should be available for refineries. Government policy of using the locally available crude at any cost should be techno-economically evaluated before taking any final decision. Refineries should be taken into confidence before finalisation of any crude oil import

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