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MACRO-ECONOMIC POLICIES AND ENERGY SECURITY – IMPLICATIONS FOR A CHRONIC ENERGY DEFICIT COUNTRY

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Paper to be Presented at the

The 29th Annual General Meeting & Conference of

the Pakistan Society of Development Economists,

"Energy Security and Economic Sustainability: The Way Forward"

December 19-21, 2013,

Serena Hotel, Islamabad, Pakistan

Macro-Economic Policies and Energy Security – Implications for a Chronic Energy Deficit Country

Introduction:

Pakistan's energy crisis, despite being continuously a focus of political, technical and economic analyses and discussions, seems to be continuing unabated. Notwithstanding the fact that there have been numerous studies which have identified critical issues and the available options in the energy sector, the energy deficit seems to be ever widening. An issue which has rather been overlooked in this debate relates to how the energy sector's foreign exchange requirements for meeting current consumption and for capital expenditures for creating domestic capacity would be financed. This paper seeks to address this question, and follows up with identifying its implications for the country's macroeconomic policy and management.

In order to address the energy crisis, the government is planning and implementing various structural measures such as increasing share of renewable energy production, diversification and rebalancing of the energy production mix, reducing oil intensity, and exploration for fossil fuels (Government of Pakistan, 2013, NEPRA, 2013). However, the energy infrastructure and production projects are heavily capital and technology intensive necessitating foreign investment with concomitant foreign exchange liabilities for repatriation of returns and the principle. Moreover, the gestation periods for such measures to make a substantial impact is generally quite long. In addition to the increasing energy demand in the country, volatile oil prices pose another challenge which call for physical and financial strategies for hedging price risk. Such strategies, however, also require substantial foreign exchange resources (Bacon and Kojima, 2008; Daniel, 2001).

It is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements for a long time to come (Ahmed, 2007), and will need to generate commensurate foreign exchange resources to ensure long term energy security. The paper addresses the implications for macro-economic policies given the country's chronic dependence on imported energy and continuing pressure on its foreign exchange resources. More specifically, the study first rigorously establishes the above *chronic energy deficit* hypothesis. Second, it elaborates the logical consequences of this condition for the demand for foreign exchange. Third, the paper

discusses implications for macro-economic strategies, in particular, with respect to the foreign exchange regime, and related interest rates, foreign trade, savings and domestic and foreign direct investment policies. We make international comparisons of macro-economic policies adopted by countries which face secular energy deficits comparable to Pakistan. After discussing various policy alternatives, the paper concludes with recommendations.

With regards to the continuing energy crisis in Pakistan there have been a number of academic studies and policy papers on the subject (e.g., Alahdad, 2012; Ghayur, 2007; Malik, 2008 and 2010; Siddiqui, 2004; Kugelman, 2013). The major focus of these studies has, however, been on basic long term structural measures designed to reduce oil consumption over the longer term, achieve energy portfolio diversification away from oil-fired power generation, improving energy efficiency, and demand management. These strategies provide the potential to reduce exposure to high and volatile oil prices, but do not address the long term fundamental problem of *energy poverty*. In general, there is an apparent dearth of studies on the implications of energy deficit for macro-economic policies for the energy importing developing countries. Other studies deal with the impact of energy shortages on the macro-economies, energy production strategies, and demand management, for example, see Finleya (2012), Bielecki (2002), Pandey (2006), Labandeira and Manzano (2012) and Munasinghe (1984). It is notable that, on the contrary there have been a number of studies with respect to oil exporting and developed countries (IMF, 2003; IMF 2012; Sturm et al. 2009) which examine the macro-economic policy options for oil the surplus countries. Moreover, the policy options and alternative strategies have to be country specific taking into account it's economic and industry structures. Therefore, the current paper is likely to contribute significantly to the development of a long term economic strategy to enhance energy security for Pakistan.

Background on the Oil Sector

Pakistan is an oil producer, but the domestic production of crude oil meets only 16-20 percent of the total consumption; the remaining 80-84 percent of demand is filled by importing crude oil, high speed diesel, and fuel oil and other petroleum products. At the beginning of 21st century, the sector stood mostly deregulated. However, the world oil price increased very sharply over 2004-2008, when led the government to roll back deregulation and exert greater control on

the sector, with a view to protect the consumer from the brunt of full pass-through of the international prices.

Heavy fuel oil and aviation fuel are presently largely deregulated. Liquid Petroleum Gas (LPG) was deregulated in 2000 and the licensed private firms have been free to import LPG, and marketing companies are allowed to set domestic market prices. In practice, the government uses direct and indirect price controls (moral suasion) to keep oil products and LPG prices low for the benefit of the consumers. It results in domestic prices being below the prevailing international prices.[1] This implicit price ceiling reduces the quantity of LPG imports; consequently a shortage results, and a "black market" emerges with end-users paying higher prices. The Oil and Gas Regulatory Authority (OGRA) sets the price ceilings through official notification. The price is based on Arab Gulf fuel ex-refinery/import-parity price, and plus other charges including customs and excise duty, sales tax, other levies and a distribution margin.

Following the sharp rise in the world oil prices during 2004-2008 period, the government took several steps to protect consumers by imposing a cap on the domestic sale prices (MPNR 2005).[2] The policy of providing relief to the consumers was also implemented by reducing the petroleum development levy (PDL) which over time was reduced to zero. In 2004, the government also started to pay a 'price differential claim' (PDC) to compensate the oil companies for the lower price charged to the consumers, particularly for kerosene and diesel oil. The oil policy thus not only led to the government subsidizing oil consumption, but also resulted in reducing the tax revenues accruing to the government. Over time, the policy has had a substantial negative impact on the fiscal position of the government.

Despite the government's efforts to provide subsidies, particularly on kerosene and diesel oil, to cushion the increases in international oil prices, and the use of a transparent price adjustment formula, the increase in the end-user domestic prices has led to fierce protests. There have been numerous strikes and price increases at the pump have been challenged in the courts. On the other hand the energy policy quite predictably has resulted in continuing energy

[1] For example, the ceiling was about US$300 per ton, against international LPG prices exceeding US$500 per tonne at times. In April 2006, wellhead LPG prices were increased from Rs 17,000 (US$283) per tonne to Rs 20,200 (US$337).

[2] MPNR (Ministry of Petroleum and Natural Resources). 2005. "Brief on pricing of petroleum products." November 10. www.mpnr.gov.pk/pricing%20formula.php.

shortages, manifested as blackouts of unprecedented duration and frequency. It is said that one of the major cause of the ruling PPP government's defeat at the polling booth in May 2013, has been its failure to satisfactorily address the energy crisis. Besides the government, the oil companies have also been blamed for exploiting the situation and profiteering at the expense of the public.

Another factor exacerbating the energy crisis has been the rising demand for energy fueled by robust economic growth over 2002-2007; average real rate of growth was 6.22% over this period. The consumer demand for petroleum products was attenuated somewhat by a large scale substitution of gasoline and heavy fuel oil with natural gas. The conversions were the result of government's pricing structure which created financial incentives in its favor. A record number of gasoline powered vehicles were switched to CNG to the point that Pakistan has the third largest number of CNG vehicles in the world with 63.3% of the vehicles running on CNG.[3]

Pakistan has been so far self-sufficient in natural gas, but the gas reserves are depleting at a fast rate and gas shortages have started to appear. Pakistan's reserves-to-production (R/P) ratio stood at slightly less than 35 years in 2004. At the end of 2012 it is estimated to be only 15.5 years.[4] As such the country's import of natural gas (LPG) will become substantial in the near future, particularly, as the Iran-Pakistan gas pipeline becomes operational, which, however, stands very small chance due to non-availability of finance as per the recent announcement of Iranian government. The price gap between the government's implicit ceiling on LPG prices and corresponding import-parity prices has contributed to supply shortages. Although in the recent years the government has raised the price of gasoline in order to partially offset the lower prices of kerosene and diesel, the net subsidy has been large and contributed to fiscal deficits.

Management of the demand side has also been lacking. The policies to discourage use of large auto-mobiles, air-conditioners and other power guzzling appliances have been either absent or non-effective. Nominal energy conservation campaigns have mostly relied on public exhortations without much effect on consumer behavior. Steps to combat energy pilferage and

[3] IANGV (International Association for Natural Gas Vehicles). "Current Natural Gas Vehicle Statistics." http://www.iangv.org/current-ngv-stats/

[4] "Statistical Review of World Energy 2013." http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

payment delinquencies have also not yielded the desired results partly because of the ability of the opposition groups and vested interests to block such moves by the government.

The impact of energy crisis on the macro-economy is also well documented in the academic literature, financial press and government policy documents. The Planning Commission estimates that as a result of losses from power and gas shortages, the average GDP growth rate of Pakistan's economy is reduced by 3-4% since 2010 onward (NEPRA 2012). Technical experts on the energy industry like Zahid Hussain (ex-CEO of OGDC), Shahid Sattar of Planning Commission and others are on record drawing a grave outlook for the energy sector. At a seminar held at PIDE in May 2013, Sattar said that the Planning Commission estimates show that the power sector deficit will balloon to Rs 742 billion ($7.4 billion) in the current financial year. The circular debt has touched around Rs 600 billion-mark, while the overall losses may touch Rs 2,000 billion up to June 30, 2013. Pakistan is currently spending two percent of GDP on the power sector, which needs to be jacked up to four to 4.5 percent on an immediate basis to cater to the demand. In order to end the power crisis, Pakistan will have to focus on nuclear civil energy and producing electricity through coal. A visiting senior fellow at PIDE, Alahdad, attributed the prevailing condition to lost opportunities, prohibitive delays, implementation performance and reform reversals. "The story of Pakistan's energy sector is symptomatic of virtually all sectors of the economy. At the micro level the decision-making in the sector remains inherently flawed, and policy initiatives are reduced to shooting in the dark." The overwhelming evidence from energy analysts points to the absence of coordinated policy formulation as a fundamental issue. He identified coordinated policy formulation as a fundamental issue and advocated adopting the concept of Integrated Energy Planning and Policy Formulation (IEP) and the institutional structure which supports it (also see a recent monograph, Alahad, 2012). Rashid Amjad pointed out that the integration of energy plans with economic objective remains weak. Stagnation is well documented all over export data in recent years, e.g. sec Haque (2011).

According to the Economist (2013), "Not charging consumers for electricity has created a big problem for Pakistan. At the end of 2012 the country's stock of energy-industry debt was $9.1 billion - about 4% of GDP - according to a report funded by the United States Agency for International Development (USAID) and carried out by the national Planning Commission. The

same USAID–backed report claims power shortages retard economic growth by at least 2% a year. The situation is deteriorating as the debt mountain grows. Riots break out each summer in protest." The basic fact remains that the integration of energy policy plans with macro-economic objectives has remained week since late 1970's and early 1980's. Pakistan export sector growth has not managed to offset the rising of oil import bill, resulting into high level of energy subsidies to the magnitude of Rs 1,400 billion with little progress to show.

To add to the energy woes, unfortunately, the deteriorated security situation in Pakistan has led to a significant decline in foreign investment in the energy sector as well as in the overall economy. It is appalling to note that in a globally integrated economy and global liquidity environment in recent years, net foreign direct investment in Pakistan for 2008-13 are USD 5.4, 3.7, 2.2, 1.6, 0.8 and 1.8 billion for each year. The net foreign inflows in oil and gas development and exploration declined by 11 percent to $560 million in 2013, as compared to $629 million in the previous fiscal year. The oil and gas sector contributed 39 percent to FDI during FY13 as compared to 77 percent in 2012, mainly due to the worsening law and order situation in Balochistan and Khyber Pakhtunkhwa (KPK), where exploration activities witnessed contraction.

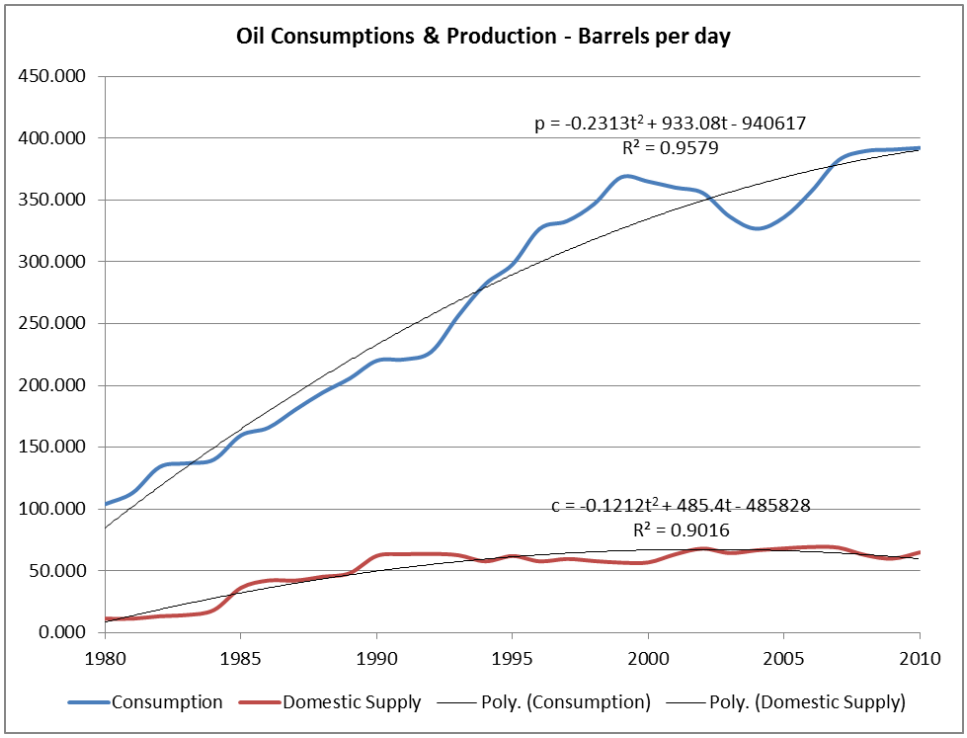
Realistically speaking, any decent/ worthy economist of our generation would be hard pressed to declare the Pakistan's macroeconomic situation in general and energy policy in particular as "satisfactory and sustainable." Borrowing a famous political phrase from President Clinton campaign in 1992, "it is the economy, stupid," we argue in this paper that Pakistan's macroeconomic policies are inherently inconsistent, *ad hoc* and have significantly contributed to the current crisis in energy, and other sectors of the economy. Meekal (2012) has summed up this current situation as "a never-ending energy crisis that has crippled growth and employment prospects, especially in the SME sector which is the main-stay of the economy in terms of value-addition, employment, living standards and exports.

Pakistan's Chronic Energy Deficiency

Figure 1 below conveys our *chronic energy deficit* hypothesis by making a comparison of the country's long term domestic production and consumption and presents a picture of long-term import dependency. The figure also shows fitted trend lines for the two series using 2nd

degree polynomial functions; estimated equation for time (t) are also reported. Detailed statistics on the domestic consumption and production are provided in Table A-I in the appendix.

Figure 1: Oil Consumption and Production



As the figure indicates the consumption-production gap has grown from 83,000 to 327,000 barrels of crude oil per day over 1980-2010. The historic average compound annual growth rate (CAGR) in consumption has been 3.51% p.a., compared to 1.75% p.a. for the domestic production. As a matter of fact, the domestic production has been at a virtual standstill level since early 1990s.

As a result of the persistent consumption-production gap the country has become chronically dependent on oil imports rendering the economy greatly exposed to high and volatile oil prices. Yépez-García and Dana (2012) lay down the key indicators of a country's vulnerability to higher and volatile oil prices. These include a greater share of oil imports as a percentage of gross domestic product (GDP), a high proportion of oil usage in the primary energy supply, and rising oil imports and expenditure over time. When we examine such indicators in relation to Pakistan, as is shown in Table 1, they indicate a high degree of country's vulnerability.

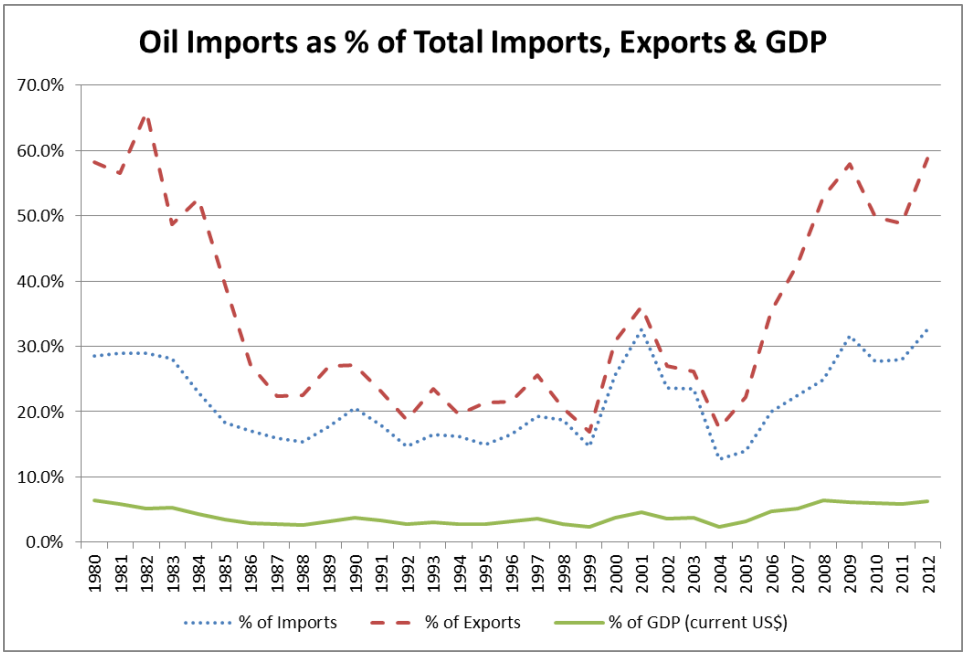
As the table shows, over the last ten years, the oil imports have increased from 2.7% of the GDP to over 6% in current USD terms, while these have increased from 2.4% of the country's GDP (in constant USD) to about 10% in recent years. As a percentage of total imports, the oil imports have doubled to about 35% over the ten year period. More importantly, oil import expenditure, as a percentage of exports, has increased from 18% to 57%. An important factor has been that the country's exports, which are the main component of the country's capacity to pay for imports, have not kept pace with the oil import requirements. The last column in the table points out to the other aspect of the country's vulnerability, i.e., increasing reliance on the imported oil sources for power generation, percent of total electricity production increasing from about 16% in year 2003-04 to over 35% for year 2011-12, and is expected to be higher for the year 2012-13.

Table 1: Petroleum and Products Imports as Percentage of Key Indicators

Year	% of Exports	% of Imports	% of GDP (constant 2005 US$)	% of GDP (current US$)	Electricity production from oil sources
2003-04	18.3%	16.6%	2.4%	2.7%	15.7%
2004-05	24.5%	18.7%	3.5%	3.6%	15.9%
2005-06	36.0%	23.8%	5.4%	5.4%	20.3%
2006-07	42.5%	27.2%	6.3%	5.8%	28.6%
2007-08	51.4%	29.7%	8.5%	7.3%	32.2%
2008-09	52.5%	31.6%	8.0%	6.1%	35.4%
2009-10	53.2%	33.5%	8.1%	6.5%	38.0%
2010-11	48.6%	34.3%	9.2%	7.0%	35.2%
2011-12	58.2%	35.5%	10.4%	6.8%	35.4%
2012-13	56.8%	35.3%	9.8%	6.1%	n.a.

A longer term picture of the Pakistan's oil imports in relation to imports, exports and the GDP is depicted in Figure 2. As the figure shows, the oil imports have assumed an increasing role in the economy. More pertinently, as a growing percentage of exports, the oil imports have come to claim a large share of the export earnings, which has been on the rise since 2004 in particular. However, the figure also shows that in the 1980s the country experienced a similar rise in the oil imports relative to exports. It seems that the reliance on oil imports is a more fundamental and long term problem.

Figure 2: Pakistan's Oil Imports



Energy Projects and the Capital Expenditure (CAPEX) Requirements

A fundamental reason for Pakistan' chronic deficiency in the energy sector is the fact that the country is resource poor. There are no major oil deposits, and hydro-electric sites remaining to be exploited are limited and small. Due to the political choices made regarding the nuclear weaponry and technology in the past, driven by security concerns, the options of building new nuclear plants for civilian use also seem to be limited in view of the associated international concerns. The recent China-Pakistan Nuclear Reactor deal (WSJ, Oct. 16, 2013) involves Pakistan acquiring two large nuclear power reactors (1000 MW each) from China will cost $9.1 billion. Notwithstanding the opposing international stance, the capital investment will need to be serviced which will require additional foreign exchange earnings. There are prospects for coal based energy plants, mainly based on Thar coal field, but these are still shrouded in technological and financial uncertainties. However, besides the constraint of the natural resources, there is another constraint which is to do with how the energy projects requiring large inflows of foreign capital and technology would be financed, even if there is a miraculous expansion in the country's resource endowment. It is this financial constrain which has not been addressed adequately in previous studies on Pakistan.

There are various projects and structural measures in the planning and implementation stages, relating to increasing share of renewal energy production, diversification and rebalancing of the energy production mix, reducing oil intensity, and exploration for fossil fuels (see for example, Government of Pakistan, 2013, NEPRA, 2013). However, the energy infrastructure and production projects are heavily capital and technology intensive which will necessitate large initial foreign investment as well as subsequent foreign exchange outflows on account of repatriation of returns and the principle. Moreover, the gestation periods for energy projects is generally quite long, which increases the final capital costs due to interest that would accrue during period of construction.

The Capital expenditure (CAPEX) requirements for energy projects vary considerably depending on the individual country, type and technology of plant. Table A-II (appendix) provides estimates from the US Energy Information Agency (EIA) of the "overnight" capital requirements of various types of energy projects.[5] These costs are summarized below, and indicate that a power project will call for a capital cost in the range of $2.1 to $8.3 billion in the USA. Capital costs for developing countries are much lower, but still substantial compared to their resources.

Table 2: Overnight Capital Cost ($/kW)

Type of Plant	Min	Max	Average
Coal	2,934	6,599	4,416
Natural Gas	676	7,108	2,132
Uranium	5,530	5,530	5,530
Biomass	4,114	8,180	6,147
Wind	2,213	6,230	4,222
Solar	3,873	5,067	4,374
Geothermal	4,362	6,243	5,303
Municipal Solid Waste	8,312	8,312	8,312
Hydroelectric	2,936	5,288	4,112

As a reference we can consider India's Ultra Mega Power Projects (UMPP). These are a series of ambitious power projects planned by the Government of India to provide "power for

[5] The term "overnight" refers to the cost of the project as if it would be constructed 'overnight' and no interest was incurred during its construction.

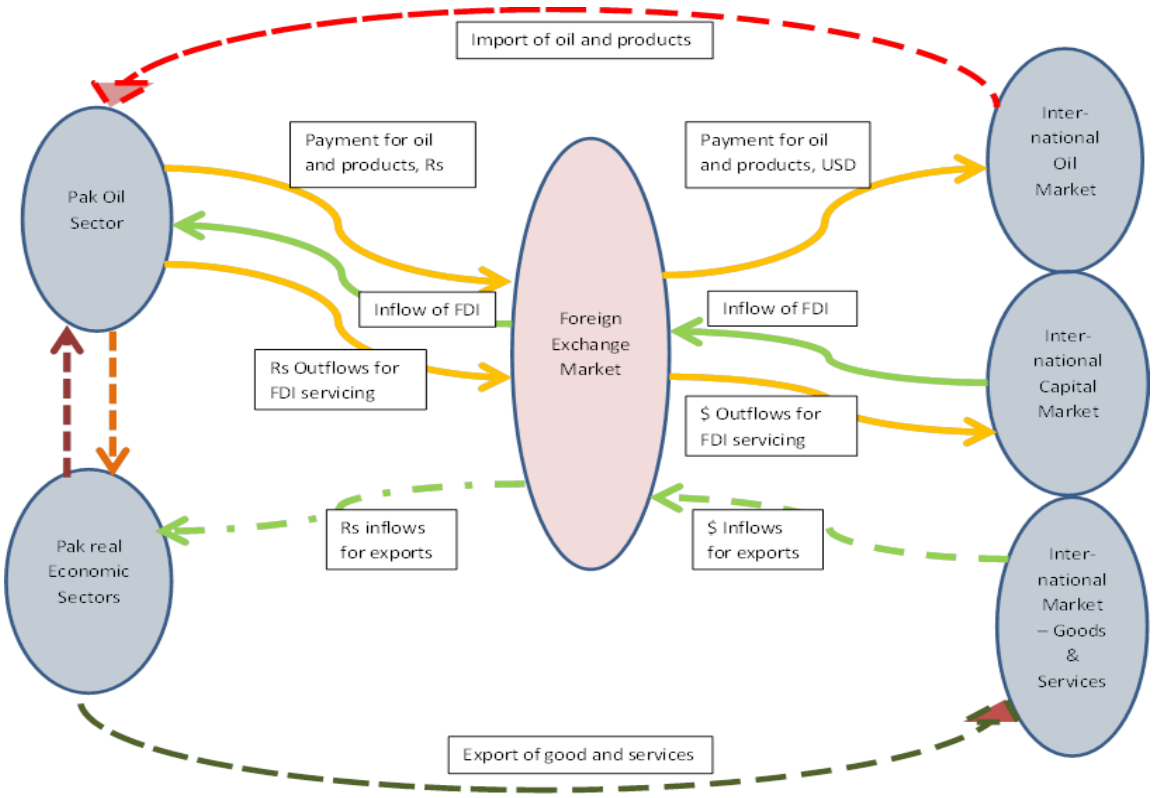
all" by the end of the Eleventh Five-Year Plan (2007–2012). The UMPPs would create additional capacity of at least 100,000 MW. The projects, with an average capacity of 4000 MW are estimated to cost roughly INR15,000 crores, roughly equivalent to USD 2.5 billion each.

As discussed in the previous section it is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements in the future and the country will need to generate adequate foreign exchange resources to secure its energy needs. We can then proceed to develop a model for estimating the country's foreign exchange requirements.

Projection of Foreign Exchange Requirements

The main implication of the country's chronic dependence on imported energy is a continuing pressure on its foreign exchange resources. In this section, we develop a conceptual model for projecting the demands on the foreign exchange resources given energy sector's long term reliance on imports and foreign direct investment in building new power capacity. The conceptual model is schematically presented Figure 3.

Figure 3: Oil Sector Inflows and Outflows of FX



Our model for projecting future FX requirements is a two sector model; energy sector and the rest of the economy. The energy sector imports oil and incurs payment obligations in foreign exchange. Besides, oil and related imports the energy sector also requires foreign exchange which can materialize as FDI for plant equipment and technology. The inflow of FDI however creates obligations to service the capital investments; if these are debts inflows, it would involve interest and repayments of the principal. If, these are equity investments, we'll need to repatriate profits to the investors' commensurate with their expected risk adjusted returns, as well as provide for possible liquidation. In addition, there would be obligations such as payments for royalties, management and licensing fees, etc. These three kinds of foreign exchange transactions are shown in Figure 3 as solid lines. As far as the non-energy sector is concerned we, for this exercise, may assume that the import of goods and services are paid for by this sector's matching exports. Thus, any increase in the FX earnings from exports of goods and services, would be offset by additional import of goods and services other than oil. These transactions are depicted in the figure as dotted lines. This simplification allows us to focus on the oil sector's FX requirements which are relevant to the present analysis.

Model Simulation Results and Projections

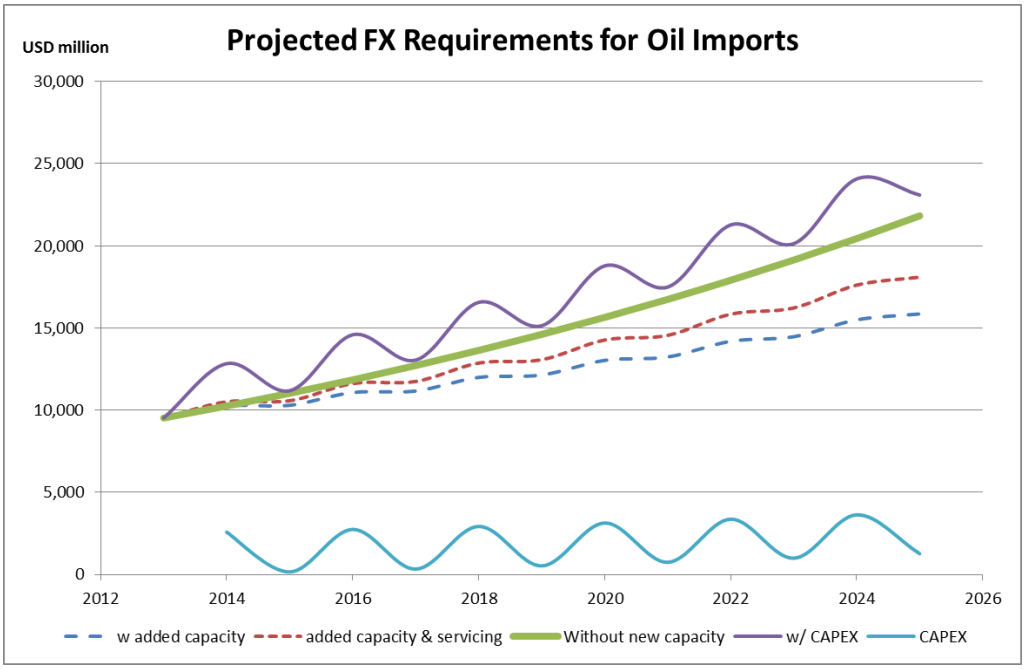
Given the simplified model for the oil sector's FX flows in Figure 3, we conduct a simulation exercise under certain simplifying assumption and stylized facts as explained below.

Our starting points are the country's current GDP, its oil consumption, production and import levels. We assume that the country would target a 6% per annum real growth rate in its GDP. We assume that the oil consumption is a direct function of the GDP; this implies that country's energy intensity is held constant, while it can be argued that it may increase or decrease as the incomes rise. As the first pass we hold the current domestic production of oil as constant, which allows us to determine the quantity and the value (assuming constant oil prices) of the oil imports. Next, the required quantity of oil imports (in M tons) is converted into TWh (tera watt hours) per year. We adopt as a policy goal that we would invest in the energy sector each year to create addition power capacity which would be adequate to meet the annual addition in import requirements. The additional capacity is created at an assumed overnight cost of $2,000 per kW. We assume that the new power generating capacity comes on stream in the following year, which will help to attenuate the import bill in the following year. Thus, the foreign

exchange required as FDI is projected. The final calculation involves determining the servicing obligations resulting from the FDI, which are assumed to be 10% of the project cost per year. Working with these assumptions, we project 13 years into the future up to year 2025.

The results of the simulation are presented in Table A-III (in the appendix) and are shown in Figure 4. The results show that generally by increasing domestic production capacity, the oil sector would be able to reduce its FX requirements, compared to when no new capacity is added. These savings increase over the years, and amount to 17% from the base case in the year 2025. However, when we include the required FDI for the CAPEX, the sectors requires additional net inflows of FX resources, which are in the range of 6% to 18%. The demand for foreign exchange by the year 2024-25 is projected to be US$ 20-21 billion without the FDI in new power generation; with the FDI forthcoming this demand will be curtailed to US$ 17-18 billion, including the FDI servicing requirements. However, when we include the CAPEX foreign exchange requirements, the total FX requirements are in the range of US$ 23-24 billion. The main conclusion that can be drawn from our simulation is that the oil sector is likely to remain a substantial net user of the foreign exchange resources.

Figure 4: Projected FX Requirements



Implications for Macro-Economic Strategies

The country's chronic energy deficiency has broad implication for macro-economic policies and management with respect to: the foreign exchange regime, interest rates, foreign trade, savings, and domestic and foreign direct investment policies. The energy deficiency and its logical consequences for the demand for foreign exchange in particular, have implications for exchange rate policies; see e.g. Mangla (2011) and H. Ahmad (2009).

Pakistan has experienced a real growth rate of about 4.1% per annum over 1991-2010, which is not much higher than the *Hindu growth rate* of 3.5%.[6] As a comparison, the economy of India has been growing at rate of around 6-8% since economic liberalization began in the 1990s.The energy deficiency directly affects the economic growth rates, and can be a binding constraint on the country's growth. In order to achieve a growth rate unconstrained by energy availability, the country has to be able to import its energy requirements and/or expand its domestic energy production through capital investment. Either way, the country would require foreign exchange resources. As we show in the previous sections, the energy sector is likely to remain a net user of foreign exchange funds. Thus, the logical way out is to expand the export capabilities and the growth strategy making export expansion its central focus.

In 2000, Pakistan officially moved away from the managed exchange rate to a floating exchange rate regime and can be categorized as managed floaters per its official pronouncements.[7] IMF's de facto classification of exchange rate regimes, as of July 31, 2006, however, notes that, "the regime operating *de facto* in the country is different from its *de jure* regime," and categorizes Pakistan as following "other conventional fixed peg arrangements". A study by Rajan (2011) examining the exchange rate regimes in Asian countries over 1999-2009 period finds that, "Pakistan seems to operate rather ad hoc adjustable pegs." It, however, finds insufficient evidence for the existence of any systematic exchange rate fixity, but notes a high degree of influence of the US dollar and negligible influence of the other currencies for Pakistan, suggesting that the country manages its currency against the US dollar.

[6] The 'Hindu rate of growth' is a derogatory term referring to the comparatively low annual growth rate of the socialist economy of India before 1991. At the same time, Pakistan grew by 5%, Indonesia by 6%, Thailand by 7%, Taiwan by 8%, and South Korea by 9%. The term was coined by Indian economist Raj Krishna and popularized by Robert McNamara.

[7] See Janjua (2007) for details on the history of exchange rate regimes in Pakistan.

Considering that the energy sector is central to the economic growth and shall likely remain import dependent, the FX policy needs to be redefined to reflect the projected demands on hard currencies. The FX rate which would reflect its expected scarcity value will be helpful in expanding exports and curtailing domestic consumption of oil and related products. Contrary to the above logical implication, there is empirical evidence that the Pakistani rupee "suffers from chronic overvaluation," (Ahmad, H. 2009). There is also empirical support for Pakistan's economy being a victim of the *Dutch Disease*, an affliction caused by unrequited transfers and foreign aid.[8] Under this condition remittances cause an appreciation of the real exchange rate and loss of competitiveness of Pakistan's exports sector at the same time increases share of the non-tradable sector in the economy. Makhlouf and Mughal (2011), Javaid (2009) and Ahmed H. (2009) find empirical support for the Dutch Disease hypothesis for Pakistan.

Exchange rate has to be consistent with the reality of country's chronic energy deficit. This implies that the exchange rate should not only reflect its fair value notwithstanding the Dutch Disease, but may also be tilted in favor of the export sector. The current managed-float seems to be focused on overall balance of payment, aimed at keeping a stable level of foreign reserves. Yet, the country has experienced declining foreign exchange reserves over the recent years. In order to create a fair playing field for the export sector, the managed-float regime should instead be focused on the current account balance minus the transfer payments. Such a policy would imply a higher FX rate compared to the rate prevailing under the current policy; i.e., a depreciation of rupee compared to its current value. There would be a concurrent and steady buildup of foreign exchange reserves, which may prove to be beneficial in other ways. First, it will exert a beneficial impact on the exports, and at the same time a stronger dollar will also discourage excessive import consumption and help with energy demand management. Second, a steady increase in the FX reserves will provide more confidence to the foreign investor, which may be critical to attracting the needed FDI to the country. Third, increases in the FX reserves will help to sterilize foreign exchange inflows, curbing inflation in the country. Fourth, a steady increase in FX reserves commensurate with the growth in the country's exports and GDP is also required to support trade transactions.

[8] The term originally referred to natural resource discovery, but has been used in reference to "any development that results in a large inflow of foreign currency, including a sharp surge in natural resource prices, foreign assistance, and foreign direct investment".

Exchange rate policies followed by China and India, two oil importing countries, have led to steady increase in their foreign exchange reserves which are currently reported at $3,557 and $281 billion respectively (until recently Indian reserves exceeded $300 billion). There is a consensus that China manages its currency to be undervalued in pursuit of an export led growth strategy. The steady increase in the Indian FX reserves also point out to a slight undervaluation of the INR.

Another aspect of the exchange rate policy relates to its volatility. As Engel and Hakkio (1993) explain, the system of fixed but adjustable rates, such as followed by Pakistan, introduces a new kind of volatility: volatility caused by the expectations of exchange rate realignments. By eliminating the market's uncertainty about the future exchange rate, a system of absolutely fixed exchange rates reduces *normal* volatility. However, when the rates are fixed but adjustable, the market knows that realignment may occur and exchange rate volatility will reflect the speculation around the magnitude and timing of the realignment. Therefore, between realignments, exchange rate volatility will tend to be within normal limits, but around the time of realignments it can be extreme. If the equilibrium rate continues to trend upward or downward, then the incidence of realignment increases, with it, the incidence of extreme volatility also rises.

From the point of view of the foreign investor, a volatile and steadily weakening currency is an anathema to FDI. With larger FX reserves the float managers are in a stronger position to dampen volatility, absorb short-term shocks, and thus reduce FX economic and transaction exposure for the foreign investor.

In addition to the exchange rate policy within the managed-float regime, there are implications for the monetary and fiscal policies. Inflation and interest rates differential are main determinants of the FX rate which are affected by monetary and fiscal policies. Fundamental macro-economic relationships link saving gap, public deficits and current account deficits. It is quite basic that exchange rates would be strengthened by subduing inflation and curtailing fiscal deficits. However, from the perspective of meeting energy sectors projected FX requirements, a prudent management of the monetary and fiscal policies assumes greater significance.

Monetary policy can also be helpful by maintaining higher real interest rates. Due to historical inflations rates in excess of nominal interest rates, the real interest rates in Pakistan

have tended to be negative. Partly because of this, in addition to the adverse security situation, Pakistan has not been the beneficiary of foreign capital flows to the same extent as other emerging countries. India for example, has been able to capitalize on the global liquidity resulting from quantitative easing policies followed by major developed countries.

As case in point, India's central bank recently raised policy interest rates for the second time in the current quarter to fight high inflation, while pulling away from the emergency measures put in place recently to support the slumping rupee. In a related move, RBI started subsidizing some of the cost of hedging against currency risk in foreign currency deposits and loans. The program has raised $10 billion since then, as the interest rate of about 4% on the NRI deposits, so attractive that some international banks have even been offering loans to non-residents, (WSJ, Oct 24, 2013, "India's Central Bank Program Brings in Billions"). Such, measures to reduce FX risk with guarantees for repatriation and against restriction/partial blocking of FX funds would be necessary for attracting foreign direct and portfolio investment.

In addition to the monetary and fiscal policy measures that are consistent with the long-term dependency on imported energy, institutional and governance measures will need to be addressed; these issues have been extensively discussed, e.g., see (Uppal, 2011). Non-economic measures, such as ensuring political stability and security, in support of FDI and foreign portfolio investment have been thoroughly discussed in the literature, and there is a body of good practices which are recommended for creating a suitable environment.

Capital Account and Macroeconomic Policy

Finally, a few observations on the capital account and the macroeconomic policy are warranted. Theoretically, the opening of the capital account should improve the country's access to private foreign capital, *ceteris paribus*, but because of domestic security and economic and political concerns, the inflow of private capital has significantly fallen over 2009-2013. Haque (2011) has demonstrated that although capital outflows were not a major cause for the decline in foreign exchange reserves during Pakistan's economic crisis of 2008, the open capital account and rupee convertibility have made the country more vulnerable to outside shocks. Haque further identifies three areas where policymakers in Pakistan face serious challenges, i.e.,

macroeconomic management; controlling tax evasion, which the Pakistani rupee's convertibility has made easier; and minimizing the real cost of portfolio investment to the country.

The movement of capital and international trade are two indicators of global integration. The magnitudes of these two flows relative to Pakistan's GDP provide a good indication of its degree of global integration. Unfortunately, Pakistan's score on both these accounts have continuously deteriorated. The ratio of foreign trade (i.e., exports plus imports) to GDP for Pakistan fluctuated between 40 and 45 percent during 2004-08, but fell sharply to less than 35% in 2009, and continues to fall in recent years. On the contrary, India's trade ratio gradually rose to about 50 percent of GDP, which was initially of the same order of magnitude as Pakistan's; India has become more global in its trade sector.

An open capital account also calls for a more vigilant macro-economic management because of a potential for economic disruption and increased vulnerability to external shocks. As Reinhart and Rogoff (2008) note: "Periods of high international capital mobility have repeatedly produced international banking crises, not only famously as they did in the 1990s, but historically," (p.8). Similarly, Rodrik and Subramanian (2008) observe that "countries that grow more rapidly are those that rely less and not more on foreign finance; and in turn foreign capital tends to go to countries that experience not high, but low productivity growth." Haque notes, "The high dependency on foreign sources to finance domestic investment has made Pakistan's economic performance highly vulnerable to outside factors. There is little question that this dependency will have to be reduced and domestic savings rate drastically raised if economic growth in Pakistan is to reach levels comparable to the rapidly growing Asian economies."

In summary, and looking at the broader picture, it is the trade deficit, rather than decline in capital flows, that is the basic cause for loss of foreign exchange reserves. Thus, energy deficit and concomitant foreign exchange liabilities will require a significant boosting of Pakistan's exports. In recent years the country has come to rely on foreign remittances to meet import requirements. These inflows are, however, a mixed bag as alluded before.

Summary and Conclusions

Pakistan's economy is greatly exposed to high and volatile oil prices when compared to commonly used economic indicators of a country's vulnerability; these include a greater share of

oil imports as a percentage of gross domestic product (GDP), a high proportion of oil usage in the primary energy supply, and rising oil imports and expenditure over time. It is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements for a long time to come and will need to generate commensurate foreign exchange resources to ensure long-term energy security. An issue which has rather been overlooked in this analysis relates to as to how the energy sector's foreign exchange requirements for meeting current consumption and for capital expenditures for creating domestic capacity would be financed. This paper has tried to address this question, and to identify its implications for the country's macroeconomic policy and management.

The paper addresses the implications for macro-economic policies given the country's chronic dependence on imported energy and continuing pressure on its foreign exchange resources. The basic fact remains that the integration of energy policy plans with macro-economic objectives has remained week. Pakistan export sector growth has not managed to offset the rising of oil import bill. To add to the energy woes, the deteriorated security situation in Pakistan has led to a significant decline in foreign investment.

We have proposed a *chronic energy deficit* hypothesis by developing a model for projecting energy sector's long-term requirements for foreign exchange. An analysis of the country's long term import and capital inflow requirements presents a picture of long-term import dependency. As a result of the country's chronic dependence on oil imports, the economy will remain greatly exposed to high and volatile oil prices.

A fundamental issue for Pakistan is how the energy projects requiring large inflows of foreign capital and technology would be financed. The energy infrastructure and production projects are heavily capital and technology intensive which will necessitate large initial foreign investment as well as subsequent foreign exchange outflows on account of repatriation of returns and the principle. It is this financial constraint which has not been addressed adequately in previous studies. The main implication here is that there will be a continuing pressure on the county's foreign exchange resources. Any increase in the FX earnings from exports of goods and services in the normal course is likely to be offset by additional import of goods and services other than oil.

We conducted a simulation exercise which shows that when we include the required FDI for the CAPEX, the oil sector requires additional net inflows of FX resources 6% to 18% above the base case. The demand for foreign exchange by the year 2024-25 is projected to be US$ 20-21 billion without the FDI in new power generation. However, when we include the CAPEX foreign exchange requirements, the total FX requirements are in the range of US$ 23-24 billion.

The country's chronic energy deficiency has broad implication for macro-economic policies and management with respect to the foreign exchange regime and foreign direct investment policies. Our analysis suggests that the FX policy needs to be redefined to reflect the projected demands on hard currencies. The FX rate which would reflect its expected scarcity value will be helpful in expanding exports and curtailing domestic consumption of oil and related products. Moreover, Pakistan's economy is likely afflicted by the *Dutch Disease*, an affliction caused by unrequited transfers and foreign aid, leads to appreciation of the real exchange rate and weakening of the competitiveness of Pakistan's exports sector. Therefore, our exchange rate policy has to be consistent with these realities.

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APPENDIX

Table A-I: Pakistan's Oil Consumptions (Thousand Barrels Per Day)				
Year	**Petroleum Consumption**	**Domestic Oil Supply**	**Consumption-Production Gap**	**Domestic Production %**
1980	104.000	11.200	92.800	10.8%
1981	113.000	11.200	101.800	9.9%
1982	134.000	13.200	120.800	9.9%
1983	137.000	14.200	122.800	10.4%
1984	140.000	18.200	121.800	13.0%
1985	159.672	36.200	123.472	22.7%
1986	165.748	42.109	123.639	25.4%
1987	180.425	42.070	138.355	23.3%
1988	194.201	45.144	149.057	23.2%
1989	205.635	48.031	157.604	23.4%
1990	220.051	62.039	158.012	28.2%
1991	221.059	63.341	157.718	28.7%
1992	227.210	63.675	163.536	28.0%
1993	256.420	62.549	193.871	24.4%
1994	282.170	57.651	224.519	20.4%
1995	298.094	61.948	236.146	20.8%
1996	326.903	57.624	269.279	17.6%
1997	333.036	59.560	273.476	17.9%
1998	346.835	57.843	288.992	16.7%
1999	368.569	56.572	311.997	15.3%
2000	365.014	56.763	308.252	15.6%
2001	360.125	63.374	296.750	17.6%
2002	355.895	67.931	287.964	19.1%
2003	336.599	64.330	272.269	19.1%
2004	326.846	66.592	260.255	20.4%
2005	336.186	68.126	268.060	20.3%
2006	357.077	69.257	287.820	19.4%
2007	382.259	68.687	313.573	18.0%
2008	389.752	62.604	327.148	16.1%
2009	390.935	59.846	331.089	15.3%
2010	392.300	64.898	327.402	16.5%
CAGR	**3.51%**	**1.75%**		

Table A-II: Updated estimates of power plant capital and operating costs

	Plant Characteristics		Plant Costs (2012$)		
	Nominal Capacity (MW)	Heat Rate (Btu/kWh)	Overnight Capital Cost ($/kW)	Fixed O&M Cost ($/kW-yr)	Variable O&M Cost ($/MWh)
Coal					
Single Unit Advanced PC	650	8,800	$3,246	$37.80	$4.47
Dual Unit Advanced PC	1,300	8,800	$2,934	$31.18	$4.47
Single Unit Advanced PC with CCS	650	12,000	$5,227	$80.53	$9.51
Dual Unit Advanced PC with CCS	1,300	12,000	$4,724	$66.43	$9.51
Single Unit IGCC	600	8,700	$4,400	$62.25	$7.22
Dual Unit IGCC	1,200	8,700	$3,784	$51.39	$7.22
Single Unit IGCC with CCS	520	10,700	$6,599	$72.83	$8.45
Natural Gas					
Conventional CC	620	7,050	$917	$13.17	$3.60
Advanced CC	400	6,430	$1,023	$15.37	$3.27
Advanced CC with CCS	340	7,525	$2,095	$31.79	$6.78
Conventional CT	85	10,850	$973	$7.34	$15.45
Advanced CT	210	9,750	$676	$7.04	$10.37
Fuel Cells	10	9,500	$7,108	$0.00	$43.00
Uranium					
Dual Unit Nuclear	2,234	N/A	$5,530	$93.28	$2.14
Biomass					
Biomass CC	20	12,350	$8,180	$356.07	$17.49
Biomass BFB	50	13,500	$4,114	$105.63	$5.26
Wind					
Onshore Wind	100	N/A	$2,213	$39.55	$0.00
Offshore Wind	400	N/A	$6,230	$74.00	$0.00
Solar					
Solar Thermal	100	N/A	$5,067	$67.26	$0.00
Photovoltaic	20	N/A	$4,183	$27.75	$0.00
Photovoltaic	150	N/A	$3,873	$24.69	$0.00
Geothermal					
Geothermal – Dual Flash	50	N/A	$6,243	$132.00	$0.00
Geothermal – Binary	50	N/A	$4,362	$100.00	$0.00
Municipal Solid Waste					
Municipal Solid Waste	50	18,000	$8,312	$392.82	$8.75
Hydroelectric					
Conventional Hydroelectric	500	N/A	$2,936	$14.13	$0.00
Pumped Storage	250	N/A	$5,288	$18.00	$0.00

Table A-III: Projected Foreign Exchange Requirements for the Oil Sector – USD million

Year	Without new capacity	Capital Cost	With added capacity	With added capacity & FDI servicing	Total Including CAPEX
2013	9,525	0	9,525	9,525	9,525
2014	10,254	2,581	10,254	10,512	12,835
2015	11,027	155	10,298	10,571	11,182
2016	11,846	2,745	11,073	11,621	14,591
2017	12,714	329	11,166	11,747	13,043
2018	13,634	2,929	11,993	12,867	16,564
2019	14,610	524	12,142	13,068	15,134
2020	15,644	3,137	13,028	14,268	18,781
2021	16,740	744	13,238	14,552	17,484
2022	17,902	3,370	14,189	15,841	21,272
2023	19,134	991	14,469	16,220	20,125
2024	20,439	3,631	15,495	17,609	24,071
2025	21,823	1,268	15,853	18,094	23,091