INSTITUTE FOR POLICY REFORMS

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Putting Power Back on Track: A Sustainable Resolution to the Energy Crisis

Ashraf M. Hayat

Summary

Despite repeated commitments expressed by governments to resolve the country's energy crisis there has been no improvement in power supply. Successive governments have not come to grips with the sector's deep structural, policy, and governance challenges. They also have not taken the seemingly simpler route of administrative measures to reduce line losses in DISCOs and ease cash flow in the sector.

This is the context of this IPR Report whose objectives are as follows:

- Recommend ways to enhance power supply in the short term
- Propose policies and plans that would place the power sector on a sustainable path of growth

While the report recommends several short and medium term measures to enhance power supply in the country, it determines that probity and rectitude in government decision making is key to having a viable power sector. Weak governance leads to high project cost, revenue loss in the system, and capture of state decision-making by interest groups. Governance improvement is one of the key issues in resolving the power crisis.

Cost of electric shortage is high. NEPRA estimates annual loss at between 2 to 3 percent of GDP. Another study estimates it at a high 5% of GDP. Moodys has warned that power shortage will affect Pakistan's credit worthiness. The power crisis also is a potential source of instability that can exacerbate latent discontent.

The electric power sector suffers from a large number of issues. In addition to weak governance, its incentive structure is flawed, public investment is skewed, and investment cannot recover cost, requiring subsidy for consumers and fiscal incentives for investors. Despite public statements, government does not give energy sector the priority it deserves.

There is a history of power shortage, though in terms of hours of load shedding, the intensity of the present crisis is unprecedented. It began in 2007 when world energy prices increased manifolds. Its genesis lies with

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the power policy of 1994. This policy effectively shifted the main source of power supply from hydropower to thermal energy with concomitant reliance on imported fuel. Increase in energy price in the last two decades meant higher cost per unit (energy prices have declined 50% in recent months). Price increase had a telling effect on the sustainability of the sector. The main objective of 1994 policy was to attract private investment. Currently, 36% of generation is in the private sector, but it came at a high cost for the economy with the government providing large-scale fiscal incentives and guarantees. In addition, it resulted in high reliance on imported energy. Despite current low prices, the country cannot afford the extent to which it depends on imported energy if it is to meet current and future demands. Apart from initially attracting private investment, the 1994 policy did not achieve its declared objectives of resolving power shortage, adding over 50,000 MW capacity, or improving access to electricity. Because of it and continued weak policy, tariff and power shortage both increased.

Already weak, governance worsened during the decade of 1990s and has hardly improved. It manifests itself in high line losses and under recovery of billed amount. Weak governance also reflects in poorly conceived policy and in capture of state decision making by interest groups. Since the 1990s, public power generation has suffered from a lack of attention and transmission and distribution systems have remained weak. High distribution losses deprived the power supply system of cash flows and did not allow capital formation for investment in the system. Skewed priorities in public investment meant growing allocation for roads and not enough for the power sector.

Government's policy response has been inadequate. While the whole power supply chain needs reforms, GOP's focus is entirely on generation and, until recently, on increase in tariff. It has focused on ambitious foreign investment to increase generation. IPR agrees with government's efforts to increase the share of coal in total power generation. Government though must ensure transparency in implementation and on the feasibility of new projects or else they will have the same deleterious effect on the sector as the earlier private projects.

The policy to increase tariff has made electricity unaffordable for low – middle income consumers, affects business competitiveness, and has incentivized poor governance. The elasticity of revenue gains to each unit of tariff increase is 0.6.

Similarly, the approach to circular debt lacks depth. Circular debt is an outcome of governance and policy flaws. One-time payments cannot make it go away without fixing its causes. In

2013, government made a one-time payment to settle it, hoping unreasonably, that the problem would disappear. Since then, it has grown again. In fact, the problem reared in full force in January 2015 in the shape of the petrol crisis. The source of circular debt lies in Government's current tariff and subsidy policy. It encourages distortions and allows inefficiencies. By absorbing all system deficits, it does nothing to improve DISCO performance. On the one hand, circular debt clogs cash flow resulting in production below capacity, and on the other, because of capacity guarantees, government must ultimately pay the amount due with mark-up for power that was never produced.

Government's response to the recent decline in fuel input cost is revealing. This could have been an opportunity to fix the tariff policy. More recently, in a travesty of rational judgment, it is reported to have instructed NEPRA to include an additional 55 billion rupees into consumer tariffs to account for the cost of inefficiencies[1]. It is not clear if NEPRA would follow the instructions.

- IPR recommends that in addition to new generation projects, government can increase power supply by taking immediate action as follows:
- Pay the outstanding tariff differential subsidy and continue to timely liquidate this obligation
- To settle the issue of circular debt, take administrative measures to reduce line losses, under recovery of bills, and charge applicable tariffs. It should also reduce tariff slabs.
- Government must increase gas allocation to the power sector
- Reform the tariff and subsidy policy
- It should immediately divert public funds from roads for early completion of on-going hydro and thermal power projects prioritizing allocation to impact projects for early power generation

In the medium term, for sustainable development of the power sector, it must:

- Plan base load generation based on cost/KWh (prioritize hydro and coal) and solar/wind for off grid. Adopt a least cost approach to sequence projects
- Focus on indigenization, despite present decline in energy prices: expand hydropower, develop Thar resources, explore shale potential, and increase solar and wind generation. It should have a special policy for small-scale hydro production in the private sector:
    - It should create a dedicated window for financing of private power
    - Create a private energy support fund with Rs. 157 B Special Development Fund (from the Kingdom of Saudi Arabia) as seed
- Seek international support for the fund. In addition to traditional multilateral sources, tap into China's Asian Infrastructure Investment Bank, WB Global Infrastructure Facility, G 20 Global Infrastructure Hub, and risk mitigation through MIGA
- Begin in earnest an energy conservation programme

A Table is attached.

Table of Recommendations

I. Short-term relief				
	Activity		**Responsibility**	**Implication**
1	Improve governance in government owned generation, transmission, and distribution		GOP	
	I	Reduce line losses by 50%	GOP PEPCO, DISCOs	Improve cash flow, reduce circular debt to increase generation, and allow capital formation, and increase capital formation
	II	Reduce under recovery of billed amount	--do--	
	III	Charge applicable tariff rates		
	IV	Create holding company for DISCOs	GOP	
	V	Set up Summary Courts	GOP	
	VI	Consider technology for tracking power use	GOP PEPCO, esp. DISCOs	
	VII	Stipulate time or amount ceilings for disconnection of supply	GOP PEPCO, esp. DISCOs	
2	Reduce tariff slabs and increase peak off-peak difference		GOP, NEPRA	
	I	Reduce tariff slabs	GOP, NEPRA	Reduce DISCO losses
	II	Increase peak off-peak differential	--do--	Conserve energy and manage demand
3	Increase gas allocation for power		GOP	i. Reduce unit cost and total power cost ii. Reduce subsidy and circular debt
4	Retire circular debt and pay TDS in time		MOF, GOP	i. Increase generation ii. preclude invoking of guarantees by IPPs
5	Subsidy policy must incentivize efficiency and make DISCOs accountable for live losses.		MOF, NEPRA	Increase generation
6	Provide duty drawback to export industry		GOP	Increase exports
II. Short to medium-term				
1	Public Investment			
	I	Divert PSDP to power from other sectors	GOP	Quick addition to generation capacity Rehab reduces capital cost Lower unit cost from hydro Hydro helps with indigenization
	II	Invest in prioritized GENCOs and in hydropower	GOP, PEPCO, WAPDA	
2	Increase Investment in Transmission and Distribution		GOP, PEPCO, NTDC, DISCO	
	I	Prioritize transmission projects		Realize benefits from completed projects, Build reliability
	II	Prioritize distribution projects		--do--

3	Address structural issues		GOP/NEPRA/NTDC	
	I	Begin competitive trading of power	NTDC / NEPRA	Increase efficiency in generation
	II	Resolve NTDC-IPPs disputes	Ministry / NEPRA	Improve environment
	III	Privatize GENCOs	Ministry	Increase efficiency
	IV	Give on lease or privatize loss making DISCOs	Ministry	Increase efficiency, reduce losses
4.	Strengthen NEPRA capacity before privatization		Ministry	Effective management of sector
III. Sustainable development of the sector in the medium term				
1	Demand Estimate		Planning Commission, M/O W&P	Logical development of sector
2	I	Plan base load generation on the basis of cost/KWh (prioritize hydro and coal) and alternative for off grid	Ministry of Water and Power	Sustainable development
	II	Least Cost Generation approach to sequence projects		
3	Indigenization		GOP, GOS	Increase reliable fuel supply, reduce cost
	I	Expand hydropower capacity	GOP, WAPDA	
	II	Develop Thar resources Establish reliable estimate of reserves Develop infrastructure Concession management	GOS, Thar Coal Development Board	Reduce import dependence
	III	Explore shale oil and gas	GOP, M/OPetroleum	Reduce import dependence
	IV	Increase solar and wind	GOP, M/O W&P, Alternate Energy Development Board	• Increase access to electricity, especially for off-grid consumers • Reduce import dependence
	V	Special policy for small private hydro power projects	PPIB	
4	Energy Efficiency and Conservation			
	I	Raise awareness		• Manage demand • Increase affordability and competitiveness • Improve environment
	II	Parliament to pass law		
	III	Government to issue rules for transport and building		
	IV	Government to begun rating of appliances		
	V	Have some incentive for consumers		
	VI	Increase difference between peak and off-peak tariff		
5	Financing of power sector			
	I	Create a private energy support fund with Rs. 157 B from SDF as initial	GOP, MOF	Assist financial close of private projects to meet with investment gap
	II	Prepare a plan for private participation in power	GOP, M/O W&P	Ensure least cost
	III	Seek international support for the fund	GOP, MOF, EAD	External finance to help meet investment needs

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1

Introduction

Putting Power Back on Track: A Sustainable Resolution to the Energy Crisis

Introduction

If good intentions were the same as fulfillment, Pakistan's energy crisis would not have occurred. In 2007, a senior Pakistan government officer declared that Pakistan would be "a new energy hub for the region."[2] In the same document, another senior officer said that in the near term gas imports from Central Asia and the Gulf would help bridge the country's fuel supply gap while it develops the large coal deposits in Sindh[3]. Later, he estimated investment needs in the sector to amount to fifty five billion dollars until 2015[4]. Investment since then has not touched ten percent of that rosy forecast though good intentions have flourished. A newly elected government in 2008 stated that load shedding would end December 2009. We all know what happened. The energy crisis in Pakistan does not exist for want of good intentions. It exists despite it.

The crisis does not continue for want of international support either. For decades, Pakistan has had multilateral and bilateral donor support. Pakistan's 1994 policy had substantial inputs from international institutions and financial support from them and many bilateral agencies. In 2006, during a visit to Pakistan, the US President announced a USA-Pakistan Energy Working Group[5]. A number of meetings were held. In 2010, the sector became a key component in the bilateral Pakistan US strategic dialogue. In 2010 also, the Friends of Democratic Pakistan set up a Task Force on Energy[6]. Electric power has received major pledges in the Country Strategy documents of the World

Bank and the Asian Development Bank[7]. There is reason to reflect if such support has helped create a coordinated and integrated strategy consistent with the country's institutional capacity to formulate policy and implement programmes. It is moot too if external support was always in line with the sector's long-term sustainability.

Nor does the crisis exist for want of analyses and knowing what are the issues affecting the sector. All manner of studies exist that give short and long-term solutions, estimate investment needs, give views on fuel mix as well as on fuel supply sources, provide guidance on load management and on energy conservation. Forecasts of supply and demand with sensitivity to GDP growth, pricing issues, proven and potential energy reserves, and the logistics of moving them have been cut and sliced in every way possible. There is sufficient amount of knowledge about the extent of arrears and receivables from government that clog the system, popularly known as the circular debt, as well as what power distribution companies fail to recover from their customers.

It was clear as far back as 2004 that power shortage would occur from 2007 if nothing were done. High GDP growth rates coupled with stalled investment showed when the supply and demand curves would intersect. The crisis received stimulus from the unexpected surge in the price of oil. An international financial crisis followed and affected investment decisions. All this occurred in a year when general elections were to take place in Pakistan and the government not ready to pass the cost of high energy to the consumers.

GoP Planning Commission's Medium-Term Development Framework 2005-2010, forecast shortage to begin during the plan period[8]. There has been a profusion of studies since. Presciently, in 2006, a well-known US think tank studied the sector in a document and conference titled 'Fueling the Future'[9]. The Friends of Democratic Pakistan Energy Sector Task Force issued the Integrated Energy Sector Recovery Report and Plan in 2010[10]. In 2011, the Planning Commission issued the Integrated Energy Model, and in 2013 it studied the causes and structure of the circular debt[11]. Also in 2011, Pakistan's National Transmission and Dispatch Company prepared the National Power System Expansion Plan 2011-2030 Report. There are a series of studies by the Planning Commission's Pakistan Institute of Development Economics on the many aspects of the energy sector and by many other public and private academic institutions.

Meanwhile, there has been little relief for the consumers of power in the country. Since the crisis began in 2007, power tariffs have increased with no visible change in the quantity and quality of energy service for consumers (see Table 15). IPR analysis shows that the energy crisis continues partly because of the intractability of the problem, but also because of inability of successive governments to reform and come to grips with the complex interplay among policies, resource allocation, regulatory and governance issues that affect the sector. The plethora of studies and advice from within and outside the country (in the case of donors, they sometimes come as conditions for disbursement) seems to have stymied decision-making. GoP's policy ecosystem has created a patchwork of responses, without addressing systemic issues. Governments have yet to show leadership and capacity to identify issues, develop and implement a coordinated strategy, prioritize action, and manage the sector in a sustainable way. The enormous task before the government is to develop policies and incentives, reform regulations and governance, and allocate resources effectively to bring the sector back on track.

The energy crisis did not happen because of the rise in oil prices alone. The price increase and

the ensuing chain of events that led to the energy crisis in Pakistan, from 2007, showed the deep policy and governance fissures that existed already. There was also the challenge of managing a politically sensitive issue. Endemic high line losses and a shift in the 1990s to dependence on costly fuel required continuous increase in tariff as oil prices rose internationally. Inability to recover costs choked the power supply system, on the one hand, and discouraged investments, on the other. Successive governments avoided the difficult structural issues that hobbled the sector. The single dimensional response to increase tariff, often on the promptings of international donors, has not shown results.

1.1 Objectives

The two-fold objectives of this IPR report are:

- To analyze and recommend ways to enhance power supply in the short term
- To examine structural issues of the power sector and propose policies and plans that would place it on a sustainable path of development so that it becomes a vehicle for economic growth.

In order to do so, this report will review:

- Holistically, the issues that impair power supply
- The system wide policy environment of the power sector and how they incentivize behaviour
- Measures to increase energy supply within present system capacity in generation and transmission
- The fuel mix alternatives and their effect on costs and power supply
- Management and technical structure for possible system efficiencies and sector viability
- Ways for elimination of circular debt to lubricate the power supply chain

How is this report different from myriad others? IPR finds two clear differences:

- The Report's analyses rely on IPR experts with practical experience of the energy sector and of policymaking and implementation at senior government levels. IPR also has the expertise to view solutions to this crisis in the perspective of economic conditions and governance structure. In essence, this report combines available data and analyses, and findings of existing literature with the experience of experts. It does not look at ideal solutions, but practical, operational, and achievable ones.
- The report takes a systemic view of electric power supply with a view to finding an exit from the current impasse in the near term. It also takes a holistic look at the long-term sustainability of the sector. In doing so, it does not propose textbook solutions, but realistically, optimizes among conflicting needs of consumers, producers, and retailers of electric power. It keeps in mind, also, the institutional capacity of policy and decision makers, and of on-ground executives. It does not have a formulaic approach 'to privatize this or unbundle-centralize that'. Its recommendations rely on what the decision and delivery mechanisms can bear.

IPR acknowledges government's efforts to address the issue of power supply. Our purpose is to help the government in its effort to revive the energy sector. This report analyzes issues affecting electric power at each stage of the supply chain, provides data about power shortage and its implication, and reviews present financial viability (or otherwise) of the power sector. It analyzes also the policy, regulatory, and governance mechanism that support or limit the sector's potential to serve as a catalyst for economic growth.

Pakistan's power sector has never been without challenges. Supply has often trailed demand and a large part of the country's population has had no access to electricity. The present crisis is a different take on a long enduring challenge. It began in 2007, and led to unprecedented shortages that affect economic growth. In addition to the inconvenience to citizens, its new incarnation has touched a broad area of economic activity in most parts of the country. Today, it is a critical issue for the country's economic revival and stability. It has already sparked protests and is known to exacerbate latent discontent[12].

1.2 Economic Cost of Power Shortage

Power shortage comes at high economic cost. Lack of energy supply has limited the industry's ability to operate to capacity, has inconvenienced citizens, and stymied growth altogether. The literature refers to energy shortage variously as 'the largest single drain on Pakistan's economy' and as a 'key impediment to growth'.

Estimates of loss on GDP growth vary. NEPRA estimates 'the power sector is responsible for 2 to 3% in annual GDP'[13]. Citing sources, a Lahore Journal of Economics article estimates 37% loss in industrial output[14]. NEPRA estimates a loss in industrial output of 210 billion rupees (but does not say for which period)[15].

Table 1
Cost of Power Outages

Billion Rupees

Methodology	**Cost**	**Remarks**
Simple Value Added Approach	1,600	7% of GDP Estimate based on high cost per KWh
Adjusted Value Added Approach	463	A conservative estimate
Difference between projected GDP with no load shedding and actual GDP (2011-12)	1,000	The study considers this a credible estimate
Consumer Surplus Approach (2011-12)	1,000	

Source: Institute of Public Policy; Beaconhouse National University Load Shedding Part1 Page 24-26

A study by the Institute of Public Policy, Beaconhouse National University, Lahore, gives a range of cost to the economy from power outages[16]. It bases loss estimates on three approaches. Resultantly, loss to GDP from power outages range from a low estimate of 463 billion rupees to a high of 1.6

trillion rupees. Their range of loss estimates are in Table 1below. The IPP study considers its medium estimate of one trillion rupees for fiscal 2012-13 as realistic. This amount is about 5% of GDP.

Another study estimates the effect of power shortage on industrial output. In 2011, PIDE surveyed and analyzed evidence in 'selected industrial cities of Pakistan'[17]. Three hundred and thirty nine firms were surveyed in nine industry groups. Tables 2 to 5 summarize the survey's findings. PIDE conducted the survey in 2008 and 2009 to determine the effect of electricity shortage along a number of indicators.

Loss in Output by Value

Table 2 gives the aggregate loss in billion rupees for all nine surveyed industries in Pakistan. Because of their size in the economy, food and beverages, and textiles top the list of industry with the highest loss in output. The survey shows that loss to output increases where the firm operates on eight hours shifts and load shedding takes place throughout the year. This is the high estimate of 820 Billion Rupees. Losses decline when firms operate on twelve-hour shifts and load shedding takes place during six months only. This is the low estimate of 270 Billion Rupees. Most firms though suffer round the year load shedding.

Table 2
Loss in Output by Value

Billion Rupees

	High Estimate	**Low Estimate**	**Comments**
Total for the nine industries	820	270	Load management and a predictable load shedding schedule in consultation with industry reduces impact
Food & Beverages	264	87	
Textiles	227	75	

Source: PIDE Islamabad, The Cost of Unserved Energy, PIDE working paper 75,2011

Loss as Percentage of Total Annual Output

Table 3 gives the value of the loss from power shortage as a percentage of annual output. Ceramic, Wood and Furniture, and Plastic are those industries whose absolute loss values are not high, but have the highest percentage loss as compared to total annual output of the industry. Losses in the export industries of textile and leather were 22% and 26% respectively.

Table 3 Loss as Percentage of Total Annual Output		Percentage
Industry	**High Estimate**	**Low Estimate**
Ceramic and Pottery	55	22
Wood and Furniture	49	16
Rubber and Plastic	46	15
Food and Beverages	44	14
Machinery	43	14
Leather and Products	26	9
Textiles	22	7
Source: PIDE Islamabad, The Cost of Unserved Energy, PIDE working paper 75,2011		

Labour Hours Lost per Day by Industry

Table 4 gives the labor hours lost per day because of load shedding. Among export industries, 54% of all textile firms and 39% of leather and leather goods firms suffer losses of three labour hours or more per day. Among the nine surveyed industries, ceramic suffered the most at 64% of total firms. Losses affected also demand for labour.

Table 4 Labour Hours Loss per Day by Industry				% of firms surveye
Industry	**3 to 5 Hours**	**5 to 8 Hours**	**Above 8 Hours**	**% of firms over 3 hours/day**
Average for nine industries	27	20	5	52
Food & Beverages	20	28	8	56
Textiles	17	32	5	54
Leather and Products	35	0	4	39
Wood and Furniture	37	21	5	63
Rubber and Plastic	41	14	5	60
Pottery and Ceramic	38	13	13	64
Source: PIDE Islamabad, The Cost of Unserved Energy, PIDE working paper 75,2011				

Delays in Supply Orders

Of all firms surveyed, on an average 69% of the firms had to delay supply orders. Among export-

oriented industries, supply orders were delayed in 68% of textile firms and 62% of leather and leather goods firms.

Tables in this section have been adapted from a PIDE Working Paper[18].

Literature on the subject is clear. Electric power insecurity affects firm productivity, increases production cost, and investment decisions. One study examined the effect on firm productivity from blackouts in the Peoples' Republic of China. The study surveyed 32,000 energy intensive firms in China during the years 1999 to 2004.It found that firms re-allocated resources among factors and moved to buying or outsourcing intermediate goods.

This significantly increased production cost. Costs rose by up to 20% primarily because of outsourcing inputs[19]. Another study finds that the effect may be marginal and inconclusive[20].Electricity insecurity increases poverty also and affects low-income families in areas such as food insecurity and health[21]. Overall, this issue is important for any government to address fully.

Table 5
Delays in Supply Orders

Industry	Percentage of Firms
Nine Industry Average	69
Food and Beverages	58
Textiles	68
Leather and Products	62
Wood and Furniture	72
Chemical	64
Rubber and Plastic	68
Ceramic and Pottery	71
Iron and Metal	71
Machinery	82

Source: PIDE Islamabad, The Cost of Unserved Energy, PIDE working paper 75,2011

This paper now reviews the present structure of the electric supply sector and major trends.

2

Structure of the Electric Power Sector

Structure of the Electric Power Sector

A review of the structure and trend of Pakistan's electric power sector since the crisis began in 2007 makes a few facts evident:

- Despite continuous attention at the highest level, the structure, capacity, and efficiency of the power sector has not changed since the crisis began
- Cost of power generation is high and has increased continuously since 2007 (except for recent decline) because of reliance on thermal power production (which began in the 1990s)
- Within thermal power, generation from furnace oil has increased at the expense of gas with concomitantly high production cost
- The country has not done enough to increase domestic energy supply. It continues to rely on imports. Allocation of domestic energy has been inefficient
- Public investment in hydropower generation and in improving transmission and distribution efficiencies has been below requirement
- Public investment to increase efficiency of state owned power generation units has been inadequate
- Government has not focused sufficiently to improve governance and efficiency in generation, transmission, and distribution of electric power or in recovery of bills
- Deep policy and incentives flaws have skewed generation and consumption of energy and electric power, which successive governments have not addressed

2.1 Installed Capacity and Energy Mix

Electric power generation capacity has been slow to increase since the current crisis began in 2007. Average per annum increase between 2007 and 2013 is less than 2%[22]. Table 6 below summarizes installed capacity and annual power generation in the country.

Generation capacity increased in the decade of 1990s largely because of the IPP policy. Most of the increase was in thermal power. While capacity grew by 126% during the decade, electricity generation grew at a lower rate of 74%.

Table 6
Installed Capacity and Generation Trend

MW/GWh/KWh

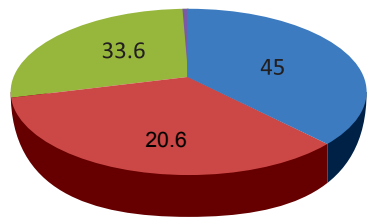
	1990	2000	2007	2010	2013
Total[23]	7,727	17,458	20,232	21,614	23,664
Hydro	3,477	4,826	6,555	6,555	6,826
Thermal	-	12,169	13,215	14,597	16,000
Nuclear	-	462	462	462	787
Generation GWh	36,348	63,400	90,802	100,582	98.894
Energy Consumed GWh	30,540	46,854	72,199	73,561	75,926
Energy/Capita KWh[24]	277	357	470	450	??
Distribution Losses %	20.7	24.29	19.44	18	17

Source: Database of Energy Information Administration, US Government, NEPRA State of Industry Report 2013, Pakistan Economic Survey, Ministry of Finance, Chapter on Energy.

Generation increase flowed over to the next decade when capacity increased by 16% only while energy production grew by 43%. Distribution losses increased significantly during the decade of 1990s. More research would determine the reasons, but this likely happened because of a large jump in tariffs (see Table 7), and possible decline in governance. Also, investment in transmission and distribution did not keep pace with investment in generation. Distribution losses declined in the next decade, but remain high.

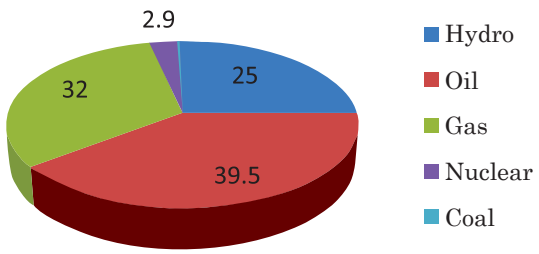
For a primary energy deficit country, Pakistan's electric power sector is structured to flounder. Because of thermal power's share in generation, reliance on imported fossil fuel is high. This change in structure began in the middle nineteen nineties when private power production increased. In 1990, share of hydropower in total power production was 45%. Its share declined to 25%by 2000. See Figure 1.

Figure 1
Share of hydro and thermal power production year 1990



Source: World Bank Indicators, Pakistan, Energy Production, and Use http://www.tradingeconomics.com/pakistan/energy-production-kt-of-oil-equivalent-wb-data.html

Figure 1 A
Share of hydro and thermal power production year 2000

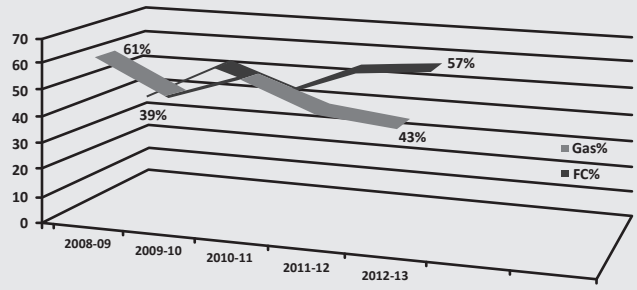


Source: World Bank Indicators, Pakistan, Energy Production, and Use http://www.tradingeconomics.com/pakistan/energy-production-kt-of-oil-equivalent-wb-data.html

consumption of primary energy in Pakistan is 40 MTOE (2011-12 data)[25]. With increase in the share of thermal power, dependence on imported energy has increased. In 2013, Pakistan imported 85% of its oil and oil product needs[26]. Production cost is resultantly high. Diversion of gas from electric power to other uses further increases cost and puts pressure on foreign exchange. Counter intuitively, since the crisis began, there is a shift in fuel supply for power generation from gas to furnace oil (Figure 2).

Figure 2
Share of Gas and Furnace Oil in Thermal Power Generation

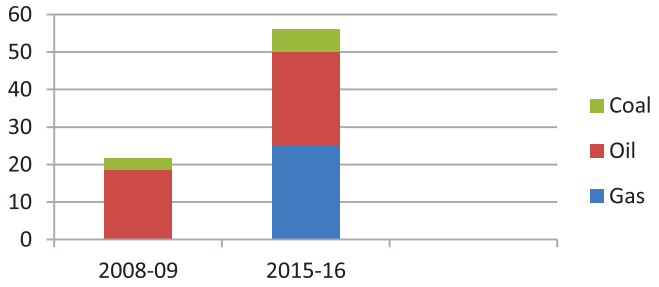
% of Total



Source: IPR Research

The above ADP Report states that if nothing is done to increase indigenous energy sources, the deficit will continue to rise. In 2008-09, Pakistan's oil import was 18.5 million tons oil equivalent of energy (TOE) and coal imports of 3 MTOE[27].Total cost of import was USD 10 Billion. The Report projects the deficit to climb to 56 MTOEs by 2016 (Figure 3)[28]. Regardless of the accuracy of forecast, the trend in deficit is clear, especially if the government maintains its single dimension strategy of meeting the supply gap through higher thermal production. Clearly, this is an unsustainable model for Pakistan to follow. Pakistan has underinvested in hydropower, its traditional source of electric power. Its allocation of natural gas among electric power, fertilizer, vehicle use, and domestic consumption, is inefficient. Its effort to tap into new domestic energy sources lingers.

Figure 3
Pakistan's Primary Energy Deficit



Source: Integrated Energy Recovery Report and Plan 2010, page 2

Box 1
The curious case of China's coal fired power plants

As a policy, IPR supports introduction of coal in the generation mix. Its low price, declining of late, merit early inclusion. It is important though to learn from the past. China's coal fired plant is a case in point. The arrangement lacks transparency. Ideally, private power investment opportunities must run through the process of public offer and bidding, even if other bidders were hard to attract. From NEPRA's tariff determination, we observe the unusual practice of ROE during construction, which when included takes guaranteed return on investment to between 25 and 27%. That is why transparency is important. At current tariffs, the country must have the means to pay an annual bill of 4.77 billion USD. IPR estimates that reduced coal price will lower tariff by 2 cents/KWh. Even if prices do not rise again, the annual remittance will be a high 3,614 Million USD.IPR has the numbers.

Assumptions

Capacity: 220 MW
Cost: 331 Million $ by NEPRA, 374 Million $ by IPR, Exchange Rate: 102.5 Rs/$
ROE: 27%, Cost of debt financing 7%
Tariff estimate by IPR varies from NEPRA determination because of change in exchange rate and higher mark-up.

Tariffs in Cents per KWh			
	NEPRA	**IPR at past coal price**	**At current prices**
Energy purchase price	**5.10**	**4.87**	**2.87**
Fuel component	4.66	4.43*	2.43
Other costs	0.44	0.44	0.44
Capacity Purchase Price	**3.65**	**4.50**	**4.50**
Amortization	1.81	2.09*	2.09
RoE	1.16	1.73*	1.73
Fixed O&M + Others	0.68	0.68	0.68
Upfront tariff C/KWh	**8.75**	**9.37**	**7.37**
Tariff Rs/KWh	**8.58**	**9.60**	7.55
Internal transport of Coal C/KWh	2.00	2.00	2.00
Punjab plants	**10.75**	**11.37**	9.37
Tariff Rs/KWh	**10.44**	**11.65**	9.60

Import bill for coal: 4.77 billion $ annually based on 6,600 MW generating 57.8 GWh
Fuel= 57816 x 4.43/100 = 2,561
Amortization= 57,816 x2.09/100 = 1,208
RoE = 57,816 x 1.73/100 = 1000
Total USD/annum: 4,770 Million

At present coal price:

Fuel = 57,816 x 2.43 = 1,405
Total USD/annum 3,614 Million

The above does not include environmental costs

As cost recovery has been an issue in Pakistan, each unit consumed requires government subsidy. Coupled with distribution losses, under recovery of bills, and inefficiencies, circular debt increased and the system of power production and distribution was strained. The country's current electric power structure has limited the economy's ability to respond to the crisis.

Peak hour gap between supply and demand continues to defy all efforts (Table 7).

Table 7
Gap between supply and demand during peak hours

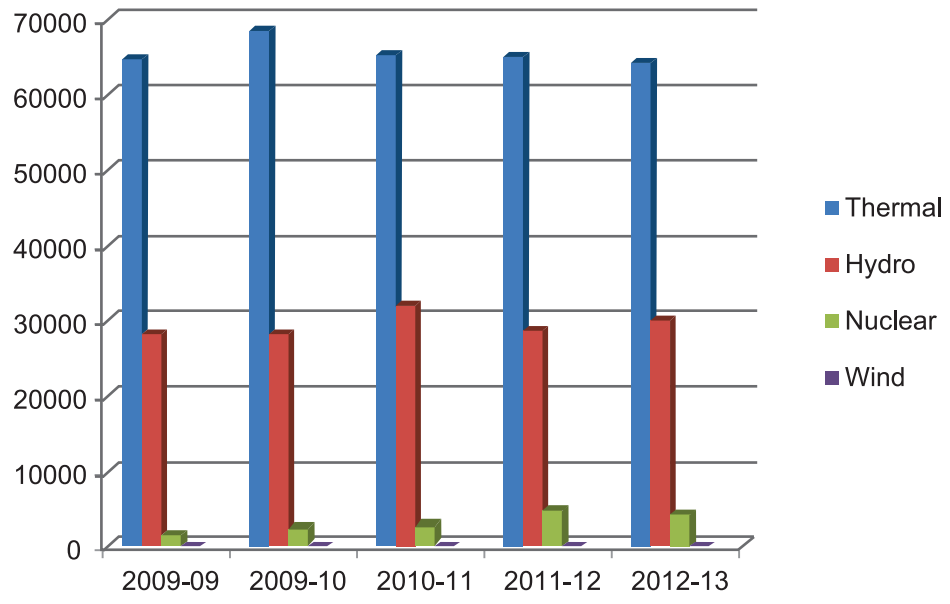
MW

	2009	2010	2011	2012	2013	2014*
Generation capability	16040	15144	15430	14483	15823	24087
Demand during peak hours	20314	21029	21086	21536	21605	28745
Gap	4274	5885	5656	7053	5782	4658

Source: NEPRA State of the Industry Report 2013, Tables 26 & 27 Page 82 *2014 Projected

Since the crisis began in 2007 the profile of power generation has remained unchanged largely. Power generation capacity too has not changed much.

Figure 4
Generation by type



Until the 1990s, WAPDA was an integrated power organization, with generation, transmission, and distribution all over Pakistan, except Karachi. Since private power production began, electric power production takes place among public and private sectors. Government generation companies (GENCOs) comprise 20% of installed capacity and 13% of generation. Most state owned thermal power producers operate under the umbrella of government's Pakistan Electric Power Company (PEPCO). PEPCO is also

the holding company for all DISCOs (except K Electric) the retail end of the power supply chain. It also transmits power from generation to distribution through the subsidiary National Transmission and Despatch Company (NTDC) and buys power for transmission to distribution companies through CPPAs (Central Power Purchase Agreements).

Private producers of thermal power (IPPs) have 36% share of installed capacity and 41% of production. A small group of captive and special producers of thermal power has an installed capacity of about 1%. Their production is dedicated for specific purpose and do not always add to the national grid.

The installed capacity of hydropower is 29%, which, in 2013, generated 30% of total production. Hydropower generation is mostly state owned. Nuclear power contributes 4% to total power production with an installed capacity of 787 MW. The emerging wind power generation is yet too small to make an impact though with high potential

Table 8
Share in Electric Power Generation

Type	Installed Capacity 2013 MW	% Share	Generation 2013 GWh	% Share
Thermal	**16,000**	**67.6**	**64,274**	**64.9**
GENCOs	4,720	19.9	13,235	13.4
IPPs	8,575	36.2	41,177	41.6
CPP/SPPs	324	1.3	1,255	1.3
K-Electric	2,381	10.0	8,567	8.7
Hydro	**6,826**	**28.8**	**30,032**	**30.4**
WAPDA	6,612	27.9	29,326	29.6
IPPs	214	0.9	706	0.7
Nuclear	**787**	**3.3**	**4,181**	**4.2**
Wind	**50**	**0.2**	**32**	
Import			375	0.3
Total	**23,663**		**98,894**	

Source: NEPRA SOI 2013

Because of higher share in generation, on surface, IPPs appear to be efficient producers compared to GENCOs. IPP plants are newer than GENCOs and can produce more (please see GENCO efficiency discussion in chapter 3, Table 17). Table 9 shows that for each fuel source, their cost of generation is higher than that of GENCOs. This does not imply that the average cost of production by GENCOs is lower than that of IPPs. That depends on fuel mix between gas, RFO, and HSD and loss in efficiency (NEPRA also recounts governance issues).

Table 9 Cost of Generation per Unit	
	2012-13 Rs./KWh
Thermal IPPs Gas Oil	 6.67 20.93
Thermal GENCOs Gas Oil Coal	 5.95 18.06 3.46
KESC Gas Oil	 4.42 17.26
Hydro	1.5
Nuclear	1.35
Import from Iran	9.8
Source: NEPRA State of Industry Report 2013, Table 13 Page 62 for GENCOs, Table 16 Pages 66 and 67, weighted average for IPPS, Table 15 Page 65 for K-Electric (derived), hydro cost from NTDC's National Power System Expansion Plan, Chapter 9, Page 14. 2011	

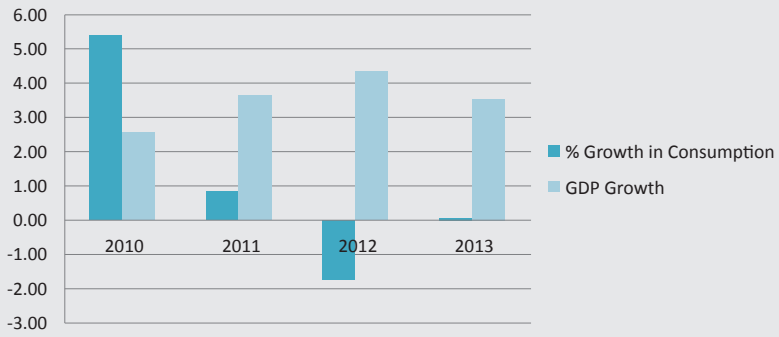
With demand suppressed because of supply constraints, consumption is a function of production. Earlier studies determine growth in energy use by a coefficient of 1.25 to each percent of GDP increase. Yet the comparison in Table 10 shows almost no relationship. This perhaps indicates firm level decisions to find solutions through outsourcing inputs or reliance on alternate energy sources. Part of the lack of pattern may be because of line losses, where power is consumed, but not counted.

Table 10 Growth in GDP and Power Consumption					
	2008-09	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Electricity Consumption GWh	74,674	78,768	81,760	81,436	80,295
Electricity Consumption Growth Rate %[29]	-2.90	5.48	3.80	-0.40	-1.40
GDP growth rate %	0.4	2.6	3.7	4.4	3.6
Source: NEPRA State of Industry Report, Tables and Economic Survey of Pakistan					

The contents of this report rely on government published data. Sometimes numbers do not add up. For example, Pakistan's GDP growth during the five years 2008-09 to 2012-13 has increased by a cumulative 15%, but power generation has increased by as little as 4% over the same period. Pakistan's GDP at factor cost in 2008-09 was 8.6 trillion rupees. It increased to 9.9 trillion rupees for fiscal 2012-13 an increase of 15%. During the same period, electricity generation increased from 94,647 GWh in 2008-09 to 98,894 GWh in 2012-13 an increase of 4.5%. If the elasticity between power consumption and GDP growth rate is 1.25 the numbers above show the opposite picture.

Even if elasticity is a unity, there is 10.5% less production of power than the GDP increase would suggest. One of a number of explanations that come to mind is line losses i.e. power that goes into the economy, but is not counted. Part of this gap could be from increase in off grid, self-generation power capacity though it is unlikely that that alone is the reason. It may also indicate that some assumptions used by government for GDP estimates are not supported by facts. Inevitably, Figure 5 shows an unstable relationship between GDP growth rates and growth in power production.

Figure 5
Growth of the Economy & Electrical Generation 2010-2013



Source: NEPRA State of the Industry Report 2013, Table 29, Page 87 for electricity generation data, Economic Survey of Pakistan 2012-13, Table 1.1, Statistical Appendices, Ministry of Finance for GDP

2.2 Consumption Pattern

Consumption by economic groups for the year 2013 shows a structural bias in favour of domestic use over the economically more efficient industrial, agriculture, or commercial use. Figure 6 gives the weighted distribution of consumption by economic groups. Table 11 gives the distribution by number of connections. One development of concern is the decline in per-connection power use in the PEPCO system.

Figure 6
Percentage share in total consumption weighted

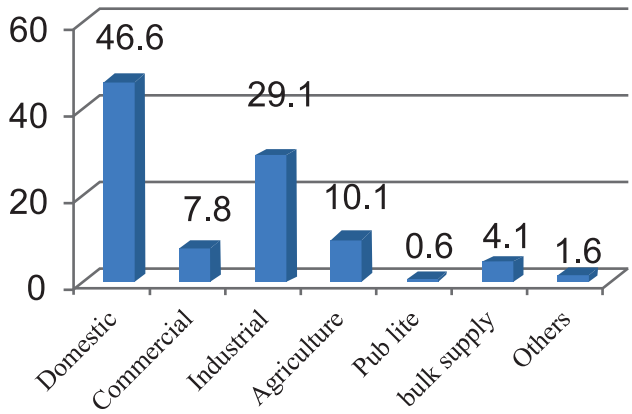


Table 11 No of Connections with usage					
Consumption Group	**Number of Connections 2013**	**% of total connections**	**KWh/Connection 2008-09**	**KWh/Connection 2012-13**	**Rs/KWh**
Domestic	18,712,907	85.5	1750	1621	11.22
Industrial	296,842	1.4	63,3611	62,781	12.30
Agriculture	301,115	1.4	33,650	25,067	11.29
Commercial	2,550,781	11.7	1,835	1,738	12.30
Public lighting	8.927	0.04	45,313	44,271	13.44
Bulk Supply	4,233	--	816,970	622,921	13.26
Others	795	--	55,635	1,264,311	
Total	21,875,600	100	3,227	2,971	11.15
Source: NEPRA State of the Industry Report 2013 Tables 58 and 62					

Performance of distribution companies has not helped the crisis. Money received from sales sustains the electric power supply chain and brings return on investment in generation, transmission, and distribution. An important cause of financial un-sustainability is DISCO performance. So far, this issue has refused to go away. As Table 6 shows line losses (difference between units purchased, but not billed) already high in 1990 increased during that decade. It declined somewhat in the decade of 2000s, but remains high. There are other reasons too that contribute to DISCO losses. Their revenue suffers also from under recovery of billed amount. Recovery rates at QESCO and SEPCO are particularly low. The difference among DISCOs for rates charged from consumers, and especially for domestic users, is another source of revenue loss. K-Electric and TESCO charge domestic users an average of 11.22 and 11.47 Rs/KWh respectively, while GEPCO, FESCO, and MEPCO charge almost three rupees less per unit. With sales measured in billions of units, the loss of one rupee per unit sold is in billions. Table 12 gives absolute and percentage line losses. It provides also data on short recovery from billed amount.

Financial loss at the distribution stage has three components:

- Units sold are far below units purchased.Commonly referred to as line losses, theaverage for DISCOs is 21.72%. This is significantly more than what technical causes would justify.

- In addition to above, billed amount do not all get recovered (the difference between amount billed and amount received). The average for DISCOs is 10.4% (the inverse number of 89.6% in Col 7). This increases the combined loss to 32.12% for fiscal 2012-13

- Further to above, average rates that DISCOs apply to the billed amount for each unit of electricity vary greatly among them. While K Electric charged an average of 12.98 Rs/KWh in 2012-13, DISCOs charge much less. The rates range between 9.44 for QESCO to

12.14 Rs/KWh. The consumer base is not the same for all DISCOs. However, the difference in consumption pattern does not justify the wide variance. FESCO, one of the better run DISCOs in terms of line losses and bill recovery, cannot have a consumer profile too different from K Electric and yet the difference in average rate is Rs 1.85/KWh. FESCO sells 8,586 GWh of power. This rate differential could be to hide line losses or to benefit end consumer by charging rates in a lower slab.

Table 12
Loss by Distribution Companies 2012-13

	Total Units Purchased GWh T	Total Units Sold GWh	Units lost GWh %	Total Amount Billed Million Rs	Total Amount Received Million Rs	% Recovery	Rs./KWh Average	Rs./KWh Domes-tic
PESCO	10,814	7,162	3,730, 33.22%	71,749	60,752	84.7	10.02	8.65
TESCO	1,643	1,294	349 21.49%	15,024	17,944	119.4	11.61	11.47
IESCO	8,573	7,763	810 9.45%	84,125	79,447	94.4	10.83	9.13
GEPCO	6,633	5,920	713 10.75%	63,705	62,588	98.2	10.76	8.28
LESCO	16,458	14,285	2,173 13.21%	163,866	160,341	97.8	11.47	9.79
FESCO	9,622	8,586	1,036 10.76%	95,606	94,711	99.1	11.13	8.62
MEPCO	14,660	9,913	4,747 32.38%	107,932	99,035	91.8	10.88	8.07
HESCO	4,850	3,524	1,326 27.33%	33,944	27,560	81.2	9.63	6.00
SEPCO	4,506	2,726	1,780 39.5%	33,023	17,673	53.5	12.11	10.42
QESCO	4,681	3,812	869 18.57%	36,007	11,461	31.8	9.44	9.14
Total DISCO	**82,440**	**64,535**	**17,533 21.72%**	**704,981**	**631,512**	**89.6**	**10.92**	10.60
KESC	15,824	10,942	4,882 30.85%	142,063	120.560	84.9	12.98	11.22
Total	**98,264**	**75,927**	**22,415 22.81%**	**847,044**	**752,072**	**88.8**	**11.15**	10.71

Source: NEPRA State of Industry Report 2013, Tables 59, 60, and 61 Pages128 to 133

Overall, the PEPCO system despatches 82,440 GWh to DISCOs (not including K Electric). At the distribution stage, total loss incurred is the sum of above three components. The total for the DISCO system is 21.72% line loss and 10.4% less recovery.

2.3 Circular Debt

A major constraint to a sustainable power sector is the circular debt. It is now endemic to the supply chain of power. Circular debt breaks flow of funds among parts of the power sector, where each stage owes money to the one immediately upstream resulting in the end with the inability to buy fuel for power generation. Circular debt has grown as price of oil stayed high (until recent decline) and as issues affecting each stage of the sector gained intensity and became ever more complex.

Circular debt, at present, hovers over 300 billion Rupees and may be touching 400 billion[30].Circular debt is caused by a combination of factors and has kept rising for several years. It has become one of the causes for the power sector's diminished performance[31]. Circular debt grew rapidly during the years that oil prices increased. Its growth would likely slow with declining prices in world oil prices. They would not go way altogether though as there are other factors that contribute, which need to be addressed by government. NEPRA gives a breakdown of the circular debt for recent years[32]:

Table 13
Growth in Circular Debt

Billion Rs

Primary Cause	**2008**	**2012**
Brought forward from previous year	145	538
Non-collection	53	101
Delay in determination and notification of tariff	--	72
Fuel price adjustment	--	33
Difference between DISCOs claims and disbursement	(36)	106
DISCOs line losses higher than NEPRA permitted	--	23
Total circular debt	161	872

3

Slippery Slope

Slippery Slope: How policy and incentives affect the electric power sector

In June 2013, the government estimated an increase of 1700 MW in power supply, resulting from settling, in most part, the outstanding circular debt. IPR is not troubled that government's estimate was significantly above what it should have been. Supply may have spiked, by 700 MW at best, and inevitably slipped again. The worrying fact is that government considered that a one-time reduction of circular debt would alone remove the choking points that affect supply. The underlying cause of circular debt is the inability of the power sector to recover its cost. Without removing root causes, the circular debt was set to climb up again. It is currently over 300 billion rupees. Some sources estimate it to be as high as 500 billion.[33]

A number of issues encumber the power supply chain. These are embedded in the policy framework, in government's approach to resolving the crisis, and the governance and regulatory framework.

Whereas issues exist with the entire power supply chain, repeatedly governments have focused on generation alone. Transmission and distribution issues equally affect power supply, but suffer for want of attention. In fact, distribution's role in collecting revenue at the point of service delivery is what lubricates the system and makes investment possible. Revenue leakage at the distribution stage contributes to the un-sustainability of the sector. This chapter looks at how policy affects the power sector and incentivizes behaviour. It reviews:

- Government's policy to attract private investment and its deleterious effect
- Priorities in public investment: Hydropower, GENCOs, and Transmission and Distribution
- Policy on allocation of domestic gas to the power sector
- Weak state institutions reflected in policy formulation and implementation, lack of capacity to manage the transition from government to private power production
- Distortions in the tariff policy and in targeting of subsidy: This along with poor governance (at DISCOs and by government) creates the circular debt and a source of supply constraints

3.1 The fetish for generation: the private power policy 1994

An apparent magical potency of increased generation has captured the imagination of decision makers. It manifests itself in the many power policies announced in the last two decades that are almost all about generation of power. Today too, all current solutions deal with generation including the present panacea of Chinese power plants. Of late, Pakistan has held a number of investors conference aimed to attract generation capacity. Investment in electric power does not flow to Pakistan because of the security situation and particularly because of concern for cost recovery, despite the current attractive power policy. While attracting investment is important, it is equally necessary that government address the causes of cost recovery. These are manifold and include most issues discussed in this paper. Government is not very wise to persist with a tried strategy that has not worked. In fact, the strategy has caused great harm to the power sector.

GoP made a major policy shift in 1994, when it announced a policy for private power production[34]. The policy was very successful in attracting large-scale investments. As a result, Pakistan was electric surplus for several years (though power breakdowns did not entirely stop).

The policy also changed Pakistan's electric power landscape. Because of the policy, cost of power increased exponentially.

In essence, the policy put investors in a cocoon that eliminated risk and guaranteed returns even when no electricity was produced. It did so by ensuring a captive market and giving certainty about supply and cost of fuel. Tariff rates included repayment of the project's debt obligations and a guaranteed high rate of return on equity. The consumer (failing which the state) in effect assumed debt obligations and return on equity. The policy exempted power producers from all taxes and allowed them to choose fuel source, technology, and project location. Such a policy was hardly going to fail. The combined effect of these and choice of fuel and technology was to make the sector unsustainable.

Assurance of returns, made the investor immune to their production cost. They could choose the most expensive fuel and yet be profitable. Similarly, they could have inefficient technology and invest on a less than economic scale with no concern for the bottom line. The country continues to suffer from the consequences of the 1994 power policy (See Box 2).

The objectives of the1994 power policy were to eliminate shortage (estimated then at 2000 MW) and to increase access to electricity in the country. It estimated additional capacity need of 54,000 MW by 2018. Today, the policy meets none of these lofty goals.

Compared to a shortage of 2000 MW in 1996, estimated peak time gap between supply and demand today is over 4,500 MW (Table 7) and has remained at around 5,000 for most recent years. The National Power Policy 2013 refers to a 'yawning supply-demand gaps … leading to gaps of up to 4,500-5,000 MW'[35]. Access to electricity has not improved in the country (US government's EIA estimates more than thirty percent population without electricity access) while its provision to those with access has worsened with long hours of load management.

Box 2 Power Policy 1994: Created More Problems Than it Solved

If the aim of the 1994 Power Policy was to ensure reliable supply of electric power, its implementation had the opposite effect. Rather than rid the country of power shortage, it transformed the sector to increase cost of power. (The 2002 policy addresses some of the issues).

The policy provided investors:

- The choice of fuel source, technology, and site of the generation plant
- Assured returns through:
  - A long-term commitment by the state owned utility to purchase power. Tariff had two components.
    - Capacity Price: Monthly payments to cover fixed and maintenance cost, insurance expense, debt servicing, and a guaranteed ROE. The purpose of capacity price was to keep the 'profit insulated against variations in the quantum of energy purchased by WAPDA'[36].
    - Energy Price was for the actual energy purchased with the price of fuel a 'pass through' item
  - Tariff indexed to the USD exchange rate
  - A favourable debt-equity ratio that required 20% equity only (though many projects brought in higher equity)
  - The Private Sector Energy Development Fund helped with financial close of project
  - Fiscal incentives included exemption from all taxes: corporate tax, import duties and surcharge, repatriation of equity and profits, foreign lenders to the project were exempt from tax on income
- Risks were minimized through a set of agreements guaranteed by the government:
  - A long-term power purchase agreement (15-30 years) and a fuel supply arrangement (guaranteed by government if the seller was state owned). These agreements were under an umbrella Implementation Agreement signed with the government.
  - Protection against force majeure, against change in tax rates, and guaranteed foreign exchange for remittance
  - WAPDA/KESC were to buy the power from the plant and provide the cost for its transmission

The policy allowed cost plus returns, at guaranteed rates for up to thirty years and backed by sovereign guarantee. This meant the investor could choose any fuel source or technology without cost or efficiency considerations. By building debt servicing into capacity payment, the state owned utility (WAPDA and KESC) essentially assumed debt obligations. Capacity payment also guaranteed fixed cost recovery and return on equity whether or not the generating company produced electricity.

These provisions meant that:

- Over the life of the project, the government paid far more in real and nominal terms for private power than if the investments were made in WAPDA run generating plants. This is because of the cumulative effect of payment of interest on debt, ROE, and equity investment[37].
- Lack of concern for source of fuel for energy generation meant ever-enhanced fuel and generation cost for power.
- Lack of concern for efficiency of plant meant that most plants were on an uneconomical scale and were not planned to generate the maximum possible power from a given investment (as returns were guaranteed). Investment relied on single cycle turbines as opposed to the more efficient combined cycle turbines[38].

Additional capacity is nowhere close to the targeted 54,000 MW. Private power capacity in the country is 8,978 MW. However, price of electricity and extent of shortage have both increased at the same time. Liberal incentives attracted considerable investment though additional generation

nowhere met expectations. As the Table below shows, despite incentives the new policy did not even help equal the scale at which generation had increased in the previous decade (of the 1980s) when government was the sole investor in the power sector.

Table 14
Growth in electric generation in GWh

	1980	1990	2000	2010
GWh	14,512	36,348	63,400	89,732
%age growth over previous period		150	74	42
Absolute increase in GWh		21,836	27,052	26,633

Source: Energy Information Administration, US Government, Electricity Production in Billion KWh[39] (Data does not agree with NEPRA and GOP numbers for power production but consistent in method and agrees with WB data)

On the other hand, tariffs increased considerably. 'Between 1990 and 2010, tariffs in rupee terms have climbed up approximately 530% for the median domestic consumer'[40]. Because of subsequent increase in tariff since 2010, the same number in 2014 is 1680%. See Table 15.

Table 15
Average Tariff Changes

Rs/KWh

	1991	2000	2005	2008	2013*	CAGR %*	
							08-13
Nominal							
Domestic	0.63	2.33	3.19	4.39	11.22	14	21
Commercial	2.17	7.03	7.24	8.73	18.12	10	16
Industry	1.06	4.16	4.45	5.69	12.30	12	17
Agriculture	0.43	2.31	3.11	4.08	11.29	16	23
Real							
Domestic	1.39	2.33	2.50	2.65		4	
Commercial	4.81	7.03	5.68	5.26		0.5	
Industry	2.35	4.16	3.49	3.43		2	
Agriculture	0.95	2.31	2.44	2.46		6	

*2013 tariff rates are based on weighted average of actual charged
Source: PIDE Monograph Series, Afia Malik, Power Crisis in Pakistan: A Crisis in Governance, 2012, and NEPRA SOI Report 2013

The policy left key organizations bruised from its effects. In 2001-02, WAPDA paid Rs 57.85 Billion as capacity charges alone (USD 1 Billion)[41]. As capacity charge is fixed, this also included payment for electricity that WAPDA did not buy and the power companies did not generate. Variable charge for electricity purchased was additional. This was often the case during the first ten years since the policy came into effect when capacity was in excess of demand. Payment of USD 1 Billion each year

as capacity charges weakened WAPDA financially. This money could have funded several hundred MWs of new hydropower projects each year. At the same time, WAPDA all, but stalled its 'access to electricity' programme.

SDPI's above study also questions transparency in approval of IPP projects and names a number of persons in high positions who influenced decisions in the then and immediately succeeding governments[42].

Initial coddling of investors is justified in times when power shortage is extreme. Where Pakistan's policy makers fell short was not to treat the policy as a first step and progressively move to a more market driven approach. It failed also because of a lack of concern with sustainability (fuel mix and technology) and from reported conflict of interest. During those years, Pakistan also did not pursue hydropower projects sufficiently, its traditional source of power (except for Ghazi Barotha). The decade of the nineties saw a shift in hydro's share in total generation from 45% in 1990 to 25% in 2,000.

The power policy of 2002 introduced three tariff determination methods. These were upfront tariff, cost plus, andcompetitive bidding. It also provides for an electricity market.

Box 3
Not the killer app you thought it was: The National Power Policy 2013

Despite the ills it has left behind, no one would dispute that the 1994 power policy has had an impact on Pakistan's power sector. The 1994 policy's most lasting and pernicious effect is that it has forever defined the framework for power reforms. The National Power Policy 2013 is a case in point. As a twenty first century reincarnation of the 1994 power policy, its solutions are no different from the problems it sets to address in the first place.

The visionaries of 2013 take off from where the 1994 policy, and its variations of 1998 and 2002, left. Private investment is the panacea for power shortage. Government's job is to 'make policy while private sector invests' it evangelizes when all around there is evidence to the contrary.

1994 created an impact because it conceptualizes and lists the measures necessary for success. It defines objectives, provides an implementation structure, details tariff policy and fiscal incentives. An investor could look at that document and get a fair idea of what to expect from the investment and more importantly what to do next.

2013 does no such thing. In its preamble, it gives away its real intention of remaining a policy on paper. It begins with the claim that 'This bold strategy will set Pakistan on a trajectory of rapid economic growth and social development'. With equal pride it states that 'This document does not elaborate on issues surrounding operational strategy, nor does it lay out detailed implementation plans' ensuring that the policy will gather dust forever. In the more than one year since its announcement, it must have accumulated quiet a pile. In fairness to the document, it touches all the areas that impede power supply, but fails to think through just how the policy would become operational and when its implementation would begin.

In the Policy, contradictions abound. Faith in markets is paramount. At the same time, though government will ensure that all gas goes to power alone. The policy has no links with other government policies or plans. Some plans of even the Water and Power Ministry go unnoticed. It does not connect with NTDC's National Power Enhancement Plan or government's environmental policy. The 2013 policy 'will override all policies and end subsidy' it says.

In fact, in a number of ways, soon after it came into force, the government went ahead and did exactly the opposite of what the policy counsels. It increased gas supply for fertilizer at the expense of power, has held no one accountable for line loss of electricity or of gas, and has made no effort for energy conservation. The policy gives government a role in infrastructure, but the PSDP takes no heed. There are many other instances of the left hand not knowing what the right hand does.

Long on rhetoric and short on action, the policy achieves for the power sector what governments have done in recent years: an emphasis on words, but with no results.

3.2 Underinvestment in Hydropower, GENCOs, and T&D

3.2.1 Hydropower Projects

While the nation is consumed by the loss and inconvenience from power shortage, government's PSDP allocations do not show similar urgency. GOP's blasé approach to public investment in power allows continuity of the distortions embedded in the sector by the power policy 1994. Public investment should have corrected issues of fuel mix and efficiencies in production, transmission, and distribution. In the event, it has maintained benign neglect. Let us see how it invests.

WAPDA has a pipeline of twenty hydropower generation projects under execution (including studies) with a combined generation capacity of 24,700 MW[43]. Estimated cost for these projects is about 3.5 trillion rupees. Of this amount, estimated foreign assistance is 1.6 trillion rupees or 42%. Planning Commission's PSDP 2014-15 shows that seven of twenty projects (worth 7346 MW, not counting 4,500 Diamer Bhasha that is also a water storage dam project) were approved for execution five years or more ago. Expenditure on all twenty projects up to June 2014 was 211 billion rupees leaving a throw forward of over 3.2 trillion rupees (the balance amount needed to complete the projects not taking in to account cost overruns). With an allocation of 81 billion rupees for fiscal 2014-15 for these twenty projects, the balance work will take a fanciful forty years to complete. Admittedly, the picture is skewed because of Diamer Bhasha Dam and Bunji Hydropower that cost 900 billion and 1.5 trillion rupees respectively, but these also have been allocated funds each year.

Three aspects of the government's budget for power sector raise questions:

- Rather than prioritize and accordingly allocate the limited available funds, each one of the twenty projects receives some funding. In fact, Bhasha that has little chance of completing anytime soon has thirty percent of total budget for hydropower projects, most of it for land acquisition. Half of Diamer Bhasha's estimated cost of 12 billion USD is for civil works for water storage and training. On that scale, Diamer Bhasha cannot be implemented without donor support. So far, there is no evidence of financing from either the ADB or the WB. The money could be better invested to bring a smaller hydro or a GENCO project to completion.

- As the power sector cannot recover cost, NTDC and DISCOs do not generate resources to spend on development and system up gradation. Consequently, T&D development lags needs. It is important that government steps in to fill the investment gap. Much of the PSDP provisions for the power sector are PEPCO funds[44]. Of a total PSDP rupee amount of 166 billion rupees for the power sector, GOP funds are less than 30 billion, about 18%. Out of T&D's 87 billion rupees allocation for 2014-15, GOP funds are less than 15 billion[45]. We know too that actual releases would be much less.

- If peak demand shortage requires an additional 5,000 MW capacity (refer Table 7), why has government a project portfolio of 24,700 MW? Rather than spread thin limited resources on twenty projects, government would do well to prioritize projects that yield 5,000 to 7,000 MW quickly and ensure their early completion. Each year government may phase in new projects to account for growth in demand. In fact, the government has added seven new projects in this year's budget with a combined cost of 1.5 trillion, but it has made no change in the budget allocation from what it was last year.

- The government's development budget does not reflect the repeated statements of noble intent about resolving the power crisis. Overall, federal development budget 2014-15 is 525 billion rupees a slight decline from last year's 542 billion, but an increase of 25% from actual release. This year too, actual release would likely be less than budget. Within this year's budget, the highest allocation goes not to the power sector, but to highways. National Highway Authority's allocation for the year is 111 billion rupees over twenty-one percent of the total PSDP. The power sector, at 63.6 billion has a share of 12% only in the total budget. Rupee allocation for highways increased by 138% from 32 billion to over 76 billion (the rest is foreign aid). Allocation for power has grown by 23% (primarily because of investment in transmission lines to dispatch power from coal projects being set up with the help of China). If fund releases follow the pattern of the past (more for roads and less for others), iniquity between the two sectors would likely increase. Already the development budget envelope is considerably below requirement. In addition, much of budgeted allocations go to politically prioritized projects, and fund releases are below budget. On top of all that, releases skew further the amount spent on development in favour of political priorities. Planning Commission's Integrated Energy Model of 2011 assesses capacity increase of about 4,000 MW annually to meet shortage and growth needs between 2011 and 2030. Depending on the fuel mix, this would mean an increase of about 16,000 GWh of generation annually. Present rate of increase is nowhere near the target.

Of the projects in the execution pipeline, the average completion period of 15 years hardly demonstrates commitment. Neelum Jhelum Hydro Power Project (969 MW) is a case in point. The project began some ten years ago. Its cost was revised in 2013. With expenditure in excess of 125 billion rupees, it still has a throw forward of almost 150 billion rupees. Inadequate budget and slow releases have brought the project to a virtual halt. This would likely lead to further cost increase.

3.2.2 GENCOs

GENCO performance has declined significantly. Issues that affect GENCOs include:

- Reduction in installed generation capacity
- Fall in operating efficiency
- High outages and low availability ratio
- Supply of inferior quality fuels as well as incorrect records of quantities

Ageing equipment and O&M backlog have reduced GENCO capacity. From an installed capacity of 4,720 MW (source NEPRA), GENCOs produced 19,443 GWh electricity in fiscal 2008-09. Their output for 2012-13 fell to 13,235 GWh. According to WAPDA, GENCOs installed capacity is 4,829 MW, its de-rated capacity is 3,580, and maximum available in 2013-14 was 3,250 MW (67% of installed capacity, IPPs available capacity was 61%). For most GENCOs, operating efficiency levels are well below design efficiency (see Table 17)[46].With good planning and execution, it is possible to bring back the slack reasonably quickly. Governments though have shown inability to do so.

Table 16
Skewed Priorities

Rs. Billion

	Total Cost	Spent until June 2014	Allocation 2014-15	Balance amount, if whole budget released by June 2015	Years to complete
Total Power	4,955	564	200.58	4,190	21
Hydro	3,459	212	81.4	3,165.6	15
GENCOs	561.6	111.6	23.4	426.6	18
Transmission	737.4	120	58.7	558.7	9.5
Distribution	202.5	120.3	36.9	45.3	1.5

Source: GOP, Planning Commission, PSDP 2014-15 and according to NTDC's National Power System Expansion Plan 2010-2030 and Planning Commission's Integrated Energy Model

Table 17
Declining GENCO Efficiency Levels

GENCO Units	Capacity MW	Design Efficiency %	2013 Efficiency %	Availability %
GENCO I	144	32.14	30	37
TPS Jamshoro	630	33.28	26.6	21.6
TPS Jamshoro	250	37.7	32.7	35.7
TPS Guddu Units 1&2	110	37.5	25.4	N/A
TPS Guddu Unit 3	210	37.5	27.2	N/A
TPS Guddu Unit 4	210	37.5	27.2	N/A
First CCPP	300	44.36	32.69	53 to 70
Second CCPP	300	44.36	37.58	
Third CCPP	415	48.2	36.32	
GENCO III	210	36.77	NA	38
TPS Muzaffargarh	720	34	29	38
NGPS Multan	195	33	22	3
GTPS Faisalabad	244	30	30	2.6
SPS Faisalabad	66	32	26.35	19.4

Source: NEPRA State of Industry Report 2013, Pages 14-15

Where they have taken action, as in the Nandipur Power Plant (GENCO III), governance failure resulted in high cost and time overruns. Until 30 June 2014, Government has spent over 56 billion rupees on Nandipur with no addition to power generation so far.

For years, GENCO rehabilitation was at a standstill pending privatization of WAPDA's unbundled thermal units. Short of privatization, government put investments on hold. In the event, GENCOs' equipment became obsolete and their efficiency declined.

This policy seems to have changed, in principle. Government now has a portfolio of 561 Billion Rupees for nine GENCO rehabilitation projects. As with hydropower, here too, government may prioritize and focus on selected projects for early completion. The nine projects with a capacity of 5,600 MW have a throw forward of 450 billion Rs or eighty percent of total cost. Average completion time for these projects is 18 years. For one, allocation for the year is too low for the investment to have any effect. In addition, GENCO projects also seem to be laden by cost increase. It is important to increase allocation and to have a ranking of projects between hydro and thermal in the public sector and allocate prioritized funding so that some projects begin to contribute to the grid early.

3.2.3 Transmission and Distribution

With decision makers focused on increase in power generation, T&D often has played catch up. NEPRA notes that 'transmission sector proved to be the bottleneck at the time of induction of almost every new generation facility'[47]. NEPRA emphasizes expansion and up grading transmission capacity. According to NEPRA, new hydro capacity in remote areas (Dasu) and long distance transmission of coal power (Gadani to Lahore), require Extra High Voltage lines (or perhaps high voltage DC lines) and commensurate grid stations. While government focuses on generation, a constraint on power supply is transmission capacity. According SBP Annual Report 2013-14, the transmission system cannot reliably handle more than 12,500 MW of generation capacity. SBP considers transmission a greater constraint on power supply than generation (though NEPRA does not clearly observe so)[48].

Below target performance of power transmission and high line losses are evidence of endemic under-investment in T & D. Planning is an issue. A number of lines and circuits as well as transformers are either overloaded or underutilized[49]. Transmission lines tripping, both planned and forced, have increased. For 500 kV lines on the PEPCO system, forced outages increased from a total duration of 1,789 minutes in fiscal 2008-09 to 91,819 in 2012-13 an increase of 51 times. Planned outages too increased 67 times from 2,278 minutes in 2008-09 to 152,515 minutes[50]. Government's effort at power generation may stall because of below par transmission arrangements.

Turning to distribution, governmentallocation suggests that DISCO projects have an encouraging average completion period of one and a half years. This is misleading as a number of projects that began ten years or so ago have significant cost overruns. That leaves a negative throw forward for these projects and brings down average completion period. Total allocation for transmission and distribution are well below estimated needs of NTDC's National Power Expansion Plan.

3.3 Keeping fuel cost low: allocation of gas for the power sector

The National Power Policy 2013 stipulates that government will "Divert gas to the power sector and ensure firm supply to the power plants."[51] The Policy's strategy for affordable power also suggests conversion of oil plants to gas and reducing gas for CNG and UFG[52]. As it turned out, the government did not follow its own Policy for gas allocation.

Before the Policy came into effect, the ECC also decided, in January 2013, to prioritize gas supply for the power sector. In middle 2013 however, government changed its direction. This is when an upsurge in gas allocation for fertilizer occurred. The power sector received 10% less gas in the first nine months of fiscal of 2013-14 compared to the same period previous fiscal year. By contrast, gas supply to the fertilizer industry increased by 26%[53]. Given that feedstock for fertilizer has a lower price, volume increase may be higher.

In the middle of a power crisis, supply of gas fell further. In fact, this has been the trend for some years (see Figure 2). This change in fuel mix stymied power generation.

The government must have a good reason to do so though the logic of it is lost on IPR. There are two views on use of gas between fertilizer and power. Planning Commission's Integrated Energy Model estimates high economic loss from diversion of gas supply to power. It states that less fertilizer affects agriculture production and lowers GDP[54].

IPR takes a different position. Fertilizer is tradable and can be imported. IPR estimates that the economic cost of shifting gas supply from power to fertilizer far exceeds the benefits resulting from profitability of the fertilizer industry and its contribution to agriculture. Just the savings from foreign exchange spent on import of furnace oil compared with import of fertilizer shows that it costs over 50% more to import the equivalent fuel for generation plants than it would to import fertilizer. That this adds to the cost of power to consumers and the consequent effect on productivity is an added burden on the economy.

Supply of gas to power generation companies is a key recipe to help utilize their capacity more fully. Government would do well to revisit its policy of re-allocation of gas supply from the power sector to fertilizer production. Our analysis shows that an increase in gas supply by 400 mmcfd will result in over 2000 MW incremental capacity utilization (an additional 10% share in total gas produced). It will also help reduce average production cost. Power generation from gas costs Rs. 6 to 7/KWh and Rs. 15 to 18/ KWh from furnace oil. Within the sector, preference in allocation to efficient units (based on merit order) would yield higher benefits.

While on the subject of fuel cost and its consequent effect on tariffs, one other development is relevant. World oil price has declined by about fifty percent. Corresponding fall in input price has occurred. The Pakistan PM announced tariff reduction of Rs.2.32/KWh. Later, NEPRA assessed a reduction of Rs. 2.92/KWh as fuel adjustment. Soon after, government increased GST on furnace oil. The government had the choice to pass the benefit from low oil price to consumers or to consolidate the sector. In the event, it did neither. It initially tried to gain political capital by reducing tariff

and later increased sales tax at furnace oil to reduce overall fiscal deficit but increase electricity generation cost. This is poor policy.

Box 4
Increasing productivity: More power from the present investment

It is possible to increase thermal power generation within the present capacity. Actual power produced in fiscal 2012-2013 is 64,184 GWh for all thermal units in the country. Peak thermal production capacity in the last five years was 88,404 GWh. We arrive at this number by looking at peak production achieved by each GENCO and IPP in any of the last five years. Potential increase is the difference between 88,404 GWh (the achievable capacity) and actual power generated in a particular fiscal year. This under performance of thermal units of 37.7% is because of all of the issues faced by the power sector: circular debt, fuel availability, O&M backlog as well as policy, structural, and organizational issues.

Peak And Actual Output In 2012-13
Thermal Plants

	Peak Generation (GWh)	Actual Output (GWh) 2012-13	% Difference
GENCOs in PEPCO	21354	13149	62.4
Others operating under GENCOs	120	96	25.0
IPPs connected with PEPCO	50701	41215	23.0
Thermal KESC Own	13976	8567	63.1
Thermal connected with KESC	1538	1116	37.8
Thermal others Connected with KESC	835	137	∞
Total Thermal	88404	64184	37.7
Potential increase		24220	

Peak Output & Actual Output In 2012-13 GWh

Fuel Source	Peak Output	Actual Output	Difference	% Change
Gas	40051	27857	12194	43.8
Furnace Oil	33186	27357	5829	17.6
Dual	15167	8970	6197	40.9
Total	88404	64184	24220	37.7

The loss of capacity utilization is particularly high for plants producing on gas. Furnace oil based plants produced 17.6% below capacity. Gas based plants produced almost 44% below capacity.

3.4 Tariff and Subsidy: A Circular Debt beyond Control

The issue with power tariffs is on two counts. Inability to recover cost prevents new investment in all parts of the power supply chain. Subsidy creates a slew of new issues. Let us view it sequentially.

Government's National Power Policy 2013 estimates cost of power generation at Rs 12 per KWh.[55] Quoting NEPRA, the document estimates the cost of delivery to end consumer at 14.70 Rs per KWh. The Policy also estimates total cost of delivery to end consumer at 15.60[56]. The latter amount includes line losses. Taking the lower estimate of 16% line losses, the Policy estimates 'power theft' alone to cost the exchequer 140 billion Rs[57].

Cost recovery is an issue. Investment will remain shy without full recovery of cost. It increases also financial burden on government budget. An inbuilt recovery deficit exists in the tariff structure even when we do not include line and other losses that occur beyond NEPRA's liberal allowances for these. Taking generation cost alone at 12 Rs./KWh as mentioned in the policy, average sales price based on aggregate units sold is 11.15 Rs./KWh (refer Table12) leaving a deficit of 85 paisa/KWh below production. Relying on the Policy's cost to end consumer (of 14.70 Rs/KWh) the unrecovered amount is 3.55 Rs. /KWh.

The lower than cost tariff are on two accounts. Because of increase in costs, government wishes to make power affordable for low-income consumers. Subsidy was allowed for lifeline consumers. In addition, there is indication that some DISCOs often apply tariff that are below applicable rates. Refer to Table 12 again, average tariff rates for domestic, and all consumers vary a great deal among DISCOs. This is usually not possible. Variance is high at almost Rs. 3/KWh (between the high and low charge) for domestic users and over 3.50 Rs. /KWh for all users.

Tariff differences among types of consumers make the above practice an easy tool to use. The many tariff stages among domestic consumers and peak and off-peak tariffs (a good idea essentially) incentivizes this practice. Changing the domestic user category makes appreciable difference in amount billed.

In a travesty of rational tariff policy, government is reported to have asked NEPRA to build an additional 55 billion rupees into consumer tariffs to account for the cost of inefficiencies[58]. If carried out as reported, it will penalize those who pay their bills in full to the benefit of those who circumvent. As the next paragraph shows, it may not even achieve the objective of increased revenues.

Consistent increase in power tariff sets in play diminishing returns. Analysis of data by IPR shows that revenue elasticity is 0.6 to each Rupee increase in tariff. As demand in Pakistan is suppressed because of shortage of power, this clearly results from poor governance.

Subsidy has caused an escape for all manner of inefficiencies. For example, with time, the number of lifeline consumers increased. There is no GOP confirmed number for lifeline consumers from among the more than eighteen million domestic users. Their number is estimated to be far greater than their share would justify. Informally, they are estimated to be 12 to 14 million (about 70% of domestic users). Interviews with practitioners confirm that this subsidy is a source of revenue leakage for DISCOs and affects the bottom line.

IPR agrees that affordability is an issue for low-income consumers. The subsidy policy though needs overhaul. One study estimates that in 2011, about 29% of total subsidy went to the richest 20% of consumers[59]. The study concludes that just '10 percent of consumers pay more than cost recovery level' tariff. It questions if subsidy is the best way to help low-income consumers.

Subsidy and its misuse, inadequate recovery, and line losses contribute to circular debt, which, because it remains unsettled, creates impediments in power supply.

"Circular Debt is the amount of cash shortfall within the Central Power Purchasing Agency (CPPA), which it cannot pay to power supply companies"[60].It arises from a combination of factors:

- Delay in payment of Tariff Differential Subsidy by government
- Operational efficiency below performance standards set by NEPRA while determining tariff at all stages of the power supply chain (government determines TDS based on difference between NEPRA and GOP rates)
- Under-recovery of bills by DISCOs (this does not add to the circular debt, but limits DISCO ability to pay for power purchased and increases upstream receivables)
- Delayed determination and notification of tariffs

An inherent flaw in tariff policy is that NEPRA determines tariff and government notifies at a different rate. NEPRA determines tariff for each DISCO. Government notifies a uniform consumer end tariff (for each category) for the whole country normally at a rate below NEPRA rate. Two issues arise, one because of GOP the other because of performance of companies.

Government does not maintain a regular rate for TDS disbursements. The delay creates a break in the payment chain and affects performance at all stages. At times government also under provides in the budget.

NEPRA's tariff determination, among other parameters, also sets individual performance standards for production, transmission, and distribution companies. These consider efficiency levels and other indicators for each generation company and line loss for each DISCO. Inevitably, companies slip in meeting performance criteria. Loss on this account is in addition to the subsidy. While the government delays payment of the additional amount, the system begins to clog.

A set of policy issues arise from government's subsidy policy:

- Takes away attention from the real fix needed: The need for subsidy arises from high cost of production, which is a product of the fuel mix and the guarantees to producers. At present, more than one-third of the country's generation comes from high priced furnace oil. Since the plants began operation, oil price had increased by thirty to forty times (although currently declining). The circular debt debate takes away attention from the main issue that encumbers the power sector.
- Dependence on subsidy**:** As a corollary of the foregoing, Government cannot reduce fiscal burden of subsidy. It has attempted to do so also through continuous tariff increase. This

seems to be counterproductive. 'Theft of electricity increases with any increase in tariffs'[61] This reflects not only in line losses, but also increasingly in under-recovery of bills and charging a lower than applicable rate. Affordability for consumer is now a big issue. According to NEPRA, 'domestic tariff in Pakistan are touching the tariffs in developed countries'[62]. High tariffs affect business competitiveness Table 19.

- Questionable mechanism: Government's subsidy policy does not incentivize efficiency or operation on full capacity:

    - Performance standards of power producers and distributors: GOP assumes subsidy obligations based on the difference between the notified rate and NEPRA determined rate. NEPRA determines tariffs based on performance standards of producers and distributors. These vary among distributors. For example, permissible line loss for PESCO is 28% and 12% for LESCO. GOP, on the other hand, adopts a simple approach to assume aggregate liability arising from difference between notified and determined rates. The subsidy does nothing to pressure companies towards higher efficiency.

    - Government assumes liability beyond tariff differential: Though GOP's obligation is to pay subsidy for the difference between notified and determined rates, in practice it assumes all payment liability of DISCOs including those that do not occur from delay in TDS payment. Circular debt payments build up receivables of generating companies that then are unable to meet operational costs (including fuel purchase) and thus produce below capacity. DISCOs inability to pay arises not merely because of delays in TDS. Weak DISCO management does not recover fully the billed amount from sales. DISCOs also perform below the line loss standards set by NEPRA. Their ineffectiveness to recover amounts billed or to bill for the full quantity of electricity sold ensures that debt piles up. In a travesty of judgment, government assumes also the liability for the amount in addition to the TDS. This is the power industry equivalent of 'too big to fail' and an equally arguable approach. Because government delays TDS payment, production drops and all focus is to settle the circular debt. In doing so, all DISCO liability is counted as government debt including those not arising from tariff difference.

    - Government pays subsidy with mark up for electricity not produced: At a time of shortage of power, circular debt impairs IPP's ability to generate electricity. Yet IPPs have government guarantees for capacity payment. On the one hand, generating companies' production declines because of the circular debt and, on the other, remarkably, government must pay private power producers for power not produced. It pays the subsidy component along with mark up for delayed payment. The irony of this situation must not be lost. Circular debt occurs because of lack of liquidity in the system. This results in less power generation than potential with its negative effect on the economy. Yet ultimately, the government pays and does so with markup including for power not produced. Something is hugely amiss with the way we manage the sector.

Government must clarify its subsidy policy and set criteria for it. Let NEPRA determine tariffs and let it then determine subsidy too.

3.5 Competitive Market for Trading of Electricity

An important component of the 1994 power policy reforms was introduction of a market for sale of electric power generated. In its implementation, this aspect of policy was lost in favor of upfront tariff and capacity charges. It is important now that NTDC source power initially from base load plants such as state owned hydro, nuclear, and GENCOs. For supplies beyond those provided by above plants, NTDC may purchase power on the basis of bids from IPPs. The implementation agreements with IPPs provided long term guaranteed returns based on upfront tariffs. However, upon creation of a regulator NEPRA, generation license issued to IPPs provided for a competitive market in electricity. The 2002 power policy also specifically provided for competitive trading. Government and regulator both have not implemented this provision. It is key to creating efficiency in power generation and in reducing cost. NEPRA may begin trade in electricity forthwith.

3.6 Unraveled structure

The power policy 1994 had donor support. It called also for restructuring of the power industry. One restructuring condition was to 'unbundle' WAPDA, the integrated power producer, transmission, and distribution organization. Privatization of the separated units was to occur after WAPDA's unbundling. Two separate developments harmed the sector. Privatization of the units did not take place (except KESC, which was not part of WAPDA). As of date, government has not shared plans to privatize these, despite increasing awareness that DISCO performance is key to solving the power conundrum. Pressure from workers' unions could be one reason[63]. Much of the WAPDA owned generation, and all of its transmission and distribution remains in the public sector.

Second, structures, policies, and checks and balances that existed in a very visible organization, unraveled. Whereas WAPDA performance was always under high-level review, its unbundled units went below the radar. Reporting lines of DISCOs, at the government level, became unclear. Performance of individual units did not merit the attention that WAPDA did. Besides WAPDA had institutional knowledge and a reserve of competent and quality experts to support its activities. The synergies ended, as did the esteem of working in a respected organization. Performance standards fell.

Unbundling stopped midstream. It was perhaps too ambitious to hope for a market for purchase and sale of electricity. Given the guarantees to producers despite surplus power, it was hardly possible for a market to develop. Rather than reforming the sector, its restructuring ended up in distortions (and perhaps in rent seeking).

3.7 Affordability and Competitiveness

Table 15 shows that tariff rates have increased consistently in the last twenty years. They have grown especially since 2008. Yet recovery of cost of power supply is still not possible. Nor has power supply normalized.

Government, therefore, provides subsidy. Table 18 below, records the share of expenditure on electricity bills by a household as a proportion of its income and total expenditure other than on food and clothing. As a percent of income, households in the middle quintiles have the highest share. One wonders if this is how it ought to be. Low and middle-income consumers pay a high share of their

expense for electricity is indicative of the inherent inequity. The inequity is skewed particularly for above lifeline consumers who use 300 to 500 KWh per month. The issue of affordability also likely creates incentives for revenue leakage. Evidence of this is visible in a number of ways. IPR estimates that 4% of increase is lost at the distribution stage. The issue of affordability also creates incentives for revenue leakage. Evidence of this is visible in a number of ways. IPR estimates that 40% of the increase is lost at the distribution stage.

In percentage terms, there is an increase in unpaid bills for domestic consumers in the last two years. Recovery of billed amounts from private commercial and industrial consumers has increased rapidly in recent years. From ten billion rupees in 2008, it increased to 63 billion in 2013[64].

Table 18
Household Expenditure on Electricity by Quintiles
(Rs/Month)

	1	2	3	4	5	Average
Pakistan	426	602	769	952	1,605	947
Urban	677	835	1,038	1,303	1,987	1,433
Rural	386	537	656	826	1,063	690
% of Income	3.2	3.6	3.9	3.9	3.7	3.7
% of consumption	3.2	3.7	4.1	4.4	4.6	4.0

High tariffs also affect business competitiveness. A comparison of the tariffs that our businesses pay with those in other countries of the region is instructive (Table 19). Pakistani consumers of all types clearly pay more than what their counterparts pay in the region. This is especially so when taxes and levies are added. Tariff rate and unreliable power supply place our businesses at a disadvantage in the international market.

Table 19
Competitiveness
Pakistan Rupees/KWh

	Pakistan	Bangladesh	India
Households	4 to 15	4 to 12.5	
Commercial	14-18 (16-21*)	11 to 13	
Industrial	14-18 (16-21)	7.5 11.5	
Mumbai Reliance			4.5 to 17.5
Mumbai Tata			1.5 to 9.7
Gujrat			5.2 to 7.7
Haryana			5 to 10

*Figures in brackets with tax and levy
Source: IPR research

3.8 Disputes between power purchaser and power producers

Several IPPs are presently in dispute with NTDC. Most of these disputes arise from non-payment of IPPs receivables. Outstanding circular debt has reduced power generation as it limits ability of IPPs to purchase fuel. IPPs demand from NTDC capacity payment whereas NTDC imposes liquidated damages for non-supply of power. Government must step in to resolve these disputes and improve the environment in the power supply chain. It is important that these disputes do not escalate and necessitate arbitration or court cases.

3.9 Indigenization

Figure 2 shows the un-sustainability of Pakistan's policy of reliance on imported fossil fuel for power generation. The country's economic capacity and balance of payment would just not permit such a skewed generation profile. This leaves a vulnerable energy sector. Though still a contingent resource, Pakistan is not without substantial energy potential. Thar's lignite could potentially keep us self-sufficient for decades[65]. The Geological Survey of Pakistan discovered it in 1992. Since then, several studies by international firms confirm GSP findings[66]. There has been no further progress though, either with respect to infrastructure development or with extraction.

Pakistan has one of the largest potential for shale oil and shale gas in the world. According to US government's Energy Information Administration, the world has an abundance of shale energy resources[67]. Pakistan has the ninth highest potential in the world for shale oil at 9 billion barrels. The report estimates Pakistan's shale gas potential at 105 trillion cft. Extraction of shale energy is technically challenging with a long learning curve. With the help of an outside agency, Pakistan has made progress in developing a policy framework. A policy on Shale is expected soon.

Pakistan's river system offers a spate of hydropower opportunity. Yet despite acute shortages, hydro capacity is 13% of known potential. Hydropower projects are big on capital and usually complex to execute. Most potential sites lie in high mountains. The terrain is testing and land acquisition is an endemic issue. Yet once built, they provide long-term supply at low operational cost.

World energy price is in decline. This must not dissuade government from pursuing indigenous exploration though its record even when prices were at unprecedented high levels is not salutary. Exploration of energy is a strategic issue for the country to be viewed over the long term. Energy price changes over a couple of years must not affect such decisions. Prices have changed quickly in the past and remain mostly volatile. Regardless, Pakistan's external finances dictate the need for domestic development of primary energy even when prices are low.

3.10 Finance for energy development and power supply

One reason for success of the 1994 private power policy was government's 'Private Sector Energy Development Fund'. The fund contributed to financial close of projects and helped reduce financing risk. With no DFI in the country to facilitate large-scale project financing, government must step in to set up a fund. The fund must operate on market principles and payable by private project

sponsors. Government must also increase public investment in infrastructure, especially to access and transport Thar's prospects.

3.11 Politics over Governance

An immediate power management issue is distribution of electricity on a regional basis. NTDC has reoriented nationwide transmission of power by basing it on recovery of DISCOs. There are a couple of issues with this approach. There is little economic analysis available to support such a decision, which should be based on greatest economic benefits from use of power. By redirecting supply to three cities in a single province, the government opens itself to criticism with respect to equity and fairness. In addition, by comparing absolute performance, this distribution method does not incentivize DISCOs that have reduced line losses or recovery of bills albeit their overall numbers are below others. It seems that political considerations prevail over sound decision-making.

Since the nineteen nineties, government has adopted a policy for the electric power sector that is too complex for the country's weak institutions to manage. Government fell short in the entire delivery cycle. It could not conceptualize a policy that assessed needs and matched these with solutions. Government needed to find a sustainable response to energy needs. It came up with an expansive one. The policy framework was generous and all embracing and did not keep in mind economic capacity or the country's institutional constraints. Implementation was predictably weak with concerns about transparency. Since then, attempts at reforms have not broken out of the framework established by the 1994 policy. 'Band-Aids' cannot pass for reforms and so we now have

Table 19 A
Incremental change in power supply vis a vis performance

Utility	Allocation of Power %age +/-	%Change in line loss	%Change in recovery
IESCO		0.1	-4.0
GEPCO	15	0	-2.0
LESCO	12	0.2	0
FESCO	13	0.2	1.0
MEPCO	-5	0.4	-4.0
PESCO		-0.2	1.0
HESCO	3	-0.8	-2.0
SEPCO	-2	-0.9	5.0
QESCO	6	1.8	10
KESC	-3	No Information	No Information

an approach that does not see a holistic picture. What we need is a nuanced response to set right the great damage done. What we see is a trigger-happy one for generation and a lack of response on governance and subsidy.

3.12 Is DISCO privatization a solution?

IPR is of the view that privatization helps improve governance and service delivery. Private efficiency and innovation though come with competition. KESC is a case in point. A DISCO's virtual monopoly over a given area affects performance.

One of these relates to NTDC's contract with K-Electric (formerly KESC) for sale of power (News reports suggest that the contract may not be renewed). This contract allowed K-Electric to import power from an already distressed system while it kept idle capacity that remains untapped. This arrangement suits K-Electric, as power imported from NTDC is cheaper than power generated by its GENCOs. Allowing K-Electric to opt for this low cost option deprives the country's transmission system from power that could have been generated by plants in Karachi city. This is clearly a case of placing the interest of a particular company above that of the whole power sector. It is surprising that K-Electric's profit have improved consistently while they suffer over 30% in line losses[68].In fairness to K Electric, government has not allocated it the natural gas for power generation committed to it under the privatization arrangement See Box 5 (Page 48).

4

Governance and Regulation

Is it Possible to reform? Governance and Regulation

The previous chapter suggests that a dysfunctional policy environment lies behind power sector troubles. Governance of the sector has not been exemplary either and is an equal, if not a greater contributor to its flaws. The list of governance failings is long and has been touched upon in various discussions in preceding chapters about policy and structure. These impede sustainable development of the sector.

In fact, policy flaws too result from a lack of governance capacity. Clearly, the leadership of successive governments has not come to grips with the complexity of the sector. Partial efforts taken from time to time to fix it may have worsened the situation. This paper has detailed already the egregious fallout from efforts to increase generation through the 1994 power policy. Likewise, the subsidy policy supports affordability, but it has weakened the sector. Delayed subsidy payment breaks the cash flow from DISCOs through power producers to input suppliers. Power generation falls below potential. Its targeting too is an issue. In 2011 just 29% of subsidy benefited low-income consumers. Over 20% went to consumers in the highest income quintile. A large number of consumers try to fall into the lifeline category when they should be paying a higher tariff. In addition, cash flow shortfall from DISCOs below standard performance is tagged to the circular debt and is passed off as government's liability.

Governance affects all parts of the power supply chain from NEPRA autonomy to efficiency of state run units. Governance and regulation must contribute to a sustainable, affordable, and reliable electric supply system. This has not happened. Attempts by governments to pass the crisis off as one of generation capacity alone does not help deal with it effectively. While governance and regulatory structures are in place, they lack content and substance. The executive and the regulator have both failed to create a sector that can reliably supply power to firms and households.

'Best practices' from one country do not necessarily work in another. Reforms must be in line with norms, practices, and governance capacity of a country. No sector can be immune to the governance quality around it. Textbook ideas on privatization and setting up regulatory structures do not always work. Capture of policy making by interested parties is common. Lack of autonomy and capacity of regulator is the norm.

In its review of the IPP programme, the World Bank accepts that the scale of private involvement should align with the country's institutional capacity[69]. It is unlikely if Pakistan's governance ability was a secret at the time the policy was being formed.

An even bigger concern is that despite such an assessment, policy makers continue to pursue the chimera of private power in Pakistan. Fascination with foreign private investment continues and may likely have the same result as in 1994.

In order to determine what needs to be done, it is important to proceed ground up. Having seen the structure of the sector, the policy framework and its effect on the sector, this paper reviews the way the sector is governed.

Let us break down the electric power governance structure to see who does what:

- WAPDA: plans, builds, and operates hydropower plants to disperse it to the grid through PEPCO.
- K Electric: integrated power producer, transmitter, and retailer of power for Karachi city
- IPPs: produce power to sell through PEPCO or K Electric
    - PEPCO: is a holding company. Its original mandate was to manage the transition of unbundling and privatizing WAPDA, but increasingly has become a permanent fixture. It is a holding company and responsible for:
    - Operation and performance of state owned power producers (GENCOs)
    - Power transmission through the National Transmission and Dispatch Company
    - Managing power purchase from all suppliers of power to the national grid through the Central Power Purchase Agreement (CPPA)
    - Dispatch and distribution of power through nine companies (DISCOs)
- Ensuring an effective electric power sector
- Private Power and Infrastructure Board (PPIB): facilitation of private participation in the power sector[70]
- Ministry for Water and Power: responsible for overall performance of the power sector in Pakistan Directly supervises state owned production, transmission, and distribution of electric power. It makes policies for the power sector and executes it through its many organizations: PPIB for private power companies, WAPDA, PEPCO and its many subsidiaries. It is responsible also for development of alternate power (wind, solar, and others). It runs a demand management strategy through the energy efficiency programme and by limiting power use through control of works for businesses and load sharing during hours when demand exceeds supply.

Indicators of power sector performance show that all parts of the power delivery sector perform below standards.

4.1 Indicators

- Distribution
  - Line losses: difference between energy bought and energy billed
  - Under recovery of bills: difference between amount billed and amount recovered
  - Application of lower than applicable rates: allowing domestic consumers to slip to rates for below lifeline consumers, shift peak use to off peak usage
  - Over billing: bill higher units to users than actually consumed because of shortage of meter readers and to artificially comply with government pressure to reduce line losses and under recovery
  - Distribution interruptions measured by frequency and hours of interruptions in supply for other load management
  - Maintenance and investment backlog responsible for above
- Transmission
  - Transmission loss
  - Power dispersal capacity and reliability
- Thermal Power Generation
  - Input cost and availability
  - Heat rate / Plant efficiency
  - Production cost
- Government's ability to address structural and policy issues in the power sector to address the power crisis
- NEPRA: independent regulator of the electric power sector, is responsible for:
  - Granting license
  - Tariff determination
  - Setting performance standards which are built into tariff rates
  - Oversight of industry structure
  - Optimizing among competing interests of consumers, producers, and sector sustainability

A table will better capture performance:

Table 20 Performance of Power Supply Chain		
Distribution	**Performance**	**Responsibility**
Line losses[71]	This is an endemic problem. Difference between units of electricity purchased and units sold represents line loss. The National Power Policy 2013 estimates rupee loss of 140 billion from what it refers to as theft. IPR estimates are higher, between 195 billion to 250 billion Rs (see Table 12 based on NEPRA data). Line losses increased greatly in the decades of 1990s, came down in the last decade (2000 to 2010) and has stabilized at a high level. NEPRA figure for percentage line loss in 2012-13 is 21.25 for DISCOs[72]. It has increased from 16.66% in 2008-09 though below the recent peak of 22.27 in 2011-12[73]. There is no data on the extent of loss attributed to technical and non-technical reasons (the latter is the result of management), but experts assume that over half of distribution losses result from DISCO mismanagement[74].	DISCO Management and staff
Under recovery of bills[75]	Consumers often do not pay the amount billed. This loss is in addition to line loss. Over time, the unrecovered amount has increased in absolute and in percentage terms. On the PEPCO system, the loss in 2012-13 was over 73 billion rupees, which increased to over 98 billion in 2013-14. Loss from less recovery was 10% in 2012-13, which became 11% in 2013-14[76]. PEPCO billed amount in 2013-14 was 903 billion. Increase of one percentage point equals over 9 billion rupees. Overall, amount of uncollected bills increased from 34 billion rupees in 2007 to 101 billion Rs in 2012. Private users showed the highest increase from 8 billion Rs in 2007 to 55 billion in 2012. DISCOs showed reluctance to disconnect their power supply[77].	DISCO Management and staff
Lower than applicable rates	Table 12 shows considerable variance among per unit rates billed to consumers. For total units showed by DISCOs the variance was Rs 3.54/KWh between the high and low rate. Among domestic users, average rate difference is Rs. 3.15/KWh (not including TESCO, a new DISCO). Taking the high rate as reference, amounts lost on this account are substantial (see Table21). This needs more research, but clearly weakens claims of some 'well-run' DISCOs.	DISCO Management and staff However, there is now a political economy of line losses, less recovery, and lower than applicable. This is not possible without top level influence
Over-billing	News reports allege that in August 2014, consumers were charged 40 to 70 billion more than due from them. Reports suggested that DISCOs did so under government pressure to increase revenue by reducing line losses. DISCOs responded by overbilling. A government study attributes consumer discontent to tariff increase (27%), erosion of one tariff slab (50%), and to increase in use of electricity. Government also ascribes lack of meter readers to high estimated billing. The study states that DISCOs attempt to hide line losses by overbilling rural feeders. The amounts are reversedlater. There is no information yet of payment to the consumers of the over billed amount. At worse, consumers have been deprived collectively of a large sum of many billion rupees. At best, if their money is returned, they provided free finance to DISCOs.	GoP and DISCO management and staff

Reliability Indicators[78]			
Load Shedding[79]	Government claims improvement. In the peak demand months of summer, load shedding was eight to ten hours. GOP estimates do not include outages in SEPCO and QESCO. Their inclusion will increase load-shedding hours. NEPRA		GOP policy and governance at each stage of the supply chain
SAIFI (Frequency of interruptions per consumer per year)	All DISCOs except IESCO below NEPRA standard often by many multiples.		DISCOs, inability to recover cost leaves no fiscal space to invest in system improvement
SAIDI (Duration of interruptions per customer)	All DISCOs perform below NEPRA standard. PESCO was worst with over 29,000 minutes of interruptions per customer		
Transmission			
Investment and maintenance deficit	NEPRA requires NTDC to build system efficiencies and upgrade infrastructure		NTDC, GOP
Generation			
Hydro capacity	Unrealized potential, unplanned investments, engineering challenges, high transmission cost		WAPDA, GOP
Thermal capacity available for use	Less than 64% of installed capacity is available for use. High receivables reduce working capital. GENCO inefficiencies and governance are concerns[80].		GOP GENCOs/IPPs
Production	High input cost because of fuel mix		GOP
Plant efficiency	IPPs		
	GENCOs	Low: O&M backlog, aged equipment, poor practices in fuel quantity and quality	PEPCO, GOP
Government's weak management and policy for the sector: • Generation Capacity • T & D Losses • Managing the circular debt • Tariff and subsidy • New technology • Sustainable fuel mix			
Note: System Average Interruptions Frequency Index, SAIFI and System Average Interruptions Duration Index, SAIDI[81].			

The above demonstrates that the power sector's performance is poor at every stage and in many areas. A single dimensional approach of expanding generation capacity is inadequate. In fact, it may well add to the sector's woes, as each additional unit of power requires government subsidy.

Table 21
Loss from Application of Low Tariff

	PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	KE
Units Sold GWh	7,162	1,294	7,763	5,920	14,285	8,586	9,913	3,524	2,726	3,812	10,942
Amount Billed	71,749	15,024	84,125	63,705	163,866	95,606	107,932	33,944	33,023	36,007	142,063
Diff. btw ref. rate & billed rate/KWh	2.96	1.37	2.15	2.22	1.51	1.85	2.10	3.35	0.87	3.54	0
Presumptive Loss Million Rs	21.199	1,773	16,690	13,142	21,570	15,884	20,817	11,805	2,371	13,494	0
% Loss (from billed amount)	29.5	11.8	19.8	20.6	13.1	16.6	19.3	34.7	7.1	37.4	0

Source: IPR research

4.2 Load shedding

This term is a euphemism for power outages that are planned. There is one identifiable reason for load shedding without which there is no sustainable solution to the energy crisis. Government policy makes the power sector unviable. Weak governance compounds the effect of this policy at all stages of the supply chain, particularly in DISCOs. This structural lack of sustainability of the power sector precludes new private investment and requires continued subsidy for public investment. It will keep power supply stressed in Pakistan.

To a certain extent, this situation is the result of the quick fix approach to implementation of the private sector power policy of the 1990s. While that policy was part of structural reforms of the power sector, whose objective was to ensure reliable power supply, the implementation remained focused at the stage of private power production. This entailed extra-ordinary comfort and guarantees to the power producers. Assured guarantees of returns required increase in power tariff that could not be charged fully to the consumers. At the same time, WAPDA had to guarantee purchase of power, which put endless strains on a so far profitable organization. What this arrangement ensured was profitability of power producers without recognizing the need for sustainability at the downstream stages. The need is for the total power supply system to be sustainable not one stage of it. In the event, the burden on the consumer became unsustainable, which in turn led to high line losses and unpaid utility bills. The government too found it difficult to meet its part of the bargain with inadequate provisions for TDS and utility payments to DISCOs by government consumers.

As demand increased, and investment shied, gap between supply and demand widened. Load shedding is inherent in the policy structure. A review of the frequency and duration of power interruptions shows that in a number of DISCOs power interruption has worsened while in some they have been volatile. The two DISCOs where interruptions have declined are LESCO and FESCO. Overall, IESCO consistently was the best performing DISCO in terms of power interruptions. Despite privatization and induction of new management, K-Electric's performance has worsened considerably.

To recount, the stress on liquidity runs through the power supply chain with under-performing generation equipment, skewed policy for allocation of fuel inputs, under investment in transmission, variation between assessed and notified tariff, incorrect TDS measures, and weak management and governance of DISCOs. The circular debt is the cumulative outcome of flawed policies throughout the power supply chain and load shedding its most visible form.

Any set of recommendations will base itself on the above recapitulation of issues in the power sector. The above review of its performance points to a systemic failure. Policy cannot be an abstraction or based on whimsical ideas. They must relate to facts on the ground. Recommendations cannot be simple solutions such as paying off the circular debt without addressing its genesis or increasing generation capacity with no thought to its consequence. Once paid off, circular debt has the habit of rearing its head again. Policy and recommendations must consider their fall out and effect on various players in the power sector: producers, consumers, implementing agencies.

Box 5
Why Privatize?

In 2005, KESC clearly needed restructuring. The largest city of the country and its most productive economic unit was hostage to the utility's mismanagement. Some indicators would help us see how broke KESC was. In 2006, its SAIDI and SAIFI were high. The company was billions in red when federal government bailed it out. This should not have happened to a monopoly that has one of the country's most dynamic regions as its captive buyer of power. Mismanagement had been taken to an extreme. But has privatization helped?

The answer at best is mixed and an emphatic no if we considered NEPRA guidelines. Since privatization in 2005, the now renamed K-Electric's power interruptions improved for a while and have declined since. Over a five-year period, its frequency of interruptions has increased from zero in 2008-09 to over 31 in 2012-13. For the same period, duration of interruption has worsened from a 1074 minutes to almost 1800 minutes. The corresponding numbers for GEPCO, FESCO, and IESCO are far better, LESCO is worse. NEPRA's State of the Industry Report 2013 declares K-Electric as an example of an unsuccessful privatization. It demonstrates that K-Electric misses four out of seven NEPRA standards. Privatization has not helped improve line losses. These were 27.6% in 2012-13 compared to 13.5% for LESCO and 11% each for FESCO and GEPCO. Line losses have declined though from the level they were at the time of privatization. Recovery ratio on billed electricity too was far below those of public sector DISCOs in Punjab. Between 2011-12 and 2012-13, K-Electric's recovery rate declined from 89% to 85%. Recovery rates for GEPCO and FESCO was 98% each. It missed also its load shedding target.

While all indicators seem weak, K-Electric's bottom line has seen a healthy boost. In 2011-12, the company's net income was 2.7 billion rupees, which more than doubled in 2012-13 to 6.7 billion rupees. While IPR wants to see all companies profit from their operations, it would like to see this result from good management practices and effective operations. The profit increase cannot be attributed solely to good practices as a number of public sector utilities perform better on all indicators. NEPRA alludes that K-Electric's profits are built around a number of inefficiencies. At a time of extreme power shortage, it keeps idle generating capacity while buying 640 MW from the national grid (the contract is up for renegotiation). It suits K-Electric because the average cost of imported power is well below the cost of producing it from its plants. NEPRA also finds that K-Electric has limited the number of new connections resulting in a more than 7% decline in new customers over the previous year. Perhaps it does so by not investing sufficiently in transmission and distribution systems. NEPRA guidelines provide for an automatic trigger whereby utilities share the benefit of increased profits with their customers through reduced tariffs. K-Electric has not done so yet.

The government must share some of the blame. It was necessary to unbundle KESC before privatization among its generating, transmitting, and distributing components. Government's gas supply to K-Electric is below that agreed at the time of privatization. Regardless, the utility must improve on all indicators and bring its performance at par with public sector utilities. As a private company it must provide higher quality service to a productive and dynamic clientele

5

Recommendations

Recommendations

If policy makers were waiting for good fortune to come their way, it has arrived in the shape of low energy prices. Faced with the choice between reducing subsidy and passing the benefit to the consumer, they did neither. To gain political capital, GOP initially announced tariff reduction and later signaled that energy reforms is subsidiary to balancing books.

Consumers expect immediate exit from a crisis that has debilitated the economy and, in summer months, destabilizes the country. That said it is important that our concern for short-term relief must not come at the expense of optimum long-term sustainability. Each measure, whether for the short or long term, must bear in mind the overarching objective of sustainability. Many past policy changes may have contributed to the crisis.

This is because for years policy makers have prioritized the immediate over the viable. The complex character of the sector calls for a holistic approach that would forecast demand, and move down stream towards meeting it by reducing inefficiencies, improving profitability, and sustainable investment.

5.1 Develop a context: Decisions that must guide the energy plan

For a doable plan to emerge, some questions beg answers and some tradeoffs need to be identified. The energy sector has two constants: a) energy markets remain volatile and unpredictable for the best experts, and b) capital needs are high. The recommendations below will balance among the following:

- Short vs. long-term solutions: A virtual national emergency must not allow immediate considerations to trump sound growth of the sector. This is especially likely in an area that has become politically sensitive. Short-term measures must follow rigorous planning. Within the plan, those measures that are possible immediately may become near term. There are sufficient numbers of things to do forthwith to provide relief. These include higher gas allocation for power or reduction in DISCO loss. Measures, with long-term implications, taken in haste could affect the sector adversely.

- Public vs private Investment: This decision cannot be based on ideology or belief. Let the past be our guide. Investments needs are high and well beyond the country's means. Whether public or private, foreign capital must fill some of the gap. For a high credit risk country,

foreign private capital must come at a price and needs guarantees. Government guarantees for private enterprise takes away some of the value of private investment. The decision on the public private divide must bear in mind that a) Pakistan's history shows that private energy is costlier than public energy, and b) in a weak governance environment, it is easy for interest groups to capture state decisions. Whether public or private, Pakistan's case shows that quality of governance decides sustainability of the power sector. In the past, private power resulted in high prices with high deficit. While the blame for that lies with flawed government policy and decision-making, there is no indication yet that those flaws would go away soon. Governance quality affects per unit cost of power, whether sourced from public or private producers. The 1994 policy shows that incentives to attract investment made the sector unsustainable. There are similar concerns too about coal-fired plants from China. Similarly, cost escalation of Nandipur power project and the uncertainty that surrounds its executions puts to question the inherent economies of rehabilitating or rebuilding GENCOs. The question here is if our governance quality allows a sustainable power sector as it increases capital cost and tariff per KWh.

- The ideal vs. the optimum: Planners are ambitious. The International Energy Agency reports that world energy investment in 2013 was 1.6 trillion dollars, which would increase to 2 trillion dollars yearly by 2035. Add the estimated 550 billion USD needed for energy efficiency, total annual investment needs would reach over 2.5 trillion USD[82]. NTDC's National Power System Expansion Plan 2011-2030 estimates Pakistan's investment needs for the twenty-year period to be over 680 billion USD in nominal dollars and 263 billion at 2010 prices. Annual needs vary, but Pakistan will find it hard to source the average of over 13 billion USD over the twenty-year period. NTDC's plan follows a robust methodology though we must temper expectation with reality. In the five years since the plan, the country has not seen investment reach anywhere near the above estimates. Any investment plan must provide for the risk that available capital could fall short of needs. IEA's World Energy Investment Outlook 2014 cites the example of India. Despite doubling generation capacity since 2013, India suffers from electric power deficit. The document estimates that if India reduces T&D losses from the present 27% to 15%, a mere 5% tariff increase would allow full recovery and would perhaps attract required investment.

In meeting demand, it is important to decide between the optimum and the ideal. Any plan must triangulate among the goals of affordability, reliability, and sustainability of energy supply. The soon to commence LNG terminal is a case in point. Built with capacity guarantee, Petroleum ministry finds one of its uses to fill energy demand for transport. If used for generation, the cost for power would be no different from generation by oil. Similarly, the economy must assess optimum domestic use of energy. In 2010-11, 18.6% of natural gas went to meet household needs. In fiscal 2013-14 (July February) this share increased to 23.2%. Households also share in the 7% that goes to the transport sector as CNG. A mix of demand management through efficiency and conservation (including CNG pricing) will direct energy use to the more productive sectors of power and industry.

We need decisions also on carbon neutrality (Pakistan is below its commitments so far, but standards will become stringent. China and US have agreed on limits bilaterally and the environment summit this year may impose new restrictions). On the subject of emissions, Pakistan's reliance on coal

as energy source is negligible and far below world average. Pakistan has considerable space to increase coal-fuelled power despite limits imposed by high environment cost. IPR prefers reliance on indigenous source rather than on imports. With respect to renewables, wind and solar, we must look at the feasible over the ideal in new technology within Pakistan's capacity. IEA's World Energy Outlook forecasts renewables to 'become the number one source of energy' in the world.[83] Pakistan must prepare itself for increasing their use, especially for off grid access.

- Imported vs. domestic energy supply**:** Three domestic sources have potential:

    - Thar coal: So far, Thar coal is a victim of policy direction and federal-province rivalry. Possessive of its rights over Thar coal, Sindh government has done little to exploit the resource that could possibly bring the country out of its high import dependence. Some concerns merit attention: especially that present estimates turn out to be higher than what is proven and that Pakistan has limited technical and managerial ability to exploit it fully. There is no higher cost though than to let it remain below ground, which the government seems to be content with doing.

    - Renewables, including hydro: Potential for hydropower is high, but it has not merited the attention it deserves. Hydropower is a great domestic resource, which can reduce imports considerably. It comes with high capital cost for civil works and transmission, and increasingly, with engineering challenges. Government's recent focus on hydro raises hopes for early realization and could lend the power sector sustainability in the medium term. Generation from other renewables, solar and wind, have begun. NEPRA has done well to approve upfront tariff for a number of projects. They have yet to assume any major share in generation.

    - Shale and tight oil and gas: Pakistan's high shale potential can help the country source domestically a major part of its energy needs. Investment and technical requirements are large. Government must not allow current decline in energy prices to delay incentives for shale exploration.

Recommendations

This paper recommends measures that will help achieve the objectives below:

I. Relief from the crisis in the short-term

II. Short to medium term

III. Sustainable development of the sector in the medium term

I. Relief from the crisis in the short−term

To provide immediate relief to citizens, government must begin to realize potential supply possible from present capacity of the power sector. NEPRA estimates shortage of about 5,000 MW in capacity[84.] The measures below would add substantial capacity very quickly:

- Improve governance in government owned generation, transmission, and distribution:
    - A low hanging fruit is to use administrative means to reduce line losses, improve DISCO profitability, and increase cash flow to the power supply chain. Line loss occurs for two reasons: governance and technical. Given the time and extent of the practice, line losses have assumed a political economy and lobby that includes interest groups among service users and officials of DISCOs and government. Because of its effect on production of electricity, the cost to the economy from DISCO losses far exceeds the financial loss to DISCOs. With government resolve, it is possible to reduce line losses by about fifty percent in the near term. This requires political will and is entirely within government control. IPR estimates that a five percentage point decrease in line loss would generate Rs. 55 billion annually for DISCOs and K Electric consequently reduce circular debt obligations by an equivalent amount. A doable 7-percentage point would yield 77 billion rupees[85].To improve governance the government may take following action:
        - Address issues of organization and structure by restoring stature to the distribution sector. This is a trillion rupees segment, with great diversity. It must not be handled in the present fragmented way. Government must create a holding company with dedicated professionals to manage performance of the ten DISCOs.
        - Government may set up Summary Courts for handling cases of line losses and pilferage of electricity.
        - End-to-end use of technology will enable tracking and reducing line and bill recovery losses. The gains from loss reduction itself will allow capital formation for investment in technology and T&D efficiency. It will allow also to bill peak and off-peak usage.
        - Given that non-payment of bills is a major issue, government or NEPRA must declare a maximum period for non-payment or a maximum amount. DISCOs must disconnect supply as soon as the consumer breaches the ceiling.
    - Similarly, reduce amount of receivables of amount billed, but payment not received. For fiscal 2013-14, under recovered amount by DISCOs (not including K Electric) is Rs. 98 billion (118 billion including estimate for K Electric). Estimate of incremental cash flows on this account is Rs. 50 billion annually.
    - IPR estimates that DISCOs lose an amount of Rs. 130 Billion annually by applying a rate for use of power lower than applicable rate. Some DISCOs negotiate recovery with non-paying consumers on the billed amount. This is a fall out from the practice of overbilling of consumers. As consumers have no faith in DISCO billing process, they hedge by negotiating. Inevitably, DISCOs settle for an amount below the billed amount. This practice occurs in several DISCOs. This too could yield about Rs 20 billion rupees per annum.

The increase in cash flow and more importantly in the documentation would add substantial capacity to generation by reducing circular debt.

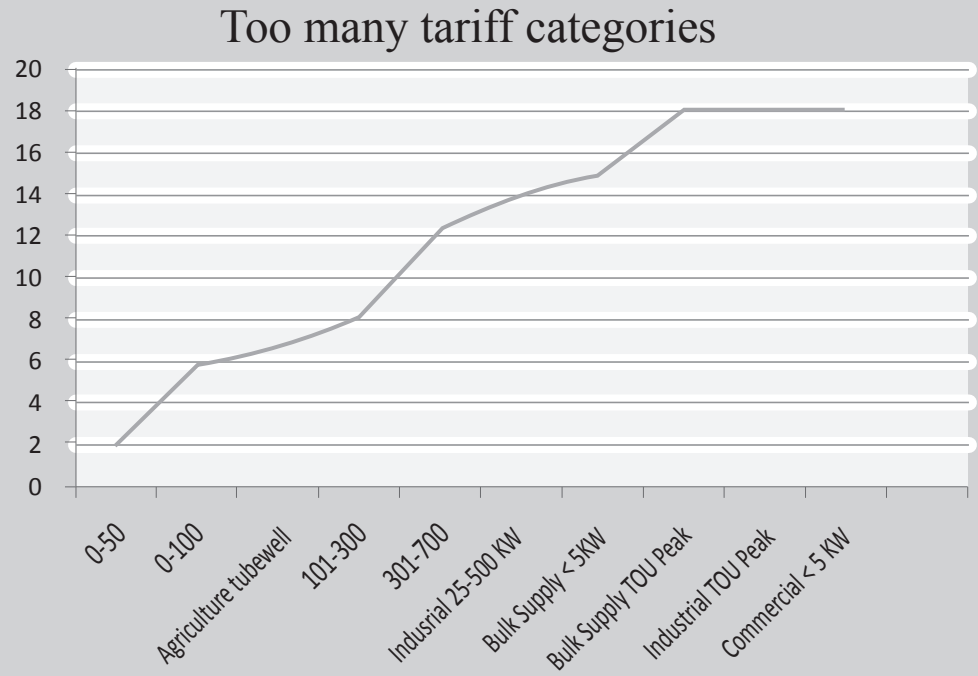
- Reduce tariff slabs and increase peak off-peak difference:

  - Reduce tariff slabs: Loss on this account is borne by data obtained from Ministry of Water and Power. Their document shows concentration of use at the upper end of each slab. Proliferation of slabs is an incentive to shifting tariff charge to a lower category (see Figure 7 below). IPR proposes reducing slabs in a way that it would be revenue neutral or have a positive effect on revenue.

  - Increase tariff difference between peak and off-peak tariff: This will help with managing demand and conserving energy. Current tariff incentive has not helped shift demand from peak to off peak hours. We recommend efforts to do so to help overcome both generation and transmission constraints. Perhaps the one-third tariff incentive is not enough. IPR proposes a fifty percent difference in tariff for industrial users by increasing peak rates and reducing off-peak rates.

  - Government's announcement of tariff relief (by almost Rs. 3 per KWh) is a 25% reduction from present level. This will reduce incentive for losses, but also may increase demand and could increase load shedding.

Figure 7



Source: State of Industry Report, NEPRA

- Increase gas allocation for power generation

Gas allocation for power dropped in 2013-14 from 2012-13 by 10 %. This trend began in 2008, when 61% of thermal power relied on gas and 39% relied on oil. By 2013, this changed to 43% for gas and 57% for oil. The cost of power produced from gas is Rs.6 to 7/ KWh as against Rs. 15 to 18/KWh for power produced from oil. Increase in power generation from gas reduces cost of power. IPR estimates that availability of an additional 400-mmcfd gas for power (10% of total production) would increase production capacity by 2,000MW. Increase of gas supply for power by 14% will reduce cost by 55 paisa per KWh and overall cost saving of 55 billion Rs[86].

Within the power sector, it is important to follow the merit order of plant efficiency. Each year NEPRA issues a merit order for plants.

The trend for shifting gas from power to other uses began in fiscal 2004-05 when the power sector received 507 Bcft. It declined since to 337 Bcft in 2010-11[87]. Fiscal 2013-14 saw further decline of gas allocation for power. Power sector received 27.5% of domestic gas produced for the period July- April 2012-13. This declined to 26% for the corresponding year-to-year period in fiscal 2013-14. Allocation for fertilizer increased from 15% to 19% during the same period[88]. The National Power Policy 2013, stipulates that all gas would go to the power sector. IPR is of the view that a ten to fifteen percentage points increase for power would bring in significant generation capacity to reduce load shedding in off peak months.

- Retire circular debt

Each year, government provides in the federal budget between 250 and 300 million rupees to settle power sector subsidy. Circular debt is the amount of unpaid subsidy as well as below NEPRA standard performance by DISCOs and GENCOs. It is possible to eliminate circular debt by:

  - Reducing cost of electricity (fuel mix and generation efficiency)
  - Improving governance (less loss by DISCOs and GENCOs)
  - Timely payment of subsidy

IPR recommends relying on the first two to reduce circular debt. Reduced cost (as in higher gas allocation) will reduce subsidy, improved governance will cut down DISCO loss. However, until government takes care of the above, it is necessary that they settle the budgeted subsidy on time and not allow it to build up. In the event, it clogs the system, and reduces availability of power. Government also pays for power not produced and mark-up on it.

IPR recommends also gradual removal of all subsidies to consumers who may pay the billed amount. Government may prepare a plan to support low-income consumers through a special social protection scheme. This will improve targeting of subsidy and do away with break in payments to power producers.

There is a danger that some IPPs may invoke sovereign guarantees. There is no confirmed estimate of circular debt though most estimates place it at 300 billion rupees. IPR recommends immediate retirement of 110 billion rupees followed by 20 billion Rs monthly.

- Provide duty drawback to export industry

Despite recent reduction, high cost of electricity places our businesses at a competitive disadvantage.

Table 19 shows that Pakistani businesses pay significantly more for use of power than competitors in the region do. These do not reflect recent reduction in power tariff. As energy prices have declined world over, other countries too will reduce tariff commensurate with their dependence on fossil fuel. Our businesses will continue to face relative disadvantage.

IPR recommends providing a duty drawback scheme for our export businesses to compensate for loss in competitiveness. Government may take up with WTO to define it as a like tradable commodity.

II. Short to medium-term

- Public investment
    - o In the PSDP, divert resources from other sectors, especially highways, to increase generation and transmission capacity
    - o Invest in GENCOs rehabilitation or replacement and in hydropower. In the case of GENCOs, prioritize those with useable cooling water, fuel supply infrastructure, and electric switchyards. At the same time, they will have transmission linkage.

Below is a prioritized list of Hydropower and GENCOs investment for early completion. The grey filled projects must complete early to give 1,925 MW within a few months. Tarbela, Neelum Jhelum and Mangla refurbishment would take two to three years to yield another 2689 MW.

Table 22
Proposed projects for early completion from PSDP

Project	Capacity MW	Throw forward 1.7.2014 Billion Rs
Hydropower (storage and run off the river)		
Neelum Jhelum	969	149.5
Refurbishment of Mangla Power	310	51.3
Tarbela Fourth Extension	1,410	68.5
Kheyal Khawar Hydro Power	122	3.1
Golan Gol	106	18.5
GENCOs Combined Cycle		
Guddu	747	8.1
Chicho ki Mallian	525	31.2
Nandipur	425	1.8 (does not include recent revision)
	4,614	332
Allocation 2014-15 (including self-financing)		104.3

Source: IPR recommendation based on information in PSDP 2014-15

- Increase Investment in Transmission and Distribution

    - Transmission capacity constrains additional power generation. Various estimates place a limit on overall transmission capacity at between 1200 to 1500 MW of power. Yet some feeders for some DISCOs, for example LESCO, are under used. It is possible to increase supply to these DISCOs. Transmission must reliably deliver generated power. Expansion of transmission network and augmentation of grid stations would reduce constraints on delivery of present generation and provide for expected addition to capacity. IPR recommends prioritized implementation of transmission projects to complete in two to three years for the following:

Table 23
Prioritized transmission projects

Location/Generation unit	MW	Transmission project throw forward Rs Billion
Guddu	747	7.8
Neelum Jhelum	969	20.6
Tarbela Fourth Extension	1,410	
Gadani Imported Coal (From Gadani to Lahore and to Faisalabad)	6,600 (estimated)	300 (Need to study possible cost reduction by connecting it to grid at Mattiari or Jamshoro-Moro)
Faisalabad 500 KV	1,500	11
Chashma	440	2.8
Four new projects with JBIC: RYK, Chishtian, Gujrat, and Shammar		4.2
50 kv 3rd circuit Jamshoro-Mo-ro-RYK		35.3
Augmentation of NTDC system		3.3 0.9
Total		386
Allocation		59

Source: IPR recommendation based on information in PSDP 2014-15

The 59 billion rupees allocation for transmission assumes that NTDC will finance 56 of the 61 transmission projects in the PSDP or 75% of total allocation for transmission. Recall, one of the key issues impeding power supply is restricted cash flow. There is little capital formation in loss making units. PEPCO's ability to self-finance is inherently limited. Government must step in with public investment by reducing spending in other sectors.

    - Distribution: With increase in frequency and duration of unplanned power breakdown (refer discussion on SAIFI and SAIDI), it is important to improve the distribution system. The 11 KV feeders seem to be affected especially. Government may prioritize these in the PSDP. Table 24 below shows overloaded feeders.

Table 24 Number of Overloaded Feeders				
DISCO	132 KV	66 KV	33 KV	11 KV
PESCO	17	-	-	41
TESCO	2	2	-	-
IESCO	11	-	-	30
GEPCO	31	6	-	15
LESCO	-	-	-	-
FESCO	2	-	-	383
MEPCO	10	-	-	130
HESCO	-	-	-	-
QESCO	-	-	-	-
Total	73	8	-	629
Source: NEPRA State of Industry Report 2013				

- Begin a privatization programme for government owned entities or manage them on market principles:
    - Government entities in the power sector have suffered from inaction. GENCOs have suffered in particular. Government may either commit resources for rehabilitation of GENCOs and delegate decision making to their management or privatize them.
    - It is important to strengthen NEPRA capacity before government privatizes DISCOs or gives them out on lease.

III. Sustainable development of the sector in the medium term

The present crisis is not a transient case of demand exceeding supply. It results from deep policy, governance, and structural flaws. A number of issues affect power supply. A plan for improvement must look, among others, at the energy and fuel mix, participation of public and private sectors, efficiencies of generation. It must deal with fuel supply arrangements, especially increase in indigenous fuel supply, import of energy, logistics (at port and pipeline capacity), and refining capacity. Government must also optimize among power tariff levels, creating fiscal space for reinvestment in the sector, and in ending subsidy. It must correct PSDP allocation to realize the country's hydro potential, improve GENCO and T&D efficiencies.

Reduction in world oil prices has allowed government to provide relief to users. The resultant tariff decrease may reduce some of the incentive for line losses.

- Demand Estimate
    - It is important to begin with a reliable estimate of power needs for the next twenty years. GDP growth estimates are not much help as in recent years there is no convergence between growth and demand. History could be a guide though with suppressed demand and high losses it is hard to rely too much on past consumption increase (consumption

grew by a simple average of 2.7% per annum between 2008-09 and 2012-13 [89]). High line loss suggests that electricity inputs the economy though is not counted. Some of the demand estimates are:

- NTDC's five year forecast for demand, which NEPRA endorses, places capacity needs at 26,755 MW for 2018 (actual available capacity as opposed to installed).They estimate 2013 available capacity to be 18, 827. This means a 42% increase in capacity over five years or 8.5% annually[90].
- NTDC's National Power Expansion Plan, 2011, provides a long-term perspective and forecasts a similar increase in demand. With 2009-10 as the base year, it estimates demand to grow from 106,569 GWh to over 737,000 GWh in 2034-35 at an increase of 8.05% annually[91]. They estimate average annual GDP growth at 5.2%. All benchmarks show an elasticity of 1.6 is high.
- Planning Commission's Pakistan Integrated Energy Model estimates a fourfold increase in generation by 2030 to reach 410,000 GWh requiring an additional capacity of 82,000 MW[92].
- A government sponsored private sector energy committee estimates generation capacity needs of 50,000 MW by the year 2022[93].
- The country has always fallen short of past ambitious demand targets for generation capacity. It is important to invest in T&D and not focus on generation alone. With an elasticity of 1.2 to average annual GDP growth of 5%, IPR estimates the country's capacity needs to be as follows:

Table 25
Estimate of Capacity to Meet National Power Demand

Year	2014	2020	2025	2030
MW	23,000	32,500	43,500	58,500

- A least cost generation approach
  - Have a base load plan contingent on cost of power. The plan will prioritize hydro generation, gas fuelled, and coal power in that order. Demand in excess of normal may be sourced from fossil fuel (RFO and HSD). Government may also increase share of alternative fuel based on solar and wind. Solar and wind power are important particularly for off grid supply for localized development and to provide access to population that are outside the coverage area. World price of photovoltaic cells has fallen by 80% since 2008, and estimates are that 'the best utility-scale solar projects can now produce electricity for less than $0.10 per kilowatt-hour'[94]. For the foreseeable future though hydro and coal should have the major share in power supply. Other than those under implementation, IPR proposes that all new thermal plants be in private sector and new hydropower may be in public and private sector.

To maintain sustainability, Pakistan must aim to change its production profile as follows:

Table 26
Profile of Power Production and Fuel Source

	Hydro	Thermal	Gas	Coal	Fossil fuel	Alternative	Nuclear
2015	28.8	67.6		< 1		< 1	3
2025	35	50	(20)	(15)	(15)	10	5
Add capacity MW	9,000	8,000		(8,000)		3,000	1,500

Note:

Production from gas, coal, and fossil fuel are given in brackets as they are subset of thermal. Breakup between gas and fuel not given for 2015 as it is contingent on gas allocation for power by government

Additional capacity is based on demand of 43,500 MW estimated for 2025.

Additional capacity takes in to account projects under implementation

- Sequencing the projects: Under short to medium-term recommendations, we have taken GOP GENCO and hydropower projects on which government has committed significant resources. Within this group, we choose the economical options, in terms of capex and per unit price (see Table 27 for forecast of fuel cost/MMBtu). This is NTDC's approach, whose recommendations get lost in government's planning process. Government may follow this approach for medium to long-term expansion in private and public sectors.

Table 27
Forecast of Fuel Cost S/MMBtu

Fuel	2010 Price	Projection			
		2015	2020	2025	2030
Crude Oil	13.75	16.46	18.85	20.05	21.51
Imported Gas	9.26	10.60	11.87	12.51	13.29
Imported LNG	7.96	13.23	13.98	14.68	16.84
HSFO	12.48	12.57	14.41	15.32	16.44
LSFO	13.72	13.84	15.85	16.85	18.07
Diesel	19.84	21.68	24.78	26.31	28.20
Imported Coal	4.83	6.19	6.91	6.36	5.88
Thar Coal	3.99	3.99	3.99	3.99	3.99
Thar Syngas	2.86	2.86	2.86	2.86	2.86
Nuclear	0.23	0.36	0.27	0.27	0.27

Source: Adapted from NTDC National Power System Expansion Plan based on data from EIA, Pakistan Energy Yearbook, and Inter State Gas Systems

The fuel data may appear outdated in view of current energy price trends, but they remain relevant to exercise choice based on relative prices.

- Planning Commission or PPIB do not have retirement plan for existing equipment. More than fifty percent of world generation investment is replacement. Government must prepare a Hydro, GENCO, and IPPs rehabilitation and replacement schedule years before they need it to ensure continued supply without breakages.

- Competitive Trading in Electricity

NTDC may begin to source power from IPPs on the basis of competitive bidding in timelines of two to four weeks. NTDC may initially purchase power from base load plants (hydro, nuclear, GENCOs) and use a process of bidding for remaining supplies.

- Dispute Resolution

Government or NEPRA may immediately make efforts to resolve disputes between NTDC and IPPs.

- Indigenization

If present domestic production pattern continues, import needs will increase exponentially (Figure 3). IPR estimates that the coal-fired plant from China alone would need annually 1.4 billion USD at current low prices (Box 1). Even with declining prices, Pakistan cannot afford such high dependence on imported energy. Present government policies, looking for quick fixes, will enhance dependence on imports:

- Develop hydropower potential (see discussion under generation)
- Develop Tharto builddomestic coal capacity: This would help reliable fuel supply. The lignite resources at Thar need three interventions by the provincial government:
  - Drilling of exploration wells to reliably estimate proven reserves and their location
  - Infrastructure to access resource locations: reliable road access, power supply, and drainage of brine as present infrastructure is limited
  - High level leadership for development of the resource and to ensure concession management
- Explore shale production: Potential for shale gas and oil is high. Government must announce soon a policy on shale and a framework to encourage investment. Given its long learning curve and high investment needs, E&P companies need support to realize shale potential. Current low energy price must not allow complacency.
- Build Wind and Solar: NEPRA has done well to approve upfront tariff rates. Wind and solar is especially useful to meet off-grid local needs.
- Government may announce special policy for small hydro plants in the private sector. This could help local off grid needs.

- Energy efficiency and conservation

- Embark on a strong conservation awareness programme
- Parliament must pass immediately Pakistan Energy Efficiency and Conservation Bill.
- Update transport and building laws and regulations
- Begin energy rating for appliances
- Create incentives for consumers as some of above require them to commit resources before realizing the benefits from conservation
- Increase tariff differential between peak and off-peak power use (refer above)

- Financing plan

Financial close of private or PPP projects is a major hurdle in adding new capacity. Pakistan may establish an Energy Support Fund to pump prime energy investment. Government's PDF of 157 billion rupees should be the initial source. This may be promoted with donors and funds, after an announcement of a programme (policies exist already) for increasing private generation and other investment. Government may access following sources:

- Multilateral and bilateral lending institutions
- China's Asian Infrastructure Investment Bank
- WB Global Infrastructure Facility
- G 20 Global Infrastructure Hub
- Risk mitigation through MIGA

While sourcing private or PPP investment government must ensure the following:

- Observe private power policy provisions of transparency
- Not provide incentives that make the sector unsustainable and prefer these for indigenization and for renewables
- Prioritize low unit cost power

Table 28
Table of Recommendations

I. Short-term relief				
	Activity		**Responsibility**	**Implication**
1	Improve governance in government owned generation, transmission, and distribution		GOP	
	I	Reduce line losses by 50%	GOP PEPCO, esp. DISCOs	Improve cash flow, reduce circular debt to increase generation, and allow capital formation, and increase capital formation
	II	Reduce under recovery of billed amount	--do--	
	III	Charge applicable tariff rates		
2	Reduce tariff slabs and increase peak off-peak difference		GOP, NEPRA	
	I	Reduce tariff slabs	GOP, NEPRA	Reduce DISCO losses
	II	Increase peak off-peak differential	--do--	Conserve energy and manage demand
3	Increase gas allocation for power		GOP	iii. Reduce unit cost and total power cost iv. Reduce subsidy and circular debt
4	Retire circular debt and pay TDS in time		MOF, GOP	iii. Increase generation iv. preclude invoking of guarantees by IPPs
5	Subsidy policy must incentivize efficiency and make DISCOs accountable for live losses.		MOF, NEPRA	Increase generation
6	Provide duty drawback to export industry		GOP	Increase exports
II. Short to medium-term				
1	Public Investment			
	I	Divert PSDP to power from other sectors	GOP	Quick addition to generation capacity Rehab reduces capital cost Lower unit cost from hydro Hydro helps with indigenization
	II	Invest in prioritized GENCOs and in hydropower	GOP, PEPCO, WAPDA	
2	Increase Investment in Transmission and Distribution		GOP, PEPCO, NTDC, DISCO	
	I	Prioritize transmission projects		Realize benefits from completed projects, Build reliability
	II	Prioritize distribution projects		--do--
3	I	Begin competitive trading of power	NTDC / NEPRA	Increase efficiency in generation
	II	Resolve NTDC-IPPs disputes	Ministry / NEPRA	Improve environment

III. Sustainable development of the sector in the medium term				
1	Demand Estimate		Planning Commission, Ministry of Water and Power	Logical development of sector
2	I	Plan base load generation on the basis of cost/KWh (prioritize hydro and coal) and alternative for off grid	Ministry of Water and Power	Sustainable development
	II	Least Cost Generation approach to sequence projects		
3	Indigenization		GOP, GOS	Increase reliable fuel supply, reduce cost
	I	Expand hydropower capacity	GOP, WAPDA	
	II	Develop Thar resources Establish reliable estimate of reserves Develop infrastructure Concession management	GOS, Thar Coal Development Board	Reduce import dependence
	III	Explore shale oil and gas	GOP, M/O Petroleum	Reduce import dependence
	IV	Increase solar and wind	GOP, M/O W&P, Alternate Energy Development Board	• Increase access to electricity, especially for off-grid consumers • Reduce import dependence
	V	Special policy for small private hydro power projects	PPIB	
4	Energy Efficiency and Conservation			
	I	Raise awareness		• Manage demand • Increase affordability and competitiveness • Improve environment
	II	Parliament to pass law		
	III	Government to issue rules for transport and building		
	IV	Government to begun rating of appliances		
	V	Have some incentive for consumers		
	VI	Increase difference between peak and off-peak tariff		
5	Financing of power sector			
	I	Create a private energy support fund with Rs. 157 B from SDF as initial	GOP, MOF	Assist financial close of private projects to meet with investment gap
	II	Prepare a plan for private participation in power	GOP, M/O W&P	Ensure least cost
	III	Seek international support for the fund	GOP, MOF, EAD	External finance to help meet investment needs

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