REFORMING THE POWER

An institutional analysis of power sector reforms in Pakistan

Kafait Ullah

UNIVERSITY OF TWENTE.

REFORMING THE POWER
AN INSTITUTIONAL ANALYSIS OF POWER SECTOR
REFORMS IN PAKISTAN

DISSERTATION

to obtain
the degree of doctor at the University of Twente,
on the authority of the rector magnificus,
prof.dr. H. Brinksma,
on account of the decision of the graduation committee,
to be publicly defended
on Thursday 9th of April 2015 at 14.45 hours

Kafait Ullah
born on 7th of April 1979
in Sialkot, Pakistan

This thesis has been approved by

Promotor: prof.dr. Jon C. Lovett

Co-promotor: dr. Maarten J. Arentsen

Members of the graduation committee:

Chair and secretary:	prof.dr.ir. T. Mouthaan	UT/BMS
Promotor:	prof.dr. J.C. Lovett	UT/BMS
Co-promotor:	dr. M.J. Arentsen	UT/BMS
Member:	prof.dr. A.J. Groen	UT/BMS
Member:	prof.mr.dr. M.A. Heldeweg	UT/BMS
Member:	prof.dr. R.W. Künneke	Technische Universiteit Delft
Member:	prof.dr. A.E. Steenge	Rijksuniversiteit Groningen

Colophon

The work described in this thesis was performed at the Department of Governance and Technology for Sustainability (CSTM), School of Behavioural, Management and Social sciences, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands.

© 2015 Kafait Ullah, University of Twente, BMS/CSTM

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of the author.

Cover Photo: Children doing homework during loadshedding

Printed by Ipskamp drukkers B.V., Enschede

ISBN: 978-90-365-3862-6

URL: <http://dx.doi.org/10.3990/1.9789036538626>

Table of Contents

Table of Contents	v
List of Figures	ix
List of Tables	x
List of Boxes	x
List of Appendices	xi
List of Abbreviations	xii
Acknowledgements	xv
1. Introduction	1
1.1. Background and Motivation	1
1.2. Scope of the Study	3
1.3. Research Problem and Questions	5
1.4. Outline of the Thesis	7
2. Power Sector Reforms in Developed and Developing Countries	11
2.1. Introduction	11
2.2. Institutional Reforms in Developed Countries	12
2.2.1. The UK	13
2.2.2. The Scandinavian Countries	14
2.2.3. The European Union	15
2.3. Institutional Reforms in Developing Countries	18
2.3.1. Need for reforms	18
2.3.2. Determinants of reforms	19
2.3.3. Reform outcomes	21
2.4. Conclusions: Gaps in Knowledge	28
3. Analytical Framework	31
3.1. New Institutional Economics	31
3.2. New Institutional Economics (Development and Challenges)	33
3.3. Institutions	34
3.3.1. Informal rules	36
3.3.2. Formal rules	36
3.3.3. Enforcement mechanism	37
3.4. Williamson's Institutional Framework	38

3.4.1. First layer-embeddedness.....	39
3.4.2. Second layer-Institutional Environment	39
3.4.3. Third layer-governance structure or institutional arrangement.....	41
3.4.4. Fourth layer-resource allocation	41
3.5. Evolution and Design Approach to Institutional Change	42
3.6. Institutional Change and Sector Reform in Pakistan’s Electricity Industry: An Analytical Framework	46
4. Data and Methodology	51
5. Pakistan and its Power Sector Reforms	57
5.1. Country Profile: Pakistan.....	57
5.1.1. Geography.....	58
5.1.2. Population	58
5.1.3. Government.....	59
5.1.4. Economy	59
5.1.5. Energy	61
5.2. Institutional Reforms in the Power Sector of Pakistan	63
5.2.1. Pre-reform organization and performance of power sector in Pakistan.....	64
5.2.2. Implementation of power sector reforms	65
5.2.3. Post-reform organization and performance of the power sector	65
6. The Persistence of Power Sector Problems after the Reforms.....	75
6.1. Introduction.....	75
6.2. The main Problems Affecting the Electricity supply Industry (ESI) in Pakistan	76
6.2.1. Lack of investment/ insufficient capacity addition	76
6.2.2. Inefficient fuel mix in generation: from low cost to high cost.....	77
6.2.3. Financial constraints	80
6.2.4. Transmission and distribution losses	85
6.3. Institutional Causes of the Electricity Problems	87
6.4. Conclusion	94
7. The Impact of Reforms on Power Sector Performance	97
7.1. Introduction.....	97
7.2. Data and Methodology.....	97
7.3. Results.....	99
7.3.1. Electricity installed capacity per capita, generation per capita and capacity utilization ...	100

7.3.2. Transmission and distribution losses	101
7.3.3. Electricity prices and ratio of industrial to residential prices.....	102
7.3.4. Percent thermal generation.....	103
7.4. Conclusion	104
8. The Impact of Reforms on Private Investment in the Power Sector	107
8.1. Introduction.....	107
8.2. Rationale for Private Investment in the Power Sector	109
8.3. Materialization of Private Investment in the Power Sector.....	110
8.3.1. Location, size, volume, and type of power plants.....	111
8.3.2. Institutional arrangements for private investments in electricity	113
8.3.3. Impact of private investments on reliability of electricity supply.....	114
8.4. Private Investment Barriers According to the World Bank 2002 Survey	115
8.5. Results: (Institutional) Investment Barriers in Pakistan Perceived by Private Investors	117
8.6. Discussion	121
8.7. Conclusion	123
9. Discourses on Barriers to Power Sector Reforms	125
9.1. Introduction.....	125
9.2. Q-methodology and How We Applied It.....	125
9.2.1. Defining the theme and population	126
9.2.2. Collecting the concourse	127
9.2.3. Selection of a representative (Q) sample and P sample	127
9.2.4. Q-sorting	128
9.2.5. Analysis of Q-sorts and results	129
9.3 Results.....	130
9.3.1. Consensus and disagreement notions.....	132
9.3.2. Discourse A: weak governance structure.....	133
9.3.3. Discourse B: mismatch with sector's starting conditions	134
9.3.4. Discourse C: a weak regulatory authority.....	135
9.3.5. Discourse D: political contexts	135
9.4. Analysis of Results from Analytical Framework.....	136
9.4.1. Consensuses and disagreements among all the discourses over reform failure	136
9.4.2. Discourses on reform failure.....	138
9.5. Conclusion	139
10. Conclusions.....	141

10.1. Introduction.....	141
10.2 The Answers to the Research Questions.....	141
10.3. Policy Suggestions.....	147
10.4. Suggestions for Further Research	149
Bibliography	151
Summary	161
Samenvatting.....	169
About the Author	173
Appendices.....	175

List of Figures

Figure 1-1: Thesis map of research questions.....	8
Figure 3-1: Organization of the chapter for development of an analytical framework.....	32
Figure 3-2: Hierarchical view of inter-dependence of rules	35
Figure 3-3: Williamson's layered framework.....	38
Figure 3-4: Analytical Framework (The figure needs to be read from left to right).....	46
Figure 5-1: Map of Pakistan.....	57
Figure 5-2: Energy Balance in Pakistan during 2012	61
Figure 5-3: Contribution of energy resources to energy supply during 2012.....	62
Figure 5-4: Final consumption of energy	62
Figure 5-5: Vertical Monopolies of WAPDA and KESC before Reforms.....	64
Figure 5-6: A map of the post-reform structure of power sector in Pakistan	66
Figure 5-7: Comparison of electricity consumption in 1960 and 2012 in Pakistan	68
Figure 5-8: Relationship between GDP growth and industrial growth	72
Figure 5-9: Situation of electricity demand and electricity generation in Pakistan	72
Figure 6-1: Trend in electricity generation from different resources.....	78
Figure 6-2: Fuel mix in electricity generation.....	79
Figure 6-3: Gap between cost of service and average consumer end tariff	84
Figure 7-1: Direction of installed capacity (ICPC), generation capacity (EGPC) and actual capacity utilization (CU)	100
Figure 7-2: Transmission and distribution losses	101
Figure 7-3: Electricity prices for industrial (IndPr) and residential (ResPr) consumers	102
Figure 7-4: Ratio of industrial to residential prices.....	103
Figure 7-5: Percent private generation	104
Figure 8-1: Supply demand comparison in the electricity sector of Pakistan, 1996-2011.	114
Figure 8-2: Satisfaction level of international investors' in the power sector of developing countries	115
Figure 8-3: Ranking of priorities for making investment decisions.....	116
Figure 8-4: Number of investors with their plant specific investments for next couple of years	119

List of Tables

<i>Table 4-1: Research Design</i>	52
<i>Table 5-1: Installed capacity and generation of electricity in Pakistan</i>	68
<i>Table 6-1: Growth rates of electricity demand and supply (ACGR %)</i>	76
<i>Table 6-2: Electricity generation cost from different sources in 2012</i>	80
<i>Table 6-3: Difference between electricity purchased and sold among all DISCOs in Pakistan on 30th June 2012</i>	86
<i>Table 8-1: Sector wise electricity generation in Pakistan in 2012</i>	111
<i>Table 8-2: Location and volume of private investment in the power sector</i>	112
<i>Table 8-3: Size and type of power plants</i>	113
<i>Table 8-4: Features of sample power plants</i>	117
<i>Table 8-5: Factors responsible for location decision</i>	118
<i>Table 8-6: Factors responsible for technology preference</i>	118
<i>Table 8-7: Barriers to private investment</i>	120
<i>Table 8-8: Comparison of investment environment in the electricity sector of Pakistan with other developing countries</i>	120
<i>Table 9-1: List of stakeholders included in the population</i>	127
<i>Table 9-2: Barriers score (from -4 to +4) for each discourse</i>	130
<i>Table 9-3: Stakeholder's loadings on each factor or discourse</i>	131

List of Boxes

<i>Box 2-1: Existing stages of electricity reforms in developing countries</i>	22
<i>Box 2-2: Gradual stages of electricity reforms in developing countries</i>	22

List of Appendices

<i>Appendix 1: Switching rate of residential consumers among different countries and US states</i>	<i>175</i>
<i>Appendix 2: General steps in electricity reforms</i>	<i>176</i>
<i>Appendix 3: Pre-reform electricity sector characteristics in non-OECD countries</i>	<i>177</i>
<i>Appendix 4: Private investments in power sector of developing countries during 1990-1999 (million US\$).....</i>	<i>178</i>
<i>Appendix 5: Valuation of industrial load shedding in Pakistan during 2008 and 2009</i>	<i>178</i>
<i>Appendix 6: A summary of example studies on the impact of institutional reforms over performance of power sector</i>	<i>179</i>
<i>Appendix 7: A summary of example studies on the determinants of institutional reforms.....</i>	<i>183</i>
<i>Appendix 8: A summary of example studies explaining the impact of reforms over the performance of power sector in individual countries or a group of regional countries (case studies)</i>	<i>187</i>
<i>Appendix 9: A summary of example studies on institutional reforms in South Asia and Pakistan</i>	<i>190</i>
<i>Appendix 10: Third layer-transaction costs, asset specificity and frequency.....</i>	<i>191</i>
<i>Appendix 11: Description of dependent and control variables</i>	<i>194</i>
<i>Appendix 12: Descriptive statistics of variables.....</i>	<i>194</i>
<i>Appendix 13: Correlation matrix of variables</i>	<i>194</i>
<i>Appendix 14: Concourse for Q Study</i>	<i>195</i>
<i>Appendix 15: Factor Loading on Discourses</i>	<i>200</i>
<i>Appendix 16: Energy Map of Pakistan</i>	<i>206</i>
<i>Appendix 17: Questionnaire from power sector private investors</i>	<i>207</i>

List of Abbreviations

ADB	ASIAN DEVELOPMENT BANK
BOO	BUILD OWN OPERATE
BOT	BUILD OWN TRANSFER
CANUPP	CHASHMA NUCLEAR POWER PROJECT
CCGTs	COMBINED CYCLE GENERATION TECHNOLOGIES
CEER	COUNCIL OF EUROPEAN ENERGY REGULATORS
CEGB	CENTRAL ELECTRICITY GENERATION BOARD
CPPA	CENTRAL POWER PURCHASE AGENCY
DISCOs	DISTRIBUTION COMPANIES
EAP	EAST ASIA AND PACIFIC
EdF	ELECTRICITE de FRANCE
ESI	ELECTRICITY SUPPLY INDUSTRY
EU	EUROPEAN UNION
FDI	FOREIGN DIRECT INVESTMENT
FESCO	FAISALABAD ELECTRIC SUPPLY COMPANY
GDP	GROSS DOMESTIC PRODUCTION
GENCOs	GENERATION COMPANIES
GEPCO	GUJRANWALA ELECTRIC POWER COMPANY
GW	GIGA WATT
GWH	GIGA WATT HOUR
HESCO	HAIDERABAD ELECTRIC SUPPLY COMPANY
IBRD	INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
ICT	INFORMATION & COMMUNICATION TECHNOLOGY
IESCO	ISLAMABAD ELECTRIC SUPPLY COMPANY
IMF	INTERNATIONAL MONETARY FUND
IPP	INDEPENDENT POWER PRODUCERS
ISO	INDEPENDENT SYSTEM OPERATOR
IV	INSTRUMENTAL VARIABLE
KAPCO	KOT ADDU POWER COMPANY
KESC	KARACHI ELECTRIC SUPPLY COMPANY

KW	KILO WATT
KWH	KILO WATT HOUR
LAC	LATIN AMERICAN COUNTRIES
LESCO	LAHORE ELECTRIC SUPPLY COMPANY
MEPCO	MULTAN ELECTRIC POWER COMPANY
MW	MEGA WATT
MWH	MEGA WATT HOUR
NEPRA	NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NETA	NEW ELECTRICITY TRADING ARRANGEMENTS
NIE	NEW INSTITUTIONAL ECONOMICS
NGC	NATIONAL GRID COMPANY
NTDC	NATIONAL TRANSMISSION AND DISPATCH COMPANY
nTPA	NEGOTIATED THIRD PARTY ACCESS
OFFER	OFFICE OF ELECTRIC REGULATION
OIE	ORIGINAL INSTITUTIONAL ECONOMICS
OLS	ORDINARY LEAST SQUARE
PAEC	PAKISTAN ATOMIC ENERGY COMMISSION
PC	PLANNING COMMISSION
PCA	PRINCIPAL COMPONENT ANALYSIS
PEPCO	PAKISTAN ELECTRIC POWER COMPANY
PESCO	PESHAWAR ELECTRIC SUPPLY COMPANY
PPI	PRIVATE PARTICIPATION IN INFRASTRUCTURES
PPHC	PAKISTAN POWER HOLDING COMPANY
PPIB	PRIVATE POWER INFRASTRUCTURE BOARD
PPP	PAKISTAN PEOPLE's PARTY
PSO	PAKISTAN STATE OIL
QESCO	QUETTA ELECTRIC SUPPLY COMPANY
RECs	REGIONAL ELECTRICITY COMPANIES
RPPs	REGIONAL POWER PLANTS
RTOs	REGIONAL TRANSMISSION OPERATORS
rTPA	REGULATED THIRD PARTY ACCESS
SBP	STATE BANK OF PAKISTAN
SCBA	SOCIAL COST BENEFIT ANALYSIS

SECP	SECURITY & EXCHANGE COMMISSION OF PAKISTAN
SEPCO	SUKKAR ELECTRIC POWER COMPANY
SPP	SMALL POWER PROJECTS
TRANSCO	TRANSMISSION COMPANY
T&D	TRANSMISSION AND DISTRIBUTION LOSSES
TDS	TARIFF DIFFERENTIAL SUBSIDIES
UAE	UNITED ARAB EMIRATES
UK	UNITED KINGDOM
US	UNITED STATES
US\$	UNITED STATES DOLLAR
WAPDA	WATER AND POWER DEVELOPMENT AUTHORITY
WDI	WORLD DEVELOPMENT INDICATORS

Acknowledgements

This doctoral dissertation is purely inspired by the problems that common people face in Pakistan due to electricity crises. This accomplishment was not possible without the support of many people. I am deeply indebted to all of them who utilized their time and resources to complete this work. I acknowledge their contribution to this work from the core of my heart.

First of all, I am very grateful to my esteemed supervisors Prof. Dr. Jon Lovett (Promoter) and Dr. Maarten Arentsen (Co-promoter) for putting me on right track and supporting me at every step of my research. It was quite difficult to start and advance in PhD research without funding. However, Prof. Jon Lovett not only encouraged me for starting PhD but also throughout the period. His insights on Institutional Economics and Q methodology that he shared with me even before I came to formally start the PhD, moved me seriously to those topics. I also thank you Jon for your invaluable contributions in editing this dissertation.

I am also greatly thankful to Dr. Maarten Arentsen for guiding me in a minute manner in writing this dissertation. His guidance corrected me always while I was about to astray in my writing. He also helped me in settling down in Enschede and thanks for the bicycle to ease my movement to and from the university. Actually, the credit to select the field of electricity reforms goes to Maarten. It happened in very early days of PhD when I sent some writings to Maarten and his comments and discussions drove me to this particular field. In order to clarify my thoughts on network liberalization, he instructed me to attend a week-long course on liberalization of network industries in TUDelft. That course basically answered many questions and cleared ambiguities, I had in my mind. I also thank to the organizers of that course, particularly Prof. Rolf Künneke for his kind encouragement, comments and discussions.

All the colleagues working in CSTM have been very helping throughout my PhD. Particularly the staff at CSTM secretariat including Annemiek, Barbera and Ada have always been very kind to solve the problems that I faced throughout this period. I am very thankful to all of them. I am also thankful to other fellows at CSTM for being kind and supportive during my stay at Ravelijn.

The participants, the key informants, the officials and the facilitators who generously gave their time for sharing important information are highly commendable. I also thank you all.

Alongside, I also thank to all my friends who always encouraged me and offered their sincere services during this PhD research. I also thank to Higher Education Commission of Pakistan for giving me partial scholarship for the last six months of my PhD. In fact, it was quite difficult to complete this dissertation without that partial scholarship.

Last but not the least; I am highly grateful to my family for letting me spend my time abroad when they really needed me. My parents, brothers and all family members really deserve appreciation for sacrificing their comforts and putting resources for completing my PhD research. Most of all, I am highly appreciative of my beloved wife who lived without me in her critical period. I have no doubt that this dissertation was not possible to complete without her sheer sacrifice.

1. Introduction

1.1. Background and Motivation

The main purpose of this dissertation is to analyze the institutional reforms in the power sector of Pakistan from the perspective of *New Institutional Economics (NIE)*. Institutions are defined by North (1990a) as “*rules of the game*”, and play a key role in the reform of an economic sector such as the electricity sector (Besant-Jones, 2006). Institutional change of an economic sector requires changing the basic rules for governing transactions, altering existing organizational structures and creating new structures to meet the transactional requirements of a new framework (Bhattacharyya, 2007). By the early 1980’s, poor performance of vertically integrated electricity sectors had motivated many countries (developed and developing) to reform their power sectors towards a market oriented institutional framework (Bacon and Besant-Jones, 2001, Erdogdu, 2012, Jamasb, 2002). Post-reform evaluations reveal that many reforming countries (mostly developing) have not made major improvements to the performance of their power sectors (Nagayama, 2007, Jamasb, 2006, Jamasb et al., 2004, Kessides, 2013). Discrepancies in reforms’ performance amongst developing countries is triggered by differences in country specific institutional endowments such as political and economic institutions, state level organizations and ideology of the key reform entrepreneurs (including rule makers, implementers and employees of the organizations) (Erdogdu, 2013a, Zhang et al., 2008). Given the importance of country and sector specific institutional endowments in the success of institutional reforms in a particular country, it is necessary to analyze the institutional reforms in the power sector of a single country rather than at the aggregate level of a group of countries or at the continental level.

Like other developing countries, Pakistan implemented a suite of institutional reforms in the early 1990’s to improve its struggling electricity sector. However, there is little improvement in performance from the pre-reform era. Pakistan experiences severe electricity blackouts, insufficient and inefficient electricity generation reduced private investments, an inefficient pricing system and excessive transmission and distribution losses. Several reports from domestic and international organizations reveal that institutional and governance aspects are dominant reasons for the poor performance of the power sector in Pakistan (WorldBank, 2013, USAID, 2010, ADB, 2010a, CCP, 2009). As a result, the poor performing power sector has been inflicting agony upon every aspect of social and economic life. For instance, excessive blackouts in the country (up to 20 hours a day in rural areas and 14 hours/day in

urban areas) have afflicted the society badly and presented a serious barrier to the country's economic development. Electricity blackouts have caused a reduction of 3-4% in Pakistan's GDP in recent years (IPP, 2009, IPP, 2010), adversely affecting people working in micro, small and medium industries¹. These social and economic miseries have driven to explore the main reasons behind the perpetuation of the pre-reform problems in the electricity supply sector of Pakistan.

The dissertation focuses on the power sector reforms in Pakistan to find out how the reforms were designed and implemented, what the effects were, and whether the performance of the power sector improved or not after the institutional reforms. More specifically, the study focuses upon (a) the need for institutional reforms (b) the gist of institutional reforms (c) the impact of institutional reforms on the performance of the power sector and (d) the factors responsible for poor performance of the sector after the institutional reforms. Our analysis will be guided theoretically by New Institutional Economics (North, 1994c).

The main motivation to analyze the power sector reforms in Pakistan from an institutional perspective was to explore the function of institutions to overcome the power sector problems of the country and to explore to what extent contextual circumstances influenced the type and direction of the institutional reforms. The institutional dimensions in combination with contextual circumstances have not been well studied at the level of a single developing country. We fill in this knowledge gap by analyzing these topics for Pakistan.

A second motivation for analyzing the power sector reforms in Pakistan is the apparent lack of positive results, with respect to both the kind of reforms and effects of the reforms. It appears that the reforms have not really changed the structure and functioning of the power sector. The problems that existed before the reforms, and the main reason for those problems, have continued after the reforms (Kessides, 2013, Malik, 2012). The institutional reforms that were initiated to deal with these problems have apparently met with limited success. The persistence of the pre-reform power sectors' characteristics is not only affecting the performance of the power industry, but also the overall social and economic life in the country. Firstly, extensive power outages are causing a rise of unemployment among poor and semi-skilled labor due to the closure of small and medium industries. Secondly the

¹ These industries have rarely any alternative source of power and thus rely heavily on electricity from the national grid. Their operations are severely affected by the increase in load-shedding in the country. Severe instances of load-shedding in some cities have even forced closures of these small industries thereby causing unemployment.

routines of schools, households, hospitals, government offices and private companies are affected. Thirdly, pre-reform feature of financial dependence over government resources is eroding the government's capacity to allocate resources to other societal needs. The persistence of underperformance in the power sector motivated me to study the dynamics of the institutional reforms in the power sector of Pakistan to find out why the reforms did not change the institutional outlook and performance, and have continued the pre-reform institutional structures and its poor performance.

1.2. Scope of the Study

This study develops and applies an institutional framework to analyze and understand institutional reforms in the power sector of a single country, Pakistan. Literature review (both theoretical and empirical) on institutional reforms in the power sector reveals that designing and implementing electricity reforms in a specific country is determined by country and sector specific dynamics (Ruffin, 2003, Bacon and Besant-Jones, 2001). This type of literature is influenced by *NIE*, which stresses the importance of country specific characteristics for explaining variation in type and outcome of institutional reforms among developed and developing countries. The literature shows that developing countries tend to follow an incremental design or a particular sequence in power sector reforms. The rationale behind such a reform approach is to match the context gradually with the new institutional frame, because country specific informal institutions and other aspects of a developing country may change slower compared to developed countries. Therefore, many experts argue that adopting a standard institutional reform template from developed countries in a developing country is inadequate due to the specific contextual differences.

Experts such as Besant-Jones (2006), Jamasb et al. (2004), Pollitt (2009), Joskow (2006), Nagayama (2007), Bacon and Besant-Jones (2001) and Holburn and Spiller (2002) agree that the best way to analyze reforms is at the country level, because this allows exploration of the contribution of the specific national contexts on the reforms and their outcomes. These contexts need to be taken into account in the design and implementation of institutional reforms. The level of harmony between context and reform may help to improve the reform outcomes in a later phase of institutional reform. This type of evaluation study is still quite rare at the level of a single developing country. Moreover, applying *New Institutional Economics* in the analysis of power sector reforms for a single developing country is not common in the literature to date.

Quantitative evaluation studies on power sector reforms have been extensively conducted on cross-country perspectives, in particular developed countries. Inclusion of countries in such quantitative research is decided by availability of reform data, which is why developed countries have mostly been included in the quantitative studies. Recently, however, researchers have also started including developing countries in the evaluation studies of power sector reforms (Besant-Jones, 2006, Zhang et al., 2008, Erdogdu, 2013a). Single country evaluation studies tend to analyze electricity reforms based on discussions and arguments rather than numbers. In this thesis, we have collected reform data for Pakistan to evaluate power sector reforms firstly qualitatively in Chapter 6 and secondly quantitatively in Chapter 7. Both these methods reinforce the findings on the impact of reforms using different performance indicators.

Attracting private investment has been, and still is, considered a strong driver of institutional reform of the power sector. In particular, developing countries went through severe investment gaps in power generation. Private investment rose considerably in the early phases of reforms (early 1990s) but slowed down in later half of the 1990s, due a variety of reasons. Pakistan was among the top 20 countries of the world in raising private investments in the power sector in the early 1990s (Jamash, 2006) but is now passing through severe investment lags, with power blackouts throughout the country as a consequence. This is one of the few performance indicators that reacted positively to power sector reforms immediately after the start of reforms, but for a very short period. So, it is important to find out why this happened and why private investments could not continue in the power sector of Pakistan. It is important to understand the perceptions of the private investors, and why they are no longer investing in the up-gradation and expansion of the existing plants and installation of new power plants in Pakistan, despite the institutional reforms. Once their apprehensions are understood, it will be possible to suggest revisions in the institutional reforms to improve the investment climate. In Chapter 8 of the dissertation we will look into the barriers which discourage private investors from investing in the power sector of Pakistan.

Evaluation of reforms reveals the degree of achieving the reform objectives in a specific country. If the reforms did not bring about the improvements as expected, then it is important to understand why. Our assumption in this dissertation is that failures in institutional reforms are related to, or even caused by, the specific country characteristics (contextual factors of a country). In Chapter 9 of the dissertation we will analyze this assumed relationship for the

power sector in Pakistan. To our best of knowledge, this type of studies on a single developing country is quite rare in the literature on power sector reforms.

1.3. Research Problem and Questions

Pakistan's electricity sector is underperforming. It is inadequate, inefficient and unreliable. There is capacity shortage, high transmission and distribution (T&D) losses, inefficient pricing structures, costly and ineffective subsidies, circular debts and an inefficient resource mix in generation (Kessides, 2013, Malik, 2012, Malik et al., 2009, Munir and Khalid, 2012). These problems already existed before the 1990s, the period that Pakistan reformed its power sector with the intention to solve these problems. But the problems weren't solved by the institutional reforms. Therefore, the assumption analyzed in this dissertation is that the continuation of the poor functioning of Pakistan's power sector is caused by poor and incomplete design of the institutional reform of the power sector and by the pace of implementation of the reforms (Munir and Khalid, 2012, Malik et al., 2009). Pakistan adopted the UK package of institutional reform but only implemented initial reform steps such as allowing IPPs to enter generation and the unbundling of production and distribution of electricity. Other reform aspects such as corporatization, independent regulation, privatization of electric utilities and competition at retail and wholesale supply remained negligible in Pakistan; thus, part of the problem of poor performance lies in insufficient reforms.

This dissertation analyzes reforms in the power sector of Pakistan from an institutional perspective. Our analysis will start with an overall analysis of the problems in electricity supply in Pakistan as they persisted after the institutional reforms in the 1990s. Then we evaluate the reforms quantitatively to validate that reforms did little to disconnect the pre-reform problems such as lack of private investments, transmission and distribution losses, expansive fuel mix in electricity generation, prices and capacity utilization as we argued previously. Then we focus in more detail on an important problem i.e. lack of private investments to reveal why they did not continue on a sustainable basis. The final chapter focuses on why reforms did not succeed in bringing the required changes to Pakistan's power sector. This allows us to make policy recommendations for improving the structure and performance of Pakistan's power sector.

In summary the dissertation will focus on the following research themes of power sector reforms in Pakistan:

- The design and implementation of institutional reforms in the power sector according to institutional theory;
- Institutional reforms and problems in the power sector of Pakistan;
- Institutional reforms and performance of power sector in terms of installed generation capacity, electricity production, capacity utilization, transmission and distribution losses, percent thermal generation and electricity prices;
- Institutional reforms and privatization in the power sector of Pakistan
- Barriers to institutional reforms in the power sector of Pakistan.

The analysis of these research themes has been guided by the following overall research question:

Did the institutional reforms improve the organization, functioning and performance of the power sector of Pakistan and if not, what are the reasons according to NIE?

1. What is, according to *New Institutional Economics*, institutional reform of the power sector and how did developed and developing countries reform their power sector?
2. What are the existing problems in the organization, functioning and performance of electricity supply in Pakistan and are these problems related to the institutional reforms in Pakistan?
3. Did the power sector reforms affect the performance of the electricity sector in terms of installed generation capacity, electricity production, capacity utilization, transmission and distribution losses, percent thermal generation and electricity prices for the industrial and domestic segments and if yes in what way?
4. Did the power sector reforms affect private investments in electricity production capacity in Pakistan and if yes, in what way?
5. What are, according to experts' opinions, the major barriers in the institutional reform of Pakistan's power sector?

The theoretical underpinning of *New Institutional Economics (NIE)* is used to answer these questions. Chapter 3 of this dissertation develops an institutionally oriented analytical framework, based on NIE, which has guided the analysis in the empirical chapters. The

empirical analysis is based on two sets of data. With the help of secondary data we have answered the questions 1, 2, and 3. Questions 4 and 5 have been answered with data collected for this research. The primary data have been collected in two phases. In first phase, a survey was conducted for collecting relevant information from private power investors located in Pakistan to answer question 4. In a second phase, interviews were conducted with power sector stakeholders to answer question 5 and to allow us to apply Q methodology. In a first step, preliminary interviews were conducted with relevant stakeholders to collect notions on impediments to institutional reforms in the power sector of Pakistan. In a second step, a sample of selected notions was presented to the participants for ranking on a Likert scale ranging -4 to +4 during interviews. This process is known as Q sorting. These Q sorts were later utilized to trace and analyze specific discourses in the power sector reforms. Details on data and methodologies are further described in Chapter 4 of the dissertation.

1.4. Outline of the Thesis

The thesis is organized as follows. Graphically the outline is explained in Figure 1-1.

Chapter 1 introduces the dissertation by focusing on the need for current research on electricity sector institutional reform. This chapter further explains the scope of the study and presents the research problem and research questions. It also briefly indicates how the questions will be answered in the respective chapters of the dissertation.

Chapter 2 positions the thesis topic in international empirical research on institutional reforms of power sectors in developed and developing countries. Our analysis of current research indicated knowledge gaps, to which the thesis will make contributions.

Chapter 3 develops the institutionally grounded analytical framework applied in the thesis. It introduces a summary of the theory of *NIE*, its relationship with mainstream *Classical Economics* and differences with *Old Institutional Economics*. The chapter continues by introducing the institutional ingredients of the analytical framework. These ingredients are taken from two institutional scholars: Oliver Williamson and Oliver North. Williamson has introduced a layered institutional framework for understanding a national economic system in general which we use in the institutional structuring of specific economic sectors, such as the power sector, in particular. We will use Williamson's framework to understand the institutional featuring, the institutional change and the institutional outcomes of Pakistan's power sector. Williamson's framework is combined with North's notions on the change in

Figure 1-1: Thesis map of research questions

institutions. North will allow us to analyze the causes of the failure of institutional reforms in Pakistan's power sector and the performance of the sector after the introduction of reforms during the 1990s.

Chapter 4 presents the methodology applied in the five empirical chapters of the dissertation (5, 6, 7, 8, and 9). Chapter 4 gives an overview of the methods applied in these chapters. The methods are explained in more detail in the relevant chapters.

Chapter 5 analyses the pre and post reform era in the power sector of Pakistan and the implementation of the power sector reforms which started in the early 1990s.

Chapter 6 answers the second research question on the relationship between institutional reforms and problems in the power sector of Pakistan.

Chapter 7 answers the third research question on the quantitative relationship between power sector reforms and the performance of the electricity sector in terms of electricity generation

capacity, installed capacity, capacity utilization, transmission and distribution losses, percent thermal generation and price ratio.

Chapter 8 answers the fourth research question by discussing the relationship between institutional reforms and private investment in the power sector of Pakistan.

Chapter 9 answers the fifth research question on barriers to institutional reforms in the power sector of Pakistan.

Chapter 10 presents the conclusions of the dissertation and proposes policy suggestions.

2. Power Sector Reforms in Developed and Developing Countries

2.1. Introduction

This chapter answers the first research question on how countries implemented institutional reforms in their power sectors. Various countries implemented institutional reforms according to a reform model theoretically linked to *New Institutional Economics* (See also Chapter 3). We will analyze institutional reforms based on relevant literature in developing and in developed countries, since both types of countries have adopted different approaches in institutional reform. Our analysis allows us to position the focus of the thesis by identifying several knowledge gaps in the current empirical literature in power sector reforms, in particular in Pakistan.

A large number of countries including developed and developing ones have implemented institutional reforms in the power sector under different models. Some countries, mostly developed nations, have progressed to the advanced stages of reforms, whereas developing countries have either stuck somewhere in the middle or stayed in the earlier phases (Besant-Jones, 2006). This varying progression among countries has yielded different success levels in accomplishing the reforms' main objectives such as improvements in economic, social and environmental indicators (Jamasb et al., 2004). Since, a number of country specific contextual aspects such as political, economic, social and historical, impact the decisions regarding model selection for reforms, progression of reforms and their accomplishments (discussed in detail in Chapter 3); therefore, in this chapter, we briefly analyze the institutional reforms in power sector in a selected number of developed and developing countries to place this dissertation in context to international literature. This literature based analysis and a brief literature review of power sector reforms in Pakistan helps to identify important knowledge gaps that this study will focus on.

This chapter starts by analyzing the reforms in the developed countries, followed by the analysis of reforms in developing countries. Based on the previous literature, this chapter identifies knowledge gaps in the fourth section, which allows us to position our research focus in institutional reform of the power sector.

2.2. Institutional Reforms in Developed Countries

An important reform goal is to create those institutional arrangements for the electricity sector that may provide long term benefits to society by supplying electricity services to consumers at economically efficient costs (Joskow, 2006). Developed countries faced surplus capacity, expensive generation mix, high prices and inefficient production before reforms (Pollitt, 2009). These starting conditions along with the fundamental reasons for reforms² helped to determine the nature and direction of reforms in the electricity sectors of the developed countries. Developed countries required a reduction in prices to increase overall economic efficiency. New technology in generation and distribution facilitated this (Sioshansi, 2006). For example combined cycle generation turbines (CCGTs), smart meters, use of information and communication technologies (ICTs), etc. were supposed to contribute to augment the economic efficiency by lowering the overall costs of electricity services' provision (Steiner, 2001, Joskow, 1998, Joskow, 1996, Joskow, 2001). The idea was that changing the sector's monopoly regulation into a competition-based type of regulation would improve efficiency. Thus institutional reforms in the electricity sectors of developed countries were mainly aimed to remove monopoly features and implant competition at different segments of the electricity value chain with the aim of improving economic efficiencies.

Experiences of developed countries in electricity reforms have displayed mixed results. Some developed countries have achieved more progress with full implementation of reforms, while others succeeded less due to limited implementation of reforms. Anderson (2009) shows that electricity reforms are associated with generation efficiency in developed countries, particularly in nuclear generation. Formation of regional power markets such as Nord Pool among Scandinavian countries, OMEL among Spain and Portugal, RTOs and ISOs among US states and integration of regional power markets at greater level such as in the EU have brought net benefits to the consumers by decreasing variation in electricity prices among countries (Kopsakangas-Savolainen and Svento, 2012). In addition, electricity reforms have resulted in more benefits in the form of "new and innovative pricing options, clean energy production, innovative technological solutions and customization of offerings"³ (Anderson,

² These fundamental reasons can be differentiated into at least two categories. The first reason is ideological, and the second improvement in efficiency. For the first reason, reforms culminate normally in privatization, such as in the UK; whereas the second reason may not lead to privatization but efficiency improvement, such as in the Nordic countries.

³ Innovation in Retail Electricity Markets: The Overlooked Benefit, National Economic Research Associates, Inc., March 2008, at 1. Copy is available on the COMPETE Web site at: <http://www.competecoalition.com/files/innovation%20in%20the%20Retail%20Electric%20Market.pdf>.

2009). Some countries have also been hesitant in following electricity reform packages fully because of the fear that new arrangements may result in diminishing net benefits to the consumers. Below, we describe electricity reforms in a couple of early and later reforming developed countries.

2.2.1. The UK

The UK has been one of the early reformers of electricity sectors among developed countries and the one that has often been referred as a model for other countries such as India, Pakistan, Ukraine, Brazil, Etc. Before the reforms in the UK, the national grid was divided into three regional grids (comprising England and Wales, Scotland and Northern Ireland) which were utilized by one major transmission and generation company (CEGB) and twelve regional electricity companies (RECs) for the distribution of electricity to consumers (Newbery, 2002). Under the electricity restructuring act that was implemented in 1989, the UK government vertically disintegrated the operations of generation, transmission and distribution in 1990. The transmission grid was entrusted to the National Grid Company (NGC). 12 regional distribution companies (RECs) were privatized and were given to the joint share-holder ship of the NGC. With horizontal disintegration, the generation sector was divided into three companies. The fossil fuelled power plants were transferred to National Power and PowerGen and the nuclear power plants to Nuclear Electric. All except Nuclear Electric were privatized. Some new plants of Nuclear Electric were privatized later in 1996 as British Energy (Newbery and Pollitt, 1997). A sector regulator of the Office of Electricity Regulation (OFFER) was formed and Stephen Littlechild became the first head with the power to supervise the entire UK electric industry (Littlechild, 2005).

In a later move in 1995, privatized regional distribution companies (RECs) were asked to sell their stakes in NGC for the purpose of establishing its independence. Takeovers of RECs were prohibited for the first five years (1990-1995) in order to reduce concentration of companies and usher competition among them. However after the expiry of the restriction period, ownership of 11 RECs changed within two years, of which 7 were taken over by the American companies. In another policy move during 1998, generation companies such as National Power and PowerGen were permitted to get involved in the distribution businesses. As a result heavy re-concentration or integration materialized between generation and distribution sectors. Until 2003, all the 12 distribution companies had been assimilated by the 4 generation companies (3 owned by each of National Power, PowerGen, Electricite de

France (EdF) and Scottish Hydro) (Anderson, 2009). In addition, New Electricity Trading Arrangements (NETA) have also been in place since 2001 which enforced a single bidding system for determining prices for the electricity generators on the basis of a day ahead and hourly prices.

Electricity reforms in the UK have been overarching, and have involved all the reforms' steps from unbundling to competition. Electricity markets have been introduced at wholesale as well as at retail level where consumers can freely choose suppliers. Electricity prices have fallen by 25% since the inception of reforms (Thomas, 2004). Despite considerable achievements in transferring the benefits of reforms to the British consumers, integration of distribution and generation segments has risen again, which has increased the role of the competition commission to take necessary measures against cartelization activities.

2.2.2. The Scandinavian Countries

Scandinavian countries [Norway, Denmark, Sweden, Finland and Estonia] have successfully reformed their power sectors by deregulating and integrating into a regional power market (Nord Pool) for the purpose of trading electricity across borders.

Electricity sectors in the Nordic countries share history. Public and private control of electricity companies has been common among all the countries. Governments in the countries stepped back from regulating the sector in favor of self-regulation. All Nordic countries, except Denmark have been, and still are, heavily reliant on hydropower. In addition, the role of public sector companies has remained leading in all the countries, especially in Norway, Sweden and Finland (Kopsakangas-Savolainen and Svento, 2012).

The electricity infrastructure in Nordic countries was considered inefficient before the reforms. Co-generation plants based on oil, coal and biomass were established at municipal level and considered less efficient in production. In addition, municipality owned utilities were responsible for electrification at the initial stage and then for distribution of electricity in urban areas, whereas the rural areas were serviced by cooperatives. Thus there existed numerous small and inefficient distribution companies that were reduced in number during the restructuring process. For instance the number of distributors reduced from 2000 (mid 1950s) to 300 (in 1996) in Sweden (Hjalmarsson, 1996).

Electricity reforms in the Nordic countries were aimed at improving economic efficiency, which did not lead to privatization as in the UK, where ideological reasons led to the

privatization of the power sector. Electricity reforms in the Nordic countries basically required deregulation of the electricity sectors at national levels and integration at regional level. Norway was the first country in the region that liberalized its electricity sector according to the UK model in 1991, but without privatization as in the UK. As a result of liberalization, Nord Pool (Norwegian national power exchange) was joined by Sweden in 1996, Finland in 1998 and by Denmark in 2000, which eventually integrated the Nordic electricity market. Nord Pool has also been joined by Estonia in 2010. The state remains a major shareholder of power generation in all Nordic countries. Municipalities (Communes) have been important players in the distribution sector whereas the transmission segment has been put under public monopoly.

Existence of Nord Pool and the large mix of production technologies in the Nordic countries has improved production efficiency of the power generation companies in the region (Kopsakangas-Savolainen and Svento, 2012). Consumers are free to choose their suppliers in the region. Electricity prices have increased due to enforcement of electricity taxes and adoption of the European Emission System on CO_2 permits. However, illogically, the price hike has been attributed to electricity reforms which has also reduced admiration for reforms in the region (Erdogdu, 2013b).

Amundsen and Bergman (2006) argue that factors that have been key to the comparatively successful electricity reforms in the power sectors of the Nordic countries are (a) adoption of a simple but comprehensive market design, which became possible due to the massive share of hydroelectricity (b) weakened market power due to formation of a well-integrated regional market in the form of Nord Pool (c) strong political commitment from the participating countries for a market based system (d) unconditional participation by the power industry in the market mechanism for the sake of public service due to heavy involvement of the public sector companies in the power sector. They claim that (b) and (c) can be copied by any country or group of countries; however (a) and (d) are non-transferable because they are country specific.

2.2.3. The European Union

Before initiation of the reform process in electric power, electricity utilities were vertically integrated and were owned either by the state or the municipalities (Communes) in most of the European countries. The sector specific regulation hardly allowed consumers to change between electricity suppliers because systems were mainly operated by public sector

monopolies, which rarely allowed other parties to access transmission systems and be involved in electricity distribution (Fiorio et al., 2007).

Inspired by the early reforming countries, the European Union initiated liberalization through different directives. The first directive (1996) required the member states (total of 15) to liberalize their retail sectors partly by 2000. The directive also required the member states to separate monopoly segments of the infrastructures from potential competitive segments and to permit large consumers select their suppliers. Negotiated Third Party Access (nTPA) was suggested for transmission access in this directive. According to Jamasb and Pollitt (2005) and Pollitt (2009), all the member states introduced markets at retail level, except Greece. This directive was perceived to be insufficient in implementation. It did not necessitate that countries set up wholesale markets, disintegrate vertically and allow free access to transmission networks. However, this directive helped open the retail market for consumers stepwise. Firstly the retail market was opened for consumers consuming above 40 GW in 1999, above 20 GW in 2000, more than 9 GW by 2003 and then in 2007 the market was opened for all other consumers as well (Anderson, 2009).

In the next directive of 2003, member states were required to separate their vertical utilities into generation, transmission and distribution segments and bring competition into generation and retail supply. Under this directive, nTPA was taken back and regulated Third Party Access (rTPA) was suggested for giving access to third parties to the transmission systems. At the same time, independent regulators were required to be set up in the member states. The second directive did not succeed in fixing market problems and thus was repealed and a new directive was issued in 2009, which was implemented in 2011⁴. This directive was a reiteration of the previous directives of 1996 and 2003. New things included in this directive were *“fair prices, cleaner energy, security of supply, cross border energy trade, effectiveness of national regulators, market transparency on network operation and supply and solidarity among EU countries”* (Erdogdu, 2013b).

The directives of the European Commission were meant to contribute to the establishment of a single EU electricity market. The introduction of competition and the separation of production, trade and supply on the one hand and transmission and distribution on the other,

⁴ Accessed from the website of European Commission
http://europa.eu/legislation_summaries/energy/internal_energy_market/en0016_en.htm

were used as means to establish the internal market. However, the speed of reforms across Europe has been slower than expected.

In fact, EC directives did not manage to harmonize the electricity sectors of all the member states. There still exist wide variations in ownership type, degree of openness and the level of vertical integration. However, the European Commission asserts that liberalization of the electricity sector has put downward pressure on retail prices in the EU from 1998 until 2011, because prices have been stable since 2005⁵.

This section reveals that power sector reforms have shown mixed results among the selected developed countries. The reason to study reforms in these countries is their reputation as being among the most successful (the UK and the Scandinavians) and relatively less successful (the EU) countries or the regions of the developed world. Countries have adopted the design and pace of reform implementation according to their preferences. A number of countries cited as successful examples still face challenges in upholding the key essence of power sector reforms i.e. competition in generation and distribution. For instance, unbundled utilities in the UK have shown concentration trends in recent years. Scandinavian states, although succeeded in establishing a regional market; however ownership of the industry is still largely public. Relatively less successful countries of the European Union have not been so successful in reducing the share of the public sector in the overall value chain and connecting regionally to establish an integrated European Electricity Market.

However, despite some structural problems, the performance of the power sector in the selected countries has increased in terms of efficiency and distributional impacts. Signs of improvement in the efficiency have been reported by Steiner (2001). He found that operating efficiency and capacity utilization improved in developed countries due to privatization. Efficiency increase is evident from the measures such as choice of supplier, reduction in CO_2 emission, adaptation of cleaner energy productions, such as wind. In addition prices, although they did not decrease significantly in many developed countries (Thomas (2006), have remained stable in a large number of European Countries for some time. Thus overall, there is improvement in the efficiency and affordability of electricity in the developed countries.

⁵ http://ec.europa.eu/energy/observatory/electricity/doc/analysis_retail.pdf

2.3. Institutional Reforms in Developing Countries

2.3.1. Need for reforms

The electricity sector developed in developing countries after the 2nd World War. Ownership and operation of the power sector remained mostly under state authority. The governments considered supply of infrastructural services as key to industrial development and thus the state utilities were required to supply electricity services to all the consumer groups. Electricity prices for different economic groups were subsidized through national budgets. National budgets were required to allocate funds for all the programs such as system intensification and adaptation of technological innovations. This state-led model in developing countries was also supported by international donor agencies such as the World Bank and ADB in Asia and bilateral development partners from developed countries. As a result, the electricity sectors of developing countries grew significantly. For instance, electricity generation in developing countries progressed from 130 billion KWh in 1950 to 2.9 trillion KWh in 1980 (Williams and Ghanadan, 2006) (for more detail on the features of pre-reform electricity sector, please see Appendix 3).

However, support for a state-led model in developing countries not only started fading by the early 1980s, but it also changed to favor the market-based model. International development partners pressed for market-based models by linking their development loans with the necessary economic reforms. This situation created difficulty for most of the developing countries, which were unable to finance their power sectors from their national budgets without the support of development partners. A few countries were financially capable of resisting this change for some time, but most have accepted transformation of their power sectors from a centrally planned to a market based system.

Developing countries felt a need to reform the power sector due to external and internal problems. Firstly, there was a high need for investments in different segments of the infrastructure to meet the needs of a rising electricity demand as the existing utilities were either loss making or their profits were insufficient to cover all the investment needs of the sector. For instance, a survey conducted during the 1980s from 60 developing countries showed that utilities' profits were only able to cover 12% investment needs of the power sectors in respective countries (WorldBank., 1993).

Secondly, the utilities depended on public resources for leveling their losses and for making the necessary investments in the power sector. Governments in developing countries however, were unable to meet the investment needs for upgrading and installing new capacity in generation, transmission and distribution networks (Gratwick and Eberhard, 2008). Thirdly, international donors such as the World Bank, International Monetary Fund (IMF) and Asian Development Bank (ADB)-the major facilitators of public investments in the electricity sector of developing countries, stopped funding and forced the countries to reform the power sector and other infrastructure sectors. The three funding organizations made progress in reform part of the decision criteria for funding (Besant-Jones, 2006). Fourthly, the number, intensity and duration of internal problems of the utilities such as electricity blackouts and brownouts, extensive technical and non-technical losses in power generation, transmission and distribution losses⁶, poor payment by consumers, below cost electricity tariffs; subsidization and overstaffing of utilities, pushed developing countries towards institutional reforms (Joskow, 1998, Newbery, 2002, Besant-Jones, 2006).

Besant-Jones (2006) mentions three drivers of reforms in the power sector of developing countries. In his view, reforms are predestined to improve the service quality for electricity consumers, give better and affordable access to electricity and to increase the financial capability of the governments. He argues that electricity reforms in developing countries shall be measured against these three outcomes.

2.3.2. Determinants of reforms

Different external (economic, political and structural) and internal factors (sector specific) played a key role in stimulating institutional reforms in the power sector. These aspects not only drove reforms but have also determined the extent of reforms in these countries (Williams and Ghanadan, 2006, Jamasb, 2006).

Although fewer in number, however there are empirical studies which reveal that country specific contextual circumstances such as political, social, legal and economic aspects impact the selection of design of electricity reforms and their success level (for a detailed summary of literature please see Appendix 7).

⁶ Technical losses are incurred due to inefficiency of generation, transmission and distribution technologies whereas non-technical losses arise due to weak governance environment which results in corruption, power theft and other pilferages.

- Institutional quality and national level policies are very important to determine the extent of electricity reforms in reforming countries (Bacon and Besant-Jones, 2001).
- Market oriented economic ideology favors competition and private ownership of electricity industry. If the distribution of resources is conflict ridden then it may discourage unbundling of the electricity industry and the industry may tend towards monopoly. Overall, the study concluded that economic ideology, judicial independence and distributional conflicts are highly important for the progress of the reforms (Ruffin, 2003).
- Path dependence and transaction costs have an important relationship with the progress of electricity reforms in a country. For path dependence, education of the minister or governor (in charge of power sector) has a significant relationship with the progress of reforms. Transaction costs represented by corruption level in the country significantly impact the progress of reforms. The form of government such as democracy or dictatorship also impact progress of reforms (Erdogdu, 2013a).
- Countries with strong labor unions have a lower tendency to progress in reforms (Erdogdu, 2013a).
- Level of corruption as measured by Transparency International (TI) was also important for progress in the reform (Besant-Jones, 2006).
- Sector specific endowments have strong impacts upon the progress of reforms. Size of the sector has negative impact upon institutional reforms of power sector, which means that larger the size of the power sector less will be inclination towards reforms. For instance, only 13 of a total of 71 countries with power systems smaller than 1000 MW have procured electricity from IPPs without any sort of unbundling, whereas 28 of 39 countries with large power systems (between 1000-5000 MW) have allowed IPPs entry and 15 of these countries have opted for unbundling. Additionally, 17 of 40 countries with power systems larger than 5000 MW have unbundled their power systems. Countries with larger power systems have unbundled vertically integrated companies with each segment further broken down into numerous entities (horizontal separation) (Besant-Jones, 2006).
- Countries having more dependence on foreign aid or assistance tend to reform more (Erdogdu, 2012).
- Educational background of the Prime Minister or President also impact the pace of reforms as the state heads having education in entrepreneurship tend to reform faster

than others. In addition educational level and background of utilities heads also impacts on the level of reforms (Erdogdu, 2012).

- In addition, the political and economic characteristics of the countries such as membership of EU or OECD, the existence of electricity market reform idea, population density, electricity consumption, income level (GDP per capita), educational level and imports of goods and services (as % of GDP) have strong impact upon the success level of reforms (Erdogdu, 2012).

2.3.3. Reform outcomes

Institutional reform is a slow and gradual process, which requires some pre-requisites and a particular course of action to follow to get adequate reform results. Besant-Jones (2006) argues that countries should adopt a reform template in accordance with their strategic preferences and the electricity sectors' initial conditions. Reform templates for developed, middle income and developing countries should vary due to differences in institutional and economic endowments. Copying a template from a developed country will not ensure similar results in a low-income developing country. Countries which simply copied reform models from developed countries without adjustment to indigenous country conditions, failed in implementing reforms in the right sequence, in the right way and with adequate results. This is why the reform results differ so much between countries (Ibid).

Since the early 1990s, 70 out of 150 developing countries have initiated reforms in the electricity sector, which are still ongoing slowly, and haven't been completed (Besant-Jones, 2006). Most of the time reform stagnates in the initial reform steps. These different steps in reform in developing countries are described in ascending order by Besant-Jones (2006) (see Box 2-1). After initiating reform, countries pass through these stages gradually. These stages include the establishment of a market structure, unbundling of transmission and supply, involvement of the private sector, establishment of the regulatory institutions and overall system management. Some countries which initiated reforms in the early 1990s still lie in the early stages of reforms while others have progressed more (for details on the progress of developing countries along these reform stages, see Box 2-2).

Box 2-1: Existing stages of electricity reforms in developing countries

- A vertically integrated monopoly with involvement of IPPs that sell power to the monopolist.
- National entities in generation, transmission and distribution sectors, which are either separate from one another, or vertically integrated. IPPs are also involved here, which are only able to trade with the national transmission and distribution entities in a single buyer framework.
- Unbundling has completed and there are many generators and distributors in the system either public or private with one Transmission Company (Transco). Transco procures electricity from generators and IPPs and sells it to distribution companies and the large consumers.
- An established market at wholesale level among generators, distributors and large users. A transmission company, a regulator and a system operator facilitates the generators, distributors and the consumers.

Source: (Besant-Jones, 2006)

Box 2-2: Gradual stages of electricity reforms in developing countries

• **Vertically integrated monopoly + IPPs (total 35 countries)**

Bangladesh, Belize, Burkina Faso, Cambodia, Cameroon, China (most provinces), Costa Rica, Cote d'Ivoire, Croatia, Cuba, the Czech Republic, the Dominican Republic, the Arab Republic of Egypt, Ghana, Honduras, India (most states), Indonesia, Jamaica, Lao People's Democratic Republic, Malaysia, Mauritius, Mexico, Morocco, Nepal, Nigeria, Oman, Papua new Guinea, Senegal, Sri Lanka, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Vietnam, West Bank and Gaza.

• **Breakdown of vertical monopoly into national Gencos, Discos and Transco or all the three segments still vertically integrated but separated internally based on functions+ IPPs (Single Buyer model) (17 countries)**

Albania, Algeria, Armenia, Bosnia and Herzegovina, Estonia, Georgia, India (Andhra Pradesh, Karnataka, New Delhi, Orissa, Rajasthan and Uttar Pradesh), Jordan, Kenya, Latvia, Lithuania, Macedonia, Pakistan, the Philippines, Serbia and Montenegro, the Slovak Republic and Uganda.

• **Many Discos and Gencos including IPPs, Transco as single buyer with third party access (6 countries)**

Bulgaria, Ecuador, Hungary, Moldova, Poland and Russian Federation

• **Power market among Gencos, discos and large users at whole sale level with ISO (13 countries)**

Argentina, Bolivia, Brazil, Chile, Colombia, El Salvador, Guatemala, Kazakhstan, Panama, Peru, Romania, Turkey and Ukraine

Source: (Besant-Jones, 2006)

According to Box 2-2, Latin American, Central Asian and Eastern European countries have progressed to the final stages of market restructuring. A few countries have progressed up to the second stage of reform whereas a large number of countries located in Africa, Asia and the Middle East, are still in the first stage of reform with only limited private involvement in the form of IPPs next to the still dominant vertically integrated monopolies. Pakistan is positioned in the second stage of reform indicating that generation, transmission and distribution have been unbundled and IPPs established with the single buyer model. It shows that Latin American countries fall with highly advanced countries in electricity reforms, Asia and Africa are the continents with least reforms, whereas the Eastern European countries lie in between these two extremes (EBRD, 2001, APEC, 2000, Fairhead et al., 2002, Estache and Gassner, 2004, Bacon and Besant-Jones, 2001).

One of the immediate benefits of reform that most of the developing countries opted for was the level of private investment in the power sector. Statistics indicate that developing countries started accumulating a large volume of private investment by the early 1990s; however the volume of private investments varied among countries. One of the main determinants of investment proceeds from the private sector in the developing countries has remained commitment to reform, which was shown by the level of industry's vertical integration and the regulatory framework in the respective countries. Vertical integration has had a negative impact on the level of proceeds from privatization. On the other hand, independence of regulation has a positive impact on the level of proceeds from privatization (Siniscalco et al., 2001). Although, reforms favor private investments, institutions strongly determine the nature and volume of private investments in the power sector. Institutional factors such as protection of property rights, judicial and regulatory independence and country political risk have a positive relationship with private investment in the sector (Bergara et al., 1998, Holburn, 2001, Zelner and Heinsz, 2000).

The World Bank database on Private Partnership in Infrastructures (PPI) indicates that countries from Latin America and the Caribbean (LAC), East Asia and Pacific (EAP) and South Asia (SA) have been major targets of private investments in the power sector and those regions have raised 40, 35 and 12% of private investment respectively. The remaining 13% went to rest of the developing countries in the world (Jamasp, 2006). The database also shows that top 20 destinations have raised almost 95% of global private investment in power (US\$ 161 billion) (please see Appendix 4).

There were also regional variations in the pattern of private investments in the power sector. For instance, private investment in Latin American and Caribbean countries went mostly to divestiture projects (purchase of selling out projects) whereas in South Asian and East Asian countries, the major share of the private investment was absorbed in greenfield projects in the form of IPPs (Ibid). Patterns of private investment also reveal the reform preferences of countries. Latin American states focused on restructuring the overall institutional framework of the power sector by privatizing existing utilities and creating markets for generators, distributors and consumers. South Asian and East Asian countries were more interested in procuring electricity under long-term power purchase agreements with independent power producers (IPPs) while keeping state ownership on existing utilities.

The momentum of private investments in the power sectors of developing countries faltered by the late 1990s. It seriously increased problems for the developing countries, which were in the early phases of reforms. This downfall in private investments is ascribed to a number of factors such as lack of seriousness among reforming countries on implementing full scale reforms; meltdown of resolve of some of the host governments to honor power purchase agreements with the IPPs, which reduced the investors' confidence and lack of investment incentives in a number of developing countries. In consequence, many developing countries, which initially were favorites among private investors, later faced a serious shortage of investments. This created problems because these countries were unable to match investment with the increasing electricity demand. As a result these countries increasingly faced system blackouts.

Did the reforms improve the performance of the electricity system? We briefly address this question by looking at the service quality, improvement in government financial standing and affordable access of electricity for the poor.

Better service quality

The basic purpose of reforms is enhancing sufficiency and efficiency of the electricity sector so that it may contribute to improving the quality of electricity services. Empirical studies regarding the impact of reforms on efficiency have revealed that different reform steps have shown different impacts in the respective countries (see Appendix 6). These studies have shown that all steps of reforms did not usher similar results in all the countries. For instance, privatization improved efficiency in developing countries when it was combined with independent regulation (Zhang et al., 2008). Alongside privatization, competition has also

resulted in improved efficiency in developing countries (Ibid). Independent regulation when combined with privatization and competition has impacts on efficiency; however alone it has no significant impact on efficiency both in developed and developing countries (Zhang et al., 2008, Steiner, 2001).

A few countries from Latin America such as Chile and Argentina have been able to improve their service quality as a result of involvement of the private sector after reforms (Pollitt, 2004b, Pollitt, 2004a). Privatization of power sector utilities has resulted in decreasing the cost of production per unit, reducing energy losses, more investments and increased labor productivity (Paredes, 2001, Fisher et al., 2003). Improvements were also observed in Peru in reducing losses, increasing quality of service, labor productivity and access to electricity. In another study, Andres et al. (2006) found that privatization improved labor productivity, efficiency, product and service quality among 116 distribution utilities of 10 Latin American countries. The supply situation in countries in East Asia and South Asia improved due to the involvement of IPPs, which contributed significantly to increasing generation capacity. It also enabled some countries such as Pakistan to tackle the problem of electricity blackouts for a short period (1999-2004) due to IPP entry in the generation sector (PC, 2010). A study by Price and Pham (2009) in Albania and Bulgaria also revealed that reform scenarios have more adverse impacts on low income households than others.

Improvement in government's financial standing

The developing countries that have only opted for IPP involvement in the power sector and did not chose divestiture to bring in the private sector, have faced difficulty in improving their overall financial position. This is caused by governmental guarantees for the payment of the production of IPPs if public sector utilities failed to pay. So the IPP investments in generation do not reduce public spending, but conversely increase it with the overall result that the financial position of a country worsens. This has been the case in countries like Pakistan, which have attracted IPPs in thermal generation in addition to state owned utilities. Other groups of countries, such as in Latin America, which applied divestiture, have received heavy one time receipts that significantly improved their financial position. For example, nine Latin American countries obtained approximately US\$ 60 billion during 1990 and 2002, which significantly contributed to their economic stabilization (Besant-Jones, 2006).

In addition to receiving direct proceeds from privatization, governments also benefitted in terms of fiscal gains as a result of additional taxes from the profit making private utilities of

Latin America. After privatization, profits of distribution and generation companies increased considerably in Chile; however the distribution sector gained more than the generation sector (Fisher et al., 2003). Companies also increased their profits in Brazil (Mota, 2003). Although, companies succeeded in increasing their profits, the welfare gains could not be transferred directly to the general public in form of lower prices, which created unease among people for reforms (Lora and Panizza, 2002, Haselip et al., 2005).

Thus, privatization proceeds from divestiture of public sector utilities and then additional taxes from the private companies improved the financial position of some of the Latin American countries, which extended their capacity for investing in the projects aimed at economic uplift of the poor people who remained isolated from the of direct benefits of power sector reforms.

Affordable electricity access for the poor

Another criterion against which electricity reforms should be evaluated is the affordability of electricity for the poor. There is empirical evidence that all reform steps do not always reduce prices in all countries. Some steps may drag prices down in one country, while increase them in another country. Nagayama (2007) examined the impact of electricity reforms on electricity prices in a sample of 83 countries over the period of 1985-2002. The study revealed that reform steps or independent variables such as unbundling, entry of Independent Power Producers (IPPs), formation of a regulatory agency, establishment of markets at wholesale and retail levels and privatization, had diverse impacts on electricity prices even though some of the variables showed unexpected relationships with the prices. The results of the study showed that unbundling and formation of a wholesale market did not contribute to reduce electricity prices, but to increase them. However if combined with an independent regulator, then unbundling may induce prices to fall. Privatization, entry of IPPs and retail competition contributed to decline in electricity prices in some of the regions, but not all the regions. In another paper Nagayama (2009) studied whether the reforms' impacts differed among regions or between developed and developing countries by analyzing panel data from 78 countries in four regions (developed countries, Asian developing countries, ex-Soviet states and Eastern European countries and Latin America countries). The study found that higher electricity prices were very important for governments for adopting liberalization models. However electricity prices did not fall as a result of liberalization in the electricity

sector but showed a propensity to rise in every market model, as opposed to what was anticipated.

Erdogdu (2011) examined the impact of electricity reforms on price-cost margins for residential and industrial consumers and on cross subsidies between consumer groups such as industrial and residential by using panel data from 63 developed and developing countries over the period 1982-2009. The study found that each reform variable had a different impact on price-cost margins and cross subsidies in different groups of countries.

Other studies have also found that different reform steps impacted prices differently. For instance, Cubbin and Stern (2006) studied the impact of regulatory law and better regulatory governance on the performance of the electricity industry by using panel data from 28 developing countries during 1980-2001. Their analysis concluded that regulatory law and better regulatory governance was positively and significantly correlated with electricity generation capacity per capita. The study also asserted that this positive effect strengthens the consolidation process of regulatory governance. Impact of privatization on inducing cost reflective prices which required lower prices for industrial consumers and rationalization of industrial/residential prices' ratios in developed countries is mixed and is related to the definition of variables and time factor (Steiner, 2001, Hattori and Tsutsui, 2004) whereas the impact of privatization on prices and price ratios in developing countries is found to be insignificant statistically (Zhang et al., 2008). The impact of competition on cost reflective prices in developed countries was found to be mixed again (Steiner, 2001, Hattori and Tsutsui, 2004) and in developing countries, the impact of competition on prices is quite weak (Zhang et al., 2008). Regulation was found to have no effect on electricity prices in developing countries (Ibid). In addition, the systems with large private sector participation have more price volatility; however the prices' mean value tends to be lower than systems with less private sector participation (Wolak, 1997).

Although power sector reforms in developing countries have brought overall societal welfare through efficiency gains, welfare gains have mostly been shared between distributors, governments and consumers rather than those from lower income groups (Besant-Jones, 2006). Poor consumers have not only remained out of the welfare equation, but some have even been at the losing end as a result of power sector reforms. Besant-Jones (2006) argues that some low income consumers in developing countries, although through illegal means (power theft), were getting electricity before reforms and they were disconnected after action

against power theft started in order to reduce losses of the distribution utilities. Some others, who were already getting electricity at subsidized rates, have been forced to pay high electricity prices, as subsidies for the poor consumers reduced considerably after reforms. Direct effects of power sector reforms are less for the poor; however they may accrue indirect benefits from electricity reforms as a result of economic growth and job creation. Chisari et al. (2001) argue that the poor are the group least likely to benefit from power sector reforms. However electricity access to the poor households has improved in Latin American countries and also in South Africa.

So far, we have analyzed the power sector reforms in developed and developing countries. The analysis of reforms has utilized relevant literature across countries, regional and country based empirical studies to explain the need, implementation, determinants and impacts of reforms on the organization and performance of the power sector in both types of countries. The basic purpose of the review has been to position this dissertation with the ongoing research in the area of electricity reforms. For that purpose, we have discussed some of the main studies relevant to this dissertation from international, regional and country specific aspects that provide us an understanding about what aspects have been studied internationally (for knowing how those aspects were studied, please see Appendix 6, Appendix 7 and Appendix 8). We also did a literature review on power sector reforms in South Asia in general and Pakistan in particular (see Appendix 9). Based on these literature reviews, we are able to identify knowledge gaps to be studied in the empirical chapters of the dissertation.

2.4. Conclusions: Gaps in Knowledge

First of all, the literature review of analyses of power sector reforms reveals that empirical studies, or studies based on some framework/model, are more scant in the existing literature on power sector reforms compared to studies based on opinions and discussions. Empirical studies either compare countries or are country specific case studies. The literature indicates that developed countries attract more attention from researchers than developing countries in both types of empirical studies because of ease in accessing reliable and sufficient data, which was necessary for statistical testing. In recent years, empirical research of institutional reforms in the power sectors of developing countries is also gathering pace; however that research is more focused on cross country analysis rather than country specific case studies. Among the case studies, Latin American countries are ahead of other countries in the developing world. Countries in South Asia, especially Pakistan, have rarely attracted

researchers' attention for the empirical analysis of institutional reforms in the power sector. This study aims to fill that gap by focusing on institutional reforms in the power sector of Pakistan from different entry points. Empirical research in country specific case studies is necessary because country specific contexts play an instrumental role in designing and implementing institutional reforms in any economic sector such as electricity, gas and transport.

Secondly, New Institutional Economics focuses on institutions in economic reforms and requires that empirical studies account for institutional aspects of reforms. However a large number of cross country empirical studies have not included institutional aspects of reforms. Only recently a few studies have included institutional aspects in their analyses. Institutional economics is more competent to explain market interactions in the case of imperfect markets dominated by state interests, where the assumptions of perfect rationality and price determination of market equilibrium rarely applies (Klein, 2000). Since, reforms reshape electricity markets starting from a controlled structure to a more liberalized one, institutional economics is an approach that can explain and guide the markets through the transitional periods. This dissertation will contribute to filling that knowledge gap by developing and applying an institutional framework on power sector reform in Pakistan.

Thirdly, there is also a potential gap in the institutional analyses of the problems of the power sector of Pakistan. According to North (1994a) institutional analysis is able to provide an effective diagnosis of economic underperformance in developing countries in general and in diagnosing power sector reform problems in particular. However, the institutional analysis of these problems in South East Asian countries in general and in Pakistan in particular, is still almost completely missing. This dissertation will fill this knowledge gap by systematically analyzing power sector reform problems in Pakistan with the help of a NIE based analytical framework. This institutional analysis will provide for an alternative analytical perspective to mainstream analysis of power sector reform problems, which completely neglects the institutional dimension of the problems in Pakistan. Therefore our research will be one of the first studies that explore the current power sector reform problems of Pakistan with the theoretical lens of New Institutional Economics.

Fourthly, the impact of power sector institutional reforms on the performance of the sector has hardly been studied at country level. In Pakistan, there are too few studies that quantitatively analyze the impacts of institutional reforms in the power sector using

performance indicators. This is because of the lack of sufficient and reliable data on the important variables. However, more data have become available recently which will attract researchers to quantitatively analyze the power sector. Chapter 7 will contribute to fill that knowledge gap.

Fifthly, although there are studies that have discussed different aspects of investments in different economies of the world, single country studies on private investments in the power sector are still quite rare. As a result of institutional reforms, many countries have succeeded in attracting a considerable volume of private investments in their power sectors during the early phases of reforms. The pace of investments faltered in some of the countries such as Pakistan, which seriously affected the efforts of the government to increase generation capacity over a longer period. Investors may have faced some uncongenial circumstances that discouraged them from making further investments. Institutional change in the power sector was required to establish fundamental institutions in the country such as institutions covering property rights, contract enforcement, etc. Lack of important institutions discouraged investors from investing in long term projects due to the fear of expropriation. Therefore, it is important to analyze the slowdown of investments from the perspective of investors to disclose the reasons behind the withdrawal of investors. This has not been studied for Pakistan. Our research reported in Chapter 8 of the dissertation fills this knowledge gap.

Sixthly, there are a few cross-country studies that empirically analyze the impact of country specific contexts on the design and progress of institutional reforms. This type of study is, however, quite difficult to find at a single country level because of the data limitations on country specific political, economic and institutional aspects. This study aims to contribute to filling that knowledge gap by utilizing Q methodology, which is based on analyzing the experts' opinions on barriers to institutional reforms in the power sector of Pakistan.

3. Analytical Framework

This chapter contributes to answering the first research question with an overview of New Institutional Economics which will be the theoretical orientation applied in this dissertation. In addition to explaining the gist of institutional reform according to NIE, this chapter develops an analytical framework for analyzing institutional change in an infrastructure industry such as the electricity industry.

3.1. New Institutional Economics

The role of institutions in economic performance of countries has not been part of the mainstream economic literature despite the fact that it has been heeded in the literature until the first modern economist, Adam Smith (Brousseau and Glachant, 2008, 68). Recent mainstream economic literature emanating from New Classical Economic Theory has focused on labor, capital and technology as major determinants of differences in economic growth among countries. This paradigm has stimulated international development and financial organizations such as The International Bank for Reconstruction and Development (IBRD) and World Bank to structure various aid programs globally. This has been done under the guise of supporting poor countries to overcome the shortage of skilled labor, capital and technology, and so put them on the track of economic growth. It has also been perceived that such efforts could reduce differences of economic growth among countries. However, these technologically oriented aid programs did not help many countries to grow more than a certain amount, which once again has raised the importance of institutions in economic and development literature (Ibid).

In recent years, institutions have been increasingly recognized in economic and development literature as important for economic performance. In that respect the work by Ronald Coase [(Coase, 1937, Coase, 1960)] and Douglass North [(North and Thomas, 1970, North, 1979, North, 1990b, North, 1994b)] has influenced economic literature in explaining the differences of economic performance among countries. For instance, poor performance of ex-Soviet states, under-development of Africa and Asian financial crisis has highlighted the difference of institutions as important factor among countries in explaining their economic growth. New Institutional Economics (NIE) is important in this respect because it explains the economic growth among countries by adding institutions into New Classical Economic Theory. NIE though discusses the performance of economies from an institutional perspective; however it also talks about the origin, nature and evolution of institutions. The importance of institutions

has also been recognized by organizations such as World Bank, which now emphasizes the importance of institution building to invoke economic growth in poor countries, instead of simply providing technological aid to curtail under-development (WorldBank, 1997, WorldBank, 2002).

Our analytical framework applied in this study builds on New Institutional Economics, in particular the work of Douglass North and Oliver Williamson, who have been among the core scholars of New Institutional Economics. This chapter connects the theory of institutional change in the electricity sector to the work of both institutional scholars and their classical work. Figure 3.1 explains the organization of this chapter, and how it develops an analytical framework based on Williamson's framework and North's approach starting from the theoretical underpinnings of institutional economics.

Figure 3-1: Organization of the chapter for development of an analytical framework

This chapter proceeds as follows. Section 3.2 summarizes the theory of NIE, its relationship with mainstream Classical Economics and its difference with Old Institutional Economics. Then we discuss the definition of institutions, which is still evolving. This part briefly explains the definition of institutions from North's perspective by discussing basic

ingredients of the definition such as formal rules, informal rules and the enforcement mechanism. Then we present the theoretical debate that connects basic institutions as described by North to the work of Oliver Williamson's 'layered institutional framework'. The four layers of the framework are explained. Then we analyze the concept of institutional change in general and in the electricity industry. This part presents and explains the analytical framework we apply in the dissertation. Finally, based on the analytical framework we define our conceptualization of power sector reform in electricity.

3.2. New Institutional Economics (Development and Challenges)

New Institutional Economics (NIE) appeared in the spheres of institutional economics when the theoretical perspective of Old Institutional Economics (OIE) apparently could not explain some of the key economic issues such as causes and consequences of 'Great Depression'. OIE did not gain much acceptance in contemporary economic thought, and as a result, two school of thought (new classical and institutional) remained at daggers drawn in some cases. For instance the rift between institutional economists and new classical economists over university positions in a university in France (Joskow, 2008, pp6). OIE is also criticized for lacking strong theoretical and empirical foundations. So, OIE was thought to be consisting of ideas without a credible theory (Furubotn and Richter, 2005, Commons, 1931). That gap was filled by New Institutional Economists.

Although the term 'New Institutional Economics'(NIE) was first used by Williamson (1975), the following literature has also contributed to its origin (Coase, 1937, Hayek, 1937, Hayek, 1945, Chandler, 1962, Simon, 1947, Arrow, 1963, Davis and North, 1971, Williamson, 1971, Williamson, 1975, Williamson, 1985, Alchian and Demsetz, 1972, Macneil, 1978, Holmström, 1979). It is important to see what it is, and how it relates to 'New Classical Economics'. A very fundamental assertion of 'New Institutional Economics' is that "when it is costly to transact then institutions matter". NIE adds institutions into mainstream Classical Economics. Like previous attempts, it is not aimed at reversal of the mainstream economic theory (New Classical); rather it builds on existing literature and increases the horizons of New Classicists to deal with range of issues. Like microeconomic theory, the theoretical perspective of NIE is built on the fundamental assumptions of scarcity and competition (North, 1986). Alongside upholding the theoretical perspectives, it not only maintains the analytical tools such as mathematical modeling and econometrics developed during the past

several decades but also adds new empirical and analytical tools to tackle more economic and development issues (Joskow, 2004).

Despite laying its foundations on new classicists' thoughts, it disagrees with them on the assumption of complete rationality which means that perfect information or full rationality prevails among all the players such as buyers, sellers, firms, etc. in a market. NIE asserts that some players may either hide some of the information for their personal gain, or the mental capability of some players may not be able to process all the information properly, which may create extra costs in such exchanges for the parties lacking full information. Those costs are known as transaction costs and to overcome that information gap, or reduce transaction costs, institutions are important in economic theory.

3.3. Institutions

It is argued that the purpose of an institution is to transform individual behavior in a particular pattern. Three main approaches to define institutions are discussed here. First there is the 'institutions as equilibrium approach' which traces its linkages to Putnam et al. (1993), Hayek (1973a) and Aoki (2000). In this approach, institutions are regarded as "established patterns of behaviors transformed by mutually understood preferences of actors through their optimizing behavior". It is based on the assumption that a rational actor may refine his responses according to the actions of other rational actors until the parties reach to an equilibrium where no room is left for further refinement (Crawford and Ostrom, 1995). Second is the 'institutions as norms approach' with its roots in Lewis (1969), Ullmann-Margalit and Edna (1977) and Coleman (1987). It argues that shared perceptions of a group of actors having different level of perceptions, may create a generally 'observed pattern of interaction'. Thirdly the approach, which is also important for current study, is 'institutions as rules' with its linkages to the work of Hohfeld (1913), Commons (1968), Shepsle (1975), Shepsle (1979), Shepsle (1989), Olson (1996), Shepsle and Weingast (1987), Plott (1986), Oakerson and Parks. (1988), North (1986), North (1990b), Ostrom (1986), Ostrom (1990), Ostrom (1980), Ostrom (1987), Ostrom (1991), Williamson (1985) and Knight (1992). Institutions are defined below from the perspective of 'institutions as rules' approach.

According to this approach "*institutions are humanely devised constraints which structure human behavior*"(North, 1986). For instance, human behavior in routine work such as shopping, working, getting admission in a university, using a computer, travelling in a train with or without a ticket, etc. is governed by some constraints. These constraints, according to

North and other proponents of this approach, consist of a “set of formal and informal rules along with their enforcement mechanisms”. North further argues that institutions configure human exchanges at different levels (economic, political and social), reduce uncertainty in such exchanges, provide economic incentives and bring order to the economy (North, 1990a, North, 1994a). Ostrom (1990, 51) defines institutions in a comprehensive way.

"Institutions" can be defined as the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions All rules contain prescriptions that forbid, permit, or require some action or outcome. Working rules are those actually used, monitored, and enforced when individuals make choices about the actions they will take".

Formal rules such as constitutions, property right laws, contract laws, regulations, etc. have got legal enforcement mechanisms whereas informal rules such as norms of behavior, social values, conventions, societal rules, etc. have a different enforcement mechanism than that of the formal rules. Despite being subject to different enforcement mechanisms, formal rules and informal rules are greatly inter-dependent for any transaction (for instance sale of a car) to take place between the two parties (Figure 3-2). They cannot operate efficiently in isolation. Full enforcement of these rules may lead to lessen uncertainty of behaviors among interacting actors. This set of informal rules, formal rules, their enforcement mechanisms and the way they change is presented in detail in Figure 3-2.

Figure 3-2: Hierarchical view of inter-dependence of rules

Source: (Ollila, 2009)

3.3.1. Informal rules

In less complex societies, informal rules play a key role in exchange. Even in today's world, where societies have transformed into more complex ones, formal constraints, though important to shape choices, are not sufficient to do this job all the time. It is the set of informal constraints that enables the member of a society to behave in certain manner in their mutual interactions. North (1990a) considers norms of behavior, codes of conduct and conventions as important determinants in our daily interactions with relatives, friends, business clients and colleagues. Any change in formal constraints such as constitutions, laws and even in economic institutions cannot be sustained without sufficient support from informal rules.

These rules are formed from a set of information which pass through generations and are part of the heritage known as culture (Figure 3.2) (North, 1990a). Culture can be understood as the *"transmission from one generation to the next, via teaching and imitation, of knowledge, values, and other factors that influence behavior"* (Boyd and Richerson, 1985). Culture, traditions, customs and history form altogether a basic building block of the hierarchy of institutions. Previous experiences of interacting parties lead to ongoing changes in traditions and customs. Such changing traditions may create behavioral pressures upon actors, which if strong enough, may cause the actors to change formal rules in a certain direction, as well providing the organizations' working rules (Cyert and March, 1963).

3.3.2. Formal rules

Increased specializations and division of labor in ever evolving complex societies has created a need for certainty of rules in the form of written formal rules, unlike unwritten informal rules that have evolved over time to meet the needs of less complex societies (in some cases, such as the UK, formal rules can be unwritten). It is important that these two types of rules are not rivals but both complement and reinforce each other. As discussed earlier, informal rules act as stepping stones to formal rules (Figure 2-1); similarly formal rules increase the efficiency of informal rules, reduce their enforcement, information and monitoring costs and enable them to solve the issues of even complex transactions (North, 1990a).

Formal rules consist of political rules, judicial rules and economic rules. For instance constitutions; rules segregating the roles of the parliament, executive and judiciary; statutes;

economic regulations; laws relating to property rights; contract law, etc. can be included in the long list of formal institutions that smooth exchange in a society.

3.3.3. Enforcement mechanism

Enforcement mechanism is important to enforce informal and formal rules. Inefficiency in enforcement may endanger the possibilities of exchange among interacting parties. Efficiency of enforcement mechanisms is determined by transaction costs. These are neither perfect, nor constantly imperfect, as claimed by a substantial literature on transaction costs (Williamson, 1998, Spiller, 2011). In fact, it is the structure of enforcement mechanisms and the level of imperfections that determines the fate of contracts and size of the transaction costs. Higher imperfection in enforcement mechanisms may yield higher transaction costs and greater threats to contracts.

In a simple exchange of primitive societies, enforcement mechanisms were provided by informal rules. In such a personal exchange where both interacting parties might have good information about each other, self-enforcement of contracts was possible; it was also in the interest of both the parties to act according to mutually agreed terms of exchange. Enforcement instruments such as ostracism and reputation loss might be effective punishments in case of violation of contracts among interacting parties. Thus under societal pressures of primitive societies, it was in the interest of both parties to stick to the agreements. This involved less transaction costs to enforce agreements.

However, in today's world of impersonal exchange, self-enforcing contracts are difficult when there are rare repeat dealings among interacting parties and they have incomplete information as well. In such an environment, parties may find it in their personal interest to hide some information which may cause an increase of transaction costs for others. In these complex situations, need is felt of third party enforcer to ensure the enforcement of contracts. North argues that exchange takes place in all societies, even in societies where the state concept is non-existent, but it is the enforcement mechanism which explains the differences of economic development between developed and under-developed world.

North's approach to institutions as being a set of formal and informal rules and their enforcement mechanism is important for developing the analytical framework later in this chapter. Williamson used this approach to explain the key institutions in an economic society

by putting them in four layers of his framework. He also discussed implications regarding the change in institutions lying in four layers of the framework (Figure 3-3).

3.4. Williamson's Institutional Framework

Williamson (1998) proposed a framework for understanding the hierarchy of institutions, sequence and pace of change in the institutions lying in four layers; and their importance in overall economic performance (Figure 3-3). The framework highlights four layers of institutions. It connects the interfaces starting from Original Institutional Economics (Commons, 1931) to New Institutional Economics and then to New Classical Economics. Downward arrows that connect upper layers to lower layers of the framework direct constraints from upper layer to the lower layer; whereas the upward and dotted arrows indicate feedback that the institutions in the upper layer receive from institutions in the lower layer. Williamson talks more comprehensively about the 2nd and 3rd layer of the framework because, in his view, these two layers are more relevant to NIE. The top layer or embeddedness of the society, is perceived to being relatively stable due to its slow changing nature.

Figure 3-3: Williamson's layered framework

Source: Williamson, 1998

3.4.1. First layer-embeddedness

The first layer of the framework is ‘embeddedness’ or the basis of a society’s institutions which might be implicit in nature. Social characteristics of a society such as informal rules including customs, ethics, behavior, traditions, social norms, etc. lie at this layer. Among many others, religious beliefs and history influence these characteristics. All these social characteristics of a society impact the behaviors and norms of its people, which ultimately influence the ability of actors in the formation of rules of the game and their implementation in an economy/economic sector or the organization. Embeddedness of a society can impact the mental maps of its individuals on certain aspects. Many economic historians and social scientists such as Banfield (1958), Putnam et al. (1993), Nee (1998), and Huntington (1996) have analyzed embeddedness; however, Williamson believes that embeddedness of a society cannot be determined in short period of time, instead they are assumed to be given in a society due to their slow process of change. This type of institution may take between 100-1000 years to change. Embeddedness is conceived as providing for the cognitive, cultural, political and structural characteristics of a society (Smelser and Swedberg, 1994). Embeddedness of a society is an important influencing factor on the actors of an economic sector, such as the electricity sector, and carries high importance in the analytical framework of this dissertation.

3.4.2. Second layer-Institutional Environment

The second and third layers of Williamson’s framework are important for this dissertation since they largely explain the important steps of institutional reforms in an economic sector such as electricity. The second layer of the framework consists of the ‘institutional environment’ or “formal rules of the game”. These are macro level formal rules which are explicit in nature. Constitutional and meta-constitutional rules lead the long list of formal rules in the present world. Other formal institutions structuring economic, political and social life originate from constitutions. For instance, institutions such as human rights laws, laws relating to property rights and their enforcement mechanisms, contract laws, rules on basic financial institutions, trade laws, taxation laws, investment laws, courts’ procedural laws, etc. also originate from the constitution and are part of the institutional environment of a country. The institutional environment constitutes a significant part of the overall institutional endowments of a nation (Levy and Spiller, 1994) which may impact significantly on any politico-economic reforms in a country. Institutional endowments of a country partly involve the institutional environment (formal rules) and partly the embeddedness (informal rules).

Thus institutional endowments may include legislative and executive institutions, judicial institutions, administrative institutions, informal rules and ideology of the nation (Ibid).

These sorts of rules are significant for economic performance of countries (Coase, 1992, North, 1994a, Levy and Spiller, 1994, Olson, 1996, Bergara et al., 1998, Rosenberg and Birdzell, 1986, Williamson, 2000) and they are considered by Williamson as ‘first order economizing’, he suggests ‘get formal rules right first’ for better economic performance. These institutions are partly structured through evolutionary processes and partly by design. Design instruments at this level comprise functions of polity, judiciary and bureaucracy and power sharing among different segments of the government (Williamson, 1998). However, at a dynamic equilibrium point, the institutional environment in a country is always compatible with the embeddedness or institutional foundation of the society at any point in time (Joskow, 2004).

Through evolutionary processes, these institutions (formal rules) may take between 10-100 years to change, which is comparatively less than the time required for embeddedness to change. Rapid cumulative change in the formal rules as a result of exceptional incidents such as discontent, revolution, financial crisis, civil wars, occupations, breakdowns, etc. does not impact the performance of the countries for longer period of time (Williamson, 1998).

At level 2 of Williamson’s framework, institutions of property rights and contracts have gained immense importance in NIE literature. Property rights mean the right of a person to use, sale and rent a property (Furubotn and Richter, 2005). Institutions for defining and enforcing property rights are considered key to economic performance. For that purpose, the relationship among judicial, legislative and executive institutions is significant. Literature on NIE suggests that clearly defined property rights and their efficient enforcement which is conducted through third party contracts’ enforcement in certain circumstances enhance the economic performance of the economies.

Williamson gives high importance to the institutions of polity, judiciary and bureaucracy in this layer due to their special position in establishing and protecting the institutions of property rights. Among many other new institutional economists, he advocates for a greater and independent role of institutions in reducing the chances of personal gains for people from polity, judiciary and bureaucracy in order to ensure the protection of property rights. For instance a weak institutional environment may attract some people from polity to expropriate

property of private investors in some countries by different measures (Holburn and Spiller, 2002). Therefore, it is important to have a right and efficient institutional environment that may protect private property rights to improve the economic performance through enhanced private investments.

3.4.3. Third layer-governance structure or institutional arrangement

The third layer in Williamson's framework is "governance structure". It is the layer where "institutions of governance" are placed. Williamson asserts that if the institutional environment deals with "rules of the game" then institutional arrangement talks about "play of the game" according to rules settled in the previous layer. Under the guidance of a given set of pre-specified "rules of the game", a particular structure of the play is figured out at this level to govern the relationships among players of the game. Organization-players of the game, and transactions among organizations, are important aspects for analysis at this stage. Institutional arrangements focus on transactions among firms or organizations in a microscopic way. They structure the parameters for the firms' internal and bilateral transactions which consequently help firms to organize internally, compete and cooperate with fellow firms. These institutional arrangements may also configure the boundaries of mutual transactions among firms under the specification of formal rules. For example, a given electricity law may feature the entire institutional structure of the electricity sector, in terms of organization, functioning and performance (some relevant aspects to organizations and transactions such as transaction costs, frequency, asset specificity and uncertainty are given in Appendix 10).

However, a number of factors at this level such as actors' personal interests and path dependence may impact the level to which formal rules are acted upon. However if an electricity law is implemented in its true spirit, it may result in a better power sector whereas an incomplete law implementation may place the sector in between the pre-reform status and actual perceived status in a post-reform situation.

3.4.4. Fourth layer-resource allocation

The fourth layer of Williamson's framework highlights the need for "short term resource allocation", or for conducting day-to-day economic operations under the assumptions of New Classical Economics, provided that the institutions are well defined at the other three levels of the framework. The operations such as determination of prices, wages, costs, sales and

purchases are conducted in case of market imperfections for example monopoly, oligopoly, duopoly etc. (Williamson, 2000).

So far, we have focused on how different institutions (formal and informal rules and their enforcement mechanisms) are economically linked and in what sequence and pace they will change. Williamson's four-layer framework allows us to analyze the institutional structuring of the electricity sector in a wider economic institutional perspective. For our analytical framework layer 2 and 3 have particular relevance. In the analysis of institutional reforms in power generation the institutions featuring at the second layer determinates the institutions featuring at the third layer, which in our case refers to the electricity sector. The institutions featuring at the third layer to a large degree determine the governance patterns at the fourth layer. The relationship between the second and the third layer allows us to theoretically understand the (mis)match between the reforms and the organization of the electricity sector and the relationship between the third and the fourth layer helps understand the (mis)match between the functioning of the electrify sector and its outcomes. So Williamson's framework helps to analyze and understand the institutional configurations and their outcomes in a country's electricity sector, initiated by power sector reforms. In the empirical chapters of this dissertation we will use this framework to analyze and to understand the power sector reforms in Pakistan.

Williamson is helpful in understanding institutional configurations, but the four-layer framework does not explain how these institutional configurations come about. In other words, institutional change is not explained. This is why we now turn to Douglass North's evolutionary approach, which provides us with a theoretical understanding of institutional change. North combines an evolutionary and design approach of institutional change (see next section).

3.5. Evolution and Design Approach to Institutional Change

As indicated above, we follow North's ideas on institutional change, which actually are a combination of the so-called collective choice and evolutionary approach of institutional change. Since three main approaches to institutional change including collective choice, evolutionary and a mixture of collective choice and evolutionary approach are part of the literature as indicated by Kingston and Caballero (2009). Therefore after giving a brief introduction to the first two approaches, we move onto the third approach.

Institutional change as a collective choice process conceptualizes institutional change as “purposefully designed and implemented in a cohesive manner” (Libecap, 1989). Rules are established explicitly by a collective body such as legislature, administration and the state. Individuals and organizations remain in a continuous engagement to change rules to their own benefits. The collective choice approach has two major shortcomings: 1) it cannot explain why some rules remain ineffective and 2) it is not able to explain informal rules such as social norms and conventions and their role in the overall institutional change process. Issues like informal rules, their origin, sources of change, roles, etc. have been poorly explained by this approach.

Institutional change as an evolutionary process sees institutional change as an uncoordinated change in behaviors and beliefs which leads to new rules sub-consciously. Such newly established rules either die out due to lack of acceptance or spread because of their success in establishing acceptability in society (Veblen, 1899, Hayek, 1973b, Knight, 1995, Levi, 1990).

The third approach provides a more encompassing explanation of institutional change. This approach, explained in more detail in the following section, combines the design and the evolutionary approach (North, 1990a). Following North on institutional change allows us to connect with the four-layer scheme of Williamson, which forms the core of our analytical framework. North puts emphasis on the first, embeddedness, layer in Williamson’s scheme. At this level, North explains the evolution of informal rules and their impact on the institutional featuring and change of the lower layers of Williamson’s framework. In this way we are able to relate the structural, institutional side and the agency, dynamic side in processes of institutional change. Thus we can say that Williamson’s framework talks about the design of change, whereas the North’s approach reveals the process of change. This combination of structure and process approach allows us to provide for a comprehensive analysis of the power sector reforms in Pakistan and to understand why these reforms did not succeed in bringing about the required change. The final step in developing our analytical framework, therefore, is to explain North’s conceptualization of institutional change in more detail.

North’s conceptualization of institutional change

North (1990a) argues that if institutions are the rules of the game, then the organizations which may include political parties, ministries, business firms, stock exchange, etc. are players of the game. “Organizations are composed of a group of people engaged in purposive

activity” (Ibid). People working in or for the organizations are entrepreneurs, which play key roles in institutional change. Every institutional matrix requires specific organizations for reaping benefits. When new opportunities arise for the organizations, then entrepreneurs of the organizations (people involved in decision making and implementing those decisions)⁷ strive to adapt (or change) the rules of the game (institutions) with new circumstances in order to get maximum benefits from new opportunities.

North’s approach is distinct from mainstream institutional scholars by conceptualizing institutional change as an endogenous factor. It is the mental perception of agents of change (external and internal entrepreneurs in the case of public organizations) that drives institutional change. Opportunities act as sources of change that can either be provided by some change in the relative outer environment, or change in the mental perception of entrepreneurs due to enhanced learning and skills. Some of the informal institutions such as behavior, societal values, political and economic ideologies (in the embeddedness layer) may have strong influence in shaping the mental perceptions of the entrepreneurs. The embeddedness helps in shaping the endogenous factors of change i.e. mental maps or mental constructs. Thus, both exogenous factors, such as relative prices, performance, costs, political environment, national institutions like bureaucracy, parliament, etc. and endogenous factors like mental constructs, can affect the entrepreneur’s approach towards change in institutions. It is also argued that learning enables entrepreneurs to change their mental models and then to restructure the relative prices of choices based on their newly established mental perceptions. So, it is partly an internal effort in the form of learning, and partly external change, which induces entrepreneurs to change their choices which ultimately results in institutional change (Ibid).

Deliberate institutional change occurs due to entrepreneurs’ perceptions of costs attached to altering institutions. Their decision will be based on a benefit-cost analysis, which will decide to keep the current institution, or to go for a change of institution. Institutional continuity can result in path dependency (Pierson, 1995, Pierson, 2000)

⁷ These entrepreneurs can include decision makers and implementers from inside and outside of the organizations. Inside management and workers contribute to achieve goals of the organization, which are sometimes set by entrepreneurs from outside. Entrepreneurs from outside the organizations are equally important if organizations are public entities. These public entities such as infrastructure utilities are dependent on state level institutions including polity, bureaucracy, etc. for decisions regarding structure, finance, production, technology and others.

In particular, in developing countries, path dependency plays an important role in explaining institutional reform in infrastructure industries. This is because of economies of scope and network externalities of current institutions. The welfare gains of the entrepreneurs are dependent on the current institutions, which restrict the room for institutional change. The interest in perpetuating existing institutions is backed by the logic that adoption of a new institutional framework may jeopardize the interests of organizations and their entrepreneurs. This situation is called 'path dependent', and is highly influenced by external sources of change (such as economic, legal and political institutions and the technology), internal sources (mental maps formed by beliefs, behaviors, customs, etc.) and the relationship nature between external sources and the internal sources, which tend to shape the actions of entrepreneurs in a particular direction. If the majority of entrepreneurs decide in favor of existing institutions then institutional change becomes highly uncertain and complicated. In such a conflicting situation, institutional change proceeds gradually and incrementally. A more encompassing institutional change in a public sector organization is only possible if internal and external entrepreneurs do not resist. The stronger the resistance the higher the risk that reforms stagnates or even move in directions opposite to what was intended.

There is another situation called 'gridlock' by North (1994c), where the exchange faces more severity than path dependence (Künneke et al., 2005). North reveals that revolutionary change may remain the only solution for bringing required change in a gridlock situation. Unlike path dependence, a gridlock situation lacks mediating parties such as economic and political institutions to help resolve the conflicts among interacting parties. Entrepreneurs also lack extra bargaining power in a gridlock situation. Thus, the lack of bargaining authority by entrepreneurs, and lack of mediating parties, may result in an intensive halt situation (gridlock), which can only be solved by a radical institutional change (revolutionary).

Path dependence doesn't require radical change, but can be resolved by (political) pressure or by new organizations. Aoki (2000), (Aoki, 2008) for instance asserts that not all entrepreneurs might resist institutional change. There might be entrepreneurs with certain payoff assessments, in particular future focused, which can favor institutional change and that can relieve path dependency.

According to North, the dominant model is that entrepreneurs have strong stakes in current institutions and therefore will resist institutional change. The resistance will intensify the

more encompassing the institutional reforms are. So if they cover all layers of Williamson's framework, then resistance might be assumed maximal. Large scale change increases the number of losing entrepreneurs. For that reason it is assumed that institutional change will be incremental and will take place only in those areas that are relatively conducive for negotiation among entrepreneurs. Consequently, the reforms will stay small and restricted since they are compatible with the existing institutional structure (Künneke et al., 2005). An incremental way of reform may reduce the entrepreneurs' resistance gradually.

Therefore our expectation is that in developing countries institutional change will be limited and incremental, because the change process will be dominated by entrepreneurs negotiating about the reforms, but also trying to keep the change as close as possible to the existing institutions. In the next, final part of the chapter, we will apply our analytical framework to the electricity sector.

3.6. Institutional Change and Sector Reform in Pakistan's Electricity Industry: An Analytical Framework

So far we have introduced and discussed the different components of our NIE based analytical framework, we now can put the elements together in an explanatory framework. We have visualized the framework in Figure 3-4.

Figure 3-4: Analytical Framework (The figure needs to be read from left to right).

The first set of vertical blocks represents the four-layer model of Williamson, which provides the layered structuring of institutions and institutional reform. According to this model, a country's institutional outlook is determined at four different layers, which are related: the upper layer determines the institutional features of the lower layer. According to Williamson it is important to follow a certain sequence in institutional reform in order to establish congruence among the reform steps and the other layers. Williamson asserts that failure to establish this congruence may worsen the performance of a specific economic sector after institutional reform.

In our framework we focus on the institutional reforms at the second and the third layer. This is represented in Figure 3.4 by the two vertical blocks. The upper block represents the institutional environment of Pakistan (layer 2) and the lower block the institutional structuring of the electricity sector in Pakistan (layer 3). We conceive the institutional environment of Pakistan as consisting of the constitutional rules, political rules and legal rules and conditions determining among others, property rights and law enforcement mechanisms. Literature on NIE shows that lack of consistency and predictability of the institutional environment increases the complexity of sector reform. In our framework we assume that the sector reform (layer 3) should be aligned to and in congruence with the country's institutional environment (layer 2). In our framework we assume that this alignment can be effectuated by an electricity law that facilitates the sector reforms and by adequate organization and functioning of an independent sector regulator, which should guarantee adequate functioning of the electricity industry after the reforms. The reforms as well as the transactions should be grounded in the electricity law. An electricity law is necessary to give a legal base to all considered and implemented reform steps, such as the formation of a separate and independent regulatory authority, corporatization, involvement of the private sector and the introduction of competition in power generation or electricity supply. The law should also provide basic rules for the regulatory authority to monitor and control the power sector.

At the sector level (layer 3) the reforms manifest in changes in the institutional featuring of the electricity sector. In our framework we incorporated four reform steps for Pakistan. The first one is unbundling. In our framework unbundling refers to the separation of production and supply activities on the one hand and transmission and distribution activities on the other. Before the reform, these activities were united in vertically integrated companies. Unbundling of these vertically integrated companies was part of the sector reforms in

Pakistan. So the reforms intended to separate generation of electricity on the one hand, and transmission and distribution on the other. This attracted the private sector to investing in power generation. The reforms also intended to establish an independent system operator (ISO) to coordinate production, transmission and distribution of electricity in Pakistan.

The second reform step was corporatization of unbundled entities. The idea behind this reform step was to make the unbundled production, transmission and distribution entities responsible for financial obligations such as payments of debts, taxes and dividends in the same way as required from ordinary private companies in Pakistan. They were also required to commit to procurement activities and employment and labor regulations (Gratwick and Eberhard, 2008). In order to ensure their independence, licenses were granted for specific periods of time and for specific regions in the country.

The third reform step was competition in power generation. As a result of unbundling, transmission and distribution continued as monopolies, whereas electricity production was opened for competition. Pakistan allowed private parties to invest in power generation. This attracted IPPs to invest in power production in Pakistan. The fourth and final reform step was privatization of publicly owned electricity production plants. This was meant as a measure of divestiture to improve the financial situation of the Pakistan state. Privatization was meant to sell publicly owned generation installations to the private sector.

Pakistan designed and implemented its power sector reforms along these lines, which are represented in Figure 3-4 by the third set of vertical blocks (generation, transmission, distribution and retail). The above shows that the reforms did not affect electricity retail in Pakistan. The implementation of the reforms had certain impacts. The general idea was that the reforms would solve the pre-reform problems, which will be analyzed in detail below. We will focus on the impact of the reforms on five performance indicators as displayed in the right block of the figure. This analysis will be subject of the empirical chapters.

So far, the Williamson part of our framework explains the institutional configurations before and after the reforms. Now we turn to the North part of the framework, which provides for explanation of the success and failure of the reforms. Above we have seen that both the design and implementation of institutional reform are the subject of deliberation and negotiation of entrepreneurs, both internal and external. In Figure 3-4, this is represented by the upper circle. This circle represents the arenas where entrepreneurs interact, negotiate, and exercise power to influence the design and implementation of institutional reform according

to their own preferences. The general assumption here is that if the reforms deviate too much from the preferences of entrepreneurs, then the design and implementation of the reforms will be affected negatively. Entrepreneurs will attempt to limit reforms. The general assumption is that the more inclusive the reforms are, the more intensive resistance of entrepreneurs will be, since all inclusive reforms will harm the existing interests of the entrepreneurs. Consequently, entrepreneurs will decide only in favor of institutional change that benefit, rather than harms, their interests.

Our framework further assumes that the thinking and acting of entrepreneurs is conditioned by the first layer of institutional framework i.e., embeddedness. This is the layer of ideas, ideology, values etc. that shapes the thinking and ideas of entrepreneurs. But the mental maps of the entrepreneurs are also conditioned by exogenous factors such as the political, the economic, the legal and the technological system. The concept of the entrepreneur represents a wide range of actors, such as reform architects, bureaucrats, politicians in ministries including the finance ministry, planning ministry, energy ministry, labor ministry, private businesses, employees and labor unions of the electricity sector. This makes the outcomes of the deliberations and negotiations highly unpredictable, which means that both the design and implementation of institutional reform will be unpredictable as well. At the theoretical level we only know that the design, implementation and the outcomes of institutional design are the result of a complex power game between entrepreneurs. Empirical research is needed to get a more detailed picture of what really happened in Pakistan's power sector reform and to analyze the processes that can provide explanations of the results. This will be the subject of the following chapters, in which we empirically analyze the institutional configurations before and after the reforms and the processes of institutional change. The framework developed in this chapter will guide us in this analysis.

4. Data and Methodology

This doctoral dissertation uses a range of methods to answer the research questions posed in Chapter 1. The reasons for adopting different methodologies are the following. Firstly, analysis of institutional reforms in the power sector is complex task because of the incremental nature of reforms. In Pakistan, reforms have remained immature for a long time (due to their slow progress) so evaluating their success or failure appears at first sight to be a bit irrational. Secondly, institutional reforms impact economic, social and environmental dimensions of a society, but it is difficult to include all these aspects in an evaluation due to data availability problems and lack of analytical techniques. Thirdly, developing countries lack single country evaluation studies on power sector reforms. An important reason for this is shortage of sufficient and reliable data and measurement instruments. We have been confronted with these problems in our research. In this dissertation therefore, we have applied a combination of qualitative and quantitative methods to be able to answer the research questions. The different methods are presented in Table 4-1. The table also specifies methods for each research question. Below, I briefly describe the methodological approach adopted to answer each research question. Detailed accounts of the methodologies used are in the relevant chapters.

Firstly, secondary data have been used to answer question one on the explanation of institutional reform in the power sector from the perspective of New Institutional Economics and how these reforms have been implemented in developed and developing countries.

The second question relates to the institutional reforms in Pakistan. Initially, overall reform implementation in Pakistan is analyzed, followed by an exploration of the existing problems in the power sector (Chapters 5 and 6). We argue that existing problems in the electricity sector of Pakistan, such as scarcity of private investment, high transmission and distribution (T&D) losses, financial constraints (in the form of circular debt and inefficient pricing mechanism) and expensive fuel mix for power generation have correlations with the poor implementation of the power sector reforms in Pakistan. Our analysis is guided by the analytical framework (Figure 3-4) developed in Chapter 3. This means that we also analyze the causes of the reform problems.

Table 4-1: Research Design

Main research questions	Data type and data collection technique and data sources	Main relationship under analysis	Analytical technique
What is, according to <i>New Institutional Economics</i> , institutional reform of the power sector and how did developed and developing countries reformed their power sector?	Secondary data collected from published work	-New Institutional perspective is competent to explain the gist and implementation of power sector reforms. -Developed and developing countries faced different sectoral conditions and contextual circumstances which also impacted the outcome of reforms in respective countries.	Qualitative analysis based on secondary data
What are the existing problems in the organization, functioning and performance of electricity supply in Pakistan and are these problems related to the institutional reforms in Pakistan?	Secondary data collected from reports by NEPRA (the regulator), Planning Commission, State Bank, NTDC (system operator) and the World Bank. Review of relevant research papers.	-Power sector reforms have not contributed to decrease pre-reform problems. -Existing problems in the power sector of Pakistan originate from insufficient institutional reforms.	Qualitative analysis based on secondary data
Did the power sector reforms affect the performance of the electricity sector in terms of installed generation capacity, electricity production, capacity utilization, transmission and distribution losses, percent thermal generation and electricity prices for the industrial and domestic segments and if yes in what way?	Secondary data collected from NTDC, NEPRA, World Bank development indicators (WDI) and Fraser Institute	Performance indicators such as electricity generation per capita, electricity installed capacity per capita, T&D losses, percent thermal generation and prices should behave differently after reforms' introduction in 1994.	Quantitative analysis based on secondary data.
Did the power sector reforms affect private investments in electricity production in Pakistan, and if yes, in what way?	Primary and secondary data. Primary data based on online survey from private power investors. Secondary from the World Bank PPI database	Political, economic and institutional factors impact perceptions of private investors in their decisions on private investment in the power sector of Pakistan	Qualitative analysis based on primary and secondary data
What are, according to experts' opinions, the major barriers in the institutional reform of Pakistan's power sector?	Primary data collected in two rounds of interviews from stakeholders related to the power sector	Institutional reforms in the power sector of Pakistan are impeded by sector specific, politico-economic and social institutions. In addition misalignment of institutions also impedes institutional reforms.	Mixture of quantitative and qualitative analysis with the help of Q methodology

The third question on the impact of the reforms has been answered by using a quantitative analysis of the relationship of reform steps and five performance indicators: installed capacity, electricity production/capacity utilization, transmission and distribution losses, percent private generation and prices. In respective Chapter 7, we use an econometric technique to measure impact of reform variables taken as dummies for all the five reforms' steps initiated in Pakistan on the performance variables. However, data limitations prevented our approach from meeting all the requirements of the methodology.

After facing difficulties in estimating cause-effect relationships due to limitations of relevant data and country level quantitative studies, we decided to look into the direction of time series data (1971-2010) of specific performance indicators with and without reforms. Since 1994 is the year when electricity reforms actually started in Pakistan, so this is a reference year in our methodology for observing change in the performance indicator. Firstly, a graph is drawn using normal time series data for each indicator and observing the direction of change before and after 1994. This is an indicator of the direction caused by reforms. Secondly, we forecast the values of each indicator up to 2010, starting from 1994, based on the previous years (1971-1993). This is an indicator of direction without reform.

The fourth question is on the impact of reforms on private investments in the power sector of Pakistan and uses both primary and secondary data. Primary data was collected in an online survey during August-September 2012 among private investors in the power sector of Pakistan. The list of private power projects in Pakistan was our point of departure, and was taken from World Bank data on Private Participation in Infrastructure (PPI) in developing countries. This list contained a total of 59 projects, including thermal IPPs, hydro IPPs and Rental Power Plants (RPPs). The data showed all the projects as fully operational, except one thermal plant, two waste plants and one geothermal plant. Recently, a number of RPPs have also left the market due to litigation on alleged corruption over terms of contracting and their actual production capacity. All projects were cross-checked on operational status through their websites and annual reports via the regulatory authority, NEPRA.

Initially a brief round of discussion was conducted with private investors to grasp the full range of important factors affecting investor decision-making. A questionnaire was then designed, partly based on the interviews and partly based on existing surveys of private power projects in Pakistan. The questionnaire contained questions regarding firms' decisions about the location of the plant, preference for current technology in use, planned investment

for the next few years and investors' perceptions regarding barriers to their decisions on private investment (See Appendix 17 for a complete overview of the questionnaire). Emails containing questionnaire were sent to 52 private power projects with follow up calls. In response, a total of 29 firms replied completely to the questionnaire, with another two partially answering the questions. The overall response rate was approximately 60 percent, which was sufficient to ensure reliability of the answers.

The fifth question relates to barriers to institutional reforms in the power sector of Pakistan. We used Q-methodology for answering the question. The lack of relevant data prevented us from employing econometric techniques, as utilized in some cross country studies (Erdogdu, 2012, Erdogdu, 2013a). We therefore opted for Q-methodology, since this allowed us to collect data ourselves and to analyze them in a reliable and valid way.

Q methodology has been extensively used in various fields of study (McKeown and Thomas, 1988). This methodology involves six steps to find out which are the main factors, or in our case, the main barriers of institutional reform. The first step involves the selection of themes and topics to be studied through Q. In a second step, items (such as statements, notions, pictures, etc.) regarding the main themes are collected from primary and secondary sources. This collection of items is called a *concourse*. A primary source for creating the *concourse* is to access the stakeholders for discussion or interviewing on the main theme. The second source includes material derived from books, newspapers, magazines, journal articles, etc. We employed both methods for building the *concourse*.

The third step involved shortlisting statements for preparing a miniature of the original *concourse*. This is called the *Q sample*. There are various techniques for selecting a representative sample of the *concourse*. The challenge is to select statements covering all important aspects of the main theme and representation of the background of the participants of the sample. There are different opinions on the number of statements to be used in Q, but a normal number of statements in a Q sample lie in the range of 40-70. I selected a sample of 52 statements from the *concourse*. During this step, the participants are selected for administering Q sorting, and may also include people who were interviewed during the initial phase (more detail on the process of selecting Q-notions is given in Chapter 9).

In the fourth step, participants were asked to rank the statements on a Likert scale. We used the range -4 to +4 and employed a free choice method for efficiency reasons. The method of Q-sorting (i.e. forced or free) is considered to have no significant impact on results (Brown et

al., 1999). After Q-sorting the participants were interviewed to get more information on the reasons for their sort decisions.

From Step 5 onwards the data are quantitatively analyzed. I used PQ Method for analyzing the Q sorts in a multivariate fashion. Firstly, PQ creates a correlation matrix for all Q sorts for the purpose of quantifying the degree of divergence among respondents' view-points. Then the Q-sorts are grouped together on the basis of similarities and differences as perceived in an inter-correlation matrix. In order to identify the natural groupings, the inter-correlation matrix is factor analyzed either by Centroid Analysis or Principal Component Analysis (PCA), the latter of which has been used in our analysis. People with similar views on specific discourses will fall in the same group. This stage of the analysis also determines how significantly each Q sort loads on each factor. This level identifies more groups or factors than anticipated after the final stage of the analysis i.e. rotation. The rotation may be either Varimax or Judgmental. This study used the rotational method. Van Exel and de Graaf (2005) maintain that rotation of factors only shifts the angle for observing the Q sorts and does not impact the perceptions carried through individual Q sorts and the relationships among Q sorts.

Factors may be selected on the basis of two criteria. Firstly, eigenvalues of the factors should be more than 1 and secondly each factor should load on at least two sorts (Brown, 1980, Watts and Stenner, 2005). According to Brown (1980), at the $P < 0.01$ significance level, significant loadings on to a factor can be measured by the equation $2.58(1/\sqrt{N})$ where N is the number of statements in the Q sample. This implies that all the factor loadings in this study are considered significant if they are greater than or equal ($\geq$) to the value $[2.58(1/\sqrt{51})] = \pm .36$. Thus each factor extracted through this process characterizes a cluster of individual sensitivities, which are associated internally and dissociated with the clusters of individual perceptions loading on other factors. In the last step, these factors are explained with the help of the material collected from the participants of Q sorting process.

5. Pakistan and its Power Sector Reforms

This chapter is the first empirical chapter of the dissertation and explains the implementation of power sector reforms in Pakistan. The findings will contribute to answering the first research question. We start the analysis with a brief introduction of Pakistan as a country.

5.1. Country Profile: Pakistan

Recent archeological evidence indicates that humans, lived in the areas presently known as Pakistan about 2.2 million years ago (FRD, 2005). The present population of the country is densely located along the 1000 miles of the Indus River and its four main tributaries (Chenab, Jhelum, Ravi and Sutlej), like the ancient civilizations of Soanians⁸ (Chauhan, 2003), Mehrgarh⁹ (Singh, 2008) and Indus Valley civilizations (2800-1800 BC) of Harappa and Mohenjo-Daro¹⁰ (Arnett, 2006).

Figure 5-1: Map of Pakistan

Source: CIA, the World Fact Book

⁸ Archeological artifacts of Lower Paleolithic age (500,000 to 125,000 BC) have been discovered in Suan Valley just 16 Km away from the capital, Islamabad.

⁹At Mehrgarh, west of the Indus River, remnants of a civilization of Neolithic age (7000 BC to 2500 BC) were found in 1974 by a team of the French archeologists.

¹⁰ The Indus Valley civilization whose relics have been found in Harappa (Punjab province) and Mohenjo-Daro (Sindh province) is believed to be as old as the civilizations of ancient Egypt and Mesopotamia (current Iraq).

5.1.1. Geography

Pakistan is located at the crossroads of South Asia, West Asia, the Middle East and China. With an approximate area of 796,095 sq. km, Pakistan shares its borders with India to the east, Iran to the southwest, Afghanistan to the northwest, China to the northeast and the Arabian Sea to the south (Figure 5-1).

The topography of Pakistan can be divided into three main regions: the northern areas where three famous mountain ranges Himalaya, Karakorum and Hindu-Kush meet which also contain some of the world's highest mountains such as K2, Nanga Parbat and Raka-Poshi, the plains alongside the Indus river and its four main tributaries which run through the provinces of KPK, Punjab and Sindh towards Arabian Sea and the Baluchistan Plateau (FRD, 2005).

5.1.2. Population

With a projected population of 188 million, Pakistan is the sixth most populous country in the world. 48% of the population falls in the age group of 15-49. 56% of the total population falls in the productive age group i.e. 15-64 (GOP, 2013). The youth bulge is an opportunity and a challenge for the country at same time. It can become an economic force for the country if equipped with education, training and jobs, or it may provide fuel to economic and societal disintegration by falling into the hands of non-state actors.

According to the Economic Survey of Pakistan (GOP, 2013), around 70% of the population lived in rural areas about a decade ago; however rural-urban migration for the sake of jobs, better education, health facilities and social uplift has decreased the percentage of population living in rural areas, which currently stands at 61.4%. Growing dissatisfaction among the rural population will accelerate the rural-urban migration in the future, which will require intensification of government efforts to provide basic infrastructure such as safe drinking water, sewerage, transport, energy, etc. in the urban areas.

Pakistan with a labor force of 59.7 million people in 2013 is the 10th largest country in terms of labor reservoir. However not everyone is able to work. According to the Economic Survey 2013, a total of 45.7% of the overall labor force is participating in working activities. These people were either employed or unemployed but willing to work and looking for jobs. Out of the total participatory labor force, 68.9% are males, whereas the females constitute just 21.5%. Agriculture employs the largest number of people (approximately 43.7% in 2013, which has decreased from 45% in 2009-10 due to continuous mechanization of the sector).

Manufacturing and construction employs around 21.5% of the labor force and the commercial sector about 14.4%, community, social and personal services about 13.3% and communication/transport employs around 5.5%. 1.6% of the workforce is employed in other sectors (GOP, 2013).

5.1.3. Government

The Islamic Republic of Pakistan is a parliamentary democracy run under the 1973 constitution, which clearly demarcates three important organs of the state including executive, legislative and judiciary. The supreme institution of the country i.e. constitution, which was created under the directions of meta-constitutional rules i.e. Objective Resolutions (1948), has been suspended a number of times by the military rulers since its promulgation on 14th August 1973. The last suspension took place on November 3, 2007 when Gen. Musharraf initiated emergency rule in the wake of country-wide protests by lawyers in support of deposed Chief Justice of Supreme Court.

The constitution divides the legislative organ into two houses, the upper house known as Senate and the lower house as National Assembly. The members of National Assembly are elected directly through general elections, while members of Senate are elected indirectly by members of the Provincial and National Assemblies to represent their respective provinces. The executive organ is headed by the Prime Minister who enjoys all administrative powers after the 18th amendment in the constitution, which were earlier used by the head of the state i.e. the President. The President appoints cabinet members from both houses following suggestions from the Prime Minister. The Judiciary, which has the mandate of upholding the constitution, runs under the British Common Law system ingrained with the injunctions from Islamic law. The Supreme Court operates as the highest court in the country with provincial high courts and then district courts system. The Judges of the higher courts are appointed by an eight member parliamentary committee under the suggestions of an elite panel of judges from the Supreme Judicial Council.

5.1.4. Economy

Pakistan is a developing country that ranks 177th in terms of GDP per capita. The economy has been passing through severe challenges with declining revenues and expanding expenditure, which has been contributing to a widening of the budget deficit that has remained around 7.1% of the GDP in the fiscal year 2013-14. This rising budget deficit has

been fortified over a period of time due to expanding demand for pressing expenditures such as the social sector, infrastructure development, etc. and declining revenue collection from taxes and non-taxes (MOF, 2013). On the revenue side, the manufacturing sector contributes about 85% whereas the other three sectors including commercial, agriculture and services pay altogether 15% taxes. The main expenditures are made in connection with payments to the provinces, debt servicing, defense, subsidies to public sector loss-making enterprises, federal government expenditures, expenditures on social development projects and others.

During the fiscal year 2012-13, total revenue collection from all economic sectors remained approximately Pak Rs. 2100 billion (US\$ 20.79 billion¹¹) whereas expenditure has been around Pak Rs. 3266 billion (US\$ 32.37 billion) thus producing a budget deficit of more than US\$ 11 billion, which is unsustainable for a country that ranks high among the countries with lowest tax to GDP ratio and savings to GDP ratio. Out of these expenditures, subsidies to public sector enterprises (PSE) from infrastructure industries such as energy, airline, railway and steel mills have remained above Pak Rs. 520 billion (US\$ 5.1 billion). This huge amount is precious for a country that fills its budget deficit through borrowing from the domestic commercial banking system and printing new currency notes, leading to other problems like high inflation (Zaidi, 2012).

One of the reasons for lower level of tax revenues, which are mostly indirect, is slow economic growth in Pakistan in recent years, stagnating at between 2.5 and 4%, which is one of the lowest in the region. During the 2013-14 fiscal year, the agriculture sector has shown 2.12% growth against 2.88% last year and the industrial sector expanded by 5.34 % against 1.37% last year due to encouraging statistics from large-scale manufacturing. The services sector showed 4.29% growth against 4.85% last year.

There is a strong need to create a balance between revenues and expenditures to make the economy of Pakistan sustainable, which is possible only by either increasing revenues or reducing expenditures. A sector which may do both directly and indirectly is the energy sector. The energy sector depends heavily on subsidies and if this wasn't the case, the government could reduce expenditure significantly. At the same time tax income could be increased if crucial economic sectors could rely on a constant supply of electricity (IPP, 2010).

¹¹ 2013 exchange rate

5.1.5. Energy

The Pakistan energy sector is going through serious crisis that has been severely impacting economic growth since 2006. The gap between supply and demand is increasing (NTDC, 2012). The supply of energy is restricted by various factors such as low investment in developing indigenous energy resources; over dependence on imported energy resources; and widening losses in transmission and distribution of energy. The demand side is also contributing significantly to extending the supply-demand gap by rising energy demand as a result of extensive consumerism, urbanization and use of energy intensive and inefficient devices (WorldBank, 2013).

The energy balance of Pakistan during 2012 indicates that total energy supply has remained 85758 ktoe¹², of which 65992 was produced locally, 20876 imported, 758 exported, 91 provided to international marine bunkers, 190 provided to international aviation bunkers and 70 Ktoe consumed in stock changes (Figure 5-2). Different energy resources have contributed to supply 85,758 ktoe energy to Pakistan during 2012 (Figure 5-3). Biofuels and waste made a major contribution, since this is the only energy resource available to a large proportion of the population living in rural areas, where no other energy resource, such as natural gas and electricity is available for heating, lighting and cooking. Other primary resources for meeting energy needs are natural gas and petroleum products.

Figure 5-2: Energy Balance in Pakistan during 2012

¹² Kilo ton oil equivalent

Figure 5-3: Contribution of energy resources to energy supply during 2012

Data source: International Energy Agency (IEA)

Figure 5-4: Final consumption of energy

Data source: International Energy Agency (IEA)

Out of 85758 ktoe energy available during 2012, consumers used a total of 71834 ktoe of energy; the difference between supply and consumption was loss during transformation of primary to secondary resources, transmission and distribution of the energy resources (Figure

5-4). Among the consumption sectors, the residential sector has remained the largest energy consumer while the industrial and transportation sectors were second and third respectively¹³.

Pakistan is facing severe challenges in meeting the supply-demand gap of primary energy resources. Indigenous energy resources such as natural gas and crude oil are not getting sufficient investment for exploration and development of new sites due to structural problems, such as lower prices for natural gas, security risks in potential areas for oil and gas, financial constraints and institutional problems. Under these circumstances, the demand for primary energy resources is set to be met through imported fuels in the near future. This is certainly unsustainable for Pakistan, which is already burdened by a huge trade deficit.

The electricity sector, which is one of the major consumers of primary energy resources, is set to rely on imported fuels because it is unable to attract sufficient private investment in indigenous resources for electricity production. Domestic circumstances for production of indigenous resources are bad, and this contributes to the extension of the supply-demand gap and electricity blackouts for extended periods throughout the country.

The overall energy crises has kept the economy of Pakistan in a low-level trap that has not let the economy to grow beyond 3-4% (IPP, 2009, SBP, 2012). In recent years, a consensus has been building among experts from key economic institutions of Pakistan, such as the Planning Commission, Ministry of Finance and the State Bank, that the electricity sector is causing serious problems. These problems cannot be solved without institutional reforms that allow the entrance of private investors in electricity production and distribution. According to the experts, the public sector alone is no longer able to operate and finance the electricity provision in the country (MOF, 2012, SBP, 2012, PC/USAID, 2013).

5.2. Institutional Reforms in the Power Sector of Pakistan

This section explains institutional reforms in the power sector of Pakistan. We initially explain the pre-reform features of the power sector. These are the features that increased the need for reforms. Then this section explains implementation of reforms in several steps and finally the nature of change observed in the power sector as a result of reforms.

¹³ Data used on energy balance is available on the webpage of International Energy Agency (www.iea.org).

5.2.1. Pre-reform organization and performance of power sector in Pakistan

The pre-reform institutional situation of the Pakistan electricity sector was similar to other developing countries in the region. Electricity infrastructure consisted of two vertically integrated state utilities in two distinct regions. The Water and Power Development Authority (WAPDA) controlled the electricity supply infrastructure in Pakistan, except Karachi, the country's most urbanized region, and its periphery which were served by Karachi Electric Supply Co. (KESC). All the segments of the infrastructure such as generation, transmission and distribution and retail sales were the sole responsibilities of the two utilities as presented in Figure 5-5 (GOP, 1994a).

Figure 5-5: Vertical Monopolies of WAPDA and KESC before Reforms

Both utilities were characterized by financial and technical inefficiencies which left them unable to generate sufficient funds for the maintenance and expansion of the existing power infrastructure to meet the needs of the consumers (WorldBank, 1994). As a result, the utilities remained dependent on state resources for their investment needs. Financial meltdown of the government during the 1980s, high pressure for investments in other social arenas and reduced interest of international development partners (such as World Bank and Asian Development Bank which were main financiers of the power sector) in investing in publicly owned power sector, eroded the government's capacity for financing the loss making (public) power entities. These factors, along with examples of successful reforms in Chile, UK and Norway, pushed the government to introduce institutional reforms in the power sector from state monopoly to a market structure (CCP, 2009, WorldBank, 1994).

5.2.2. Implementation of power sector reforms

Like many other countries, Pakistan followed a sequence of reforms that was different from the sequence suggested by NIE literature, and which is explained in the analytical framework (Chapter 3). According to the NIE approach, reforms should start at layer 2 establishing the right institutional environment by enacting a new electricity law. Pakistan reformed differently.

Implementation of a different sequence of reforms was mainly due to acceptability of reform steps among key stakeholders, and the impending requirements of the sector (see also below). Electricity reforms in Pakistan started with IPPs entry under the plan for restructuring and privatization of WAPDA in 1992 (WorldBank, 1994). This plan basically laid the foundation of the Power Policy 1994, which formalized the involvement of IPPs in power generation. Besides legalizing IPP entry in power generation, this policy also required disintegration of the vertically integrated monopolies and formation of a separate regulatory authority to regulate the restructured power market.

5.2.3. Post-reform organization and performance of the power sector

As a result, a new power sector regulator, National Electric Power Regulatory Authority (NEPRA), was established by a presidential ordinance in 1995, approved by Parliament in 1997 (NEPRA, 2012). Both state utilities, WAPDA and KESC, were disintegrated vertically by separating generation, transmission and distribution segments. WAPDA's thermal and hydropower plants were separated. The thermal plants were spread over four new generation companies (GENCOs) and the hydropower plants stayed under the control of WAPDA as a power producing company. Transmission became part of a separate company operating under public monopoly, the National Transmission and Dispatch Company (NTDC). Distribution became regionally spread and organized in eight distribution companies (DICSOs). Due to the recent establishment of two new entities, the number of DICSOs rose to ten. Unbundling continued at a slow pace and was finalized in 2001.

Part of the reform was opening of the power sector to private companies and investors. The 1994 power policy (CCP, 2009), offered incentives for private companies to start electricity production activities. Privatization was institutionally designed in two ways: 1) private companies starting Independent Power Projects (IPPs) and 2) privatization of the unbundled public companies. For this second form of privatization a specific organization was erected to

organize the task, the Pakistan Electric Power Company (PEPCO). For that reason all the unbundled organizations (thermal generation, transmission and distribution) were brought under the control of PEPCO.

Figure 5-6: A map of the post-reform structure of power sector in Pakistan

Source: SBP and Ministry of Water and Power

Together with privatization, the single buyer model was introduced to coordinate the production of all the newly established production companies and private producers. Pakistan created a special organization for this task, NTDC/CPPA, the Central Power Purchase Agency. This organization coordinated electricity production of the thermal plants, the hydropower plants, which still are part of WAPDA, the nuclear power plant and the production of IPPs. A graphic representation of the post-reform power sector in association with overall energy sector is given in Figure 5-6.

Despite the reform attempts to vertically unbundle and establish unbundled companies in all the segments of the infrastructure, the institutional structure of Pakistan's power sector started vertical integration again. This was one of the final activities of the government of the Pakistan People's Party before leaving office in January 2013. The government merged the unbundled entities into WAPDA, one of the two initially operating vertically integrated companies in the pre-reform period. This process of reintegration was strongly pushed by WAPDA's ex-employees. These ex-WADPA employees stayed with their mindset and their activities in the institutional structure of the post-reform period. They never accepted the reforms.

With a few exceptions, privatization plans of the unbundled companies did not happen. A "so called successful" privatization was KESC, which has been privatized, but without being unbundled, in 2007. The private investor bought a monopoly in generation, transmission and distribution for the Karachi region. The main reasons for privatizing KESC as an integrated monopoly were to solve the huge deficits of the public exchequer and to attract new private investments in the KESC system. Reports reveal that both objectives have not been achieved (PC/USAID, 2013, PC, 2010). The services of KESC have deteriorated compared to the pre-reform period and the government is forced to provide subsidies to compensate the losses of the company. KESC has not managed to extend generation, transmission and distribution investments according to the initial agreements at the time the company was sold.

Despite success in raising private capital in new generation, outcomes of electricity reforms have remained dismal with no major change from the pre-reform situation. Reforms have been successful in expanding generation capacity as a result of IPP entry that attracted significant private investment. According to World Bank PPI data, IPPs in Pakistan raised private investment of around US\$ 11 billion up to 2011, with above US\$ 7 billion during the 1990s only. Prior to 2000, the investments largely concentrated in Greenfield projects. After the year 2000, the government succeeded in attracting some investments in the divestiture projects as well.

Due to the private investments, the privately owned and operated production capacity developed a share in installed capacity of 49% and a share of 53% in actual production in 2012 (NEPRA, 2012) (see Table 5-1). It showed that the private power stations were more efficient than the publicly owned plants, and the publicly owned hydropower capacity in Pakistan cannot produce whole year round (Saleem, 2007b).

Table 5-1: Installed capacity and generation of electricity in Pakistan

		Installed	Generation
Total		23,538	98,664
Sector wise	Public	11,957	45,832
	Private	11,581	52,832
Plant wise	Thermal	16,035	64,821
	Hydro	6,716	28,643
	Nuclear	787	4,872
	Import	-----	328
System Wise	PEPCO	20,394	89,057
	KESC	3,144	9,607

Source: (NEPRA, 2012)

The institutional reforms did not have a major impact on transmission and distribution of electricity, which remained solely the responsibility of publicly owned utilities. The challenge is still considerable since one third of the population (60 million people) does not have access to the grid.

Figure 5-7: Comparison of electricity consumption in 1960 and 2012 in Pakistan

Data sources: (NTDC, 2012, NEPRA, 2012)

Apart from the share of the population not connected to the grid, there is the supply demand problem, for those connected to the grid. This problem is caused by insufficient capacity and production, which does not cope with increasing electricity demand. Electricity demand has increased with industrialization, urbanization, increased commercial activities, subsidies for

agricultural tube wells, attractive consumer tariffs due to an inefficient tariff structure, rising per capita income, rural electrification, high energy intensity and remittances from Pakistani expatriates (Kessides, 2013, IPP, 2009). The pattern of consumption has also changed. The share of industry decreased from 65% in 1960 to 29% in 2012, whereas the share of the residential demand has increased from 13% in 1960 to 29% in 2012 (Figure 5-7). Also the regional spread in consumption has changed. Punjab, the biggest province, is ahead of the other four¹⁴ provinces by consuming around 60% of the total electricity (NEPRA, 2012).

Due to the rising electricity demand in combination with decreasing private investments in new capacity, the demand-supply gap has increased to above 30% of peak electricity demand in recent years. This causes electricity breakdowns of more than 20 hours a day in rural areas and 14 hours a day in urban areas (Kessides, 2013, Munir and Khalid, 2012).

The private investments and the privatization were also meant to unburden public spending in electricity supply. This goal of the reforms hasn't been attained at all due to financial commitments made by the government with the IPPs. The IPPs received sovereign guarantees for off-take of the IPPs' generated electricity by the single buyer (NTDC) with accompanying payments and financial guarantees. These guarantees caused financial problems for the government and led to the serious problem of inter-corporate circular debt. Circular debt is a buildup of receivables and payables among different segments of the power sector and its allied sectors (PC/USAID, 2013). The result is that those who produce electricity cannot be paid anymore, with the effect that production cannot continue due to lack of financial resources. The financial problems of the government were increased by the energy subsidies. These subsidies, together with the single buyer model, burdened the state finances heavily. The reforms were also meant to relieve the financial burden of the energy subsidies, but the reforms failed on this point too.

Before the reforms, electricity prices were below the actual costs of electricity production and supply, and the reforms were expected to increase electricity prices, so that tariffs reflected real costs of production. However, the prices didn't rise and costs weren't recovered completely, with the result that the government was forced to continue the energy subsidies. Differentiation in energy subsidy continued after the reforms. Subsidies extensively prevail in the system and are of various types, such as Tariff Differential Subsidies (TDS) which compensates for regional differences in the costs of electricity provision (PC/USAID, 2013).

¹⁴ Other four provinces are Sindh, Baluchistan, Khyber Pakhtun-Khwah and Gilgit-Baltistan.

Also cross subsidies between economic groups continued (SBP, 2012). And the subsidies to the poor continued, however other groups benefitted most (Trimble et al., 2011). These subsidies have put an unbearable financial burden on the government, which is liable to pay the (private) generators. Failure in timely reimbursement results in increasing the number of hours of load shedding (PC/USAID, 2013, WorldBank, 2013).

An accompanying problem is the transmission and distribution losses, which did not decrease after the reforms as was expected. These losses have been hovering around 20 to 26% in the last several years, and on one hand are the result of technical inefficiency in the generation, transmission, and distribution and corruption, electricity theft and over-staffing in the utilities on the other (NTDC, 2012, NEPRA, 2012).

The reforms were meant to unburden the public financial burden and problems of electricity supply. However, on the contrary, intensification of financial problems, in particular the circular debt problem, caused serious load shedding with the daily system falling out for many hours. This has severely impacted all walks of life in Pakistan. The impact on the economy has been overarching and this also affects the social fabric of the country. Many workers in small and medium industries have lost their jobs because the industries were closed due to electricity load shedding. This has instigated wide-spread protests against load shedding in recent years by poor workers and the general public in several cities, such as Faisalabad (a city in central Punjab, famous for its textile industry), which have even resulted in fatalities (Kessides, 2013). The economic impacts of electricity load-shedding in Pakistan are briefly reviewed below.

Three successive years¹⁵ of economic growth (above 7%) became one of the major reasons for rising energy demand in Pakistan. Electricity supply could not be coordinated with demand from 2005 onwards. Increase in demand was fueled by a boom in consumer financing for electrical appliances such as refrigerators and air conditioners, caused by construction activities, remittances, GDP growth rate of above 7% and also by subsidized tariffs for residential and agricultural consumers (ADB, 2010a). The demand buildup in the residential sector increased the share of residential consumers considerably for overall consumption of electricity in the country. This share kept growing despite a massive shortage of electricity in the system.

¹⁵ 2004, 2005 and 2006

The electricity shortfall was 1247 MW in 2005-06, and moved above 8000 MW in 2012 (SBP, 2012). The gap between demand and generation has been widening continuously (Figure 3-4). The electricity shortfall is passed on to consumers in the form of load shedding in Pakistan, which has become a normal instrument for load management. In 2012, the PEPCO system¹⁶ undertook a peak load management of 8393 MW or 44.3% of the peak demand, which means that all the consumers under the PEPCO system faced complete shutdown of electricity supply for more than 44 % of the time in a day (Ibid). The actual situation is more severe than indicated in the official reports and publications. Various media reports indicate that load shedding in urban areas has reached up to 16 hours and in rural areas up to 20 hours a day during peak load management¹⁷.

A few studies have been conducted to find out the economic impacts of load shedding on industrial sector, but valuation of impacts on services, agriculture and households is still rare. Electricity shortfall has dragged down the industrial growth in the country (Figure 5-8 & Figure 5-9). Such industrial downfall has also transferred its impacts to other sectors of the economy such as commerce, trade and agriculture. This led to contraction in GDP growth because of existence of a positive relationship between industrial growth and the GDP growth (Figure 5-8). It is apparent that an increase in the gap between demand and supply is negatively affecting industrial growth and GDP. A number of studies found that the industrial sector has suffered badly from load shedding with a cost of 2-3% to GDP annually. The institute of Public Policy (IPP)¹⁸ estimated the cost of electricity load shedding in the industrial sector of Pakistan for consecutive two years (2008, 2009) (IPP, 2009, IPP, 2010). They conducted surveys from 65 stratified randomly selected¹⁹ industrial units. Two types of costs incurred by industrial units as a result of load shedding were estimated in this study. First was the direct cost incurred by industries due to permanent loss of production capacity, loss to the machinery, restarting costs, etc. The second type was indirect cost that appeared to lessen the impact of load shedding and to regain some percentage of the lost production capacity. Another type of indirect cost measured, that was not directly linked to the sector under study but had huge impact on rest of the economy, was cost of welfare loss to consumers attached to the allied sectors of the industry and the cost of contraction in the

¹⁶ Country's overall electricity system except the areas served by KESC

¹⁷ <http://dawn.com/2012/06/17/residents-protest-prolonged-loadshedding-in-lahore/>,
<http://www.wsws.org/en/articles/2012/03/paki-m29.html>

¹⁸ Beacon house National University (BNU), Lahore, Pakistan.

¹⁹ By city and industry group

economic activities of the allied sectors which suffered due to power outages in the industrial sector.

Figure 5-8: Relationship between GDP growth and industrial growth

Figure 5-9: Situation of electricity demand and electricity generation in Pakistan

Sources: (Hussain et al., 2010) , (Gul and Qureshi, 2012)

The study found that cost of load shedding in the industrial sector was US\$ 2.53 billion²⁰ in 2008. The cost incurred due to losses in industrial value in addition from allied sectors was around US\$ 0.69 billion. Overall cost of industrial load shedding remained at US\$ 2.53 billion, which was equal to 2% of the GDP. In addition the economy lost 400,000 jobs and exports up to US\$ 1 billion. In 2009, the load shedding increased in industrial sector by about 30%, which also increased the cost of load shedding by increasing direct and indirect costs. Thus cost of industrial load shedding increased to US\$ 3.92 billion (2.5% of GDP). Displacement of labor also increased to 535,000 in 2009. Export loss increased from US\$ 1 billion to US\$ 1.3 billion. Since the incidents of load shedding have increased significantly from 2009 onwards due to widening a supply-demand gap; then the cost of load shedding has been on the rise as well. Various reports indicate that the economy of the country has been contracting between 3 to 4 % since 2010 (SBP, 2012).

The gravity of the situation requires unearthing the fundamental causes beneath the electricity crisis in Pakistan. Since institutional reform has been viewed as a scheme to overcome

²⁰ With average exchange rate in 2009-10 of US\$1= Pak Rupees 83

problems in the pre-reform power sector; however if problems persist in the post-reform period then it is imperative to analyze the process of institutional reforms in order to find out where and what went wrong.

This chapter has clarified the background to the existence of pre-reform problems in the power sector of Pakistan. Going through the need, gist and implementation of reforms, this chapter has revealed that reforms in Pakistan's power sector have not succeeded in the way it was expected. Although electricity reforms are slow in essence, as revealed in the literature of NIE, they have not even improved on the very basic indicator (supply constraints) for which power sector reforms were implemented in Pakistan. Even the supply situation has worsened over the years. Now, after knowing that reforms did not improve supply constraints in Pakistan, we will focus on the main problems that have contributed to the persistence of supply constraints in Pakistan.

6. The Persistence of Power Sector Problems after the Reforms

6.1. Introduction

This chapter contributes to answering the second research question: what are the existing problems in the organization, functioning and performance of electricity supply in Pakistan and are these problems related to/caused by the institutional reforms in Pakistan? Currently, the power sector in Pakistan is passing through several problems such as a gap in electricity supply and demand, lack of private investments, transmission and distribution losses, inter-corporate circular debt, lack of access to project financing and inefficient and expensive fuel mix in power generation (Kessides, 2013, Malik et al., 2009). Pakistan has introduced institutional reforms in its power sector to overcome these sectoral problems, which have continued from the pre-reform period. We argue in this chapter that the persistence of these problems in the power sector of Pakistan is linked to institutional reforms that were not implemented in a proper sequence and pace as illustrated in the model for institutional reforms developed in Chapter 3.

The problems in the power sector of Pakistan affect the economic and social life of the people. For instance, due to insufficient investments in distribution and transmission of electricity, the sector remains unable to provide a country-wide electricity access, which currently oscillates around 70% of the population (ADB, 2010a). Similarly, generation capacity lags behind actual demand. Electricity shortfall has crossed 40% of the peak demand in recent years (NTDC, 2012) and is causing outages for about 20 hours in rural areas and 12 hours in urban areas. On average, out of 70% of the population connected to national grid, approximately 30% remains disconnected at any point in time throughout the year (ADB, 2010a). Some studies reveal that the economy has lost 2% of GDP per year during 2008-09; however, this figure is believed to have shifted between 3-4% due to the ever rising electricity shortfall (NEPRA, 2012, IPP, 2009, IPP, 2010). The electricity shortfall is now starting to endanger the social fabric of the country as load-shedding has damaged small businesses badly. For instance, a survey conducted of small and medium scale industry in Punjab province (Pakistan) revealed that electricity load shedding has been a major reason for plant closure and worker layoff in various districts of northern and central Punjab (Hussain et al., 2010). Rising unemployment among semi-skilled and uneducated persons working in small businesses has increased violent protests, which sometimes have turned deadly. It may also put the efforts for controlling economic, social and religious violence at stake.

This chapter is structured in the following way. The next section provides an overview of existing main problems in the power sector of Pakistan. Section three analyzes the problems through the lens of the analytical framework (Figure 3-4). The last section concludes the chapter.

6.2. The main Problems Affecting the Electricity supply Industry (ESI) in Pakistan

Various problems such as lack of investment, inefficient fuel mix, financial constraints and transmission and distribution losses are inflicting the present situation of unreliability and inefficiency on the electricity supply infrastructure of Pakistan. These problems are described and analyzed in detail before discussing the role of institutional aspects in aggravating severity of the problems.

6.2.1. Lack of investment/ insufficient capacity addition

Robust growth in electricity demand is an important factor that has increased severity of the electricity shortfall in Pakistan. Demand increased by more than 10% during the 1980s, whereas on the supply side, the installed capacity only increased by 6.8%. During 1990s, the demand for electricity did not rise as perceived and it remained around 4% due to slower economic growth. The installed capacity soared by 8% due to the arrival of IPPs. During 2000s, the growth rate of installed capacity lagged behind the growth in demand by about 4 times, which severed the coordination between supply and demand (Table 6-1).

Table 6-1: Growth rates of electricity demand and supply (ACGR %)²¹

	Demand	Supply	
		Installed capacity	Generation
1972-1980	8.6	8.3	8.9
1981-1990	10.9	6.8	9.9
1991-2000	4.2	8.5	5.4
2001-2008	6.1	1.5	5.0

Source: (IPP, 2010)

The government could not anticipate the upcoming electricity crisis caused by a sharp rise in electricity demand by 2005 (the demand rise was caused by above 7% economic growth between 2005 and 2007). So the government seemed little prepared regarding investments in new generation to meet the looming rise in future demand. In fact, poor planning from several governments on supply of electricity (in accordance with available resources) to meet

²¹ Accumulate Growth Rate

the future electricity demand contributed to the existing crisis in the power sector of Pakistan. One of the main reasons for the rising gap between supply and demand has been the continuous reduction in the share of public investments in electricity generation in order to decrease the government's involvement in administering the power sector and to increase the role of the private sector in developing and maintaining electricity infrastructure. For instance, overall public expenditure on electricity generation have been reduced significantly after the construction of mega-hydro projects at Mangla and Tarbela (from 28% during the 1980s to less than 3% during the last decade (IPP, 2010, MOF, 2012)). This move succeeded initially to attract private investments in thermal based generation projects by the mid-1990s, but could not be sustained longer to win the confidence of investors to invest more in order to meet the rising demand. In addition private investments were only restricted to thermal projects, whereas hydro projects remained unattractive due to structural and institutional problems. Thus it is argued that the fall in public sector investments in electricity supply infrastructure, unclear regulatory mechanism for projects requiring heavy sunk investments (such as hydro) and disillusionment among the private sector due to IPP conflicts with government since late 1990s over terms of contracting, contributed to restricting the growth of installed capacity at 1.5% between 2001-2008. Such deficit in public and private investments in new capacity generation and overhauling of existing capacity has exacerbated the electricity shortage and as a result the load shedding.

6.2.2. Inefficient fuel mix in generation: from low cost to high cost

Fuel mix in electricity generation has tilted significantly towards imported fossil fuels, which has weakened the financial position of the country over the years, and it has also inflicted irrecoverable losses upon industrial growth (MOF, 2012). Since the cost of electricity generation has significant importance for the competitiveness of the industry, then, dependence on expensive imported fuels has increased the cost of generation and as a result has exposed the industry to sudden shocks due to price volatility in the international fuel market. Increasing import of fossil fuels has also been one of the main reasons for a high trade deficit. Thus high dependence on fossil fuels is not sustainable due to the restricted financial resources of the country.

Over the years, fossil fuels have dominated overall primary energy supplies. The National Electric Power Regulatory Authority, NEPRA (2012) has indicated that total energy

supplies²² during 2012 have remained at 64.51 Mtoe, of which 47.56% were gas supplies, 32.04% oil, 0.53% LPG and 6.74% coal. All thermal sources contributed 86.87% to total primary energy supplies. Supplies from hydro and nuclear have remained at 11.77% and 1.27% respectively, and 0.09% from imported electricity. A similar situation has held in electricity generation, which has slanted mainly towards thermal resources over the years (Figure 6-1). Among thermal resources, the share of High Speed Diesel (HSD) and Furnace Oil (FO) has been increasing and is currently 55%. The share of gas has been decreasing over the years and currently stands at approximately 45%. Coal has remained insignificant in the overall thermal production (Figure 6-2).

Figure 6-1: Trend in electricity generation from different resources

Source: (Gul and Qureshi, 2012)

Pakistan is endowed with multiple indigenous resources for fulfilling its energy needs. The list includes renewables as well as non-renewables, which can be utilized to create a favorable balance in the fuel mix for electricity generation at low cost (PPIB, 2008). The overall potential of renewable resources such as hydro, wind, solar, geothermal and biomass is estimated to be sufficient to meet the country's energy needs for several decades; however a slight portion of these resources has been developed to meet ever increasing energy demand (PC, 2007). For instance, hydroelectricity has a potential above 40,000 MW, of which only 6,600 MW (approximately 16.5% of the total hydro potential and 28% of the total installed capacity i.e. 23,400 MW) has been exploited so far (Bhutto and Karim, 2007). Except Ghazi

²² This did not include energy supplies from biomass such as woods, animal wastes, etc. which is one of the major sources of primary energy supply in rural areas where majority of the population resides.

Barotha²³, not a single mega project in hydroelectricity has been completed since the completion of Mangla and Tarbela dams²⁴. The actual share of hydroelectricity in total generation has been declining for last several years. A similar situation persists with other renewable resources, of which most have remained untouched. Non-renewable resources such as coal have also been found. Coal's known reserves are nearly 185 billion tons which are estimated to meet the electricity requirements of the country for more than 50 years (PC, 2010) but Pakistan has not utilized this resource sufficiently, and only produced 0.1% of electricity from coal against the world average of 41 % (IEA, 2011).

Figure 6-2: Fuel mix in electricity generation

Source: (Gul and Qureshi, 2012)

Ever increasing reliance on imported fossil fuels and neglect of indigenous resources has significantly increased the overall cost of electricity production in the country. Since the price of imported fuels is linked to the international fuel market, therefore any change in international prices of fuels transmits shock waves to the overall value chain of electricity in Pakistan. For example, over the last four years, the prices of Furnace Oil (FO) have increased more than 200 times in the international market. As a result the production price of electricity increased significantly higher than the price of electricity produced from indigenous resources (See Table 6-2). Therefore if indigenous resources are utilized more than imported ones, the fuel mix may reduce the cost of electricity generation. However, despite the

²³ Ghazi Barotha was constructed on Indus River nearby the villages of Ghazi and Barotha with the financial and technical help of China.

²⁴ Two major dams in Pakistan which were constructed as water reservoirs and sources of hydroelectricity production

abundant potential of indigenous resources, very little effort has been made to change the fuel mix in the favor of indigenous resources.

Table 6-2: Electricity generation cost from different sources in 2012

	Hydro	Coal	HSD	RFO	Gas	Nuclear	Import	Mixed	Wind
GWh	28,643	66	1474	30662	23431	4413	296	730	6
% share	31.93	0.07	1.64	34.18	26.12	4.92	0.33	0.81	0.01
Cost (Mln. US\$)	46.60	20.6	278.48	4886.17	993.40	49.78	26.62	93.31	.51
Cost (\$/ KWh)	0.0016	.0312	.1889	.1594	.0424	.0113	.0899	.1278	.0912

Data Source: (NEPRA, 2012)

6.2.3. Financial constraints

Another major issue is a combination of financial restraints faced by the electricity industry. Such constraints block the industry from operating in a smooth manner. The main financial constraints in the electricity infrastructure of the country are circular debt, inefficient pricing structure and lack of project financing. These constraints are explained below in detail.

6.2.3.1. Circular debt

Circular debt or inter-corporate debt in the electricity value chain of Pakistan means the accumulation of receivables and payments among different segments of the infrastructure and its allied sectors. It originated mainly due to inability of distribution companies to recover the cost of the electricity sold to end-use customers (PC/USAID, 2013). As a result, the Central Power Purchase Agency (CPPA) - the single buyer in the value chain (PEPCO system) faced a liquidity crunch due to shortage of receivables from DISCOs and suspension in the payments of Tariff Differential Subsidies (TDS)²⁵ by the government. Such a gap in recoveries creates hurdles for CPPA to pay back to the generation companies which as a result also face difficulty in reimbursing to oil and gas distribution companies, oil importing companies, refineries and to companies providing spare parts. Once payment is delayed or suspended by CPPA/NTDC in the value chain, the whole supply system is affected. Such a buildup of inter-corporate debt among different segments of electricity infrastructure and its allied sectors in Pakistan has plagued performance of the overall system. During the financial

²⁵ High dependence on expensive and imported thermal fuels for electricity production increases the cost of overall electricity production. However, increased generation cost is not transferred to end use customers due to government interference in customer tariff determination for the sake electricity provision at affordable rates. Such a difference between tariffs and production cost is provided by the government in the form of Tariff Differential Subsidy (TDS).

year (FY) 2012, the circular debt was estimated to have climbed from Pak Rs. 537 billion (US\$ 6.102 billion)²⁶ in FY 2011 to Pak Rs. 872 billion (US\$9.90 billion) in FY 2012 or nearly 4% of national nominal Gross Domestic Product (GDP) (PC/USAID, 2013).

Several factors contributed to exacerbate the circular debt issue. Primary factors included poor governance, poor receivables' situation of DISCOs, delays and partial payment of Tariff Differential Subsidies (TDS) by the government, delays in tariff determination by regulator due to governmental and court involvement, transmission and distribution losses and delays in fuel price adjustment by the government. These primary factors along with a number of secondary factors such as delay of receivables from KESC, thermal inefficiency of public sector generation companies (GENCOs), inefficient fuel mix, and inadequate budgeting of subsidies, contributed to an ever rising circular debt. However the major contribution in the upsurge of circular debt has come from the inability of the distribution companies to get payments from their customers (44.07%). A second main contributor to the problems is the incomplete payment of the Tariff Differential Subsidy (TDS) by the government (31.08%). The final set of factors is delays in tariff notification, delays in price adjustment and Transmission and Distribution losses (24.85%).

The single purchaser in the PEPCO system (CPPA/NTDC)²⁷ time and again failed to pay the generation segment and the fuel sector. The inability of the CPPA to pay the generation sector in time, pushed some of the IPPs to access the Supreme Court of Pakistan in June 2012 to recover their arrears (SBP, 2012). Inability of the thermal sector to make timely payments to the fuel companies has also disturbed the latter in honoring their international commitments. This created default threats for state-owned oil importing and distribution companies such as Pakistan State Oil (PSO) (which has remained a highly profitable entity in the recent past). As a result, these oil distribution companies have been forced to stop fuel supply to the power sector on various occasions in recent years (between 2008 and 2013). They also have warned the government time and again to shut down the fuel supply completely unless their outstanding money was cleared²⁸. Such a scale down in the fuel provision for the generation sector has eroded its production capacity, which as a result has aggravated the phenomenon of load shedding in the country. Therefore, it is widely believed

²⁶ According to exchange rate in 2011 which was US\$ 1= Pak Rs. 88

²⁷ CPPA is a single purchaser of power in the PEPCO system from all the IPPs, GENCOs, WAPDA hydel projects and the nuclear from Pakistan Atomic Energy Commission. CPPA/NTDC also sells electricity to KESC but faces abundant problems in receivables.

²⁸ <http://dawn.com/2013/04/08/worsening-energy-crisis/>

among energy experts in the country that, in order to reduce load shedding, reduction in circular debt on a sustainable basis is imperative through overcoming the primary and secondary causes of the debt. It is also required to expand the financial horizons with the help of an innovative and globalized financial market in the face of the escalating financial crisis in public sector corporations.

The government has tried hard to scale down circular debt in recent years, but due to recurrent buildup of the gap between receivables and payables, such efforts have not led to sustainable solutions. The government struck a couple of deals during 2011 to incentivize banks for power sector lending. These banks have halted new lending due to the banks extraordinary exposure to the power sector. This situation created serious problems for the thermal based power sector to continue their operations at full capacity. The government intervened in this situation. First, all the debts owed by PEPCO (Rs. 313 billion or 1.5% of GDP) to commercial banks was acquired by newly established Pakistan Power Holding Company (PPHC) in Nov. 2011. In order to pay back this debt, which alone made up 45% of total government debt from commercial banks, the government borrowed Rs. 391 billion from commercial banks against state securities and swapped the debt owed by PPHC to clear the banks' balance sheets. Second, a deal was struck by PPHC by issuing government securities to clear the debt of Rs. 136 billion owed by IPPs to commercial banks in order to clear the banks' credit line for lending to IPPs for working capital requirements (SBP, 2012). Measures taken during 2011 proved insufficient. The sector was once again looking towards government support during FY 2012. Subsidies of Rs 464.3 billion (around US\$ 5 billion, according to exchange rate of 2012 or 2.2 percent of GDP) were issued that year to support deficits in the power sector. The newly elected government of Nawaz Sharif, which came into power in 2013 with a slogan of extinguishing load shedding, paid around Pak Rupees 500 billion (around US\$ 5 billion, according to the exchange rate during 2013) to solve the circular debt in the power sector. They also amplified efforts to reduce the gap between receivables and payables and also to reduce power theft in the system. All the efforts by the new government did not bring sustainable solutions. Within nine months of clearing the circular debt in 2013, it has piled up again to Pak Rupees 300 billion (around US\$ 3 billion). Experts still believe that the intense nature of circular debt may haunt the power sector in the future unless serious efforts are employed to bring the necessary structural changes in the system.

6.2.3.2. Inefficient pricing structure

It is evident now that a major cause of the upsurge in circular debt throughout the electricity infrastructure is because of failure in recovering the full cost of electricity supply from end-use customers. The efficient functioning of the pricing mechanism is negatively influenced by various factors. Among others, the government's tariff setting below cost recovery, untariffed subsidies, delays in tariff setting by the government, suspension of tariff increases by court rulings and a uniform tariff for all consumers despite large differences in regional distribution costs. These factors have affected the pricing structure of the electricity sector in Pakistan.

The power sector tariff for end-use consumers is determined by the government under recommendation of the regulator (NEPRA). The regulator suggests tariffs on the basis of production cost, plus a reasonable rate of return for three segments of the value chain (generation, transmission and distribution). NEPRA proposes different tariffs for consumers under different DISCOs based on the costs of services incurred by each DISCO, which means a lower price for consumers under efficient DISCOs and a higher price for those under less efficient ones. However, at the end of the tariff setting procedure, government compensates the difference of DISCOs' service costs through the provision of subsidies; so that an equitable tariff could be given to all the consumers in the country (NEPRA, 2012).

The government's intervention in the finalization of end use tariffs creates hurdles to passing on the full cost of electricity generation and distribution to consumers. The cuts imposed by the government are compensated with tariff differential subsidies which remain unpaid or partially paid- thus piling up already existing circular debt (Trimble et al., 2011). Apart from not transferring the full cost of generation to consumers, the government has also delayed tariffs intentionally for the sake of political support. An example of such a delay occurred during November 2003 to February 2007, when overall cost of electricity generation increased considerably due to rupee depreciation and increase in price of furnace oil that characterizes one third of the fuel mix for electricity generation in the country. The government ceased electricity prices during this period to get political gain in the upcoming elections of 2008 (PC/USAID, 2013). Government's failure to assess the imminent financial situation of the sector during this period also had a worse impact on operational efficiency of DISCOs. This increased the gap between the cost of electricity supply and the retail price, which could not be filled despite subsequent price rises (See Figure 6-3).

The government uses an Incremental Block Tariff (IBT) system for determination of end consumer tariffs. The purpose of adoption of this system is to protect the poorest consumers, or lifeline consumers, which consume less than 50 KWh electricity per month. An argument for setting the same tariff for the same consumer group across all DISCOs through TDS provision is to protect poor households from less developed regions of the country. However, various studies proved that the IBT system is not benefitting the poorest households in the same way as it benefits the households consuming above 50 KWh/month (Trimble et al., 2011, ADB, 2010a). A report by the World Bank mentioned that out of total subsidies provided by the federal government during FY 2011, the richest 20% of households got above 30%, whereas the poorest 20% received at maximum 11.3% (Trimble et al., 2011). Although IBT is a simple, cheap and easy to manage tariff system, it should be changed to enhance the system's efficiency, to reduce the subsidy burden and to direct subsidies to the poorest households.

Figure 6-3: Gap between cost of service and average consumer end tariff

Source: (ADB, 2010a) & PEPCO

Such an ever increasing gap between cost of service and average consumer end tariff is an unsustainable situation (See Figure 6-3). The fiscal resources of the country have proved unable to finance this mountain of subsidies and the result is appearing in devastation of the power sector. For the last four years, the power sector has been paid Rs. 1 trillion in subsidies that cannot continue as the fiscal resources of the country have already stretched beyond the limit (SBP, 2012). The power sector needs an intensive shift in financial and institutional governance to overcome the financial problems.

6.2.4. Transmission and distribution losses

The power infrastructure of Pakistan bears high losses in transmission and distribution (T&D), which have been above 20% in recent years (NEPRA, 2012, NTDC, 2012). Such losses are much higher than in other countries such as China with T&D losses at 8%, S. Korea 3.6% and the OECD countries with T&D losses of just 7%. High T&D losses in Pakistan are due to technical and non-technical inefficiency of the infrastructure. Technical incompetency includes capricious and inundated generation plants, low voltage transmission and distribution lines over long distances and weak grid infrastructure at incompatible locations. Non-technical inefficiency is the result of poor governance structure with erroneous metering and billing, unmetered supplies with or without consent of the employees of distribution companies and power thefts (Malik, 2012). The technical and non-technical losses in the network eventually enlarge the gap between receivables and payables in distribution, transmission and the generation thus worsening the problem of circular debt, which drags the companies towards financial insolvency.

The transmission network faces lack of capacity to transmit power efficiently across the country²⁹. The grids are either over congested or underutilized resulting in a loss of electricity. A poorly designed transmission network has already been causing sudden and planned tripping of the system, which have reached up to 74,060 minutes in 500 KV and 221,113 minutes in 220 KV transmission lines. In addition the forced outages have been 15,417 minutes in 500 KV and 101,514 minutes in 220 KV during 2012 (NEPRA, 2012). Such system outages have resulted in a country-wide system breakdown³⁰. Similar to the transmission system, the incapacity of the distribution system results in technical losses. Such losses are aggravated due to mismatch between the capacity of the distribution network (lines and transformers) and electricity demand. Extension of 11 KV lines over long distances and installation of below capacity transformers increase power losses. In addition, low quality electrical meters in the industry, agriculture and residential sectors contribute to the technical losses in T&D network.

Distribution losses, caused by both technical and non-technical factors, are overriding the T&D losses in the system as they are reported to be above 90% of total T&D losses (Ibid).

²⁹ Generation units are scattered across country. Hydro generation is concentrated in northern parts of the country and thermal mostly in south. Distribution points, situated all over the country are inter-connected through the transmission network.

³⁰ <http://dawn.com/2013/02/25/nationwide-power-blackout/>

Such losses vary over DISCOs operating in different regions of the country. Since the physical characteristics of the distribution systems of DISCOs are almost similar, so are the non-technical reasons such as pilferages and thefts, which might explain variance in line losses among different distribution companies. Statistics from NEPRA reveal that DISCOs operating in the premises of Punjab province have less line losses than DISCOs working in the other three provinces. Nontechnical losses in distribution arise due to loopholes in commercial activities. Electricity theft is prevalent in this regard. Consumers connect to the grid either with the consent of the employees of the distribution companies by paying a fixed monthly bribe or without involvement of the staff. It is a common phenomenon in both distribution systems (NTDC and KESC), thus increasing the gap between the number of electricity units purchased from the Central Power Purchase Agency (CPPA) and the number of electricity units sold to final consumers. Table 6-3 unveils the difference between electricity units purchased and billed among different DISCOs. It is highest in Peshawar Electric Supply Company, where losses have reached up to 65%. Islamabad and Faisalabad Electric Supply Companies seem best performing DISCOs in controlling thefts and pilferages from their distribution networks. KESC also faces severe electricity thefts despite operating in the private sector. According to KESC, the financial cost of electricity theft was over Rs. 1 billion a month during 2009-10³¹.

Table 6-3: Difference between electricity purchased and sold among all DISCOs in Pakistan on 30th June 2012

DISCO	Units Purchased (GWh)	Units Sold (GWh)	Losses (GWh) / %
PESCO	13,101	8,528	4573/65.19
IESCO	8,331	7537	794/9.53
GEPCO	6,955	6,178	781.37/11.23
LESCO	16,727	14,467	2260/13.51
FESCO	9,616	8,580	1036/10.77
MEPCO	12,456	10,049	2407/19.33
HESCO	4679	3381	1298/27.74
SEPCO	4398	2226	2172/49.39
QESCO	5159	4086	1073/20.88
Total NTDC System	77,028	62,805	14,223/18.46
KESC	15,259	10,279	4980/32.64

Source: (NEPRA, 2012)

³¹Daily Times, February 25, 2010; BBC News, July 13, 2009 (<http://news.bbc.co.uk/2/hi/south Asia/8148328.stm>); The DAWN Media Group, August 28, 2009

In addition to distribution losses by thefts, a major portion of electricity supply to customers remains unpaid. For instance, Quetta Electric Supply Co. could only recover 36% of the billed amount from its customers during 2012, SEPCO 53%, PESCO 67%, HESCO 69%, MEPCO 97%, FESCO 98%, LESCO 96%, GEPCO 98%, IESCO 96% and KESC 89% (NEPRA, 2012). The difference between supply and payment contributes to the problem of circular debt. The government attempts to reduce the impact of the poor performance of some DISCOs by controlling their commercial losses and by transferring the cost of pilferages over well performing DISCOs in the form of tariff adjustments.

Electricity theft and nonpayment of electricity bills has crept into society as a social habit. Not only poor customers are used to this habit, but organizations (public and private) such as schools, industry, agriculture, commercial centers, rich households and member of parliament have also been caught in stealing electricity and withholding the payments (Cheema, 2010). It is not considered a crime like stealing other things. Even religious groups do not consider it an immoral or criminal act. In some regions, dominated by extreme religious groups like Khyber Pakhtun-Khwah and Baluchistan, the governance capacity in the electricity system is affected (USAID, 2010). The legislature and executives have not significantly played their part in these regions to curb lawlessness in order to improve the governance of public controlled organizations such as power distribution companies.

6.3. Institutional Causes of the Electricity Problems

Existing problems in the electricity sector of Pakistan echo the poor functioning of the institutional framework in the electricity system (Malik, 2012). Selection of the right institutional framework in harmonization with the endowments of the country may provide a basis for establishing efficient organizational and institutional structures for the electricity sector. Efforts have been made to introduce these structural changes but with limited success (WorldBank, 2013).

As indicated in Chapter 3, we assume reform steps in a specific sequence (See Figure 3-4). If the reform steps are reversed then it may render different outcomes. In that regard, the process of institutional reform carries significant importance for designing and implementing an appropriate set of institutional reforms and implementing them in a specific sequence. If consensus is lacking among entrepreneurs over the existence of benefits on taking some specific steps of institutional reform, then the implementation of those steps may remain inefficient and unsustainable. This situation may contribute to lowering the pace and

increasing the costs of institutional reforms and may also keep the system path dependent. This is actually the case in Pakistan where reforms in the power sector have been lackadaisically introduced due to conflicts of interests among the entrepreneurs and the key political institutions of the power sector. This has contributed to keeping the sector path dependent³² and the problems continuing. The sector has not broken with its legacy of inefficiency (Malik et al., 2009, Malik, 2012, IPP, 2010, NEPRA, 2012, PC/USAID, 2013, USAID, 2010, ADB, 2010b). We apply the institutionally based analytical framework (Figure 3-4) to analyze the existing electricity problems in Pakistan. We analyze the problems one by one, despite the fact that all problems in the power sector are inter-connected and cannot be understood separately.

Investment lags: One of the severe problems in Pakistan's power sector is the lack of private investment in the overall electricity value chain. Attracting private investment has been one of the main drivers of institutional reform in the sector. The first step in institutional change should have been enactment of electricity reform law, but the government took a different route in the reform³³. Firstly, the support for institutional reform of the power sector was low due to the centralized institutional organization of the country with powerful institutional actors in politics, bureaucracy and the public utilities. None of these actors was in the favor of institutional reform, echoed by their unwillingness to accept the enactment of a law leading to a significant institutional change in Pakistan's power sector. However, the electricity sector was short of investments to meet the needs of a developing economy whereas government resources were insufficient to make the necessary investments in electricity infrastructure. This pressed the government for taking a reform step that could also be accepted by the resisting actors in politics, bureaucracy and utilities. Thus, as a first step, the government only opened the power generation sector for the private sector (in the form of IPPs, International Power Producers) in 1994 with the idea to increase new electricity generation capacity by means of private investments. The investors were attracted by offering lucrative long-term contracts by ensuring cost recovery prices, undisrupted supply of fuels, timely payments and full adjustments of variations in exchange rate and fuel prices. Moreover sovereign guarantees were offered to uphold the sanctity of contracts (CCP, 2009). Such an initial

³² <http://www.dawn.com/news/841501/power-sector-reforms>

³³ Pakistan nationalized all the economic sectors during the 1970s, which contributed to centralizing the economic institutions in the country. It increased the involvement of political institutions and bureaucracy in running corporations. Employees of the utilities also became another interest group due to strong labor unions. These interest groups greatly impacted the political and economic affairs of the country and resisted any institutional change that may endanger their interests.

reform step did not face much opposition from the resisting groups from within and outside the power sector. As a result, the private investments attracted significantly enhanced installed capacity in Pakistan (NEPRA, 2012).

The initial reform step needed to be backed up by other reforms. The first important change was required to enact laws regarding the formation of an independent regulatory authority in order to protect investments and to provide an equal playing field. The independent regulatory body was also necessary to regulate, determine and monitor consumer prices and to resolve contracting issues between different stakeholders of the sector. The private firms actually needed overarching institutional reforms both at the sector level (institutional arrangements) and at the national level (institutional environment). The additional demands from private investors resulted in more institutional reforms in the power sector (the level of institutional arrangements) but not in the national institutions (institutional environment). Despite enactment of a new electricity law and formation of a separate regulatory body, both remained ineffective as the government continued its heavy involvement in contracting, tariff determination and also in appointments of key positions in the institutions. The political interest groups kept interfering in regulatory affairs of the regulatory agency because of their personal interests for raising public support for elections (by keeping electricity prices below costs) and also for financial gains from private companies in the form of kickbacks and commissions by providing contracts without following proper criteria³⁴. Political players and bureaucrats behaved opportunistically due to the features of heavily sunk investments, economies of scale and massive usage, which kept the system path dependent.

By the late 1990s a new government came to office and this new government refused to accept the contracts with private producers made by the previous government. The reason was that, according to the new government, the contracts had been concluded corruptly. Although the conflict about private contracts was resolved by intervention of the World Bank, however it had far reaching consequences on the private sector's involvement in Pakistan's power sector in the years to come.

³⁴ Corruption in the power sector of Pakistan, although not well documented, has been an important feature of the sector. Various projects initiated by different governments have been branded as based on corruption. Some argue, including the current minister in charge of the power sector, that corruption has been one of the prime reasons for poor performance of power sector in Pakistan. For instance see these newspaper reports <http://www.dawn.com/news/706607/rpps-declared-illegal-by-supreme-court> and <http://www.dawn.com/news/1011248/corruption-main-cause-of-power-sector-mess-says-minister>

The disagreement about the private contracts could have been resolved easily by an independent regulator. However, Pakistan's regulator could not operate independently from the government and therefore was not able to contribute to solving the contract disputes in Pakistan in a more beneficial way. The actual private investments were severely affected by the contract debates.

Intervention by a government and other interest groups in contracting and tariff issues is normally taken as expropriation which leads either to no, or inefficient investments. Inefficiency of investment may appear in the following forms. 1) Disinvestment which means that investment will only take place in areas where return on investment is high and the return period is short. 2) Expenses for plants' repair are less, which ultimately erodes the quality and also the capacity. 3) Technologies with low specificity are preferred for investment which affects the quality too (Spiller and Tommasi, 2008).

Pakistan did not establish independent regulatory institutions³⁵ during the initial reforms. An independent regulator at the initial stage could have sent positive signals to private investors regarding the security of their investments. However, despite government's inability in starting institutional change in the right sequence, the private investments poured in. The initial private investments concentrated mostly on power plants, which were assumed to operate on imported fuels because this involved less specificity of the investment plans than investment plans for power plants using indigenous resources. However, when the government continued to intervene in regulatory affairs, the private investments decreased. The lack of private investments in electricity generation contributed heavily to the problem of electricity shortage in Pakistan.

Along with the inclusion of IPPs, the government of Pakistan has also sought private investments in the divestiture of generation and distribution companies. For that purpose vertical and horizontal unbundling was carried out to establish separate publicly listed companies that could be privatized in a future round of reform. As a result of unbundling, eight distribution³⁶ companies and four generation companies were licensed as independent companies from the regulatory agency. Government was trying hard to sell a number of

³⁵ According to theory, the enactment of law and formation of independent regulatory authority should have preceded IPPs entry in order to provide right signals to the private sector for the security of their investments.

³⁶ Recently the number of DISCOs has increased up to 10 by including another two distribution companies which are the Sukkhar Electric Distribution Company and Tribal Areas Distribution Company by geographically breaking down the Hyderabad Electric Distribution Company and Peshawar Electric Supply Company respectively.

distribution and generation companies, and only succeeded in 2006 when KESC was partially sold as a vertically integrated monopoly to Abraaj group from UAE. Other companies such as Faisalabad Electric Supply Company and Islamabad Electric Supply Company have also been high on the agenda of the Privatization Commission, but remained unsold due to a number of reasons. Firstly, whenever the government triggers efforts to privatize electric utilities, labor unions and employees start protesting, and are also supported by some major political parties of the country. Since, these political parties such as PPP, JI, ANP, etc. are well represented in the parliament; they use their political power to block privatization. Secondly, employees of the utilities along with political parties take cover through judicial activism by getting stay-orders against selling utilities. Thirdly, there are not many investors interested in buying loss making utilities.

Inefficient fuel mix: When the IPPs were invited to invest in the power sector in the early 1990s, WAPDA officials who were controlling regulatory affairs under the direction of the Ministry of Water and Power³⁷ did not offer tariffs for private power projects in hydropower. It is unclear whether this was done intentionally to keep private investors away from what was considered ‘national assets’ or to protect the interests of important stakeholders (WAPDA) in the maintenance and development of hydropower in Pakistan, which until then was dominated by public finance. As a result, the private investments concentrated in thermal power production based on imported fuels. Another important aspect favoring import based thermal projects was the rent seeking behavior of interest groups in key decision making positions in Pakistan. These interest groups are still quite influential despite tiring efforts by the recent government, which came into power in May 2013 with the election slogan of solving the electricity problems in the country by 2018. The government has employed their best efforts to attract foreign investors, particularly from neighboring China, to invest in projects based on indigenous resources. As a result, the government has succeeded in signing agreements with Chinese investors of above 10,000 MW from domestic resources; however many of those investors have complained to Prime Minister personally that the top officials of the relevant ministries are creating bureaucratic hurdles. They asked for the personal involvement of the Prime Minister’s office in facilitating their investments³⁸.

Another reason for concentrating private investments in import based thermal power plants has been the absence of an independent regulator. The regulator (NEPRA) has not been

³⁷ A separate regulatory agency did not exist by that time.

³⁸ <http://tribune.com.pk/story/572821/courting-investors-nawaz-talks-business-on-maiden-trip/>

granted much authority. A large number of employees from ex-WAPDA distribution companies and the regulatory wing have been working at key positions in different DISCOs and NEPRA that continues the philosophy of their mother organization (WAPDA) in the new companies. All these factors contributed to a decrease of the efficiency of the regulatory authority. An inefficient and weak regulatory agency is not the right signal to private investors to make them believe that the investment is without risk (Steiner, 2001). A really independent regulator may resolve expropriation threats of private investments.

The regulatory agency also was not able to set efficient tariffs for private investors at the right time. For instance the regulatory agency could not finalize tariffs for wind and coal projects for a long time. In addition, the government's rift with private thermal projects over the tariff issue further eroded investors' confidence in the institutional environment of the country for protecting them against any expropriation of property.

Financial constraints: Correction of the financial position of the utilities has been one of the main drivers of institutional reforms in the power sector of Pakistan. The government had to bear the burden of heavily subsidized prices and project finance. Institutional reforms failed because the right sequence of the reforms wasn't followed and internal forces in the institutions were blocking the reforms.

Pakistan failed to introduce changes at the level of the institutional environment by enacting rules for a renewed power sector and by forming a separate and independent regulatory agency to implement the rules. The regulatory agency had insufficient powers to oversee or regulate the functions of the utilities that were to be generated during the next reform steps. The agency could not raise enough authority for forcing the utilities to operate according to the licenses and to regulate electricity tariffs as needed in order to recover costs.

The regulatory agency in Pakistan (NEPRA) did not get the independence required for an efficient power system. Political institutions, administrative institutions and employees of the utilities all had interests to keep the regulatory agency weak. This has contributed to weaken the regulatory agency in utilizing her judicial powers against distribution utilities, to regulate prices and to mitigate theft and corruption. Thus the existence of a weak regulatory agency contributed to an inefficient pricing and the accumulating circular debt problem in the power sector.

Transmission and distribution losses: Another important aspect that contributed to ever increasing financial constraints in the power sector, was the volume of transmission and distribution losses, which are the result of insufficient measures taken for the corporatization of the power sector. The portion of technical losses in overall T&D losses in Pakistan is higher than the world average. The non-technical losses are a major concern for the successful corporatization of the utilities. According to this step, all the unbundled utilities were required to operate in the manner of private companies that work under the principal of profit maximization by introducing innovative products. However, the companies did not break with their previous path of looking towards the government for financial bailouts. They remained unable to pay the price of electricity supplied by the CPPA due to internal and external leakages. The recoveries of electricity bills from industrial and residential consumers were always below the target. In addition, non-technical losses such as theft of electricity, raw material and equipment also add to continuation of the situation. Electricity theft in Pakistan is of two types: unmetered and metered. In unmetered theft, electricity consumers connect their cables with the distribution cables, whereas in metered theft, electricity consumers tamper with the meters to steal electricity. Various sources reveal that utility employees remain involved extensively in either type of power theft in Pakistan³⁹⁴⁰.

Malik (2012) asserts that the situation might be due to the fact that ex-WAPDA officials still continue to look after the affairs of the utilities in their traditional way. The employees' mindset of being government persons (sarkari mulazims) still prevails, which makes them to believe that no one can harm their jobs even their productivity is unsatisfactory and even if they are involved in unwanted activities. They get cover from labor unions and political links against any action. The nexus between employees, bureaucracy, labor unions and political institutions is so strong that they have time and again tried to roll back institutional reforms. For instance, PEPCO, which was created within WAPDA as a facilitation body to expedite the process of institutional change, had to dissolve by 2005 after completing its role in preparing the distribution companies and public sector thermal generation companies for privatization by overcoming their financial and corporate limitations. However being a subsidiary of WAPDA, PEPCO got involved in procurement, appointments at key positions, system coordination and other corporate decisions which did not come under its assigned tasks (CCP, 2009). The interest groups tried every possible effort to slow down the process of

³⁹ <http://www.unewstv.com/18828/wapda-employees-are-involved-in-electricity-theft-khawaja-asif>

⁴⁰ <http://nation.com.pk/national/12-Oct-2013/wapda-staff-involved-in-power-theft-khattak>

unbundling and corporatization, so that PEPCO may continue enjoying the powers of ex-WAPDA to run the overall value chain. To continue the status quo, PEPCO's top officials (which were officially the employees of WAPDA) created a fuss with the help of labor unions of unbundled electric companies to cut power countrywide and hold strikes at workplaces until the government reversed its decision to dissolve PEPCO⁴¹. However, the government under international pressure, put an end to PEPCO's existence in April 2012 and delegated its role to NTDC⁴². The restructuring steps were rolled back once again in March 2013, when the outgoing government of Pakistan People's Party (PPP) delegated the management of all unbundled entities back to WAPDA. This has raised uproar across the private sector and international donors such as the IMF and World Bank⁴³. This move could not be sustained due to heavy reliance on donors, so once again the caretaker government reversed the decision by separating the merged companies from WADPA.

Entrepreneurs of the reforms such as polity, bureaucracy and employees of the utilities, might not intend to reform the sector up to the level where their short term benefits could be jeopardized. As a result, the operations of state owned entities and regulatory affairs have remained under the Ministry of Water and Power. Despite unbundling the sector, corporatization and efficient management could not be brought into the system (Malik et al., 2009). In addition, not much has been done to cut down on the technical and non-technical losses of the utilities. Electricity thefts and other leakages continued after the reforms. Ex-WAPDA officials have remained involved in system operations and regulatory affairs until now. Thus a restricted reform blocked by a contra mindset and actions of the entrepreneurs, have contributed to the limited reform results in Pakistan.

6.4. Conclusion

This chapter analyzed the main problems in the power sector of Pakistan from the theoretical perspective developed in Chapter 3. The main problems in the power sector of Pakistan are investment lags, inefficient fuel mix in power generation, financial constraints including circular debt and inefficient pricing structure and high transmission and distribution losses.

We analyzed a number of institutional reform failures that perpetuated the power sector problems of the pre-reform period. We showed that the implementation of reforms did not

⁴¹<http://tribune.com.pk/story/286352/pepcos-end-workers-threaten-to-cut-off-power-to-entire-country/>

⁴²<http://www.thenews.com.pk/Todays-News-13-14050-Pepco-dissolved>

⁴³<http://tribune.com.pk/story/528865/power-sector-imf-expresses-displeasure-at-rollback-of-reforms/>

take place according to the sequence as suggested by Williamson. This delayed formation of key institutions at the level of the institutional environment and adequate governance structure for the power sector. Moreover, the implementation of the reforms proceeded very slowly, because the process was strongly influenced by entrepreneurs who were against the reforms.

This chapter has contributed to answering the second research question. It has argued that limited institutional reform has been an important cause of the current problems in the power sector of Pakistan. In the next chapters we will analyze some of the problems in more detail.

7. The Impact of Reforms on Power Sector Performance

7.1. Introduction

This chapter contributes to answering the third research question on the impact of institutional reforms on electricity production per capita, electricity installed capacity per capita, capacity utilization, transmission and distribution losses, thermal generation and prices for residential and industrial consumers. The behavior of performance variables with and without reforms indicates whether the power sector performance has improved or not following the start of institutional reforms in 1994.

The chapter continues the analysis of the implications of the power sector reforms in Pakistan started in previous chapters. It quantitatively analyzes performance indicators after the introduction of the reforms to analyze the impact of power sector reforms. Within the restriction of reform studies, this chapter looks into the direction of electricity reforms in Pakistan, despite its incomplete implementation to date. We analyze the trend of individual performance indicators. We use time series data from 1971 until 2010, which provided us with a sufficient period before and after the institutional reforms. We adopted this particular technique because of limitations in the data. Initially, lack of control variables and collinearity among independent and control variables gave rise to another problem in the data i.e. the endogeneity (see Appendix 10, 11 and 12). Limitations in data and lack of relevant quantitative studies on the power sector reforms in a single developing country restricted our options for utilizing an econometric approach for analyzing the impact of the reforms on power sector performance.

This chapter is structured as follows. Section 7.2 discusses method and data and Section 7.3 presents the results. Section 7.4 draws some conclusions.

7.2. Data and Methodology

We have already seen in previous chapters that institutional reforms in the power sector of Pakistan have been incompletely implemented and therefore led to a continuation of problems that existed in the period before the reforms. In this chapter, we quantitatively analyze the performance of sectorial variables based on time series data. Although power sector reforms intended to improve aggregate economic, social and technological indicators of the country along with sectorial indicators (Jamasb et al., 2004), we restrict ourselves to sector specific performance indicators due to data limitations. We include electricity

production capacity, installed capacity, capacity utilization, residential prices, industrial prices, ratio of industrial to residential prices (cross subsidies), transmission and distribution losses and percent thermal production (fuel mix). Since this study faces data problems we only looked into the direction of these indicators. These indicators are proxies for different variables in the power sector.

We collected and used time series annual data over a period of 40 years (1971 and 2010) for the indicators under study. This time period covers a sufficient number of years before and after the reforms, which were initiated in 1994, to draw conclusions on the effect of the reforms. It was necessary to include data for a longer period to increase validity of the time series data so that direction of each indicator could be sufficiently visualized before and after the reform year of 1994. Basic data on electricity generation, installed capacity, prices, T&D losses and percent thermal generation was obtained from the National Transmission and Dispatch Company (NTDC), the single system operator in Pakistan, and data on population was taken from World Bank's World Development Indicators (WDI).

There might be some doubts over data quality accessed from NTDC. NTDC being the operator of the transmission network and system coordination may have misrepresented or over represented some data in order to convey a general impression of improvements in the overall performance of the value chain. The argument for data manipulation is strengthened from the fact that the actual peak electricity supply-demand gap in Pakistan manifested by the hours of the load shedding might be higher than the one reported by the system operator. In addition, data manipulation (by the operator and utilities) also manifests in the data on T&D losses and electricity prices, which seems unreliable if we look at the recurrence of circular debt as a result of T&D losses and the level of subsidies to offset the effects of T&D losses in recent years. We cross-verified these aspects of the dataset and the sources admitted the existence of manipulation in it. So, these aspects of the time series data may not display its exact movement before and after the reforms. However, despite these limitations in the dataset, we utilized it for observing directions in power sector performance after the implementation of the reforms. We think it is important to make such an analysis despite the data limitations in order to start research on the performance implications of power sector reforms in Pakistan. This study is one of the early academic exercises in this respect. It might show the need for producing more reliable and valid data on the topic in Pakistan.

Initially, we tried to find out the direct impact of reforms on performance indicators as employed in some cross countries studies such as Nagayama, 2007; Zhang et al., 2008; Erdogdu, 2011; for more studies see Appendix 6). By utilizing multiple linear regression modeling, we tried to elucidate the impact of different reform steps over the performance indicators.

After exploring several quantitative methods, we found from preliminary estimations (for correlation matrix among all variables see Appendix 11) that many control and independent variables showed strong collinearity, which means that both types of variables were showing strong relationships that were going to offset the particular effect of each variable. Other data for estimating the relationships were not available for Pakistan. One option to overcome this problem was to construct Instrumental Variables (IV), but this too faced data limitations.

After facing these difficulties we decided to look into the direction of time series data of specific performance indicators after the reforms. Since 1994 is the year when electricity reforms actually started in Pakistan, this is a reference year in our methodology for observing change in the performance indicators. Firstly, a line graph was drawn using normal time series data for each indicator and observing the direction of the line before and after 1994. This line shows the direction in the respective performance indicator after the reforms. Secondly, we forecasted the values of each performance indicator until 2010 starting from 1994 based on the previous years during 1971-1993. The reason behind doing this is to offset any change in the data that started from the reform year of 1994. This line represents the trend in the performance indicator without reforms. Comparing both lines allowed us to conclude on the impact of the reforms. We drew conclusions on the basis of the following criteria:

- Reforms had impact when the actual performance was in line with the assumed impact of the reforms
- Reforms had no impact if the actual performance was similar to the trend line

7.3. Results

This section presents the results for each performance indicator separately.

7.3.1. Electricity installed capacity per capita, generation per capita and capacity utilization

Figure 7-1 shows the trend of electricity installed capacity per capita (ICPC), generation per capita (EGPC) and capacity utilization (CU) over the period of forty years with and without the 1994 reforms. First of all, installed capacity per capita (actual) shows an increasing trend from the year 1971 when the actual installed capacity per capita in Pakistan was below 200 KWh. This line started making an upward trend from the forecast line by 1994 onwards. The installed capacity per capita reached at an all-time maximum (980.56 KWh) in 2004, however its rate of increase had already started dipping from 1998. So our time series analysis confirms our previous analysis that installed capacity per capita in Pakistan grew after the introduction of the reforms till 1998.

Figure 7-1: Direction of installed capacity (ICPC), generation capacity (EGPC) and actual capacity utilization (CU)

Electricity generation per capita and capacity utilization do not show any significant change after the reforms. Electricity generation per capita and capacity utilization slightly moved upward during 1994 and 1997 but decreased during the following years until 2004. It is important to note that generation per capita as well as the capacity utilization did not improve in an equivalent manner during the period of high installed capacity per capita. So, we can

infer from the lines of electricity generation per capita and capacity utilization that reforms did not contribute to improving these indicators in comparison to the rise in installed capacity in Pakistan. This shows that electricity generation efficiency did not improve significantly after the initiation of power sector reforms.

7.3.2. Transmission and distribution losses

T&D losses, which were expected to fall in post reform period, have not responded so. Instead of falling at the pre-reform rate as indicated in the forecast trend, the actual T&D losses have remained above the average. Initially, the actual losses have tended to increase continuously until they reached at all-time maximum of 30.41% in 1998 but later they have shown downward trend in a slow manner (Figure 7-2).

Figure 7-2: Transmission and distribution losses

The year 1998 that showed maximum losses resulted in the involvement of army to check rising losses. This moved losses slightly downward but not in an appreciable manner that would be expected from involvement of army monitoring teams. One of the reasons for an upward trend in electricity losses right after the 1994 reforms might have been weak institutional oversight over the utilities, which were going through the transitional period from vertically integrated to separate utilities. This weak institutional monitoring encouraged employees of the utilities to get involved in opportunistic activities. T&D losses in Pakistan show a downward trend in recent years, which seems illogical given the widening gap between the electricity units (KWh) provided to the distribution companies and actual

payment of those units (KWh) by the DISCOs (see Table 6-3). Continued existence of circular debt and electricity load shedding, which are constantly aggravating problems, raise questions over the claim of decrease in T&D losses.

7.3.3. Electricity prices and ratio of industrial to residential prices

Figure 7-3 shows behavior of electricity prices after the reforms. There appears to be a downward trend in industrial prices and upward in residential prices after the reforms.

Figure 7-3: Electricity prices for industrial (IndPr) and residential (ResPr) consumers

The analysis shows two important periods in Figure 7-3. The first period shows that after the start of the reforms in 1994, industrial prices increased until 1999. During this period, electricity prices for residential consumers also moved upward. The reason for this upward movement of both consumer groups was to increase prices as part of the restructuring plan in order to reduce the gap between electricity costs and prices. It was important to increase prices immediately after the reforms for attracting private investments. By 1997, electricity from private generation projects had started pouring in the national grid, which increased the available generation capacity in Pakistan. However, the Asian financial crisis (1997) slowed down industrial demand for electricity that forced the government to incentivize the industrial consumers through reduced prices for creating industrial demand against electricity excess supply from the private sector. The second period 2004-2007 indicates a fall in electricity

prices for both, industrial and residential consumers. This phenomenon traces its links to the political atmosphere of the country when a military ruler arbitrarily subsidized electricity prices for the sake of getting re-elected in the presidential referendum. So, political and economic circumstances of the country affected the determination of electricity prices in Pakistan.

Electricity reforms also required reduction in the difference between industrial and residential prices. According to Figure 7-3, this difference (IRPR) has moved towards the required target but still more than 1 (Figure 7-4). It is required to bring this ratio equal to 1 in order to reduce cross subsidization in the sector.

Figure 7-4: Ratio of industrial to residential prices

7.3.4. Percent thermal generation

Percent thermal generation, which indicates expensive generation mix, has increased as a result of reforms. Percent thermal generation as a result of private investments has largely concentrated in expensive imported fossil fuels instead of domestic resources. Such a heavy concentration of private investments in expensive fuels increased the share of expensive fuels in overall mix of power generation, which caused the emergence of successive financial problems at the sectoral and national level. It shows a continuous upward trend, which according to reform model should have moved downwards with the maturity of reforms. This shows distrust of private sector over the reforms.

Figure 7-5: Percent private generation

This chapter shows that quantitative analysis of the performance variables has yielded comparable results to Chapter 6, which discussed these variables from the qualitative perspective. Thus both chapters have shown that sectoral performance variables have not sufficiently responded to the electricity reforms in Pakistan. Instead of improving, some variables have even performed poorly after reforms. However a variable, private investment in the power sector has responded positively immediately after reforms but fizzled out after a shorter period. This has been a phenomenal aspect of reforms in Pakistan, which requires further study. In next chapter we will study why private investments could not keep filling the supply constraints of the power sector in Pakistan.

7.4. Conclusion

This chapter quantitatively analyzed the impact of the reforms in the performance of the power sector in Pakistan. We faced serious data problems, which did not allow applying more sophisticated regression based techniques. We explored several models, but we found that results would be invalid due to correlations in the time series data available for the analysis. Therefore we made a trend analysis based on data of 40 years. We looked at several performance indicators and our analysis confirmed the (non) impact of the reforms on the performance of the power sector in Pakistan. The reforms were initiated to solve the wide range of problems in the power sector discussed in Chapter 6 of this thesis. Our quantitative analysis in this chapter confirmed our qualitative analysis in Chapter 6. Private investments increased after the reforms, as was expected, but only continued for some initial years. The

reforms did not provide a good investment environment for private investors, which slowed down private investments after 4 years of the reforms in 1994.

Despite private investments in new installed capacity, electricity generation capacity has not increased comparatively. This shows that efficiency of power generation has not improved over the years. Prices for different consumer groups also increased after reforms to reduce cross subsidization; however it could not be reduced completely. The sector is skewed in favor of some sectors, like domestic, on the behalf of others. A major type of subsidies (TDS) is still burdening some consumers of a particular region to pay for the non-payment of consumers from other regions. T&D losses and percent thermal generation (expensive fuel mix) are other major concerns that have worsened over the years following reforms. The latter three problems have contributed to weakening the power sector and the country financially in the form of circular debt. Considering similar revelations in Chapter 6 and 7, it is possible to confirm that the pre-reform problems of the power sector of Pakistan have not responded to the reforms.

8. The Impact of Reforms on Private Investment in the Power Sector

8.1. Introduction

This chapter contributes to answering the fourth research question by examining the relationship between institutional reforms and private investment in a post reform era in the power sector of Pakistan. Chapters 6 and 7 have revealed that private investment has been the only performance variable that experienced considerable rise straight after the power sector reforms, but for a short period of time. Therefore, owing to the importance of investigating why the upward trend of private investment could not be sustained longer, this chapter intends to find out the underlying reasons. The inquiry is supported by survey data from private investors in Pakistan's power sector. As per expectation, the institutional reforms were supposed to increase the private investment as a result of incorporating an investor friendly environment in the power sector, so we wanted to find out if according to the investors, the reforms indeed improved the investment environment, and if not then why not. We therefore questioned private investors in Pakistan's power sector to get their perceptions about the investment environment. Together with an earlier survey by the WorldBank (2003), this allows us to analyze the quality of the investment environment in Pakistan after the reforms.

Starting from HUBCO (first private sector project that was contracted in 1986), Pakistan has been able to raise more than US\$ 12 billion private investment in the power sector up to 2011. This volume of investment materialized in the form of 50 power projects with an overall installed capacity of approximately above 11,000 MW⁴⁴. The high influx of private investment (both domestic and foreign) was observed in thermal generation as a result of the 1994 power policy, which generously offered licenses to Independent Power Projects (IPPs) based on imported fuels (diesel and furnace oil) and locally produced natural gas. According to the World Bank's database on Private Participation in Infrastructures (PPI), more than US\$ 7 billion private investment materialized during the 1990's alone in thermal generation. Even a large number of the projects completed later were thermal based and were contracted before 2000.

The surge in private investment experienced during the 1990s increased the share of installed capacity under the private sector from zero in 1990 to above 48% in 2012 (NEPRA, 2012).

⁴⁴ According to World Bank database on private participation in infrastructures (PPI)

The share of actual generation under privately owned power projects moved above 50% of the total generation in recent years (Ibid). Private investments in generation technologies were restricted to projects based on imported oil and natural gas. Private investments did not come into hydro, coal and wind, nor in transmission and distribution. The involvement of the private sector in electricity generation during the 1990's converted the electricity shortfall into a surplus for the very first time in Pakistan's history (NTDC, 2012). This bounty could not be sustained for long, as it vanished by 2005, and the country plunged once again into electricity shortage.

The growth of new installed capacity increased by 8.5% before 1998 due to massive private investments in new generation by IPPs, but fell to 1.5% during 2000-2008 (IPP, 2010). Decrease in investments in new generation by 2000 is thought to be due to different reasons, such as pricing issues, restricted demand by the late 1990's because of the Asian financial crisis, IPPs' pending receivables from distribution companies and insufficient investment incentives for the private sector. However, we will analyze, with the help of a survey, whether the above mentioned aspects are the only reasons for fall in private investment or whether there exists a more complicated set of reasons behind the behavior of this performance variable. In addition to this analysis, this chapter reports on the perceptions of investors on the investment climate in Pakistan's power sector.

A survey conducted by the WorldBank (2003) revealed that private investors in power sectors of developing countries give more importance to institutional factors in making their decisions on investment. Building on this World Bank survey, we conducted our own survey in 2012 to collect more information about private investment in Pakistan. The analysis in this chapter is based on both surveys.

This chapter is organized as follows. The next section explains the rationale for private investment in the power sector of Pakistan. This section describes why private investment is needed in electricity infrastructure in a developing country like Pakistan. Section 3 explains how private investment poured into post institutional reform era and how it impacted the reliability of electricity infrastructure in Pakistan. Section 4 discusses the results of the World Bank survey conducted in 2002 on investors' perceptions of constraints to power sector investments in developing countries. Sections 5 and 6 present and discuss investment constraints based on our own survey of 2012. The survey was designed to find out the

perceptions of private investors regarding barriers to private investment in the electricity infrastructure of Pakistan. Section 7 draws conclusions.

8.2. Rationale for Private Investment in the Power Sector

Pakistan experienced fast growth in electricity demand during the 70's and 80's due to excessive increase in electricity usage in households, agriculture and commerce. This surge in demand was partly caused by urbanization, the green revolution and extension of electrification in villages. As a result, growth in demand surpassed 9%, whereas growth in new capacity installation on the supply side did not exceed 7% during the two decades (IPP, 2010). This created a shortfall between demand and supply, which required huge investments in new generation capacity. The presence of an additional financial burden due to technical and non-technical electricity leakages in the system, investment requirements for operating the system efficiently increased considerably. Overall, the public sector needed substantial financial resources to produce and supply electricity in an effective and efficient way.

However, at the same time the international financial partners such as the International Monetary Fund (IMF), World Bank and Asian Development Bank (ADB), required sector reforms as a condition for financial assistance. These financial organizations pressed the government to open the public power sector for private companies in order to release financial burden (Wai and Wong, 1982, Bacon and Besant-Jones, 2001). Various authors agree that the tendency towards private investment in the electricity infrastructure of Pakistan was driven by many, but mainly the following two reasons (WorldBank, 2009, Ali et al., 2010, Kirkpatrick et al., 2004, IEA, 1999).

Firstly, the government was unable to solve the problem of inefficient and unreliable supply of electricity and the further electrification of the country on its own. According to a report prepared by the Prime Minister's Task Force on Energy, Pakistan had been facing an electricity shortage of between 15-35% of peak demand during the 1980's, which seriously impaired the reliability of electricity supply infrastructure in the country (GOP, 1994b). The report also highlighted the problem of low connectivity of the villages to the national grid as more than half of the population was living without electricity connections. Increase in the electricity generation capacity and rural electrification required financial resources, which the country lacked. It was proposed in the report to add generation capacity of 7000 MW with a

cost of over Pak Rupees 300 billion or US\$ 8.82 billion⁴⁵ to bridge the electricity supply-demand gap by 1998. However the government faced a fiscal crunch for such an impending need and proposed a plan for inviting private investors to the power sector.

The second reason for private investments in the Pakistan's power sector was the prospect of running out of public financial resources due to the electricity subsidies. By the end of the 1980s Pakistan's infrastructure industries in general and the electricity industry in particular, was operating in the public sector with a clear public task. Electricity tariffs were subsidized and did not reflect real costs of production and distribution. This led to a huge cumulative financial burden for the national exchequer, which became unbearable in the subsequent years. Therefore, private investment was invited into the sector by reforming the sector incrementally, and on a corporate basis, to be able to lower the public burden of subsidies gradually. In this way, it was expected that the government could free financial resources for other highly important purposes, such as social and human development projects and also to lessen the budget deficit, which had reached above 5% of GDP for many years⁴⁶ (Ibid).

8.3. Materialization of Private Investment in the Power Sector

Private investment has mainly concentrated in thermal generation (based on imported oil and domestic natural gas). Hydro, wind, solar, coal and other indigenous resources remained unattractive for private investments despite massive potential. Table 8-1 presents the overall situation of electricity generation in Pakistan in 2012. It depicts that private plants, strongly inclined towards the thermal sector, contribute more than 48 % to total installed capacity in the country.

Overall the share of thermal based private and public power plants is above 68%, including a minor share of coal based electricity from a single publicly owned coal power project at Lakhra (Sindh province). Hydropower, which relies on three mega projects Mangla, Tarbela and Ghazi Barotha, is publicly owned and comprises just 28% of total electricity production. Nuclear power, which is completely state-owned, has a meager percentage contribution.

⁴⁵ Exchange rate of Pak rupees in 1994 was US\$ 1= Pak Rupees 34

⁴⁶ The budget deficit in Pakistan could not be brought down despite economic reforms and is still soaring every year, standing above 8% of GDP during the ongoing fiscal year (2013-2014). An important reason for the increasing gap is inability of the government to lower subsidies for public sector infrastructure services and products due to poor progress in reforms.

Table 8-1: Sector wise electricity generation in Pakistan in 2012

Type	Total no. of Plants	No of plants in public sector/installed	No. of plants in private Sector/installed	Total installed capacity (MW)	Potential (MW)
Hydro	10	7/6587	3/129	6716	40000
Thermal (oil, gas)	56	12/4720	44 ⁴⁷ /12310	16030	-----
Thermal (coal)	1	1/150	Nil	120	>50000
Nuclear	3	3/787	Nil	787	-----
Others (wind,	4	Nil	4/Nil	Nil	>50000

Source: (NEPRA, 2012)

The rest of this section explains the basic characteristics of overall private investment in the power sector. Among these characteristics such as location and size, volume of investment, installed capacity and type (thermal, hydro, etc.) are important. Then the institutional arrangements under which the projects were contracted will be explained. Finally the impact of these investments in overcoming the supply-demand gap will be discussed.

8.3.1. Location, size, volume, and type of power plants

Electricity infrastructure is concentrated in densely populated regions of the country where the majority of the economic activities take place. The network of transmission, distribution and generation is poorly spread over less populated regions. The poor reach of the network in less populated regions deprives around 40% of the total population from access to electricity (PC, 2007). The regions along the Indus river system and its four tributaries, including their canal system, make up a large portion of the electricity demand due to high concentration of industrial, commercial, residential and agricultural activities. Such concentration of demand in the regions along the Indus River system became an important factor for the absorption of private investment in electricity generation at these locations (See also Appendix 16). Except for three plants with an overall installed capacity of 1130 MW in South West of Pakistan (Baluchistan province), all privately operated power plants are located close to the main transmission networks connecting consumption centers along the Indus from Karachi in the South to Lahore and Islamabad in North.

The north of the country has vast potential in hydropower, but remained unattractive for private investors with a few exceptions. AJK Jagran, Malakand III and Pehur with an overall

⁴⁷Rental power plants (around 5) have been removed from the total number of plants in the private sector since the rental plants left the market after the revelation of the government's corruption scam in contracting RPPs. Thus, their capacity has also been removed from this data on installed capacity under the private sector.

capacity of 129 MW were privately owned. The north east part of the country, which includes some bustling urban centers such as Lahore, Gujranwala, Faisalabad, Sialkot and Gujrat, has been attractive for private investors. This is due to the dense population, high demand, and relatively stable law and order compared to rest of the country. However, despite high interest of the private sector towards electricity generation in this area, the average size of the private plants is around 161 MW (see Table 8-2). The central region with some major industrial cities, such as Multan has relatively larger plants than the North East region. The South region being central in the country's industrial and commercial activities, due to cities like Karachi, Hyderabad and others, have attracted significant private investments in bigger power plants. An example is the Hub Power Plant with an installed capacity of 1292 MW. In addition to private investments in power generation, the region has also tried to attract private investment in transmission and distribution through divestiture of the state owned utility, Karachi Electric Supply Company (KESC).

Table 8-2: Location and volume of private investment in the power sector

Regions*	No. of plants	Total investment (US\$ Millions)	% investment in generation	Installed capacity (MW)
North	4	725.1	100	515
North East	24	3360.3	100	3869.1
North West	1	7.5	100	27
Central	5	1739.9	100	2890
South	15	5232.1	75 ⁴⁸	5556.8
South West	3	1362	100	1130

(Data source: World Bank report 2011 on PPI)

*Definition of regions⁴⁹: North (Islamabad and above areas which carry high potential in hydro generation), North East (Divisions including Lahore, Gujranwala, part of Faisalabad, part of Sargodha), North West (part of Faisalabad, Part of Sargodha, Dera Ismail Khan, Part of Rawalpindi, etc.), Central (Dera Ghazi Khan, Multan, Bahawalpur, Sukkhar, etc.), South (Karachi, Hyderabad and its adjoining areas), South West (most parts of Baluchistan).

The majority of the plants are smaller than 300 MW. Plants with installed capacity of 300 + are approximately 20% of all plants running under the private sector (see Table 8-3). Almost half of the private plants are below the 200 MW and this has recently become a problem with respect to production efficiency. Out of 52 plants with overall private investment of above

⁴⁸ Part of the private investment, around 25% of the total, went to purchasing a stake in distribution and transmission of the KESC system.

⁴⁹ Please note that such regional breakdown is purely based on the country map and is meant for this study only. Other organizations may have their own criteria for breaking down the country into different regions.

US\$ 12 billion, around 44 plants are thermal based and operate on imported fuels or domestic natural gas (see Table 8-3). The private sector also has initiated four renewable based electricity plants (geothermal, wind and waste), but these are not yet in operation.

Table 8-3: Size and type of power plants

Size (MW)	Hydro	Thermal (Natural Gas)	Thermal (Oil)	Dual (Oil and gas)	Thermal (Coal)	Other (Nuclear, waste, wind)
300+		3	5	1		1 ⁵⁰ Nuclear.
200-299		5	7	3		
100-199		4	8	2		1 Geo T
50-99	2	1	2			1 Wind,
0-49	1	2	1			2 Waste

Data source: World Bank report 2011 on PPI

8.3.2. Institutional arrangements for private investments in electricity

Private power projects are carried out under different arrangements depending on the level of risks involved. The first type are ‘management and lease contracts’ which involves the private sector in managing the state owned enterprises for a given period of time. The second type is a ‘concession agreement’ where a state owned entity is given to the private sector for a given period of time with certain concessions regarding risks. Next is ‘divestiture’ where a private company buys stake in a state owned enterprise through privatization, public offerings or asset sales. ‘Greenfield projects’ involves building of new projects either completely privatized or in public private partnership (PPP). The projects under PPP could be handed over to the public sector after a certain period or could be operated by the private sector after the expiry of that period (Kirkpatrick et al., 2004).

Greenfield projects under Build Own Operate (BOO) arrangements have remained a dominant form of private investment in Pakistan. Eleven publicly owned existing power plants have been transferred to the private sector under the ‘Divestiture’ arrangement. For example, the government sold a 50% stake in the vertically integrated utility of the Karachi Electric Supply Company (KESC) to a Dubai based capital group Abraaj. Another public sector power generation company, Kot Addu Power Company (KAPCO) has also been privatized under divestiture arrangements. The government of Pakistan has also tried to

⁵⁰ This plant was built under Build Operate and Transfer arrangement by a Chinese firm at Chashma near Mianwali district (Punjab province). Later another plant was built under same arrangement. Currently these two plants, along with another plant in Karachi, are run by Pakistan Atomic Energy Commission (PAEC).

privatize other power sector utilities such as Faisalabad Electric Supply Co. and Islamabad Electric Supply Co. but so far, has remained unsuccessful in its efforts due to lack of interest from domestic and foreign investors.

8.3.3. Impact of private investments on reliability of electricity supply

Private investment in electricity generation reduced the demand-supply gap in Pakistan. This gap increased continuously during the 1980's but started falling by 1997 due to privately owned and operated power plants (NTDC, 2012). In 1997-98, the gap was 934 MW, which turned into a surplus of 495 MW during the year 1999-00 (See Figure 8-1). The surplus of electricity supply over demand continued until 2004. Then the gap abruptly jumped to a shortfall of 1247 MW during the next year and widened every year since then. It is worth mentioning here that the supply-demand gap means the shortage of electricity supply to that percentage of the population (60-70%) that is currently connected to the national grid. The gap reached above 5000 MW by the end of 2010 and according to various resources, the peak supply-demand gap has reached more than 7000 MW in recent years (see Figure 8-1).

Figure 8-1: Supply demand comparison in the electricity sector of Pakistan, 1996-2011.

Data Source: (NTDC, 2012)

Another important impact of private investments in the power sector has been a shift in fuel mix in favor of imported fossil fuels. Between the years of 1985 and 2011, the share of thermal generation has increased from 46% to 69%, whereas the share of hydropower

decreased from 52% to 28% (NEPRA, 2010, NEPRA, 2012). The government had granted licenses to the private investors for thermal generation plants by the second half of 1990's. However, by 2005 fuel prices started rising in the international market and Pakistan was facing a rising import bill of fossil fuels which became a financial burden in the forthcoming years.

Thus, there seems to be positive and negative impacts of private investment in enhancing reliability of the electricity supply infrastructure. Positive impacts appeared in the form of extension in generation capacity, which helped reduce the electricity supply-demand gap over the years. Negative impacts have appeared due to heavy reliance on imported fuels, which is mainly due to investors' disinterest in developing local energy resources for electricity production. After giving an overview of the private investments, we now turn to the perceptions of the investors of the investment climate in Pakistan.

8.4. Private Investment Barriers According to the World Bank 2002 Survey

The WorldBank (2003) conducted a survey to find out the reasons behind the contraction of private investment in the power sector of developing countries by 1997 onwards. The purpose of the survey was to explore the investors' perceptions about investment environment in the host countries, which influenced their investment decisions in those countries. The survey was conducted from a set of 67 firms operating in the power sectors of developing countries.

Figure 8-2: Satisfaction level of international investors' in the power sector of developing countries

Source: (WorldBank, 2003)

48 firms with a response rate of 72%. The survey showed that respondents from India and Pakistan were more dissatisfied about the investment environment in the power sector of these two countries, whereas investors from Latin American countries (Mexico, Chile and Brazil) and South East countries (Philippines and Thailand) were more satisfied (see Figure 8-2). Their satisfaction level was based on ranking a number of factors responsible for private investment in the power sector of respective countries.

Figure 8-3: Ranking of priorities for making investment decisions

Source: (WorldBank, 2003)

Ranking of factors responsible for prioritization of investment locations in the power sector of developing countries showed that the factors receiving the highest rank (3.57) were related to the institutions of property rights which define the ownership rights of private investors clearly and enforce them efficiently (see Figure 8-3). “Consumer payment discipline and enforcement/contract enforcement” and “credit availability” were jointly ranked (3.11) as the second important factor by the respondents. “Independence of regulatory institution from government interference” was a third important factor with rank of 3.09. “Administrative efficiency” of governance machinery, which may decrease the number of permits for starting

a business and time for getting such permits, was ranked as the fourth most important factor for the investors. In short, Figure 8-3 shows that survey respondents regarded institutional factors as highly significant for their decisions on investment. They are less interested in non-institutional factors in deciding on investment location in the power sector of developing countries.

The World Bank survey shows that private investment in the electricity sector of developing countries is overwhelmed by institutional factors. We questioned private investors in Pakistan's power sector to reveal their perception of investment barriers in the sector. We compared our survey results with the World Bank Survey to develop a better understanding of barriers to private investment in the power sector of Pakistan.

8.5. Results: (Institutional) Investment Barriers in Pakistan Perceived by Private Investors

This section explains the details of the survey among power sector's private investors of Pakistan. Since the survey methods have been explained in detail in Chapter 4; we directly analyze the results.

Location and size of private projects

Table 8-4 gives an overview of the location, sizes and type of private power plants involved in the survey.

Table 8-4: Features of sample power plants

Location	No. of Plants	Size (MW)	No. of plants
North	4	300+	6
North East	13	200-299	7
Central	8	100-199	9
South	4	50-99	2
<i>(Location of plants)</i>		0-49	5
Type of Plants	No. of Plants	(Size of Plants)	
Thermal (Natural gas)	7		
Thermal (Oil)	15		
Thermal (Dual)	3		
Hydro	1		
Other*	3	<i>(Type of plants)</i>	

*Others included nuclear, wind, waste, geothermal and other renewable.

We asked investors to prioritize reasons behind their decisions on investment location. Their responses showed that fuel supply has been a major reason, closeness to demand market as second and easiness in grid connectivity as a third reason for their preferences on investment locations. Law and order situation in the region is another important factor (see Table 8-5), as well as tax incentives, local infrastructure and support from the local or provincial government.

Table 8-5: Factors responsible for location decision

(Average ranking on a scale of 1 to 5 with 1 as not relevant and 5 as highly relevant)

Factor	Average rank	% of respondents ranking #1
Fuel supply	3.31	35
Easy grid connectivity	3.03	24
Close to demand market	3.24	21
Law and order situation	2.55	14
Local govt. support	2.48	3
Local infrastructure	2.55	3
Environmental regulation	2.31	0
Tax incentives	2.55	0

n= 29

The results indicate that the last five factors in Table 7.5 relate to the institutional arrangements of the governments (federal and provincials) to facilitate private sector investments. Investors regard these factors as important but not among the top three for deciding on investment location.

Table 8-6: Factors responsible for technology preference

(Average ranking on a scale from 1=not important to 5=most important with the percentage of respondents who ranked each factor as #1)

Factor	Average Rank	% of respondents ranking#1
Technology expertise	3.41	31
Unclear rules for other technologies	2.62	18
Less construction time	2.97	17
Low sunk costs	3.31	17
Low initial investment	2.66	10
Lucrative incentives	2.17	7
Others*	2.44	0

n=29

*(Others included govt. role, low tariffs for other technologies, tax incentives, low acceptability of alternative technologies, no rebate in renewable technologies import, law and order situation etc.)

Technology preference

In response to the question on important factors responsible for preferring existing technology, the respondents gave the highest rank to technical expertise in relative technologies. They gave second priority to ‘unclear rules for other technologies’ as a reason for preferring the existing type of technologies. This factor got the highest priority preferring current plant type (18% of the respondents, with an overall average rank of 2.62). ‘Low sunk cost’ along with ‘less construction time’ was prioritized by 17% of respondents (Table 8-6).

Institutional barriers to private investment

We also asked respondents about their perceptions of investment barriers. We started asking them to indicate their investment behavior for the years after 2012 (the year of the survey). Figure 8-4 gives the results. The figure shows that most investors simply want to concentrate on keeping the plant going and invest in some upgrading. A second group of investors decided not to invest anymore. Only four investors planned new investments in extension of the plant.

Figure 8-4: Number of investors with their plant specific investments for next couple of years

(n= 29)

Various barriers were highlighted during the initial round of interviews. At this stage, those barriers for private investment were ranked to get a priority order in the list of barriers. Survey results reveal that a number of institutional and non-institutional barriers were ranked high by respondents (Table 8-7). Among such barriers ‘ambiguity in relevant laws and regulations’ received the highest average rank of 3.55 and was prioritized by 21% of the respondents. The problem of ‘circular debt’ remained influential and obtained an average ranking of 3.28 by 18% of the respondents. Problems in the ‘protection of property rights’ got

an average ranking of 2.82, and were prioritized by 17 % of the respondents (Table 8-7). Other main barriers perceived by respondents were bureaucratic hurdles, ‘contract enforcement mechanism’, ‘poor law and order situation’, ‘corruption and unsustainable fuel supply’.

Table 8-7: Barriers to private investment

(Average ranking of each barrier on a scale of 1= not relevant to 5= highly relevant and percent of respondents ranking each barrier as #1)

Barriers	Avg. Ranking	% of respondents #1
Ambiguous laws & regulations	3.55	21
Circular debt	3.28	18
Protection of property rights	2.82	17
Poor law and order situation	3.06	11
Insufficient contract enforcement	2.75	11
bureaucratic hurdles	3.24	10
Unsustainable fuel supply	3.10	3
Tariffs	3.06	3
Trade restrictions	2.68	3
Corruption	2.45	3
Power theft	2.89	0
Incapacity of dispatch system	2.75	0
Lack of coordination	2.44	0
Others*	2.48	0

n=29

*Others included untrained human resource, exchange rate issues, environmental regulations and energy policy issues.

Table 8-8: Comparison of investment environment in the electricity sector of Pakistan with other developing countries

(Ranking on a scale of 1=inferior to 5=superior)

Characteristics	Average rank
Currency convertibility	3.03
Quality of human resource	3
Financial incentives	2.83
Quality of infrastructure	2.66
Efficient dispatch system	2.59
Contract enforcement	2.59
Ownership regulation	2.48
Stability in govt. policies	2.17

n=20

Comparison of investment environment with other developing countries

This part of the survey reveals that institutional factors have a high impact on investors’ decisions regarding private investment. In response to another question to find out the

respondents' perception about the investment environment in the electricity infrastructure of Pakistan as compared to other lucrative electricity markets of developing countries, only 20 respondents answered this question due to their experience in other developing countries. They ranked 'currency convertibility' as highest in comparison to other developing countries (Table 8-8).

Another factor that was ranked higher in Pakistan as compared to other developing countries was the 'quality of human resource' (Table 8-7). They thought that human resource in Pakistan is better than in other countries. The lowest rank (2.17) was given to 'stability in govt. policies' as compared to other developing countries. 'Ownership regulation' and 'contract enforcement' were other major areas where Pakistan faces a challenge from other developing countries in attracting private investment in its power sector.

8.6. Discussion

Our survey results indicate a number of reasons that have contributed over the time to transform investors' decisions on private investment in the power sector of Pakistan. We discuss the results in the context of our conceptual framework (Figure 3-4) and compare these results with those from World Bank survey.

It showed that investors select a project location on the basis of both infrastructural and institutional considerations. Those locations with adequate infrastructure, high electricity demand and a relatively reliable institutional environment are preferred by investors. This explains the relatively large number of investments along the Indus River System and its four tributaries. Baluchistan and Khyber-Pakhtun Khawah (KPK) provinces are less favorable investment locations. Some parts of Baluchistan, KPK, interior Sindh and Southern Punjab have no connectivity to the national grid. These regions also have weak regional governments and a relatively uncertain institutional environment due to tribal and religious militancy. Militant groups have blown up electricity towers and gas pipelines many times and also killed laborers.

A large number of respondents from private thermal power projects expressed their preferences for current technologies for electricity production. They preferred thermal based technologies because they perceived that the rules and institutions for the other technologies were not clear or not supportive enough. In the perception of the investors, the institutional reforms did not succeed in establishing the necessary institutional conditions as property

rights, contracts enforcement (institutional environment) and governance structure ascertained by an independent regulator.

Investors showed limited trust in the investment conditions, reflected in a marginal willingness to continue or extent investments in Pakistan's power sector. Most investors indicated that the weak institutional environment such as an inadequate electricity law and an ineffective regulatory agency was among the core reasons why they stopped investing.

Similar information is echoed in the World Bank survey. The World Bank survey showed that laws and regulations and their enforcement mechanism are fundamental requirements for private investors for deciding on investments in any particular country or a sector. Only in this way do investors consider the investment risks to be acceptable.

The circular debt problem is another reason for investors to stop investing in Pakistan (see 6.2.3.1). The problem of circular debt is also mentioned as an important investment barrier in the World Bank report.

An important reason for the buildup of the circular debt problem in Pakistan is political involvement in the regulatory affairs of the regulatory agency. Politicians' involvement in tariff determination has time and again rolled over the efforts made by the regulatory agency to pass on the effects of increases in the costs of production (due to changes in fuel prices in international market and exchange rate) to consumers. This increased the difference between average costs of production and consumer tariffs. The average costs of production ranged between US\$ 0.137-0.167 per KWh whereas the consumer tariff could not be raised above US\$ 0.098. This difference was required to be compensated through government subsidies, which mostly delayed, and consequently discouraged, private investors from further investments in the power sector.

Institutional barriers in the investment climate of Pakistan were also revealed when respondents were asked to rank Pakistan's investment environment against those of other developing countries. The institutional environment of Pakistan was perceived among the lowest of the developing countries. Respondents had a better perception regarding the quality of human resource in Pakistan and the convertibility of currency.

In essence, these are the institutional barriers that are impeding private investments in the electricity sector of Pakistan. These barriers were supposed to wither away with the introduction of the power sector reforms but they didn't. Instead, the problems continued and

got worse because of intensive and massive resistance from inside the institutions against the reforms. This is the main reason why the initially successful private investments in the electricity sector were not prolonged. This chapter showed that according the investors, a lack of trustworthy institutional conditions made Pakistan's investment environment far too risky to continue investments.

8.7. Conclusion

This chapter has found the main reasons behind dwindling private investments in the power sector of Pakistan. The chapter has revealed that investors perceived institutional aspects highly important in their decisions regarding location of the plant, selection of technology and new investments. Not only are the sectorial and state level institutions poorly aligned, but they also function quite poorly. Poor performance of state level institutions also descended to sectoral institutions. Private investors perceived contract enforcement and property rights protection as high risk factors in Pakistan.

The same is valid for the political and bureaucratic interference in the regulation of the electricity sector. Pakistan is not unique in these investment barriers as shown by the World Bank survey. This chapter has revealed that the institutional environment has not been supportive to the private investments in the power sector of Pakistan.

9. Discourses on Barriers to Power Sector Reforms

9.1. Introduction

This chapter answers research question five on barriers to institutional reforms in the power sector of Pakistan with the help of Q methodology. Primary data was collected from sector related stakeholders in two steps and was analyzed to extract the dominant discourses on barriers to institutional reforms in Pakistan.

We have shown in previous chapters that the impact of the reforms was not according to the expectations. The pre-reform problems continued and did not disappear as was assumed at the time the reforms were initiated. This chapter focuses on the main reasons for the limited impact of the reforms. We have already concluded that one of the main reasons of the reform failures has been the poor design and implementation of the power sector reforms in Pakistan. Our analytical framework suggests that the design and implementation of the power sector reforms should adopt a particular sequence in order to maintain congruence among the layers of the country's overall institutional organization. We have also argued that the entrepreneurs of the reforms (people from within the sector and the related sectors) influence the content and direction of the reforms. In this chapter we analyze these assumptions empirically with the help of survey data collected from the sector related stakeholders in Pakistan.

This chapter proceeds as follows. The second section introduces and explains Q methodology. Section 3 presents the results, which are discussed in detail in Section 4, while the last section concludes the chapter.

9.2. Q-methodology and How We Applied It

The purpose of utilizing Q methodology in our study is to extract notions on barriers in the power sector reform in Pakistan to trace the main reasons why the power sector reform was not well designed and implemented, and in consequence hardly successful in Pakistan.

Q methodology was developed by physicist-psychologist Stephenson (1953), and is ideal for subjectivity analysis (Brown, 1996) through quantitative methods. In other words, this methodology employs both qualitative and quantitative methods in the study of perceptions, viewpoints and attitudes (Dennis and Goldberg, 1996). In Q-methodology, persons belonging to a particular background are asked to rank a number of statements (we use notions instead of statements) on a specific topic. This process is referred to as Q-sorting. Q-sorters rank statements on the basis of their beliefs, experiences, education and attitudes towards a

particular topic. This is what Q-methodology was developed for i.e. to extract the subjectivity out (Brown et al., 1999), which are further processed in a quantitative manner by utilizing factor analysis to identify dominant discourses in the sample data (Barry and Proops, 1999). Unlike other methodologies, such as R, Q does not focus on participants but rather their positions on a particular subject. This methodology has been applied in various fields such as political science, environment, sustainability sciences, health economics and energy sector for the study of subjectivity (Dryzek and Berejikian, 1993, Brown, 1980, Barry and Proops, 1999, Addams and Proops, 2000, Baker et al., 2006, Hooker-Clarke, 2005, Ockwell, 2008, Frantzi et al., 2009, Takshe et al., 2009, Cuppen, 2010).

Q methodology consists of six distinct and inter-related steps. It starts from the identification of the theme of the investigation and the relevant population upon which the study is to be applied. Then statements (or other objects of investigation such as pictures, notions, ideas or other specific aspects related to a topic) are collected from the population involved with the study. These statements may carry different ideas on the discourse according to the attitudes in the population. Then a sample of statements, representative of different ideas communicated in the discourse are selected and in the next step, are presented to a sample of respondents (P sample) selected from the population for ranking the sample statements. This process is commonly known as Q sorting. These Q sorts are factor analyzed which may result in disclosing different trends or dimensions of the data (Brown, 1997).

The main steps of data collection for the current study were completed during June 2012 and December 2012 in the second and fourth steps of the study. The second step was completed between June 2012 and August 2012, and involved the collection of a concourse or notions regarding main barriers to institutional reforms in the power sector of Pakistan. At this step, unstructured interviews with the stakeholders contributed as a primary source; whereas secondary sources such as newspaper articles, journal articles, books and talk shows also contributed to build the concourse. The fourth step involved ranking of notions by a selected number of stakeholders. This step of the study was completed during November 2012 and December 2012. Here, we present all the six steps taken during this study.

9.2.1. Defining the theme and population

Since the first step in Q-methodology relates to defining the theme of the study and population. The theme for this study is the “*barriers to institutional change in the power sector of Pakistan*”. This theme is of a specific nature, which requires a population of

experts-having affinity with the given theme. This included experts having sufficient knowledge on institutional reforms of public sector enterprises such as the power sector. Some of the study participants belonged either directly to the power sector or its related sectors, which according to our analytical framework are considered as the entrepreneurs of change. We present the list of respondents in Table 9-1.

Table 9-1: List of stakeholders included in the population

❖ Academics (Economists) (4)
❖ Institutional Lawyers (2)
❖ Employees of the Utilities (1)
❖ Experts from Regulatory Authority (NEPRA) (3)
❖ Experts from Ministry of Finance and Planning Commission (4)
❖ Members of the Parliament (2)
❖ Experts from Research Organizations (3)
❖ Businessmen (3)
❖ Members of power sector unions (1)

9.2.2. Collecting the concourse

To extract a hybrid Q sample, we utilized primary and secondary sources for collecting notions on the theme in our analysis. These notions are considered to form the concourse. In first step, semi-structured interviews (or open discussions) were conducted with 23 respondents during June 2012 and August 2012. These interviews were conducted in an open environment where the respondents were free to talk on the topic. All interviews were recorded and documented.

In addition to the information from the interviews, secondary sources such as academic research articles, newspaper articles, books and magazines were used to collect notions on the theme. In this way a total of 215 notions have been collected, to make up the overall concourse on the “*barriers to institutional change in the power sector of Pakistan*” (See also Appendix 14).

9.2.3. Selection of a representative (Q) sample and P sample

After completing the collection of statements in concourse, the next step is to shorten the number of statements in order to prepare a manageable number of statements for Q sorting.

This short version of concourse is called the Q set (or Q sample). The number of statements in a Q sample normally falls between 40 and 50 (Van Exel and de Graaf, 2005). This number may vary in different studies; however Barry and Proops (1999) argue that a Q sample of 36 statements is easily manageable for both researchers and stakeholders. During this process, statements are reduced in number ensuring that all the important dimensions of the concourse are covered (Van Exel and de Graaf, 2005).

In this study, we have selected a Q sample of 51 notions. These notions have been chosen with help of the following criteria. We included notions referring to the concept of ‘institutionally focused barriers’ we have included in our own institutionally oriented framework. So we included notions referring to institutional embeddedness and institutional arrangements. We also included notions referring to North’s approach to institutional change on path dependence, transaction costs, economic and political institutions and the electricity sectors initial institutional conditions.

A second criterion has been adopted to include notions relevant to the respondents likely to be involved in the next level of the methodology i.e. ranking the notions along a Likert scale. For that purpose, notions were chosen by considering the specializations of the likely Q sorters. Since some of these participants had given their viewpoints on the topic during the initial round of interviews for concourse building; therefore, notions of their interest were possible to include in the Q sample.

A third criterion was the positioning of respondents vis-à-vis the reforms. We therefore included notions respondents were agreed on, disagreed on, and which were neutral to the respondents. This meant that Q sorters will come across a wide range of different notions. A fourth criterion was whether the notion was referring to a barrier inside the power sector or to a barrier outside the power sector. We included both types of notions. We adjusted the original formulation of several notions to make them more understandable for the respondents, before they were printed on cards. Those cards were numbered in a random order from 1 to 51. In total we asked 34 respondents, our P set, to sort the Q sample (Table 9-1).

9.2.4. Q-sorting

In a fourth step, the 34 respondents were asked to rank Q notions according to their own ideas on a Likert scale. This ranking was done most of the time in the presence of the researcher.

Some researchers use Likert scale between -5 to +5 (mostly disagree to mostly agree) or even wider. This is done to flatten the distribution. But this widening also might increase confusion among participants.

We used a likert scale of -4 to +4 range. We gave respondents sufficient time to sort the cards with the notions, because the pretesting showed that respondents were very busy and so needed time to make the sorting.

Therefore, we applied a free choice sorting, allowing respondents to put any number of notions under any rank according to their understanding. After, the sorting the respondents were interviewed to discuss the results of their ranking. In this way we collected 34 rankings from the 34 respondents.

9.2.5. Analysis of Q-sorts and results

The fifth step is to analyze the rankings of the respondents (Q sorts) (Van Exel and de Graaf, 2005). There are different software available for this analysis. We applied PQ Method software. This quantifies the degree of divergence among respondents' view-points by putting the similar and dis-similar notions in an inter-correlation matrix. In order to identify the natural groupings, the inter-correlation matrix was factor analyzed with the help of Principal Component Analysis (PCA). This analysis showed how each notion was ranked by the respondents loading on different discourses. This level identified eight groups or discourses; however we rotated these discourses to extract more meaningful discourses out of these eight. Rotation could be done either through Varimax or Judgmental method. We used Varimax method by knowing that each method of rotating factors could only shift the angle of observing the Q sorts and does not impact the perceptions carried through individual Q sorts and relationships among the Q sorts (Van Exel and de Graaf, 2005).

Factors were selected on the basis of two criteria. Firstly, eigenvalues of the factors were required to be more than 1 and secondly each factor had to be loaded by at least two Q sorts (Brown, 1980, Watts and Stenner, 2005). According to Brown (1980), at $P < 0.01$ significance level, the significant loadings to a factor can be measured by the equation $2.58(1/\sqrt{N})$ where N is the number of notions in the Q sample. This implies that all the factor loadings in this study could be significant if they were greater than or equal ($\geq$) to the value $[2.58(1/\sqrt{51})] = \pm 0.36$. Factors extracted from this analysis represent clusters of notions that are highly associated internally.

9.3 Results

In a final step the results are interpreted. Here we also use the information provided by the respondents after they had ranked the notions.

The factor analysis resulted in four dominant discourses (see Table 9-2 for loading of each notions on four discourses A, B, C, and D) with eigenvalues greater than 1 and supported by at least two Q sorts of respondents. We have only utilized notions with significance level of 99% to interpret our results.

Table 9-2: Barriers score (from -4 to +4) for each discourse

No	Notions	Discourses			
		A	B	C	D
1	Lack of rules and regulations to invoke competition	2	0	2	1
2	Weak political parties to raise public support	-2	-3	-2	0
3	Lack of skills and education in minister and utilities heads	-1	2	2	3
4	Utilities depend on public subsidies	-1	-2	2	-2
5	Lack of commitment in Govt. due to fear of losing public support	3	-2	1	4
6	Implementation was not compatible with inst. Endowments	2	3	1	2
7	Minister and utilities' heads lacked will to reform	-2	3	0	3
8	Insufficient laws on property rights and contracts	2	-4	0	0
9	Threat of army intervention decreased commitment to reforms	-4	-4	-3	-4
10	Shortage of regulations for attracting new technologies	1	1	2	1
11	Strong unionism among employees of utilities	3	-3	-1	3
12	Lack of accountability mechanism in regulatory agency	1	-1	3	1
13	High cost of doing business	-2	-2	-2	-2
14	Regional geopolitical situation	-1	-3	1	-3
15	Culture of electricity theft and nonpayment of utilities bills	4	4	3	3
16	Less educated and trained staff in regulatory authority	0	2	4	2
17	Deficiency of necessary safeguards for regulatory freedom	2	3	2	1
18	Deadlock during different phases of the reform	3	4	1	2
19	Insufficient rules for conflict resolution mechanism	0	1	-1	-2
20	Less integrated financial sector with the power sector	0	0	-4	-1
21	Poor planning for electricity infrastructure due to no census	-1	-2	-4	-1
22	Slow process due to external involvement in implementation	-3	2	0	-2
23	Weak performance of the regulatory authority due to political	1	2	4	2
24	Economic, social and cultural differences among people	-1	3	-4	2
25	Weak commitment among legislator due to rent seeking	-3	-3	-2	-4
26	Ethnic and sectarian polarization	-2	0	-1	-3
27	Delays in legislation due to insufficient rules of business	-3	-1	-3	-4
28	Poor reforms due to demonstration effects in regional states	-3	0	-3	-3
29	Loss of enthusiasm due to poor law and order situation	-1	-3	-1	-1
30	Non clarity of roles among organizations due to unclear rule	1	-1	1	0
31	Inefficient laws to inhibit power theft	3	2	4	2
32	Lengthy and costly process of enforcement of contracts	4	2	1	3
33	obstacles in feedback learning to reforms' implementers	0	0	-1	1

34	Inefficient communication of regulatory agency and utilities	0	-1	0	-1
35	Incoherency between reforms design and implementation	-2	1	-1	-2
36	Reversal of economic policies and reforms	-1	0	0	1
37	Corruption and inefficiency in utilities and ministries	3	2	3	4
38	Politically motivated over staffing in utilities	4	-1	2	4
39	Incongruence of reforms package with sector's starting conditions	2	4	2	-1
40	Weak interactions among different stakeholders	2	-2	0	0
41	Non cost reflective and non-remunerative tariffs	-4	-4	2	-2
42	Historical baggage of poor institutions from colonial power	-4	-1	0	-3
43	Low level of GDP per capita	0	1	2	-1
44	Varied perception of net economic gains and losses	2	-2	-2	1
45	Insufficiency and inefficiency of electricity law	0	1	2	-1
46	Information constraints for business transactions	1	-1	-2	0
47	Lack of strong coalitions in the governments	-3	-2	-4	-3
48	Top- down approach for reforms' implementation	-2	1	-2	-2
49	Shortage of skilled legislators to draft right set of reform	-2	2	1	-1
50	Overlap in judicial and administrative authorities of regulatory agency with	1	1	-2	0
51	Misunderstanding of reforms due to low literacy rate	1	-1	-1	2

Note: Table 9-2 specifies the score assigned to each notion within each discourse. Reading the table by column tells the scores of notions in respect to a particular discourse. Reading the table by row reveals the scores of a particular notion across all the discourses. For example moving along the discourse A downward shows that notion 1 received score 2, notion 2 as -2 and notion 3 as -1 for discourse A and so on. While if we read along the lines then notion 1 got a score of 2 for discourse A, 0 for B, 2 for C and 1 for D discourse.

Results have given some distinguished notions for each factor which “ranked profoundly differently in other factors” due to Q sorts loading in that particular factor and the standard deviation of the Q sort distribution (Brown, 1980). In addition to distinguished notions, the Q-method has also produced a list of consensus and disagreement notions. Consensus notions may not differentiate among factors because all factors give similar scores to a consensus notion. A disagreement notion may receive opposite scores from each factor and resultantly, it explains a severe disagreement among all the factors on a given notion. Below we explain results on consensus and disagreement notions and the four discourses (see Appendix 15 for factors loading on distinguished, consensus and disagreement notions).

Table 9-3: Stakeholders’ loadings on each factor or discourse

Stakeholders	Factors			
	A	B	C	D
Academics (Economists)	4	1	2	3
Institutional Lawyers	1	1	1	2
Employees of the Utilities	1	2		
Experts from Regulatory Authority (NEPRA)	2	1		
Experts from Ministry of Finance and Planning	3		1	2
Member of Parliament	3			3
Experts from Research Organizations	3			4
Businessmen	4			
Members of power sector unions	2	3		

Table 9-3 explains the stakeholders' loading on each discourse. All stakeholders load at least in one factor which shows the clear patterns of factor loading by every stakeholder's group. For instance, academics load on factor A, B, C and factor D, similarly, experts from Ministry of Finance and Planning Commission load on factor A, C and D. Member of power sector's labor unions load on factor A and B. It is evident that factor A is heavily loaded by all respondents as compared to other factors.

9.3.1. Consensus and disagreement notions

This study reveals that all the four discourses have agreement on a number of issues. The issue of electricity theft was been one of the concerns that raised strong agreement among all the four discourses. A large number of respondents believed that the culture of electricity theft is a major barrier to progress of the reforms. It created financial problems for the unbundled utilities in a circular way from the distribution companies to the production companies.

We have shown in Chapters 6 and 7 how this contributed to the buildup of inter-corporate circular debt. The discourses also show a strong agreement that the electricity law to inhibit theft has remained inefficient. Either the laws have been poorly implemented, or they are unable to meet the requirements of the sector.

'Corruption in utilities and the ministry' also accumulated agreement among all the discourses. Respondents believed that electricity theft does not take place just from the consumer side but employees of utilities also support that theft. They thought that in some cases, higher executives such as executive engineers, superintendent engineers and their higher authorities have got involved in corruption in the utilities, which is not just restricted to electricity theft but also to the theft of electrical machinery such as transformers, wires, etc. In addition discourses have shown agreement that continued and increased political involvement after the reforms have resulted in a weak regulatory authority. Respondents argued that people from the same cadre (mostly belonging to ex-vertically integrated utility i.e. WAPDA) have been involved in regulatory affairs of the regulatory authority. With less regulatory skills and strong political affiliations, they showed less interest in strengthening regulatory governance and to build safeguards against regulatory interventions. The regulatory agency has also been unable to design appropriate regulations for attracting new technologies.

All the discourses agreed that design of the reforms and their implementation had little direct relationship with the institutional endowments of the country. Respondents thought that institutional reforms required an effective legislature to initiate and implement laws for creating a reliable and trustworthy investment environment and to protect private investments and to develop private investor's trust. But the relevant institutions have remained insufficient and incompetent to develop such a trustworthy investment climate in Pakistan.

All discourses reflect a strong disagreement on the weakening of the political commitment to reforms by the political circumstances. A majority did not believe that lack of a strong governing coalition and the threat of army interventions have been reasons for a reduced political commitment to reforms. Some of the participants quoted the examples of governments during the 1990's. The weak coalition government of the Pakistan People's Party showed great commitment to reforms reflected by the speed of privatization. Moreover, the Pakistan army never intervened in the power sector reforms without governmental request. The Nawaz Sharif's government of 1998 asked the army to curb electricity theft.

9.3.2. Discourse A: weak governance structure

The first discourse (A) with a 23% explanatory variance builds around *weak governance structure* as one the main causes of the poor electricity reforms in Pakistan. To establish this discourse, different notions move concurrently. The progression of notions which formed the discourse is the following. There exist information constraints among different stakeholders such as the regulator, firms, consumers and the government that may weaken the stakeholders' mutual interactions. Such constraints may impact the behavior of some stakeholders differently. Some may utilize these constraints for their own benefit while some others may create other types of complexities for the governance structure. For instance, information constraints among general consumers who are also not well informed about the benefit of reforms reduce their support for reforms; whereas information constraints among firms, regulator and government contribute to fade their mutual interactions. These constraints also increase opportunistic behavior among some stakeholders such as politicians and the employees of the utilities. So, the reduced interaction as a result of information constraints increases uncertainty and opportunistic behavior among stakeholders, which eventually contributes to augment the transaction costs among the stakeholders. High transaction costs impact the time and overall costs attached with contract enforcement, which ultimately weakens the governance structure of the power sector.

Respondents viewed the above mentioned aspects as important notions that contribute to weaken the governance structure of power sector. Weak governance structure constitutes an important factor responsible for poor performance of the institutional reforms in the power sector of Pakistan.

9.3.3. Discourse B: mismatch with sector's starting conditions

Discourse B with 10% variance elucidates that institutional reforms in the power sector remained dissimilar to the sector's initial conditions. The respondents who contributed to this discourse argued that reforms should have been designed and implemented while considering the pre-reform implications of the power sector, which did not happen. Such a poor integration resultantly contributed to weaken the impacts of reforms. The following pre-reform aspects of the power sector were not considered properly while designing and implementing the reforms, and have contributed to slow down the reforms' progress.

Firstly, pre-reform conflicts over the distribution of resources were neither resolved before designing a different institutional framework nor considered properly while implementing it. For instance, conflicts among provinces and the federal government over the utilization of natural resources such as water, gas and coal remained unresolved which affected the overall reform process. This also contributed to restrict power sector private investments on production projects based on indigenous fuels, which in a way increased the share of expensive electricity in the overall electricity generation capacity due to dependence on imported fuels.

Secondly, the power sector was endowed with a culture of electricity theft and non-payment of utility bills by different state level organizations and the general public. In addition, electricity prices were highly subsidized under economic and social arguments. These issues had inflicted financial suffrage upon the government and needed settlement before reforms in order to offer attractive circumstances to private companies in a market based mechanism. However these issues were also not fixed before moving to a market based system and resultantly, they remained troubling the overall value chain.

Thirdly, respondents believed that reforms' implementation in a top-down setup did not match with the sector's internal circumstances. The reforms' implementation, which meant to challenge the existing status quo of the centrally planned sector, could not be done by the

actors of pre-reform power sector. Those actors have resisted change in existing institutional framework because this threatened their personal interests.

9.3.4. Discourse C: a weak regulatory authority

Discourse C with a 7% variance is supported by notions relating different weaknesses in the regulatory agency to the poor performance of power sector reforms. First of all, respondents considered external involvement in the regulatory affairs of the regulatory agency an important barrier to different reforms steps. For instance, involvement of polity in below-cost tariff setting for the sake of public support created imbalance between electricity costs and prices, which is balanced through subsidies by the public sector. The failure of government in releasing subsidies at the right time increases the volume of circular debt, which seriously affected the performance of the value chain and also discouraged investors. A second weakness that impairs the performance of the regulatory agency is the shortage of highly educated and skilled experts to conduct regulatory affairs according to the latest regulatory instruments. A third weakness pointed out by the respondents is the lack of an accountability mechanism for the regulatory agency. This accountability mechanism should exist in a regulatory agency to check the resoluteness of their regulatory decisions in order to improve its governance but not on the cost of its independence. So a balance is required between independence and accountability of the regulatory agency.

Due to above weaknesses, the regulatory agency has not played its role properly. Firstly being an advisory body on power sector legislation, it has not helped the government to draft an effective law against power theft. Secondly, it has not devised an applicable formula for tariff determination for electricity projects based on different resources such wind, solar, etc. Its role in tariff determination for different segments of the value chain is not satisfactory either. In addition, the regulatory agency has also not been effective in utilizing its judicial authority for enforcing terms and conditions of the operating licenses granted to different stakeholders of the value chain.

9.3.5. Discourse D: political contexts

Discourse D with a 15% variance reveals that the political context has remained central in reducing the impact of power sector reforms in Pakistan. Politicians have intervened in the sector's internal affairs, particularly in the recruitment of staff and in the tariff setting for the sake of public support. Political affiliations of the employees also contributed to a rise in

corruption in utilities. Respondents did not favor the concept of politicians' involvement in rent seeking from the power sector. The discourse has also negated the idea that rules of business for the parliament and efficient parliamentarians lack for enacting a good law regarding power sector reforms. So this discourse maintains that political involvement in the sector is just to protect their public support. In addition, the discourse strongly neglects the notion that the military, which has interfered in political matters, also interfered in power sector reform matters of Pakistan.

So far, we have explained results in the form of four discourses according to the stakeholders' loadings on each discourse. Now we explain these discourses with the help of our analytical framework (Figure 3-4).

9.4. Analysis of Results from Analytical Framework

9.4.1. Consensuses and disagreements among all the discourses over reform failure

This study was intended to disclose the presence of any distinct discourses responsible for the slow progress of institutional reforms in the power sector of Pakistan. Extraction of four distinct discourses from a particular subject (by the application of Q methodology) is of vital significance despite the fact that all the participants belonged to different groups of stakeholders. It is Q methodology that revealed the shared perceptions of the participants. This capability of Q methodology makes it suitable for the investigation of a social phenomenon that has been studied quite rarely, such as institutional change in a country. Here we firstly analyze the consensus notions across the four discourses and later all the four discourses separately according to the analytical framework in order to reveal the relevance of our framework in explaining these discourses.

The culture of electricity theft is one the notions that raised consensus among the four discourses. It is one of the main reasons of some major problems in the power sector including circular debt, high transmission and distribution losses and poor coordination of supply-demand situation. All these problems contribute to weaken the impact of power sector reforms. Some of the major causes of electricity theft include corruption among employees of the utilities, weak government writ in several parts of the country, ineffective laws against power theft, lack of punitive actions against the cases of theft and a general psychological frame of mind of the people from some particular regions such as KPK, FATA, etc. that since their regions contain main sources of electricity production like rivers, so it is their right to

get electricity without any cost. The analytical framework (Figure 3-4) explains well the causes of electricity theft in Pakistan. The regulatory agency under a given electricity law should clearly explain the jurisdictions of utilities and their employees in their operating licenses. It should also establish a parallel monitoring system to check if some utility or its employees are exceeding their limits. In case of infringement of contracts, the regulatory agency should utilize its punitive instruments for forcing the utilities to work under given conditions. Flaws in an electricity law and its weak implementation increase opportunities for the utilities and its workers to deviate from their contracts and to behave opportunistically. In Pakistan, lack of safeguards in the electricity law and an effective monitoring system against opportunistic behavior of the utilities' employees has provided a weak institutional environment where the employees have behaved differently to maximize their benefits. The existing monitoring system against electricity theft is targeting mainly the consumer and they rarely take actions against employees involved in the theft. The help of utilities' employees to the consumers in planned electricity theft is ignored. In some circumstances, according to a number of respondents, the employees tell consumers about new innovative ways of theft. These employees remain uncaught and unpunished because of strong affiliations with labor unions and politicians. Politicians through their direct involvement in the regulatory and utilities' affairs also use their position to influence the implementation of relevant laws.

A second consensus notion is corruption among the employees of the utilities and the ministry. Employees of the ministry and the utilities are important entrepreneurs of the sector and they can play an important part while designing and implementing the power sector reforms. If the reforms harm their interests, they will resist, which keeps the institutional setting unchanged. This is what has happened in Pakistan in the last few years. Financial benefits of employees are restraining any considerable change in the power sector and have kept the sector path dependent.

The third consensus notion states that the design of power sector reforms and its implementation do not match with the institutional endowments of the country. Institutional endowments of a country include institutional environment (legislative and executive institutions, judicial institutions and administrative institutions) and embeddedness of the society. According to the respondents the reform design and its implementation did not match with the institutional endowments of the country. At some instances, some of the endowments have restricted the reform process instead of facilitating it. For instance the judicial role has not been complementary to reforms. Several times in the past, the judiciary

has failed to fill the place of a third party enforcer in the case of conflicts among different stakeholders (for instance tariff conflicts among IPPs and the government during 1998). In recent years, the judiciary has become one of the main reasons of delays in tariff determination by the regulatory agency due to inefficient working procedures. Legislative and administrative institutions are also not fully tuned with the market based institutional framework of the electricity sector.

9.4.2. Discourses on reform failure

We have shown that discourse A indicates that a weak governance structure (the third layer of the framework) in the power sector has been one of the main barriers to the electricity reforms. The governance structure configures the players (organizations) and the play of the game by an institutional framework designed according to the rules of the game as specified by the institutional environment. Our analysis showed that the governance structure of Pakistan's power sector hasn't been shaped appropriately, as reflected in the information constraints among the players, which led to increased transaction costs, limited interaction and opportunistic behavior.

Discourse B pointed to some unsolved problems of the pre reform period, which strongly interfered in the functioning of electricity supply after the reforms. In terms of our analytical framework this is a problem of institutional endowments (comprised of institutional environment and embeddedness) of the country. The institutional endowments did not provide sufficient institutional backing to the power sector. In Pakistan, the institutional change entrepreneurs did not bother about adaptation of contextual circumstances. Instead, they kept to the pre reform contextual circumstances. Ex-WAPDA employees got involved in the reforms' activities by occupying key positions in utilities and the regulatory agency and used their institutional position to hinder and frustrate the reforms.

Discourse C tells us that a weak regulatory authority has been one of the key barriers to institutional reforms. According to institutional scholars, an independent regulatory agency is crucial for safeguarding the proper functioning of market based electricity supply. Our analysis has shown that the Pakistan regulatory authority could not act independently from the pre reform institutional environment and politics. In other words, the institutional positioning of the regulatory agency was not clearly designed. It should have been positioned as independent agency at the sector level, but in reality it was acting as part of the institutional environment of Pakistan.

Discourse D showed how politics in Pakistan continued its overall direct influence in almost all aspects of electricity supply in Pakistan, which is not compatible with a market based electricity supply. Institutionally, a market based electricity supply assumes politics to be the policy maker at more distance of the power sector. Our analysis showed that politics continued its direct involvement in the power sector after the reforms, which frustrated the impact of the reforms.

In conclusion, our analysis of the discourses on the barriers to institutional reforms in the power sector of Pakistan, confirms our assumptions that the institutional layers of the country including embeddedness, institutional environment and the governance structure, haven't been integrated according to the institutional logic explained in our analytical framework. It also confirmed our assumptions on the process dynamics in institutional reforms. We found that the entrepreneurs of the reform, within the electricity sector as well as associated sectors, used their position to influence the reform process and outcomes according to their own interests. It showed that the interests and loyalties of the entrepreneurs were in the pre reform institutional setting of the country. The reforms could not change this situation.

9.5. Conclusion

This chapter provides an analysis of experts' opinions on barriers to institutional reforms in the power sector of Pakistan by utilizing Q methodology. We found four discourses (on barriers to institutional reforms in the power sector) that were supported by a range of notions on the theme. The discourses include weak governance structure, weak regulatory authority, misalignment of reforms' package with sectors' starting conditions and the problems relating to the political context.

All four discourses confirmed that institutional reforms in the power sector of Pakistan faced constraints because the design of reforms did not match with the overall institutional endowments of the country. Overall our analysis showed that the institutional endowments of the country actually have supported the pre-reform institutional design of vertically integrated monopoly. This has created friction between the market-oriented reforms and the supporting institutions that stayed in the pre reform design. It also showed how the entrepreneurs of change created hurdles for an effective implementation of the market oriented reforms.

10. Conclusions

10.1. Introduction

This chapter draws conclusions based on our theoretical and empirical analyses reported in previous chapters. This will allow us to answer the questions that guided our research. We will end the chapter and the dissertation with policy suggestions and suggestions for future research.

The chapter is organized as follows. Section 10.2 answers the research questions. Section 10.3 provides policy suggestions to improve the design and implementation of the institutional reforms in Pakistan. Section 10.4 explains some limitations of our research and Section 10.5 makes suggestions for future research on the topic.

10.2 The Answers to the Research Questions

This section presents answers to the research questions based on empirical analyses in the relevant chapters. Firstly we answer to research questions and finally the overarching question.

What is according to New Institutional Economics, institutional reform of the power sector and how did developed and developing countries reformed their power sector?

We have answered the first research question by developing our analytical framework based on New Institutional Economics in Chapter 3 and by analyzing power sector reforms in developed and developing countries in Chapter 2. In Chapter 2 it showed that developed and developing countries have reformed their power sector by changing the monopoly regulatory framework into a market-based framework. Both types of countries have applied roughly the same institutional features, which have been implemented differently. Developing countries have tended to develop the reforms stepwise and gradually compared to the developed countries. Additionally, the developing countries have inclined to reform separate aspects of the institutional organization of electricity supply. Whereas developed countries have reformed by implementing an all-encompassing institutional design affecting all aspects of electricity supply.

Based on the power sector reforms in developed and developing countries, which revealed that institutions have remained important in configuring the success of reforms, we have developed our analytical perspective in Chapter 3. The framework has been built along two

different lines: a structurally oriented line based on the work of Oliver Williamson and a process oriented line based on the work of Douglass North. We have combined both perspectives in our analytical framework. This has allowed us to analyze and evaluate the state of reforms and to provide for an explanation of a failure of reforms. Based on Williamson we have argued that power sector reform should follow a certain institutional logic and a certain institutional ordering between the layers of the institutional organization of a country. If this logic is not followed then a country runs the risk of power sector reform failure. Based on North we have argued that the entrepreneurs in the power sector institutions as well as in the institutions of associated sectors and the governmental bureaucracy, position themselves vis-à-vis the reforms on the basis of their interests. If the reforms affect their interests, entrepreneurs try to influence the reforms according to their own interests.

We have applied this framework in several chapters of the dissertation, to evaluate the state of the art of the power sector reforms in Pakistan and to explain empirical findings on the power sector reforms and its implications for electricity supply in Pakistan.

In Chapter 4 of the dissertation we have presented and explained the methodology and the research methods we applied. We have applied a combination of methods, necessary because of the country specific focus in the analysis and because of availability of data on the power sector of Pakistan. Not all data needed for valid and reliable quantitative research were available. But we have coped with this problem by using different available sources of data and by applying several research methods.

What are the existing problems in the organization, functioning and performance of electricity supply in Pakistan and are these problems related to the institutional reforms in Pakistan?

The second research question has been answered in Chapters 5 and 6. Chapter 5 has analyzed the organization, functioning and performance of electricity supply in Pakistan. We have sketched the institutional outlook of electricity supply before the reforms and analyzed how the reforms changed the institutional organization and performance of the electricity sector. Before reforms, the electricity sector in Pakistan was organized as two vertically integrated public utilities. Both utilities were characterized of lower installed capacity, inefficient generation, high transmission and distribution losses, inefficient pricing mechanism and reduced adoption of innovative technologies. These characteristics of the pre-reform utilities

augmented their incapacity to coordinate electricity supply with the demand and thus intensified the hours of blackouts throughout the country. Even the public sector became unable to bear the financial burden of these utilities. So, these pre-reform circumstances necessitated institutional reforms from a public sector monopoly to a market based mechanism in order to improve the performance of the sector by reorganizing its structure.

As a result of reforms, organization of the power sector has changed to some extent according to the plan but the ideology of public monopolies is still intact. Some aspects of the reforms' template relating to the structure of the sector including unbundling, formation of a separate regulatory agency and some privatization (greenfield and divestiture) have been implemented. But the aspects intended to improve the efficiency of the sector such as corporatization; an efficient electricity law; ensuring independence of the regulatory agency and competition at wholesale and retail have remained almost neglected. This strategy of pick and choose for reorganization has failed to disconnect the power sector of Pakistan from its pre-reform problems.

Chapter 6 analyzed the poor functioning of the reforms with the help of the analytical framework. We argued that prevalence of the problems has been caused by the poor implementation of reforms. Reforms have not been implemented in a proper sequence and with full vigor. Electricity law in congruence to the institutional endowments of the country and formation of an independent regulatory agency were important steps. These steps were taken but did not involve the right sequence and true spirit. An independent regulatory agency was established but this agency was not established in the right sequence and was not able to operate independently due to the interference of bureaucratic and political institutions.

Thus, poor design and weak implementation of reforms have caused the persistence of pre-reform situation of the power sector. Reforms' entrepreneurs, by influencing the design and implementation process, have resisted any change that could endanger their interests. Consequently they have contributed to the continuation of power sector's previous path of inefficiency, inadequacy and unreliability.

Did the power sector reforms affect the performance of the electricity sector in terms of installed generation capacity, electricity production, capacity utilization, transmission and distribution losses, percent thermal generation and electricity prices for the industrial and domestic segments and if yes in what way?

Third research question has been answered in Chapter 7. This chapter has quantitatively validated the relationship between electricity reforms and the performance indicators discussed in Chapters 5 and 6. We observed the trend of performance indicators before and after reforms with 1994 as the reference year for reform. For this trend analysis, we have used time series data during 1971-2010. Chapter 7 has found that private investments in the form of electricity installed capacity per capita and percent thermal generation have increased significantly following the reforms year 1994. These gains in private investments have only sustained for the period of 4-5 years. This has validated our findings from Chapters 5 and 6, which argued that IPPs' entry as a part of reforms has contributed to increase private investments in generation capacity for initial years. However this surge in private investments has not sustained due to poor functioning of the institutional framework of the power sector.

Electricity generation per capita and capacity utilization were expected to rise due to efficiency gains from power sector reforms in 1994. These indicators have not responded to the reforms. Another important performance aspect that has performed poorly before reforms is efficiency of the transmission and distribution networks. We have observed the trend of a related performance indicator i.e. transmission and distribution (T&D) losses before and after reforms. This indicator has shown that T&D losses increased immediately for the consecutive four years before they finally started moving downward slowly. Overall, the T&D losses, which were one of the main reasons for the reforms, were not solved by the reforms.

Electricity prices have also moved upward after reforms, in particular for private consumers and to a lesser extent for industrial consumers. Overall, electricity prices have responded to the reforms against our expectation.

All the performance indicators have performed poorly after the reforms except private investments. Private investments have shown a positive trend, which also contributed to enhance installed capacity. Unfortunately the increase in private investment was very short-lived.

Did the power sector reforms affect private investments in electricity production capacity in Pakistan and if yes, in what way?

The fourth research question has been answered in Chapter 8. There it showed that private investments actually only lasted for four years after the reforms. We analyzed the causes.

The answer to the question has revolved around institutional aspects that, according to the investors, have been restricting their decisions on private investments in the power sector.

Investors perceived that the institutional environment in Pakistan in general and the power sector in particular has been restricting their decisions on investments in the sector. Among the institutional environment, the institutions of property rights and contracts enforcement have been major of major concern to the investors. The independent regulator was expected to protect the interests of the private investors. However enhanced involvement of the polity and bureaucracy has limited the independence of the regulator. Alongside making new investments, these institutional aspects have also impacted their decisions on location and technology. This has also clarified why the investments concentrated on thermal based power plants. Investors wanted to prevent for huge sunk costs

So, in the perception of private investors, the reforms did not provide for a trustworthy investment climate by making the necessary changes in the institutional environment of Pakistan. This has threatened the private investors to continue investing in an investment climate where their investments could face expropriation risks from the interest groups and there would be no independent regulator to restrain the opportunistic behavior. Based on the findings of the chapter we can conclude that the reforms have not resulted in sustainable private investments in the electricity generation capacity of Pakistan.

What are according to experts' opinions, the major barriers in the institutional reform of Pakistan's power sector?

Question five has been posed to find out the barriers to institutional reforms in the power sector of Pakistan by employing experts' opinions. The answer to the question has been given in Chapter 9. Questions one to four have focused on the role of institutional reforms in improving the performance of power sector, which have indicated that institutional reforms have really stayed behind in reducing pre-reform problems and improving the performance of the power sector. This has increased the need for exploring the barriers to institutional reforms so as to reduce those problems that might eventually push the institutional reforms ahead in tackling the problems of the power sector. The perceptions of the stakeholders confirm our findings in the previous chapters on the causes of the failures in power sector reform in Pakistan.

First barrier has been the existence of a weak governance structure (third layer of our analytical framework) in the power sector of Pakistan. Due to weak governance structure, there has been lack of important information among different segments of the power sector that has created coordination problems thus causing higher transaction costs among the key players. This situation has created hurdles for implementing institutional reforms in the power sector.

Second barrier has been the mismatch of the package of institutional reforms with the sector's starting conditions or the institutional endowments of the power sector (comprised our second and first layer of the framework). This barrier has stated that starting conditions of power sector in Pakistan such as conflicts over resources' distribution, culture of electricity theft and non-payment of utility bills, burden of over-employments on utilities and weak financial positions of public sector companies required fixation before starting the key reforms' steps.

Third barrier has been the existence of a weak regulatory authority which was heavily influenced by political elites in all its key decision making processes such as tariff determination, licensing, handling of complaints made by consumers, producers and distributors.

Fourth barrier has revolved around the political contexts that have indicated heavy involvement of politicians in power sector. Ideology of the politicians and their commitment to reform has been important in this respect. A government with an ideology to increase private sector participation in power sector and a strong commitment to advance reforms' package might have significant impact on the progress of power sector reforms. Usage of power sector for political interests has also been viewed a barrier to power sector reforms in Pakistan.

Finally, Chapter 9 argued that adopting a reform package from successful countries was not sufficient without giving due importance to the country specific economic, political and institutional endowments as well as sector specific endowments as explored in this study through Q Methodology. The barriers identified should carry high importance while re-designing and implementing a package of institutional reforms in the power sector of Pakistan.

Did the institutional reforms improved the organization, functioning and performance of the power sector of Pakistan and if not, what are the reasons according to NIE?

Now, we answer the overarching research question based on the above answers to the five research questions. On the basis of the conclusions drawn from the initial four empirical Chapters (5, 6, 7, and 8), it is evident that institutional reforms, which were initiated to reduce the pre-reform problems of power sector in Pakistan, have not succeeded in that task completely and the sector still underperforms. We have found from the fifth empirical chapter that the organization of the power sector in Pakistan is still largely public. Although sector was unbundled vertically and a separate regulatory authority was formed, the logic for undertaking these actions – increasing efficiency - has been missing in the whole process. The dissertation concludes that institutional reforms have remained unable to reduce the problems and to improve the performance of the power sector in Pakistan. The sector has largely been passing through same conditions in terms of performance as it was before the reforms. Some performance indicators have even worsened in post reform period.

There have a number of reasons behind the limitations of reforms in achieving required organization, functioning and performance of the power sector. Those reasons have been largely institutional as explained by our analytical framework (based on NIE). Those reasons have also been utilized in Chapters 6 and 8 to explain the power sector problems. However, we have tested the authenticity of those reasons by employing Q methodology in Chapter 9 by finding out the main discourses for the barriers to power sector reforms.

Chapter 9 found that main reasons behind the failure of reforms in getting required outcomes have been firstly the problems in the governance structure which forms the third layer of our analytical framework, Secondly institutional endowments comprised of institutional environment and embeddedness of the society have been restricting reforms in the power sector. Thirdly, a weak and dependent regulatory authority has caused poor performance and fourthly the involvement of politics in power sector activities has kept the sector under-developed.

10.3. Policy Suggestions

Based on our research findings we can make some policy suggestions to relevant stakeholders involved in the power sector of Pakistan. Our suggestions might by inspiring for re-designing, implementing and evaluating power sector reforms in developing countries facing similar conditions like Pakistan.

1. Findings of this dissertation suggest that the endowments of the country and the sector should be made compatible to the market led institutional framework.

At country level: Institutional endowments of the country comprising constitution, legal, administrative, economic and political institutions and the ideology should be transformed according to the requirements of the market led institutional framework. Additionally, these institutions should be internally coherent in order to remove dualism of institutions. First of all, the constitutional clauses on electricity services should be adapted according to the new framework. A fundamental change in those clauses should convey a message that electricity is a market commodity and not a right. This ideological change on electricity usage should be assimilated in other institutions such as laws on contract and property rights and then to the rest of the institutions relating to the power sector.

The judicial system being important to enforce property rights and contracts according to the constitution should be prepared for new framework. Increased coherence among institutional endowments and the judiciary will make a favorable impact upon reform outcomes. Recently, many decisions by the judiciary have proved unfavorable to the power sector's progress only because of the dualistic nature of the institutions. Judiciary thought they have been operating under the institutional guidelines, which in fact is right, however those decisions have not favored the cause of institutional change in the power sector. This requires creating coherence among the institutional endowments of the country in favor of market oriented institutional framework.

At sector level: A new institution i.e. an effective electricity law should be created immediately. The electricity law with a consensus of the provinces should clarify its operating jurisdictions and should have no friction with the regional electricity laws. In fact there should be only one law across the country if all the utilities in the country are regulated by one regulatory authority. Since provinces still want to have electricity laws then those should be coherent to the national law approved by the national parliament and all the provinces and implemented by single regulatory authority. The law should comprehensively clarify the operating rules for the electricity markets, and nature of regulatory institutions comprising regulatory governance and regulatory

substance⁵¹. In addition, the law should explain instruments for effective control of opportunistic behavior from within and outside the power sector, strict laws against power theft for both the employees of the utilities and the consumers, effective rules for the performance evaluation of the utilities, efficient rules for tariff determination for all the segments and also for the innovative technologies and an efficient mechanism for conflict resolution.

2. The dissertation also suggests that governance structure of the power sector should be improved. At this level the relationship among utilities, government, regulator and the consumers should be clearly identified. These relationships are determined by the contracts offered by the regulator to the utilities. So the contracts should increase the certainty of transactions among the stakeholders in order to decrease transaction costs. Higher transaction costs among utilities will discourage unbundling activities and increase the chances of vertical integration once again.

Therefore, the regulator should frame contracts carefully by explaining all the possible transactions among the stakeholders and making that information accessible to all the stakeholders in order to reduce the problem of information constraints. Constrained information might increase opportunistic behavior among some stakeholders against others. In addition to framing the efficient contracts, the mechanism of contract enforcement should also be efficiently improved within the regulatory agency. If contracts are efficient as is the mechanism of their enforcement, then the power sector reform will be able to achieve its targets.

10.4. Suggestions for Further Research

It is anticipated that with the progress of reforms, future studies will provide more comprehensive analyses of those dimensions of the power sector reforms, which are currently difficult to uncover due to data problems. Here, we put forward a number of research dimensions which need full scale investigation in future studies.

1. This dissertation has analyzed the problems of power sector from the institutional economic perspective. Williamson and North perspectives on institutional reform have provided us an analytical framework that argued that institutional reforms should follow a proper sequence and pace. The sequence of reforms is determined by congruence among

⁵¹ Pakistan needs to change regulatory substance to increase efficiency based generation, transmission and distribution. Pakistan is one the few countries of the world that stick to the cost recovery regulations for the generation, distribution and transmission of the power sector.

different layers of the institutional framework; whereas the pace is determined by path dependence. In this dissertation we have not focused deeply on how and to what extent the mental models of entrepreneurs influenced by embeddedness and exogenous factors impact upon the design and process of implementing the institutional reforms. This could require combining institutional and cognitive economics for describing this relationship through cognitive modeling. This link can be investigated in future research. In a future study, the level of coherence between institutional endowments of the country and the power sector institutions should also be measured. These two studies would further enable us to empirically check the impact of entrepreneurs' actions on maintaining coherence in the design and implementation of power sector reforms.

2. Since institutional coherence and entrepreneurs' actions have impact upon the outcomes of power sector reforms, then this relationship should be investigated empirically in future, either by employing secondary or primary data.
3. In addition, the relationship between institutional aspects and individual reform steps separately is an important aspect for future research. In this dissertation, we have studied the overall impact of reforms on some sectoral performance indicators. However, it is also required to empirically study the impact of each reform step upon performance of the power sector by including sectoral and aggregate performance indicators and controlling institutional aspects at a single country level. We could not study this due to data problems; however this can be investigated in future when more data will become available.
4. We have studied the institutional aspects of power sector reforms at a single country level. This type of analysis is required to be expanded to cross country level. That analysis should explain quantitatively how different levels of institutional coherence and entrepreneur influences impact the outcomes of power sector reforms in countries.

Bibliography

- ADB 2010a. Integrated Energy Sector Recovery Report & Plan. Friends of Democratic Pakistan, Energy Sector Task Force. .
- ADB 2010b. Integrated Energy Sector Report and Plan. Report prepared by Friends of Democratic Pakistan (FODP), Energy Sector Task Force, Asian Development Bank and Government of Pakistan.
- ADDAMS, H. & PROOPS, J. 2000. Social Discourse and Environmental Policy: an Application of Q Methodology. *Edward Elgar, Cheltenham*.
- ALCHIAN, A. A. & DEMSETZ, H. 1972. Production, Information Costs, and Economic Organization. *American Economic Review*, 62, 777-795.
- ALI, F. A., FIESS, N. & MACDONALD, R. 2010. o Institutions Matter for Foreign Direct Investment? *Open Economic Review*, 21, 201–219.
- AMUNDSEN, E. S. & BERGMAN, L. 2006. Why has the Nordic electricity market worked so well? *Utilities Policy*, 14, 148-157.
- ANDERSON, J. A. 2009. Electricity Restructuring: A Review of Efforts around the World and the Consumer Response. *The Electricity Journal*, 22.
- ANDRES, L., FOSTER, V. & GUASCH, L. J. 2006. The Impact of Privatization on the Performance of the Infrastructure Sector: The Case of Electricity Distribution in Latin American Countries. World Bank Policy Research Working Paper No. 3936. Available at SSRN: <http://ssrn.com/abstract=923243>.
- AOKI, M. 2000. Information, Corporate Governance and Institutional Diversity, Competitiveness in Japan, USA and Transitional Economies, Oxford, UK: Oxford University Press, 48-57.
- AOKI, M. 2008. Analysing Institutional Change: Integrating Endogenous and Exogenous Views. *Institutional Change and Economic Behaviour*, 113-133.
- APEC 2000. Electricity Sector Deregulation in the APEC Region. In: APEC (ed.). Tokyo.
- ARNETT, R. 2006. India Unveiled. Atman Press. pp. 180-. ISBN 978-0-9652900-4-3.
- ARROW, K. J. 1963. Uncertainty and the Welfare Economics of Medical Care. *American Economic Review*, 53, 941-73.
- BACON, R. W. & BESANT-JONES, J. 2001. Global electric power reform, privatization, and liberalization of the electric power industry in developing countries. *Annual Review of Energy and the Environment*, 26, 331-359.
- BAKER, R., THOMPSON, C. & MANNION, R. 2006. Q methodology in health economics. *Journal of Health Services Research & Policy*, 11, 38-45.
- BANFIELD, E. C. 1958. *The moral basis of a backward society*, Glencoe, Ill., Chicago, Free Press; Research Center in Economic Development and Cultural Change.
- BARRY, J. & PROOPS, J. 1999. Seeking sustainability discourses with Q methodology. *Ecological Economics*, 28, 337-345.
- BERGARA, M. E., HENISZ, W. J. & SPILLER, P. T. 1998. Political institutions and electric utility investment: A cross-nation analysis. *California Management Review*, 40, 18-+.
- BESANT-JONES, J. E. 2006. Reforming Power Markets in Developing Countries: What Have We Learned? *Energy and Mining Sector Board Discussion Paper 19, World Bank*.
- BHATTACHARYYA, S. C. 2007. Power sector reform in South Asia: Why slow and limited so far? *Energy Policy*, 35, 317-332.
- BHUTTO, A. W. & KARIM, S. 2007. Energy-poverty alleviation in Pakistan through use of indigenous energy resources. *Energy for Sustainable Development*, 9.
- BORTOLOTTI, B., FANTINI, M. & SINISCALCO, D. 2001. Privatisation: politics, institutions, and financial markets. *Emerging Markets Review*, 2, 109-137.
- BOYD, R. & RICHERSON, P. J. 1985. *Culture and the evolutionary process*, Chicago, University of Chicago Press.
- BROUSSEAU, E. & GLACHANT, J.-M. 2008, 68. *New Institutional Economics: A Guide Book*, Cambridge University Press.

- BROWN, S. R. 1980. Political Subjectivity: Applications of Q-methodology in Political Science. . *Yale University Press, New Haven and London*.
- BROWN, S. R. 1996. Q methodology and qualitative research. *Qualitative health research*, 6, 561-567.
- BROWN, S. R. The history and principles of Q methodology in psychology and the social sciences. Red at the British Psychological Society Symposium on, A Quest for a Science of Subjectivity: The Lifework of William Stephenson, University of London, 1997.
- BROWN, S. R., DURNING, D. W. & SELDEN, S. 1999. Q methodology. *PUBLIC ADMINISTRATION AND PUBLIC POLICY*, 71, 599-638.
- CCP 2009. The Analysis of Competiton and Economic Development in the Power Sector. Competition Commission of Pakistan, Government of Pakistan, Islamabad.
- CHANDLER, A. D., JR. 1962. Strategy and Structure. *Chapters in the History of the American Industrial Enterprise, Cambridge, MA, MIT Press*.
- CHANG, C. P. & BERDIEV, A. N. 2011. The political economy of energy regulation in OECD countries. *Energy Economics*, 33, 816-825.
- CHAUHAN, P. R. 2003. An Overview of the Siwalik Acheulian & Reconsidering Its Chronological Relationship with the Soanian - A Theoretical Perspective, *Sheffield Graduate Journal of Archaeology*. University of Sheffield. Accessed on 6 July 2013 from <http://www.assemblage.group.shef.ac.uk/issue7/chauhan.html#distribution>
- CHEEMA, T. 2010. Electricity theft and pricing. *DAWN.com, Economics-and Business (Monday, 01 Nov, 2010)*.
- CHISARI, O., ESTACHE, A. & PRICE, C. W. 2001. Access by the Poor in Latin America's Utility Reform: Subsidies and Service Obligations. United Nations University/World Institute for Development Economics Research.
- COASE, R. H. 1937. The Nature of the Firm. *The Firm, the Market, and the Law, Chicago, University of Chicago Press*, 33-55.
- COASE, R. H. 1960. Problem of social cost, the. *Jl & econ.*, 3, 1.
- COASE, R. H. 1992. The Institutional Structure of Production. *American Economic Review*, 82, 713-719.
- COLEMAN, J. S. 1987. Norms as Social Capital, In *Economic Imperialism*, ed. Gerard Radnitzky and Peter Bernholz. New York: Paragon.
- COMMONS, J. R. 1931. Institutional Economics. *The American Economic Review*, 21, 648-657.
- COMMONS, J. R. 1968. Legal Foundations of Capitalism. Madison, University of Wisconsin Press.
- CRAWFORD, S. E. S. & OSTROM, E. 1995. A Grammar of Institutions. *The American Political Science Review*, 89, 582-600.
- CUBBIN, J. & STERN, J. 2006. The Impact of Regulatory Governance and Privatization on Electricity Industry Generation Capacity in Developing Economies. *The World Bank Economic Review*, 20, 115-141.
- CUPPEN, E. 2010. Q methodology to select participants for a stakeholder dialogue on energy options from biomass in the Netherlands. *Ecological Economics*, 69, 579-591.
- CYERT, R. M. & MARCH, J. G. 1963. *A behavioral theory of the firm*, Englewood Cliffs, N.J., Prentice-Hall.
- DAVIS, L. E. & NORTH, D. C. 1971. Institutional Change and American Economic Growth. *Cambridge, Cambridge University Press*.
- DELFINO, J. A. & CASARIN, A. A. 2001. The Reform of the Utility Sector in Argentina. World Institute for Development Economics Research (WIDER), Discussion Paper No. 2001/74.
- DENNIS, K. E. & GOLDBERG, A. P. 1996. Weight control self-efficacy types and transitions affect weight-loss outcomes in obese women. *Addictive Behaviors*, 21, 103-116.
- DI TELLA, R., DYCK, A., GALETOVIC, A. & HOGAN, W. W. 2008. Cost Reductions, Cost Padding, and Stock Market Prices: The Chilean Experience with Price-Cap Regulation [with Comments]. *Economia*, 155-196.

- DOMAH, P. & POLLITT, M. G. 2001. The restructuring and privatisation of the electricity distribution and supply businesses in England and Wales: a social cost-benefit analysis. *Fiscal Studies*, 22, 107-146.
- DREHER, A., LAMLA, M. J., LEIN, S. M. & SOMOGYI, F. 2009. The impact of political leaders' profession and education on reforms. *Journal of Comparative Economics*, 37, 169-193.
- DRILLISCH, J., RIECHMANN, C., DENRYOKU-CHŪŌ-KENKYŪSHO & INSTITUT, E. 1998. *Liberalisation of the Electricity Supply Industry - Evaluation of Reform Policies: Country-by-country-analysis ; Joint Research Project Between Institut of Energy Economics at the University of Cologne (EWI) and the Central Research Institut of Electric Power Industry (CRIEPI)*.
- DRYZEK, J. S. & BEREJIKIAN, J. 1993. Reconstructive democratic theory. *The American Political Science Review*, 87, 48-60.
- EBRD 2001. Energy in Transition. In: DEVELOPMENT, E. B. F. R. A. (ed.). London.
- ENNIS, H. & PINTO, S. Privatization and income distribution in Argentina. Center for Global Development Conference on Privatisation and Income Distribution, February. Weblink: http://www.cgdev.org/events/privatization/EnnisPinto_Argentina_paper.pdf, 2002.
- ERDOGDU, E. 2011. The impact of power market reforms on electricity price-cost margins and cross-subsidy levels: A cross country panel data analysis. *Energy policy*, 39, 1080-1092.
- ERDOGDU, E. 2012. The political economy of electricity market liberalization: a cross-country approach. *Cambridge Working Paper in Economics 1227, EPRG Working Paper 1212*
- ERDOGDU, E. 2013a. A cross-country analysis of electricity market reforms: Potential contribution of New Institutional Economics. *Energy Economics*, 39, 239-251.
- ERDOGDU, E. 2013b. *Essays on Electricity Market Reforms: A Cross-Country Applied Approach*. PhD, University of Cambridge.
- ESCAJ, J. 1990. Summary data sheets of 1987 power and commercial energy statistics for 100 developing countries. Washington, DC: World Bank.
- ESTACHE, A. & GASSNER, K. 2004. Recent Economic Development in Energy and Water in Eastern Europe. World Bank. Washington, D.C. .
- FAIRHEAD, LINDSAY, MELANIE, J., HOLME, L., QIANG, Y., AHAMMAD, H. & SCHNEIDER, K. 2002. Deregulating Energy Markets in APEC: Economic and Sectoral Impacts. In: ENERGY WORKING GROUP, A.-P. E. C. S. W. A. (ed.). Canberra: Australian Bureau of Agricultural and Resource Economics (ABARE).
- FIORIO, C. V., FLORIO, M. & DORONZO, R. 2007. The Electricity Industry Reform Paradigm in the European Union: Testing the Impact on Consumers, Consumers and Utility Reforms. *European Union Conference*, Milan.
- FISHER, R., GUTIERREZ, R. & SERRA, P. 2003. The Effects of Privatization on Firms and Social Welfare: the Chilean Case. Research Network Working Paper No. 456 (May), Latin American Research Network, Inter-American Development Bank, Washington.
- FRANTZI, S., CARTER, N. T. & LOVETT, J. C. 2009. Exploring discourses on international environmental regime effectiveness with Q methodology: a case study of the Mediterranean Action Plan. *Journal of Environmental Management* 90 177-186.
- FRD. 2005. *Country Profile: Pakistan* [Online]. <http://lcweb2.loc.gov/frd/cs/profiles/Pakistan.pdf>. Available: <http://lcweb2.loc.gov/frd/cs/profiles/Pakistan.pdf>.
- FURUBOTN, E. G. & RICHTER, R. 2005. *Institutions and economic theory : the contribution of the new institutional economics*, Ann Arbor, University of Michigan Press.
- GALAL, A., JONES, L., TANDON, P. & VOGELSANG, I. 1994. Welfare Sequence of Selling Public Enterprises: An Empirical Analysis. *Oxford University Press, Oxford*.
- GOP 1994a. Policy framework and package of incentives for private sector power generation projects in Pakistan. *Government of Pakistan*.
- GOP 1994b. Report of Prime Minister's Task Force on Energy, Government of Pakistan, Islamabad.
- GOP 2013. Economic Survey of Pakistan 2013-14. *Ministry of Finance, Government of Pakistan, Islamabad*.

- GRATWICK, K. N. & EBERHARD, A. 2008. Demise of the standard model for power sector reform and the emergence of hybrid power markets. *Energy Policy*, 36, 3948-3960.
- GROSSMAN, S. J. & HART, O. D. 1986. The Costs and Benefits of Ownership - a Theory of Vertical and Lateral Integration. *Journal of Political Economy*, 94, 691-719.
- GUL, M. & QURESHI, W. A. 2012. Modeling Diversified Electricity Generation Scenarios for Pakistan. *IEEE*, 978-1-4673-2729-9.
- HASELIP, J., DYNER, I. & CHERNI, J. 2005. Electricity market reform in Argentina: assessing the impact for the poor in Buenos Aires. *Utilities Policy*, 13, 1-14.
- HATTORI, T. & TSUTSUI, M. 2004. Economic impact of regulatory reforms in the electricity supply industry: a panel data analysis for OECD countries. *EnergyPolicy*, 32, 823-832.
- HAYEK, F. A. 1937. Economics and Knowledge. in *idem (1948), Individualism and Economic Order*, London, Routledge and Kegan Paul, 33-56.
- HAYEK, F. A. 1945. The Use of Knowledge in Society. in *idem (1948), Individualism and Economic Order*, London, Routledge and Kegan Paul, 77-91.
- HAYEK, F. A. V. 1973a. *Economic freedom and representative government*, London, Published for the Wincott Foundation by the Institute of Economic Affairs.
- HAYEK, F. A. V. 1973b. *Rules and order*, Chicago, University of Chicago Press.
- HJALMARSSON, L. 1996. From club-regulation to market competition in the Scandinavian electricity supply industry. In: RJ, G. & EP, K. (eds.) *International comparisons of electricity regulation*. New York: Cambridge University Press.
- HOHFELD, W. N. 1913. Some Fundamental Legal Concepts as Applied in the Study of Primitive Law. *Yale Law Journal* 23, 16-59.
- HOLBURN, G. L. F. 2001. Political Risk, Political Capabilities and International Investment Strategy: Evidence from the Power Generation Industry, mimeo.
- HOLBURN, G. L. F. & SPILLER, P. T. 2002. Institutional or Structural: Lessons from International Electricity Sector Reforms, The Economics of Contracts: Theories and Applications, editors Eric Brousseau and Jean-Michel Glachant, Cambridge University Press.
- HOLMSTRÖM, B. 1979. Moral Hazard and Observability. *Bell Journal of Economics*, 10, 74-91.
- HOOKER-CLARKE, A. 2005. Understanding sustainable development in the context of other emergent environmental perspectives. *Policy Sciences*, 35, 69-90.
- HUNTINGTON, S. P. 1996. *The Clash of Civilizations and the Remaking of World Order*. NY: Simon and Schuster.
- HUSSAIN, S. T., KHAN, U., MALIK, K. Z. & FAHEEM, A. 2010. Constraints Faced by Industry in Punjab, Pakistan. *Development Policy Research Center, Lahore University of Management Sciences*.
- IEA 1999. Electricity Market Reform. *An IEA Handbook. OECD/IEA, Paris. 106 pp.*
- IEA 2011. World Energy Outlook 2011. *International Energy Agency. OECD Publication, Paris.*
- IPP 2009. State of the Economy: Emerging from the Crises In: BEACONHOUSE NATIONAL UNIVERSITY, L. (ed.).
- IPP 2010. State of the Economy: Pulling Back From the Abyss. *ThirdAnnualReport,Beaconhouse National University, Lahore.*
- JAMASB, T. 2002. Reform and regulation of the electricity sectors in developing countries. *DAE Working Paper WP 0226, CMI Working Paper 08, University of Cambridge.*
- JAMASB, T. 2006. Between the state and market: Electricity sector reform in developing countries. *Utilities Policy*, 14, 14-30.
- JAMASB, T., MOTA, R., NEWBERY, D. & POLLITT, M. 2004. Electricity Sector Reform in Developing Countries: A Survey of Empirical Evidence on Determinants and Performance. Cambridge Working Papers in Economics, CWPE 0439. Department of Applied Economics. Cambridge.
- JAMASB, T. & POLLITT, M. 2005. Electricity market reform in the European Union: review of progress toward liberalization and integration. *The Energy Journal*, 26, 11-41.

- JOSKOW, P. Regulatory priorities for infrastructure sector reform in developing countries. Annual World Bank Conference on Development Economics, 1998. 192.
- JOSKOW, P. L. 1996. Introducing Competition into Regulated Network Industries: from Hierarchies to Markets in Electricity. *Industrial and Corporate Change*, 5, 341-382.
- JOSKOW, P. L. 2001. California's Electricity Crises. *Cambridge: National bearu of Economic Research*, 126.
- JOSKOW, P. L. 2004. New Institutional Economics: A Report Card. *Presidential Address to the annual conference of International Society of New Institutional Economics, Budapest, Hungary, September 2003*.
- JOSKOW, P. L. 2006. Introduction to electricity sector liberalization: lessons learned from cross-country studies. *Electricity market reform: an international perspective*, 1, 1-32.
- JOSKOW, P. L. 2008, pp6. Introduction to New Institutional Economics: A report card. In: BROUSSEAU, E. & GLACHANT, J.-M. (eds.) *New Institutional Economics: A Guidebook*. Cambridge, the UK: Cambridge University Press.
- KESSIDES, I. N. 2013. Chaos in power: Pakistan's electricity crisis. *Energy Policy*, 55, 271-285.
- KINGSTON, C. & CABALLERO, G. 2009. Comparing theories of institutional change. *Journal of Institutional Economics*, 5, 151-180.
- KIRKPATRICK, C., PARKER, D. & ZHANG, Y.-F. 2004. FOREIGN DIRECT INVESTMENT IN INFRASTRUCTURE IN DEVELOPING COUNTRIES: DOES REGULATION MAKE A DIFFERENCE? Presented at the Asian Development Bank Institute (ADBI) Annual Conference on 'Infrastructure and Development: Poverty, Regulation and Private Sector Development', Tokyo, 6th December 2004.
- KLEIN, B., CRAWFORD, R. G. & ALCHIAN, A. A. 1978. Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *Journal of Law & Economics*, 21, 297-326.
- KLEIN, P. G. 2000. New institutional economics. *Encyclopedia of law and economics*, 1, 456-489.
- KNIGHT, J. 1992. Institutions and Social Conflict. New York: Cambridge University Press
- KNIGHT, J. 1995. Models, Interpretations and Theories: Constructing Explanations of Institutional Emergence and Change" in J. Knight and I. Sened (eds), *Explaining Social Institutions*, Ann Arbor, MI: University of Michigan press, pp. 95-120.
- KOPSAKANGAS-SAVOLAINEN, M. & SVENTO, R. 2012. Liberalization, Deregulation, and Restructuring of the Electricity Markets. In: TECHNOLOGY, G. E. A. (ed.) *Modern Energy Markets*. London: Springer-Verlag.
- KÜNNKE, R. W., CORRELIÉ, A. & GROENEWEGEN, J. 2005. *Institutional reform, regulation and privatization : process and outcomes in infrastructure industries*, Cheltenham, UK ; Northampton, MA, Edward Elgar.
- LEVI, M. 1990. A logic of institutional change, in K. Schweers and M. Levi (eds), *The Limits of Rationality*, Chicago: University of Chicago Press.
- LEVY, B. & SPILLER, P. T. 1994. The Institutional Foundations of Regulatory Commitment - a Comparative-Analysis of Telecommunications Regulations. *Journal of Law Economics & Organization*, 10, 201-246.
- LEWIS, D. K. 1969. *Convention: a Philosophical Study*. Cambridge, Harvard Univeristy Press.
- LIBECAP, G. D. 1989. Distributional Issues in Contracting for Property-Rights. *Journal of Institutional and Theoretical Economics-Zeitschrift Fur Die Gesamte Staatswissenschaft*, 145, 6-24.
- LITTLECHILD, S. 2005. *RE: Beyond Regulation, IEA/LBS Beesley Lectures on Regulation Series XV, Oct. 4, 2005, Revised version Oct. 12, 2005*.
- LITTLECHILD, S. 2006. Foreword: the market versus regulation. In: Sishansi, F.P., Pfaffenberger, W. (Eds.), *Electricity Market Reform: An International Perspective*. Elsevier Limited, Oxford.
- LORA, E. & PANIZZA, U. 2002. Structural reforms in Latin America under scrutiny. Working Paper, Inter-American Development Bank, Research Department.
- MACNEIL, I. R. 1978. Contracts: Adjustments of Long-Term Economic Relations under Classical, Neoclassical, and Relational Contract Law. *Northwestern University Law Review*, 72, 854-906.

- MALIK, A. 2012. Power Crisis in Pakistan: A Crisis in Governance? *PIDE Monograph Series, Pakistan Institute of Development Economics, Islamabad.*
- MALIK, A., MAHMOOD, M. A. & AHMED, A. 2009. Power Sector Reforms in Pakistan: A Critical Review. *Middle East Business and Economic Review*, 21, 1.
- MCKEOWN, B. F. & THOMAS, D. B. 1988. Q methodology (Quantitative applications in the social sciences series, vol. 66). Thousand Oaks, CA: Sage.
- MOF 2012. Economic Survey of Pakistan, Ministry of Finance, Government of Pakistan.
- MOF 2013. Economic Survey of Pakistan, Ministry of Finance, Government of Pakistan.
- MOTA, R. L. 2003. The Restructuring and Privatisation of Electricity Distribution and Supply Business in Brazil: A Social Cost-Benefit Analysis, CMI Working Paper 16. *Department of Economics, University of Cambridge.*
- MUNIR, K. A. & KHALID, S. 2012. Pakistan's Power Crisis: How Did We Get Here? *The Lahore Journal of Economics*, 17, 73-82.
- NAGAYAMA, H. 2007. Effects of regulatory reforms in the electricity supply industry on electricity prices in developing countries. *Energy Policy*, 35, 3440–3462.
- NAGAYAMA, H. 2009. Electric power sector reform liberalization models and electric power prices in developing countries: an empirical analysis using international panel data. *Energy Economics*, 31, 463–472.
- NEE, V. 1998. Sources of the New Institutionalism, in *The New Institutionalism in Sociology*. Mary Brinton and Victor Nee, eds. NY: Russell Sage, pp. 1-16.
- NEPAL, R. & JAMASB, T. 2012. Reforming small electricity systems under political instability: The case of Nepal. *Energy Policy*, 40, 242-251.
- NEPRA 2010. State of industry. *Report 2010, National Electric and Power Regulatory Authority, Government of Pakistan.*
- NEPRA 2012. State of Industry Report. *National Electric Power and Regulatory Authority, Government of Pakistan.*
- NEWBERY, D. 2002. Issues and options for restructuring electricity supply industries. *DAE Working Paper WP 0210, CMI Working Paper 01, University of Cambridge.*
- NEWBERY, D. M. & POLLITT, M. G. 1997. The restructuring and privatisation of Britain's CEGB—was it worth it? *The Journal of Industrial Economics*, 45, 269-303.
- NORTH, D. 1986. The New Institutional Economics *Journal of Institutional and Theoretical Economics*, 142, 230-37.
- NORTH, D. 1990a. Institutions, Institutional Change, and Economic Performance, New York: Cambridge University Press.
- NORTH, D. 1994a. Economic performance through time *American Economic Review, People's Bank, Colombo*, p 7, 84, 359-368.
- NORTH, D. C. 1979. A framework for analyzing the state in economic history. *Explorations in Economic History*, 16, 249-259.
- NORTH, D. C. 1990b. THE NEW INSTITUTIONAL ECONOMICS AND DEVELOPMENT. *Washington University, St. Louis.*
- NORTH, D. C. 1994b. Economic Performance Through Time. *The American Economic Review*, 84, 359-368.
- NORTH, D. C. 1994c. Institutional change: a framework of analysis. *Economic History*, 9412001.
- NORTH, D. C. & THOMAS, R. P. 1970. An Economic Theory of the Growth of the Western World. *The Economic History Review*, 23, 1-17.
- NTDC 2012. Power System Statistics, Planning Power, NTDC, Islamabad.
- OAKERSON, R. J. & PARKS, R. B. 1988. Citizen Voice and Public Entrepreneurship: The Organizational Dynamic of a Complex Metropolitan County. *Publius*, 18, 91-112.
- OCKWELL, D. 2008. Opening up' policy to reflexive appraisal: a role for Q methodology? A case study of fire management in Cape York, Australia. *Policy Sciences*, 41, 263-292.
- OLLILA, P. 2009. Principles of Institutional Economics. *Marketing, Working Papers.*

- OLSON, M. 1996. Distinguished lecture on economics in government - Big bills left on the sidewalk: Why some nations are rich, and others poor. *Journal of Economic Perspectives*, 10, 3-24.
- OSTROM, E. 1990, 51. Governing the Commons: The Evolution of Institutions for Collective Action. New York: Cambridge University Press.
- OSTROM, E. 1986. An Agenda for the Study of Institutions. *Public Choice*, 48, 3-25.
- OSTROM, V. 1987. The Political Theory of a Compound Republic: Designing the American Experiment. 2d rev. ed. San Francisco: Institute for Contemporary Studies Press.
- OSTROM, V. 1991. The Meaning of American Federalism: Constituting a Self-Governing Society. San Francisco: Institute for Contemporary Studies Press.
- OSTROM, V. 1980. Artisanship and Artifact *Public Administration Review* 40, 309-17.
- PAREDES, M. 2001. Redistributive impact of privatization and the regulation of utilities in Chile. WIDER Discussion Papers//World Institute for Development Economics (UNU-WIDER).
- PC 2007. vision 2030. In: PLANNING COMMISSION OF PAKISTAN, G. O. P. (ed.). Islamabad: Planning Commission.
- PC 2010. Energy Deficit of Pakistan. *Planning Commission, Government of Pakistan, Government of Pakistan*.
- PC/USAID 2013. The Causes and Impacts of Power Sector Circular Debt in Pakistan. *Report jointly prepared by Planning Commission of Pakistan and United States Agency for International Development, Islamabad*.
- PIERSON, P. 1995. Dismantling the Welfare State *Cambridge University Press*.
- PIERSON, P. 2000. Increasing returns, path dependence, and the study of politics. *American political science review*, 251-267.
- PLOTT, C. R. 1986. Rational Choice in Experimental Markets *Journal of Business*, 59, 301-27.
- POLLITT, M. 2004a. Electricity Reform in Argentina: Lessons for Developing Countries. *Cambridge Working Papers in Economics* Cambridge, United Kingdom: Cambridge University.
- POLLITT, M. 2004b. Electricity Reform in Chile: Lessons for Developing Countries. . *Cambridge Working Papers in Economics*. Cambridge, United Kingdom: Cambridge University.
- POLLITT, M. 2009. Evaluating the evidence on electricity reform: Lessons for South East Europe (SEE) market. *Utilities Policy*, 17, 13-23.
- PPIB 2008. Pakistan's Thar Coal power generation potential. *Private Power and Infrastructure Board, Government of Pakistan*.
- PRICE, C. W. & PHAM, K. 2009. The impact of electricity market reform on consumers. *Utilities Policy*, 17, 43-48.
- PUTNAM, R. D., LEONARDI, R. & NANETTI, R. Y. 1993. Making Democracy Work: Civic Traditions in Modern Italy. Princeton: Princeton U. Press.
- ROSENBERG, N. & BIRDZELL, L. E. 1986. How the West Grew Rich: The Transformation of the Industrial World. NY: Basic Books.
- RUFFIN, C. 2003. The Political Economy of Institutional Change in the Electricity Supply Industry: Shifting Currents. *Edward Elgar, Cheltenham*.
- SALEEM, M. 2007a. Benchmarking and Regulation for the Electricity Distribution Sector in Pakistan Lessons for Developing Countries. *South Asia Economic Journal*, 8, 117-138.
- SALEEM, M. 2007b. Technical Efficiency in Electricity Generation Sector of Pakistan -The impact of Private and Public Ownership. *Australian National University, Canberra*.
- SBP 2012. The state of Pakistan's economy, Annual Report *State Bank of Pakistan*.
- SEN, A. & JAMASB, T. 2012. Diversity in unity: an empirical analysis of electricity deregulation in Indian states. *The Energy Journal*, 33.
- SHEPSLE, K. A. 1979. Institutional Arrangements and Equilibrium in Multidimensional Voting Models *American Journal of Political Science*, 23, 27-59.
- SHEPSLE, K. A. 1989. Studying Institutions: Some Lessons from the Rational Choice Approach. *Journal of Theoretical Politics*, 1, 131-47.

- SHEPSLE, K. A. 1975. Congressional Committee Assignments: An Optimization Model with Institutional Constraints. *Public Choice*, 22, 55-78.
- SHEPSLE, K. A. & WEINGAST, B. R. 1987. The Institutional Foundations of Committee Power *American Political Science Review*, 81, 85-104.
- SIMON, H. A. 1947. *Administrative Behavior*, 2nd Ed, New York, Macmillan.
- SINGH, V. 2008. The Pearson Indian History Manual for the UPSC Civil Services Preliminary Examination. Dorling Kindesley, licensees of Pearson Education India. pp. 3-4, 15, 88-90, 152, 162. ISBN 81-317-1753-4.
- SINISCALCO, D., BORTOLTOTTI, B. & FANTINI, M. 2001. The Anticompetitive Impact of Regulation: The Case of Electricity. *Edward Elgar, Cheltenham*.
- SIOSSHANSI, F. P. 2006. Electricity market reform: What has the experience taught us thus far? *Utilities Policy*, 14, 63-75.
- SMELSER, N. & SWEDBERG, R. 1994. Introduction, *The Handbook of Economic Sociology*. Princeton: Princeton U. Pres.
- SPILLER, P. & TOMMASI, M. 2008. The Institutions of Regulation: An Application to Public Utilities. In: MÉNARD, C. & SHIRLEY, M. (eds.) *Handbook of New Institutional Economics*. Springer Berlin Heidelberg.
- SPILLER, P. T. 2011. Transaction cost regulation. *NBER working paper series working paper 16735*. Cambridge, MA: National Bureau of Economic Research,.
- STEINER, F. 2001. Regulation, industry structure and performance in the electricity supply industry. *OECD Economics Studies*. OECD.
- STEPHENSON, W. 1953. The study of behavior; Q-technique and its methodology.
- TAKSHE, A. A., HUBY, M., FRANTZI, S. & LOVETT, J. C. 2009. Dealing with pollution from conflict: Analysis of discourses around the 2006 Lebanon oil spill. *Journal of Environmental Management*, 1-10.
- THAKUR, T., DESHMUKH, S. & KAUSHIK, S. 2006. Efficiency evaluation of the state owned electric utilities in India. *Energy Policy*, 34, 2788-2804.
- THOMAS, S. 2004. Evaluating the British Model of Electricity Deregulation. *Annals of Public & Cooperative Economics*, 75, 367-398.
- THOMAS, S. 2006. Recent evidence on the impact of electricity liberalisation on consumer prices. Public Services International Research Unit (PSIRU).
- TORENO & PASCO-FONT 2003. Utilities Privatization and the Regulation in Peru. *Edward Elgar, Cheltenham*.
- TRIMBLE, C., YOSHIDA, N. & SAQIB, M. 2011. Rethinking Electricity Tariffs and Subsidies in Pakistan. *World Bank Report Number: 62971-PK*.
- ULLMANN-MARGALIT & EDNA 1977. The Emergence of norms. *Oxford, Clarendon*.
- USAID 2010. United States Agency for International Development). Pakistan Power Sector: A Profile & Opportunities.
- VAN EXEL, J. & DE GRAAF, G. 2005. Q methodology: A sneak preview. *Online document*. <http://www.qmethodology.net/PDF/Q-methodology>.
- VEBLEN, T. 1899. *The theory of the leisure class; an economic study in the evolution of institutions*, New York, London, The Macmillan company; Macmillan & co., Ltd.
- WAI, U. T. & WONG, C. H. 1982. Determinants of private investment in developing countries. *The Journal of Development Studies*, 19, 19-36.
- WATTS, S. & STENNER, P. 2005. Doing Q methodology: theory, method and interpretation. *Qualitative Research in Psychology*, 2, 67-91.
- WILLIAMS, J. H. & GHANADAN, R. 2006. Electricity reform in developing and transition countries: A reappraisal. *Energy*, 31, 815-844.
- WILLIAMSON, O. 2000. The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature*, 38, 595-613.

- WILLIAMSON, O. E. 1971. The Vertical Integration of Production: Market Failure Considerations. *American Economic Review*, 61, 112-123.
- WILLIAMSON, O. E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*, New York, NY, Free Press.
- WILLIAMSON, O. E. 1981. The Economics of Organization: The Transaction Cost Approach. *American Journal of Sociology*, 87, 548-577.
- WILLIAMSON, O. E. 1985. *The Economic Institutions of Capitalism*, New York, NY, Free Press.
- WILLIAMSON, O. E. 1991. Comparative Economic Organization: The Analysis of Discrete Structural Alternatives. *Administrative Science Quarterly*, 36, 269-296.
- WILLIAMSON, O. E. 1998. Transaction cost economics: How it works; Where it is headed. *Economist*, 146, 23-58.
- WOLAK, F. 1997. Market Design and Price Behavior in Restructured Electricity Market: An International Comparison, . Working Paper No. PW-051, Program on Workable Energy Regulation (POWER), University of California Energy Institute, Berkley.
- WORLDBANK 1994. Staff Appraisal Report, Pakistan Power Sector Development Project, Report No. 11286-PAK.
- WORLDBANK 1997. World Development Report 1997: The State in a Changing World. Washington, US: World Bank.
- WORLDBANK 2003. What International Investors Look For When Investing In Developing Countries. *World Bank Paper no.6, The International Bank for Reconstruction and Development/The World Bank*.
- WORLDBANK 2009. PAKISTAN'S INVESTMENT CLIMATE: LAYING THE FOUNDATION FOR RENEWED GROWTH. *World Bank Report No. 46435-PK*.
- WORLDBANK 2013. Chaos in power: Pakistan's electricity crisis. *Energy Policy*, 55, 271-285.
- WORLDBANK 2002. World Development Report 2002: Building Institutions for Markets. Washington, US: World Bank.
- WORLDBANK. 1993. The World Bank's role in the electric power sector: policies for effective institutional, regulatory, and financial reform, Washington, DC.
- ZAIDI, S. S. 2012. Pakistan's Economic Outlook: June 2013 and Beyond, The Institute of Chartered Accountants of Pakistan (ICAP), Karachi.
- ZELNER, B. A. & HEINSZ, W. J. 2000. Political Institutions, Interest Group Competition and Infrastructure Investment in the Electric Utility Industry: A Cross National Study. A Working Paper No. WP No. 00-03, Reginald H. Jones Center, The Wharton School, University of Pennsylvania
- ZHANG, Y.-F., PARKER, D. & KIRKPATRICK, C. 2008. ELECTRICITY SECTOR REFORM IN DEVELOPING COUNTRIES: AN ECONOMETRIC ASSESSMENT OF THE EFFECTS OF PRIVATISATION, COMPETITION AND REGULATION. *Journal of Regulatory Economics*, 33, 159-178.

Summary

Pakistan's electricity sector is underperforming. It is inadequate, inefficient and unreliable. There is capacity shortage, high transmission and distribution (T&D) losses, inefficient pricing structures, costly and ineffective subsidies, circular debts and an inefficient resource mix in generation. These problems already existed before the 1990s, the period that Pakistan reformed its power sector with the intention to solve these problems. But the problems weren't solved by the institutional reforms. Therefore, we assume in this dissertation that the continuation of the poor functioning of Pakistan's power sector is caused by poor and incomplete design of the institutional reform of the power sector and by the pace of implementation of the reforms. Pakistan adopted the UK model of institutional reform but only implemented initial reform steps such as allowing IPPs to enter generation and the unbundling of production and distribution of electricity. Other reform aspects such as corporatization, independent regulation, privatization of electric utilities and competition at retail and wholesale supply remained negligible in Pakistan; thus, part of the problem of poor performance lies in insufficient reforms. So, this dissertation answers the following overarching question.

Did the institutional reforms improve the organization, functioning and performance of the power sector of Pakistan and if not, what are the reasons according to NIE?

To answer the above question, this dissertation analyzes reforms in the power sector of Pakistan from an institutional perspective. Our analysis starts by analyzing the reforms experiences of the developed and developing countries. This extends to the analysis of the reform experience of Pakistan and the problems that persisted after reforms in the power sector. Then we evaluate the reforms quantitatively to validate that reforms did little to disconnect the pre-reform problems such as lack of private investments, transmission and distribution losses, expansive fuel mix in electricity generation, prices and capacity utilization as we argued previously. Then we focus in more detail on an important problem i.e. lack of private investments to reveal why they did not continue on a sustainable basis. The finally, we focus on why reforms did not succeed in bringing the required changes to Pakistan's power sector.

The dissertation utilizes a mixture of quantitative and qualitative methods to answer the overarching and its connected research questions. The reason to use mixed methods has been

the lack of sufficient and reliable data for the power sector of Pakistan and also reliable analytical techniques for electricity reform analysis at a single country level with insufficient data. The empirical analysis is based on two sets of data. With the help of secondary data we have answered the questions 1, 2, and 3. Questions 4 and 5 have been answered with data collected for this research. The primary data have been collected in two phases. In first phase, a survey was conducted for collecting relevant information from private power investors located in Pakistan to answer question 4. In a second phase, interviews were conducted with power sector stakeholders to answer question 5 and to allow us to apply Q methodology. In a first step, preliminary interviews were conducted with relevant stakeholders to collect notions on impediments to institutional reforms in the power sector of Pakistan. In a second step, a sample of selected notions was presented to the participants for ranking on a Likert scale ranging -4 to +4 during interviews. This process is known as Q sorting. These Q sorts were later utilized to trace and analyze specific discourses in the power sector reforms.

New Institutional Economics guides the empirical analyses throughout the dissertation. This study develops and applies an institutional framework to analyze and understand institutional reforms in the power sector of a single country, Pakistan. Literature review (both theoretical and empirical) on institutional reforms in the power sector reveals that designing and implementing electricity reforms in a specific country is determined by country and sector specific dynamics. This type of literature is influenced by NIE, which stresses the importance of country specific characteristics for explaining variation in type and outcome of institutional reforms among developed and developing countries. That literature also shows that developing countries tend to follow an incremental design or a particular sequence in power sector reforms. The rationale behind such a reform approach is to match the context gradually with the new institutional frame, because country specific informal institutions and other aspects of a developing country may change slower compared to developed countries. Therefore, many experts argue that adopting a standard institutional reform template from developed countries in a developing country is inadequate due to the specific contextual differences.

Our analytical framework has been built along two different lines: a structurally oriented line based on the work of Oliver Williamson and a process oriented line based on the work of Douglass North. We have combined both perspectives in our analytical framework. This has allowed us to analyze and evaluate the state of reforms and to provide for an explanation of a failure of reforms. Based on Williamson we have argued that power sector reform should

follow a certain institutional logic and a certain institutional ordering between the layers of the institutional organization of a country. If this logic is not followed then a country runs the risk of power sector reform failure. Based on North we have argued that the entrepreneurs in the power sector institutions as well as in the institutions of associated sectors and the governmental bureaucracy, position themselves vis-à-vis the reforms on the basis of their interests. If the reforms affect their interests, entrepreneurs try to influence the reforms according to their own interests.

The first component (Chapter 5 and 6) of our research Chapters (5, 6, 7, 8, and 9) investigates the existing problems in the organization, functioning and performance of electricity supply in Pakistan and their relation with the institutional reforms. Initially, we have analyzed the organization, functioning and performance of electricity supply in Pakistan in Chapter 5. We have sketched the institutional outlook of electricity supply before the reforms and analyzed how the reforms changed the institutional organization and performance of the electricity sector. Before reforms, the electricity sector in Pakistan was organized as two vertically integrated public utilities. Both utilities were characterized of lower installed capacity, inefficient generation, high transmission and distribution losses, inefficient pricing mechanism and reduced adoption of innovative technologies. These characteristics of the pre-reform utilities augmented their incapacity to coordinate electricity supply with the demand and thus intensified the hours of blackouts throughout the country. Even the public sector became unable to bear the financial burden of these utilities. So, these pre-reform circumstances necessitated institutional reforms from a public sector monopoly to a market based mechanism in order to improve the performance of the sector by reorganizing its structure.

As a result of reforms, organization of the power sector has changed to some extent according to the plan but the ideology of public monopolies is still intact. Some aspects of the reforms' template relating to the structure of the sector including unbundling, formation of a separate regulatory agency and some privatization (greenfield and divestiture) have been implemented. But the aspects intended to improve the efficiency of the sector such as corporatization; an efficient electricity law; ensuring independence of the regulatory agency and competition at wholesale and retail have remained almost neglected. This strategy of pick and choose for reorganization has failed to disconnect the power sector of Pakistan from its pre-reform problems.

In Chapter 6, we have analyzed the poor functioning of the reforms with the help of the analytical framework. We argued that prevalence of the problems has been caused by the poor implementation of reforms. Reforms have not been implemented in a proper sequence and with full vigor. Electricity law in congruence to the institutional endowments of the country and formation of an independent regulatory agency were important steps. These steps were taken but did not involve the right sequence and true spirit. An independent regulatory agency was established but this agency was not established in the right sequence and was not able to operate independently due to the interference of bureaucratic and political institutions.

Thus, poor design and weak implementation of reforms have caused the persistence of pre-reform situation of the power sector. Reforms' entrepreneurs, by influencing the design and implementation process, have resisted any change that could endanger their interests. Consequently they have contributed to the continuation of power sector's previous path of inefficiency, inadequacy and unreliability.

In the next step (Chapter 7), we have quantitatively evaluated the performance indicators which we discussed in Chapter 6. We have analyzed the impact of power sector reforms on the performance of the electricity sector in terms of installed generation capacity, electricity production, capacity utilization, transmission and distribution losses, percent thermal generation and electricity prices for the industrial and domestic segments. We have observed the trend of performance indicators before and after reforms with 1994 as the reference year for reform. For this trend analysis, we have used time series data during 1971-2010. Chapter 7 has found that all the performance indicators have performed poorly after the reforms except private investment. Private investments in the form of electricity installed capacity per capita and percent thermal generation have increased significantly following the reforms year 1994. These gains in private investments have only sustained for the period of 4-5 years. This has validated our findings from Chapters 5 and 6, which argued that IPPs' entry as a part of reforms has contributed to increase private investments in generation capacity for initial years. However this surge in private investments has not sustained due to poor functioning of the institutional framework of the power sector. This required unearthing the reasons behind unsustainable behavior of private investments which we have investigated in the next research chapter.

The fourth research chapter (8) has looked into whether power sector reforms affect private investments in electricity production capacity in Pakistan and if they did then how. The data on private investments in the power sector showed that the inflow of private investments in the power sector of Pakistan decreased just after four years of initiating power sector reforms. We have analyzed the causes why private investments decreased after four years and what discouraged private investors from investing in the power sector of Pakistan.

The answer to the question has revolved around institutional aspects that, according to the investors, have been restricting their decisions on private investments in the power sector. Investors perceived that the institutional environment in Pakistan in general and the power sector in particular has been restricting their decisions on investments in the sector. Among the institutional environment, the institutions of property rights and contracts enforcement have been major concern to the investors. The independent regulator was expected to protect the interests of the private investors. However enhanced involvement of the polity and bureaucracy has limited the independence of the regulator. Alongside making new investments, these institutional aspects have also impacted their decisions on location and technology. This has also clarified why the investments concentrated on thermal based power plants. Investors wanted to prevent for huge sunk costs.

So, in the perception of private investors, the reforms did not provide for a trustworthy investment climate by making the necessary changes in the institutional environment of Pakistan. This has threatened the private investors to continue investing in an investment climate where their investments could face expropriation risks from the interest groups and there would be no independent regulator to restrain the opportunistic behavior. Based on the findings of the chapter we can conclude that the reforms have not resulted in sustainable private investments in the electricity generation capacity of Pakistan.

Research questions one to four have focused on the role of institutional reforms in improving the performance of power sector, which have indicated that institutional reforms have really stayed behind in reducing pre-reform problems and improving the performance of the power sector. This has increased the need for exploring the barriers to institutional reforms so as to reduce those problems that might eventually push the institutional reforms ahead in tackling the problems of the power sector. In the last research chapter (9), we have investigated what impeded institutional reforms in the power sector of Pakistan from

being fully operational to bring the required change as expected. We have utilized experts' opinions to answer that research question. The perceptions of the stakeholders confirm our findings in the previous chapters on the causes of the failures in power sector reform in Pakistan.

First barrier has been the existence of a weak governance structure (third layer of our analytical framework) in the power sector of Pakistan. Due to weak governance structure, there has been lack of important information among different segments of the power sector that has created coordination problems thus causing higher transaction costs among the key players. This situation has created hurdles for implementing institutional reforms in the power sector.

Second barrier has been the mismatch of the package of institutional reforms with the sector's starting conditions or the institutional endowments of the power sector (comprised our second and first layer of the framework). This barrier has stated that starting conditions of power sector in Pakistan such as conflicts over resources' distribution, culture of electricity theft and non-payment of utility bills, burden of over-employments on utilities and weak financial positions of public sector companies required fixation before starting the key reforms' steps.

Third barrier has been the existence of a weak regulatory authority which was heavily influenced by political elites in all its key decision making processes such as tariff determination, licensing, handling of complaints made by consumers, producers and distributors.

Fourth barrier has revolved around the political contexts that have indicated heavy involvement of politicians in power sector. Ideology of the politicians and their commitment to reform has been important in this respect. A government with an ideology to increase private sector participation in power sector and a strong commitment to advance reforms' package might have significant impact on the progress of power sector reforms. Usage of power sector for political interests has also been viewed a barrier to power sector reforms in Pakistan.

Finally, research Chapter 9 argued that adopting a reform package from successful countries was not sufficient without giving due importance to the country specific economic, political and institutional endowments as well as sector specific endowments as

explored in this study through Q Methodology. The barriers identified should carry high importance while re-designing and implementing a package of institutional reforms in the power sector of Pakistan.

Samenvatting

De Pakistaanse elektriciteitssector functioneert slecht. De elektriciteitslevering is inefficiënt en onbetrouwbaar, er is een tekort aan capaciteit en de transportverliezen op het hoog- en middenspanningsnet zijn groot. Daarnaast zijn de prijzen inefficiënt en wordt gewerkt met dure en inefficiënte subsidies. Ook wordt de Pakistaanse elektriciteitsvoorziening geplaagd door circulaire schulden en inefficiënt gebruik van energiebronnen bij de productie van elektriciteit. De problemen dateren van voor 1990, het jaar waarin Pakistan begon met de hervorming van de elektriciteitssector met de bedoeling de genoemde problemen te verminderen en op te lossen. Maar de tot dusverre doorgevoerde institutionele hervormingen hebben de problemen niet opgelost. In dit proefschrift nemen we daarom als uitgangspunt dat de aanhoudende problemen in de Pakistaanse elektriciteitssector worden veroorzaakt door een gebrekkige vormgeving en uitvoering van de institutionele hervormingen en het tempo waarmee deze zijn uitgevoerd. Pakistan nam het Engelse reform model als uitgangspunt, maar voerde slechts enkele van de hervormingen daadwerkelijk in. Naast het toestaan van elektriciteitsproductie door privé bedrijven en de scheiding tussen productie en distributie, werden andere verregaande hervormingsmaatregelen als scheiding van verticaal geïntegreerde organisaties, een onafhankelijke toezichthouder, privatisering en competitie in het consumentensegment, niet of slechts heel beperkt ingevoerd. Tegen deze achtergrond hebben we de volgende onderzoeksvraag geformuleerd:

Hebben institutionele hervormingen de organisatie, het functioneren en de prestaties van de Pakistaanse elektriciteitssector verbeterd en zo niet, wat zijn daarvan volgens de Nieuwe Institutionele Economie (NIE) de oorzaken?

In het proefschrift hebben we deze vraag beantwoord door middel van een uitgebreide en gevarieerde analyse van de institutionele hervormingen van de elektriciteitssector in Pakistan. We zijn begonnen met een analyse van de hervormingen in de context van de hervormingsproblematiek in ontwikkelingslanden. Daarna hebben we een inventarisatie en analyse gemaakt van de omvang en reikwijdte van de Pakistaanse elektriciteitsproblemen. Vervolgens hebben we meer in detail de problematiek rondom private investeringen onderzocht om te achterhalen waarom deze investeringen zich niet hebben gecontinueerd. Tenslotte hebben we geanalyseerd waarom de institutionele hervormingen niet de gewenste veranderingen in de elektriciteitsvoorziening hebben gebracht.

In ons onderzoek hebben we, daartoe gedwongen door de beschikbaarheid van data en de focus op één land, een combinatie van onderzoeksmethoden toegepast. Daarvoor hebben we gebruik gemaakt van primaire en secundaire data. De primaire data hebben we zelf verzameld door middel van survey en interviews. Op basis van deze data hebben we door middel van de zogenaamde Q-methodologie onderzoeksvragen 4 en 5 beantwoord.

Het theoretische perspectief ontwikkeld en toegepast in dit proefschrift is ontleend aan NIE. Ons analytische perspectief hebben we ontwikkeld tegen de achtergrond van de kennis over institutionele hervormingen in de elektriciteitsvoorziening in de verschillende delen van de

wereld. Uit deze analyse bleek dat de effectiviteit van institutionele hervormingen in de elektriciteitsvoorziening mede wordt bepaald door specifieke landkenmerken, waarbij ontwikkelingslanden doorgaans een meer incrementele route in het hervormingsproces volgen. Theoretisch baseren we ons analytische perspectief op het werk van Oliver Williamson en van Douglass North. Williamson geeft een meer structureel perspectief op institutionele hervormingen en North een meer dynamisch, proces georiënteerd, perspectief. Aan Williamson hebben we de gedachte ontleend dat institutionele hervormingen in de elektriciteitsvoorziening een specifieke institutionele logica en ordening tussen de vier institutionele lagen van een land moeten volgen om effectief te kunnen zijn. Aan North hebben we het idee ontleend dat de entrepreneurs in de elektriciteitssector en aanverwante organisaties, hervormingen vooral benaderen vanuit hun eigen belangenposities. Als hervormingen de bestaande belangen van de entrepreneurs aantasten, zullen ze de aard en inhoud van de hervormingen willen beïnvloeden in overeenstemming met hun belangen.

In hoofdstuk 5, het eerste empirische hoofdstuk, beschrijven we de Pakistaanse elektriciteitssector van vóór de hervormingen en de wijze waarom deze door de hervormingen veranderde. Pakistan had twee verticaal geïntegreerde publieke nutsbedrijven voor de hervormingen van 1990. Beide bedrijven waren niet in staat om een adequate elektriciteitsvoorziening te garanderen met gevolg dat Pakistan voortdurend kampte met onderbreking en uitval van elektriciteit, terwijl de hoge publieke financiële lasten nauwelijks konden worden gedragen. Deze omstandigheden waren de directe aanleiding om hervormingen door te voeren naar een meer markt gereguleerde elektriciteitsvoorziening. Echter de hervormingen werden gefragmenteerd doorgevoerd. Zo werden de verticaal geïntegreerde bedrijven formeel ontmanteld en werden productie en transmissie activiteiten gescheiden. Ook werd participatie van privé kapitaal in de productie toegestaan. Andere onderdelen van de institutionele hervormingen, zoals een nieuwe elektriciteitswet en een onafhankelijke toezichthouder, werden maar beperkt uitgevoerd. De institutionele hervormingen brachten daardoor niet de gewenste verbeteringen in de elektriciteitsvoorziening.

In hoofdstuk 6 hebben we de hervormingen geanalyseerd met behulp van ons op het NIE gebaseerde analytische perspectief. De analyse heeft laten zien dat de hervormingen niet in de gewenste volgorde en tempo volgde. Er werd weliswaar een nieuwe elektriciteitswet ingevoerd, maar deze wet sloot minder goed aan bij de institutionele context van Pakistan. Hetzelfde kan worden gezegd van de invoering van de toezichthouder die in de praktijk niet in staat werd gesteld om werkelijk onafhankelijk toezicht te houden. Ook bleken de entrepreneurs in de sector organisaties en de overheidsbureaucratie, de hervormingen te dwarsbomen omdat deze hun belangen aantastte.

In hoofdstuk 7 hebben we het effect van de hervormingen op de prestatie van de elektriciteitssector kwantitatief met behulp van een aantal indicatoren onderzocht: geïnstalleerde productiecapaciteit, elektriciteitsproductie, capaciteitsbenutting, transport en distributieverliezen, aandeel thermisch in elektriciteitsproductie en de elektriciteitsprijzen voor industriële en huishoudelijke consumenten. Onze trendanalyse met behulp van serie data over de periode 1971-2010, laat zien dat met uitzondering van de private investeringen alle

andere prestaties zijn verslechterd na de hervormingen. De hervormingen hebben tot meer private investeringen geleid, maar slechts voor een periode van 4-5 jaar.

In hoofdstuk 8 hebben we daarom een antwoord gezocht op de vraag waarom de private investeringen na zo'n relatief korte periode werden beëindigd. Daarvoor hebben we private investeerders geïnterviewd. Uit de analyse bleek dat investeerders na verloop van tijd het vertrouwen verloren in de institutionele condities voor private investeringen in de Pakistaanse elektriciteitsvoorziening. Eigendomsrechten en contracten werden niet of nauwelijks gerespecteerd en gegarandeerd. Ook werden hun belangen onvoldoende beschermd omdat de toezichthouder niet onafhankelijk kon opereren. Mede om deze redenen kozen private investeerders om alleen op specifieke locaties en in thermische productie technologie te investeren.

Tenslotte hebben we in hoofdstuk 9 met behulp van stakeholder interviews de barrières in het hervormingsproces in de Pakistaanse elektriciteitsvoorziening geanalyseerd. Uit deze interviews bleek dat de governance structuur (de derde layer in ons aan Williamson ontleende institutionele framework), zwak is waardoor het land kampt met coördinatieproblemen en hoge transactiekosten, die mede de elektriciteitshervormingen hebben belemmerd. Ten tweede bleek dat Pakistan is begonnen aan de hervorming van de elektriciteitssector zonder eerst lopende conflicten en problemen in de sector op te lossen. Deze problemen hebben daardoor het hervormingsproces te veel overschaduwd. Ten derde werd gewezen op de zwakke positie van de onafhankelijke toezichthouder, die door de overheidsbureaucratie niet in staat werd gesteld tot adequaat onafhankelijk toezicht. Als vierde barrière werd de politiek en het politieke commitment aan de institutionele hervormingen genoemd. Volgens de geïnterviewde stakeholders ontbrak het in Pakistan aan dit politieke commitment. Deze factoren onderschrijven het belang om rekening te houden met landen specifieke omstandigheden wanneer institutionele hervormingen worden ingevoerd. Het is niet zinvol om elders succesvol gebleken hervormingen ongeconditioneerd over te nemen. Ons onderzoek heeft laten zien hoe de specifieke institutionele omstandigheden in Pakistan de hervormingen in de elektriciteitssector hebben bepaald.

About the Author

Kafait Ullah was born in Sialkot (Pakistan) on 7th April 1979. Before starting PhD, the author was honored with Master of Science (MS) in Development Studies (DS) from University of Life Sciences (UMB), Norway. The author also holds MA in Economics from University of the Punjab, Pakistan.

He has previously worked as Lecturer in Economics at University of Gujrat, Pakistan. His main areas of research and teaching at the University of Gujrat have been Institutional Economics, Energy Economics, Public Finance and Fiscal Policy. He has also supervised research thesis during his stay at UOG. He has also published articles on energy, economy and development related issues of Pakistan. He obtained partial scholarship from Higher Education of Pakistan to his PhD. After finishing PhD, he is in agreement with the government of Pakistan to serve the country at least for two years.

Appendices

Appendix 1: Switching rate of residential consumers among different countries and US states

Markets opened 1998–2000	After approx. 3 years	After 5–6 years
UK	34	43
Sweden	18	29
Norway	15	24
Finland	5	11
Germany	4	5
New Zealand	18	26
Alberta	2	7
California	2	1
Maine		
MPS	36	7
BHE and CMP	0	0
Maryland		
Potomac Electric	13	6
Other utilities (3)	0	0
Massachusetts	3	3
New Jersey	0	0
New York	4	6
Ohio		
First Energy (3)	40	45
Cincinnati	2	3
Other utilities (4)	0	0
Pennsylvania		
Duquesne Light	35	23
PECO Energy	18	2
Other utilities (4)	1–7	1

Source: (Littlechild, 2006)

Appendix 2: General steps in electricity reforms

Policy dimension	Key features
Corporatization	<ul style="list-style-type: none"> Separate utility from ministry Create clear accounting framework Install private management (common in Africa)
Commercialization	<ul style="list-style-type: none"> Cost recovery in pricing Reduce or eliminate subsidies Enforcement of collections
Energy law	<ul style="list-style-type: none"> Legally mandate restructuring Legally permit private participation/ownership Legally permit foreign participation/ownership/imports
Regulator	<ul style="list-style-type: none"> Remove regulatory function from ministry Create independent regulator Legally define scope, authority, methods
Independent power producers	<ul style="list-style-type: none"> Create by privatizing state utility generation Greenfield development Power purchase agreements
Restructuring	<ul style="list-style-type: none"> Vertical and/or horizontal unbundling Create independent transmission authority/company Separate profitable parts for sale to private investors
Privatization	<ul style="list-style-type: none"> Outright sale Stock sale Joint venture
Competitive markets	<ul style="list-style-type: none"> Single buyer Bilateral forward contracts Cost-based pool Bid-based pool

Source: (Williams and Ghanadan, 2006)

Appendix 3: Pre-reform electricity sector characteristics in non-OECD countries

	Common sector characteristics	Range of conditions
Sector structure	State owned Highly bundled Vertically integrated	Generation and distribution utilities often separate. Central governments often owned major generating units and high voltage grid, local governments owned smaller facilities
Government priorities for sector	National industrialization Universal access to electricity Counter-cyclical employment Technology indigenization Improved standards of living National prestige, nation-building	Electricity central to government's development policy. Power sector often used to subsidize the rest of economy, sector balance sheet not contained within sector itself. Economic efficiency and financial autonomy of sector often low priorities
Policy and regulation	National energy ministry Provincial electricity authorities	More provincial autonomy in larger countries (e.g. China, India). Production and regulation authority often co-located in ministry. Power tied to other sectors through central planning
Revenue and tariffs	Tariffs set by ministry Direct subsidies from state budget Cross-subsidies from industry Metering and collections constraints	Cross-subsidies common for agriculture, residential, and public agencies. Limited use of meters and collection enforcement weak in some countries (e.g. much of Africa, South Asia, Soviet bloc)
Financial and investment conditions	Utility finances tied to national budget Self-financing limited by revenue generation, tariff arrangements	Rates of return range from negative to >15%. Operating losses common, requiring subsidies from national budget. Public debt financing of capital projects
Physical organization	Extent of grid integration determined by geography of load and generation Urban-centered with grid expansion pattern outward from primary and secondary cities	Integrated national grids in compact, densely populated countries (e.g. Korea, Eastern Europe). Regional/provincial grids in largest countries (e.g. China, India). Urban grid plus isolated grids in poor, mountainous, and island countries (e.g. Bolivia, Philippines)
Operational performance	Operational performance tied to utility financial conditions, national technical capacity, physical and geographical endowment, national economic conditions, and management practices	System losses range from <10% (Korea, China, Romania, Venezuela) to >30% (South Asia, Africa). Consumers per employee range from 6 (Rwanda) to 292 (South Korea). Wide range of service quality, capacity factors, reserve margins
Consumption and access	Per capita consumption and access show a straight-line function of per capita GDP	Access >90% in Eastern Europe, East Asia; <30% in South Asia; <10% in Sub-Saharan Africa. One-third of global population without electricity
Fuel mix and sources	Fuel mix a function of domestic resources, bundling of energy sector, energy security concerns, finances Most countries moved away from oil generation in response to 1970s oil price shocks	Coal dominant: China, India, Poland, South Africa. Hydro dominant: Sub-Saharan Africa, Latin America. Nuclear dominant: Korea. Natural gas just emerging as important generation fuel in most countries. Wide range of import dependence
Environment	Access to clean fuels and technology limited by finances, resources, subsidies for domestic fuels Environmental protection institutions new, limited authority and capability Emergent environmental movements	Serious local pollution, acid rain, and climate concerns from coal-dominated sectors (China, India, Eastern Europe). Ecological and population displacement problems with large hydro projects (Asia, Africa, Latin America)

Source: (Escay, 1990) accessed from Williams and Ghanadan (2006)

Appendix 4: Private investments in power sector of developing countries during 1990-1999 (million US\$)

1	Brazil	31,627	11	Malaysia	5970
2	China	19,049	12	Morocco	4820
3	Argentina	14,986	13	Korea	4522
4	Philippines	11,672	14	Turkey	3710
5	Indonesia	9580	15	Peru	3680
6	India	8881	16	Hungary	2446
7	Chile	6836	17	Russia	2070
8	Pakistan	6693	18	Kazakhstan	1508
9	Colombia	6512	19	Czech Republic	1300
10	Thailand	6413	20	Guatemala	1296

Source: (Jamash, 2006), originally accessed from the World Bank database on Private Power Infrastructures (PPI).

Appendix 5: Valuation of industrial load shedding in Pakistan during 2008 and 2009

Fiscal year	Computed peak demand	Supply	Surplus/shortfall
2001–2002	10,459	10,894	435
2002–2003	11,044	10,958	–86
2003–2004	11,598	11,834	236
2004–2005	12,595	12,792	197
2005–2006	13,847	12,600	–1247
2006–2007	15,838	13,292	–2546
2007–2008	17,398	12,442	–4956
2008–2009	17,852	13,637	–4215
2009–2010	18,467	13,445	–5022

Source: (IPP, 2009, IPP, 2010, WorldBank, 2013)

Appendix 6: A summary of example studies on the impact of institutional reforms over performance of power sector

Study	Hypothesis	Independent Variables	Dependent Variables	Control Variables	Data and Methodology	Results
Steiner (2001)	Regulatory environment, degree of vertical integration and degree of private ownership have positive impact on efficiency, industrial and residential prices and their ratio	unbundling of generation and transmission, the introduction of a wholesale power pool, third party access to transmission and privatization	electricity price per unit, ratio of industrial to residential electricity price, generation capacity utilization ratio and generation reserve margin	Control for previous generation technology and for GDP taken as proxy to electricity market size. No control for institutions and for macroeconomic policy	Panel data for 19 OECD countries during 1987-1996. Econometric model with fixed effects. Time trend was not included in the model that makes it a static model.	<ul style="list-style-type: none"> - Separation of generation and transmission do not result in decreasing prices but to lower industrial and residential price ratio, high capacity utilization rate and lower reserve margins. -Introduction of wholesale power market leads to lower prices and industrial to residential price ratio. - Introduction of third party access leads to lower prices and the price ratio but not significant, while it is also not significant for the cost efficiency measures. - Privatization appears to raise prices and the price ratio but has no significant effect on the cost efficiency measures.
Hattori and Tsutsui (2004)	Unbundling of transmission from generation, third party access, the existence of a wholesale market and the impact of privatization contribute to reduce electricity prices.	Unbundling of transmission from generation, third party access, the existence of a wholesale market and privatization	Electricity prices	Almost similar to Steiner (2001) but again did not include time trend	Same countries as in Steiner (2001) but over a larger period between 1987 and 1999. Same model as used by Steiner but also included random effects along with fixed effects.	<ul style="list-style-type: none"> -Unbundling leads to raise prices - The introduction of a wholesale power pool also leads to raise prices - The introduction of third party access or retail competition contributes to lower prices. - Privatization also contribute to lower prices. However the impact of a reform variable involving all the individual reform variables including privatization, wholesale power pool, third party access and legal unbundling has no overall impact on price
(Zhang et al., 2008)	H1: Privatization leads to higher operating efficiency and capacity utilization and to higher	Privatization, Competition, Regulation (regulatory commitment and regulatory	Residential prices, industrial prices, capacity utilization, operating efficiency and production	Controls were included only on country's economic conditions such as GDP per	Panel data from 25 developing countries during 1985-2001. Fixed effects model	<ul style="list-style-type: none"> -Privatization does not lead to higher operating efficiency - Privatization does lead to better capacity utilization

	residential and lower industrial prices H2: Competition leads to higher larger capacity, higher output and more labor productivity and also to lower industrial and higher residential prices H3: Existence of an independent regulator leads to higher productive efficiency and higher residential prices H4: Privatization supported by existence of regulatory commitment and regulatory independence leads to higher output and capacity	independence)	capacity,	capita, urbanization, economic freedom and industrial output as a percentage of GDP. Since study is based on developing countries; however control variables on institution and macroeconomic policies which may have indirect impact on the dependent variables were not included in this study.		- Privatization leads to higher output and capacity utilization if there is better regulation - Privatization is not significant to lower industrial and higher residential prices - Competition leads to lower industrial prices, higher output, more capacity utilization and more operating efficiency. - Regulation does not lead to raise prices for residential consumers.
Wolak (1997)	Market structure and market rules impact the spot prices	Market structure, market rules	Spot prices		Econometric analysis of time series data on spot prices of England & Wales, Norway, Sweden, Australia and New Zealand. VAR model to observe market rules, market structure and behavior of spot prices	Market rules and market structure have strong influence over the determination of spot prices.
Holborn (2001) Holburn (2001)	Firms' previous experience in a specific market has substantial impact on firms' decisions on entry to a specific country	Previous experience in a specific market	Firms' decision to enter into a specific country in a given year	Country, market and institutional controls are not included.	A standard probit model is estimated by maximum likelihood method. Different models are estimated to capture the separate and combined impact of independent variables.	Firms' probability of entering into a specific country increases with increase in experience; however firms prefer to operate in the same market environment (either competition or monopsony) where they have operated previously.
Bergara et al. (1998)	Well defined and credible political institutions in a country	Political institutions	Investments taken in terms of generation capacity. Investment data taken only	Nonpolitical control variables were included such as	Data from a reasonable number of developed and developing was utilized to	Political institutions impact significantly to investments in electricity sector

	impact investments in electricity sector		before reforms.	increase in population, income, percentage of urbanization.	test the hypothesis. Data on some indicators was not available for all countries; therefore they developed indices on different political aspects to create a standard measure.	
(Bortolotti et al., 2001)	H1: Vertical integration affects number of privatizations and on the aggregate proceeds of privatizations negatively H2: Regulation impacts the number of privatizations, aggregate proceeds of privatization and the percentage of private stock positively	Vertical integration and regulation	Number of sales, sales proceeds and percentage of private stock	No control of country, time and stock markets' variables.	Data from 49 countries over the period of 1977-1996. One model specified for each dependent variable. First two models specified as Tobit and the last model was based on OLS regression.	The results verified the hypotheses.
(Thomas, 2006)		Reforms	Prices	Analysis of reports on prices in European Countries -Data on 83 countries over 1985-2002		No evidence was found that reforms contributed to reduced prices
(Nagayama, 2007)	Individual steps of electricity reforms contribute to price reduction	Individual steps of electricity reforms	Prices			-All the reform's steps had diverse impacts on prices. -Unbundling and wholesale market did not reduce but contributed to increase the price -When unbundling combined with regulator then it contributes to price reduction -Privatization, IPPs, and retail competition induced to price reduction
(Nagayama, 2009)	Liberalization contribute to decrease prices	Liberalization	Prices	GDP per capita, selected liberalization model	-Panel data on 78 countries of developed and developing world -Random and fixed effect models were utilized	-As a result of liberalization, electricity prices did not decrease but increased in every model of the study.
(Cubbin and Stern, 2006)	Regulatory law and regulatory governance leads to improve the performance of power	Regulatory law and regulatory governance	Electricity generation capacity per capita	Real GDP per capita, Debt payment as a proportion of national income, Industry value	Panel data on 28 developing countries during 1980-2001. Fixed effects model	-Regulatory law and regulatory governance positively contributed to generation capacity per capita and this

	sector					added as a proportion of GDP		relationship consolidates along with the strengthening of regulatory governance
(Erdogdu, 2011)	Electricity reform's steps impact on price-cost margin and price ratios between different consumer groups	Individual reform's steps	Price-cost margin and Prices' ratios between different consumer groups	Electricity consumption in different economic groups, electricity losses, GDP per capita	Panel data on 63 countries (both developed and developed) over 1982-2009 Fixed effects and random effects models	Reform' steps did not show uniform impact on price-cost margin and prices' ratios.		

Appendix 7: A summary of example studies on the determinants of institutional reforms

Study	Hypothesis	Independent Variables	Dependent Variables	Control Variables	Data and Methodology	Results
Bacon and Besant-Jones (2001)	H1: Country policy and institutions positively correlate with reforms' steps H2: Country risk is negatively correlated with reforms' steps	Country policy and institutions which is based on 20 indicators. Political and economic risk variable is made up of 9 indices.	Individual reforms' steps such as corporatization, enactment of law, unbundling, regulation, privatization and formation of markets at retail and whole sale level.		Cross sectional data from 115 developing countries for 1998. Cross section regression analysis	Tests support both hypotheses where countries' policies and institutions have positive relationship with reforms and risks have negative correlation with reforms.
Drillisch et al. (1998)	H1: Energy dependency impact the choice of liberalization model H2: Environmental commitment impact the choice of liberalization model	Dependency on fuel imports and environmental commitments	Variables for wholesale and retail market (other reform steps were not included)	Prices and variables on past decisions on energy dependency and environment commitment. No control for macroeconomic policy, institutions, market size and level of development in a country.	Cross section data analysis	-Energy dependency impacts the choice of model selection. -No significant inter-dependence between environmental commitment and choice of liberalization model.
Ruffin (2003)	H1: Judicial independence impacts competition, ownership and extent of reforms H2: Distributional conflicts impact competition, ownership and extent of reforms H3: Ideology impacts competition, ownership and extent of reforms	Judicial independence, distributional conflicts and economic ideology	Competition, ownership and extent of reforms		OLS regression analysis of around 75 countries who took some reforms' steps during 1990s.	-Impact of judicial independence on competition and ownership is not significant -Greater distribution conflicts tend to contribute to higher degree of monopoly -Distributional conflicts have no significant impact on ownership type -Economic ideology favors competition and private ownership significantly -Judicial independence show a positive relation with extent of reforms -Distributional conflict show some positive and

(Chang and Berdiev, 2011)	Political economic factors such as ideology, political and institutional factors and globalization lead to increase the growth rate of regulation in energy industry (gas and electricity).	Growth rate of regulation in energy industry	<ul style="list-style-type: none"> -Ideology 1: government ideology index, Ideology 2: relative ideology of governments -Political and institutional factors: 1. <i>Herfindahl index</i> as a proxy for government fragmentation of an institution that measures the concentration of a ruling coalition 2. <i>Years in office</i> to represent the political strength of the government. 3. <i>institutional constraint index</i> - Globalization index covers three dimensions including <i>economic, social and political</i> integration. 	Energy consumption (gas and electricity), real GDP per capita, time trend, a dummy on regulation	<ul style="list-style-type: none"> -Panel data from 23 OECD countries over the period of 1975-2007. - Bias-corrected least square dummy variable model 	<ul style="list-style-type: none"> -Left-wing governments encourage regulation in gas and electricity sectors. -less politically fragmented institutions back deregulation -Long tenures of current government have less impact on regulation in electricity sector, while it contributes to increase in regulation of gas sector. -Greater political constraints and more globalized countries contribute to deregulation in electricity and gas sectors. -Economic and social integration promote deregulation in the gas industry, whereas political integration promotes deregulation in the electricity industry. 	significant impact on extent of reforms -Economic ideology also shows a positive and more significant relation with extent of reforms
(Dreher et al., 2009)	Educational and professional background of a head of government impact the implementation of market-liberalizing reforms	<ul style="list-style-type: none"> - Time in office -Left wing governments -Government fractionalization - Coalition government - Direct presidential - Veto players drop 	<ul style="list-style-type: none"> - Legal Structure and Security of Property Rights Index - Access to Sound Money Index - Regulation of Credit, Labor and Business Index - Composite index of economic freedom - Size of Government Index - Exchange with Foreigners Index 	<ul style="list-style-type: none"> - GDP per capita growth - Instability - Currency crises 	<ul style="list-style-type: none"> -Panel data of 500 political leaders from 72 countries over the period 1970-2002 in employed - Pooled time-series cross-section (panel data) regressions 	<ul style="list-style-type: none"> -Former entrepreneurs are more inclined to reforms. -Entrepreneurs from a left-wing party are more capable to reform than an entrepreneur from a right-wing party. -Former professional scientists also support reforms and their support increases with their stay in the office. 	

(Erdogdu, 2012)	<p>H1: Industrial consumption has an impact on the pace of liberalization process in electricity industry</p> <p>H2: Lower rural population and lower income inequality in countries are good for power sector liberalization</p> <p>H3: Foreign financial aid and/or assistance are favorable in a country for power sector</p> <p>Liberalization</p> <p>H4: Political stability contributes to more liberalization of power sector</p> <p>H5: Political ideology also favors liberalization in power sector</p> <p>H6: Educational background of head of state is important for liberalization</p>	<p>Industry value added (% of GDP), Net ODA, economic ideology of the party, Professional background of the chief executive and educational background of the chief executive</p>	<p>Entry barriers in electricity market index, public ownership index, vertical integration index, electricity market closeness index</p>	<p>Party structure, chief executive in the office (years), electoral system, rural population (% of total), Gini coefficient, polity score, EU member, OECD member, existence of electricity market reform idea, population density, electricity consumption per capita, GDP per capita, average number of years of education of people, imports of goods and services (% of GDP)</p>	<p>Panel data of 55 countries over 1975-2010.</p>	<p>- Industry sector has a significant impact on the pace of power market liberalization process and its influence increases along with increase in its size</p> <p>-Countries receiving foreign financial support are more likely to liberalize their electricity markets</p> <p>- Government ideology is one of the determinants of the progress in electricity market reform process</p> <p>- Politicians' education and profession matter for the electricity market reforms</p>	
(Erdogdu, 2013a)	<p>H1: Due to path-dependency, the background of the chairperson of the regulator and that of the governor or minister responsible for energy policy when reforms started have an impact on overall reform progress.</p> <p>H2: The level of democracy in a country has an impact on</p>	<p>-Variables on Chairperson and Energy minister: Experience in electricity industry at appointment, length of term (years), education level (BSc, MSc, PhD) and educational background (business or economics, engineering, law, other)</p> <p>-other variables taken</p>	<p>Electricity market reform score 2011</p>	<p>Size of population (2010), income level (GDP per capita in 2010), investment environment (investment freedom index in 2011), the level of authoritarianism (polity score in 2010), security of property rights in a country (property rights index in 2011) and OECD membership</p>	<p>-Cross section data of 115 countries (developed and US states and Canadian provinces over 1975-2010</p> <p>-Poisson regression is employed</p>	<p>-Professional and educational background of head of executive branch (prime minister, president and so on) seem to have very significant impact on reform process in OECD countries, but this is not the case in non-OECD countries.</p> <p>-A negative correlation between polity score and power sector</p>	

	reform progress. H3: Countries with relatively high corruption tend to introduce less electricity market reforms.	were civil liberties score in 2011, political rights score in 2011 and CPI 2010.		(dummy for OECD membership)		<p>liberalization reveals the common perception as false that liberalization policies are stronger in more democratic countries</p> <p>-Corruption is also significantly correlated with liberalization</p> <p>- A negative relationship was found between reforms progress and level of civil liberties in a country</p>
--	--	--	--	-----------------------------	--	---

Appendix 8: A summary of example studies explaining the impact of reforms over the performance of power sector in individual countries or a group of regional countries (case studies)

Study	Region/country	Hypothesis	Independent Variables	Dependent Variables	Data and Methodology	Findings
Galal et al. (1994)	Cases taken from developing countries including two Chilean companies including ENERSIS (electricity distribution company) and CHILGENER (electricity generation company).	Privatization of vertical monopolies when combined with proper regulatory framework leads to enhance welfare	Privatization and regulation	Operating efficiency. Labor productivity in generation and energy losses.	Data on different companies from developing countries	Study found that privatization significantly improved the welfare impacts of the two Chilean companies.
Fisher et al. (2003)	Chile	Privatization of 7 sub sectors of economy including companies from electricity sector contributes to increased efficiency of firms and overall social welfare	Privatization	Unit costs, energy losses, labor productivity and end users prices	Study compares the performance of electricity companies as a part of other six sub sectors of economy before and after privatization by utilizing t-statistic	-More privatization proceeds resulted in the decline of unit costs -energy losses reduced -decrease in end user prices
(Paredes, 2001)	Chile	Privatization and regulation of telecom, electricity and water industries impact efficiency and welfare aspects	Privatization and regulation	Energy losses, profits, access and prices	Descriptive analysis	-Privatization of electricity contributed to lower electricity losses, higher profits, increased access for low income groups and lower prices
(Di Tella et al., 2008)	Chile	Price cap regulation contribute to lower costs and prices	Price cap regulation	Costs, prices	-Data on the performance of firms in the Chilean electricity distribution industry from 1988–99. -Capital asset price modeling.	Price cap regulation tends to reduce costs and prices over time.
(Delfino and Casarin, 2001)	Argentina	Privatization led to consumer welfare	Privatization	Expenditure on electricity, tariff reduction	Data collected from 5000 rural households during a family expenditure survey	-After privatization, the expenditure on electricity by small consumers (<150 KWh) increased -Tariff for average large users (>150KWh) reduced. -Higher income groups benefited more than

(Ennis and Pinto, 2002)	Argentina	Privatization impacts income distribution and welfare of the people positively	Privatization	Income distribution and welfare impacts	The data was collected from three surveys including Household Expenditure Surveys (HES), the Permanent Household Surveys (PHS), and the Social Development Survey (SDS).	lower income groups -Privatization contributed to increase the collection rates and improve the quality of service -Cross subsidies reduced -Electricity prices did not change -prices for industrial consumers decreased -Access to electricity for the poor increased largely -Consumer surplus increased as a result of increased prices and lower prices for low income groups.
Toreno and Pasco-Font (2003)	Peru	-Privatization led to improve access to electricity, labor productivity, quality of service and reduction of losses -Privatization and reform of electricity sector impact access to service, labor productivity, quality of service and losses	Privatization and reform	Access to service, labor productivity, quality of service and losses		-Privatization resulted in price increase which contributed to reduce consumer surplus
(Mota, 2003)	Brazil	Electricity reforms impact positively upon social welfare impacts	Restructuring, regulatory change and liberalization of generation and distribution segments	Welfare aspects	-Data of generation and distribution sector over 1995-2000 period -Social cost benefit analysis	-Significant net benefits but most benefits absorbed by producers
(Domah and Pollitt, 2001)	England and Wales	Reforms impacts higher to distribution networks	Privatization and regulatory reform	Costs, prices, profits and efficiency gains	-Data was utilized over 1988/86-1997/98 -Social cost benefit analysis	-Prices, costs and profits of the companies increased in early years of reforms which started to decrease in later years -Efficiency of companies increased;

					however companies retained efficiency gains mostly in early years -Overall benefits to consumers were just the fall of prices by 3% -Benefits to governments were the approximate receipts of 5 billion pounds.
--	--	--	--	--	---

Appendix 9: A summary of example studies on institutional reforms in South Asia and Pakistan

Study/Country	Study Focus	Data and Methodology	Findings
Bhattacharyya (2007) / South Asia	Study analyzes the impact of four institutional and politico-economic factors, namely instability of rule-makers, poor overall acceptance, slow adaptation and poor transition management over the reform process of South Asia	Qualitative analysis based on secondary data and guided by New Institutional Economics.	-Political instability impacted reforms in the region by hardening the tough decisions to take -Slow progress and poor transition management affected the viability by lowering performance of the sector.
Nepal and Jamasb (2012) / Nepal	Study analyzes power sector reforms in small countries like Nepal. It focuses on performance of power sector in post reform situation and factors that restrict reforms.	Opinion based analysis aided by secondary data	-Political instability and demand unpredictability are two barriers to power sector reforms in Nepal.
Thakur et al. (2006)/ India	Study measures the efficiency of 26 state owned utilities engaged in generation, distribution and transmission of electric power across India in post reform setup	Data envelopment analysis	-Performance of public electric companies was sub-optimal -Number of employees in utilities is much higher than required for a best practice utility -Bigger utilities carry more inefficiency
(Sen and Jamasb, 2012) / India	Study analyses the determinants and impacts of electricity reform in India. It analyzes the impact of reforms' individual steps on economic variables such as sectoral efficiency, prices and investment flows and then the impacts of political economic factors on reforms.	-Panel data for 19 states during 1991-2007. -Econometric analysis	-Individual reforms variables impacted economic variables differently -Political economic factors contributed to adverse outcomes of reforms in initial period
Kessides (2013) / Pakistan	Analysis of existing problems in the power sector of Pakistan	Opinion based analysis aided by secondary data	Study finds that poor performance of power sector in Pakistan lies in the poorly implemented reform's policy
Malik (2012) / Pakistan	It analyzes the persistence of electricity crisis from two hypothesis. First hypothesis is that the govt. has failed to respond sufficiently and second is that the govt. has moved in a wrong direction	Opinion based analysis aided by secondary data	The study reveals that the leadership of energy sector did not make timely decisions and they also lacked capacity to decide rightly on important issues. Policy makers did not plan for longer period of time and made need based decisions
Munir and Khalid (2012) / Pakistan	This study argues that Pakistan's energy crisis primarily ensues from suboptimal policy and the governance issues are secondary.	Opinion based analysis aided by secondary data	Through contestation, study strengthens its argument that policy has more linkages with the poor performance of power sector in Pakistan instead of mere governance as argued in other studies.
Saleem (2007a) / Pakistan	The study analyses the efficiency of the distribution sector in Pakistan in post reform era	Data Envelopment Method and Malmquist indices are utilized to measure the changes in productivity of nine distribution companies over the period 1998-2003.	-There was 92 % efficiency in the sector -Six firms were operating at frontier -Total factor productivity in distribution sector increased by 3 % annually during 1998-2003 -Decline was observed in efficiency change, pure efficiency and scale efficiency change. -Total growth in total factor productivity growth is due to technical efficiency.

a) Transaction costs, contracts and organizations

In his chapter “*The Nature of the Firm*”, Coase, by differing on the original theory of firm which has been called by many economists as the ‘*theory of production*’, has asserted that boundaries of the organizations are structured by the costs of transacting or exchange rather than solely by technology. This concept of exchange costs has further developed in the following work (Williamson, 1975, Williamson, 1985, Williamson, 1981, Williamson, 1998, Klein et al., 1978, Grossman and Hart, 1986). They have argued that it is the relative cost borne by organizations in their internal and external exchange which determines the mode of organization (make or buy decisions of firms). Organizations suffer exchange or transacting costs in both circumstances whether it is market exchange in the form of information costs related to prices, costs and firms, negotiating and contract enforcement costs, etc. or costs incurred within the firms’ exchange due to information constraints, performance evaluation, etc. It is the relative costs of transactions under different governance structures that determine the *nature of the firm*.

It is mutually beneficial for transacting parties to transact under certain arrangement or governance structure even the exchange is simple. In this way, they can avoid certain hazards connected with transactions; however such hazards increase when governance structure gets complicated. It is argued in NIE literature that transaction costs increase with increase in complexity of governance structure. It is so, because along with increase in complexity of contracts due to complicated nature of transactions, the concept of completeness of contracts erodes which ultimately increases the costs for transactions to take place. Complexity of contracts or incomplete contracts is due to limitations in human cognitive powers or *bounded rationality* as illustrated by various key proponents of NIE such as *North* and *Williamson*. *Uncertainty*, *frequency* and *asset specificity* are other important aspects which add to incompleteness of contracts. Here these aspects are discussed briefly.

b) Uncertainty

Uncertainty is one of the main differentiating factors between *New Classical Economic Theory* and *New Institutional Economics*. It is related to both ‘*bounded rationality*’ and ‘*opportunistic behavior*’. As discussed earlier that *New Classical Economics* presumes complete rationality that enables actors in making rational decisions regarding sale, purchase, contracts, etc.; however this is relieved in *New Institutional Economics* which asserts that various limitations obstruct actors from being completely rational. These limitations can be

lack of complete knowledge about the products, about actors and other related circumstances which may inhibit the actors to reach to a perfect contract. Some of the actors may also conceal some information in order to gain extra benefit out of contractual arrangements, whereas other parties may have to bear extra costs (transaction costs) to overcome such uncertain situation or lack of information. This type of situations may create problems in governance structure.

Lesser the uncertainty in governance structure, the better is its efficiency. Organizations/firms in public and private sectors make extensive efforts to reduce the impact of uncertainty on governance structure in order to reduce the friction for transactions. For instance, advertisements are one way to reduce uncertainty among customers regarding certain information about products or services.

c) Asset Specificity

Asset specificity relates to that type of investment which once made, loses its value for any alternative use. Transaction specific assets are more prone to specificity of investments due to chances of change in conditions. *Williamson* talks about four types of *asset specificity* including “*site specificity, physical asset specificity, human asset specificity and dedicated assets specificity*”. Since all type of asset specificity is important; however physical assets specificity is explained here because it is more relevant to the infrastructure investments.

Physical asset specificity is common in transaction specific assets. For instance assets such as infrastructures with greater network externalities and high usage may require specific investments. *NIE* literature suggests that hazards increase with increase in the complexity of contracts. ‘*Holdup*’ situation is one of the hazards which are due to “*bilateral dependence, weak property rights, measurement difficulties, weak institutional environment*”, etc. *Holdup* situation in contracts arises when the original agreement among contracting parties becomes ineffective due to changes in initial circumstances, which eventually require some additional costs to be borne by some of the contracting parties in order to ensure contract’s compliance by the deviating parties (*Williamson, 1991*). An example of this situation is *relationship-specific investments* (*Klein, 2000*) which are exposed to certain hazards such as the rents expropriation by some of the contracting parties in case of change in the conditions. A further explanation of this situation can be of an investor who invests in a specific technology e.g. gas based power plant on request of the customer (utility) with a pre-settled selling price; however the customer demands of lowering the prices after knowing that the investor is charging a lower price in other countries. Such a situation may create problem of under-

investment where the investor will not be ready to install the required machinery without specific measures are undertaken to overcome the likelihood of such acts of expropriation.

In order to overcome such hazards, different measures are taken. Some of those measures are vertical integration, long term contracting, ownership agreements, partial investment by both parties in relationship specific investments and many other measures to enhance the efficiency of governance structure. Asset specificity is related to bounded rationality, opportunism, uncertainty and transaction costs in a given governance structures. It specifies the success and failure of the governance structure because of the presence of higher level of assets specificity may force the parties to deviate from central governance structure and opt for private contracting. Thus a governance structure which provides opportunities (to organizations/players of the game) for efficient exchange thereby minimizing asset specificity and then reducing the level of transaction costs will ultimately be sustainable (Klein, 2000).

d) Frequency

Frequency of transactions is another important factor that determines transaction costs and the contractual relationship among stakeholders. It determines the volume of variable transaction costs which change with change in the frequency. If exchange is more frequent among parties then it tends to reduce the variable transaction costs over time. Such a reduction of transaction costs also induces certainty of behavior among players if players are limited in a constrained market such as a primitive market system. However if it is a modern market where impersonal exchange takes place then increase in frequency of exchange among different players of the market increases the complexity of contracts from merely simple ones to more advanced and sophisticated type of contracts.

Appendix 11: Description of dependent and control variables

Variable	Description	Source
Egpc (=Total electricity generation/total population)	Electricity generation per capita	National Transmission and Dispatch Company (NTDC), total population from World Development Indicators (World Bank)
Icpc (= total installed capacity/total population)	Installed capacity per capita	Same as above
Irpr (=industrial price/residential price)	Industrial and residential price ratios	Same as above
Indcp	Industrial consumption percent	NTDC
Rpr	Residential Prices	NTDC
Ipr	Industrial prices	NTDC
Rcp	Residential consumption percent	NTDC
Gdpc	GDP per capita (current US\$)	WDI (World Bank)
Upp	Urban population as percentage of total	WDI (World Bank)
Ef	Degree of economic freedom	Fraser Institute

Appendix 12: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
corp	41	.2439024	.4347694	0	1
rb	41	.3658537	.4876524	0	1
ipp	41	.4390244	.5024331	0	1
ub	41	.2926829	.4606464	0	1
pv	41	.1707317	.3809488	0	1
egpc	41	296.8356	143.1504	94.35	535.83
icpc	41	595.7922	288.6225	179.97	1043.54
irpr	41	1.693659	.4980952	.67	2.64
ipr	40	338.7525	91.35435	186.2	493
gdpc	41	427.8546	246.8007	18.4	1024.59
indc	41	8.480976	5.035972	1.69	17.7
rc	41	11.38049	9.996123	.38	29.51
upp	41	30.79073	3.216785	25.12	36.21
ef	40	5.2	.6082552	3.9	6.26

Appendix 13: Correlation matrix of variables

```
. corr corp rb ipp ub pv irpr egpc_log icpc_log gdpc_log indc_log rc_log ipr_log
> g upp ef
(obs=40)
```

	corp	rb	ipp	ub	pv	irpr	egpc_log
corp	1.0000						
rb	0.7343	1.0000					
ipp	0.6267	0.8535	1.0000				
ub	0.8749	0.8393	0.7164	1.0000			
pv	0.7796	0.5725	0.4886	0.6821	1.0000		
irpr	-0.3841	-0.1393	0.0869	-0.3374	-0.2980	1.0000	
egpc_log	0.6198	0.7443	0.8151	0.6689	0.5288	0.3875	1.0000
icpc_log	0.6037	0.7881	0.8557	0.6813	0.4724	0.3866	0.9832
gdpc_log	0.6939	0.7142	0.7429	0.7065	0.6693	0.2834	0.9363
indc_log	0.6250	0.7118	0.7810	0.6647	0.5274	0.3811	0.9953
rc_log	0.5809	0.7224	0.7918	0.6431	0.4784	0.4364	0.9951
ipr_log	0.3174	0.5994	0.7101	0.4160	0.1645	0.6306	0.8981
upp	0.7154	0.8147	0.8441	0.7637	0.6136	0.2585	0.9846
ef	0.5941	0.7051	0.7966	0.6302	0.5665	0.3506	0.9585
	icpc_log	gdpc_log	indc_log	rc_log	ipr_log	upp	ef
icpc_log	1.0000						
gdpc_log	0.9210	1.0000					
indc_log	0.9691	0.9260	1.0000				
rc_log	0.9847	0.9336	0.9910	1.0000			
ipr_log	0.9111	0.7873	0.8857	0.9236	1.0000		
upp	0.9777	0.9568	0.9764	0.9766	0.8445	1.0000	
ef	0.9358	0.9249	0.9575	0.9570	0.8591	0.9463	1.0000

Appendix 14: Concourse for Q Study

Reforms package was incongruent with indigenous situation
implementation was done in haste without considering the institutional endowments of the country
Weak judicial structure was responsible for poor implementation or slow progress of reforms
considering reforms in public sector entities as foreign agenda
Weak political parties which were not able to raise public support for the reforms
Disinterest of economic managers in changing economic system
forced from outside such as world bank and IMF
insufficient technological advancement
existence of a huge informal sector
political instability in the country and provinces
Regional geo political situation increased the level of sensitivity
cultural barriers to openness
Low literacy rate in the country resulted in erosion of public support for reforms
The case of reform was not properly prepared and presented by reform managers to the general public
A general perception of price hike after reforms
High interest of the employees of vertical monopoly in continuing the existing framework
Free riders create resistance to reforms
Political feudal not in favor of transformation
low level of GDP per capita faded the commitment to reforms
historical baggage of poor institutions from the British Empire
poor projections about needs of total population due to no census countrywide for a long time
Unpredicted population growth rate changed estimations regarding demand
No cost benefit analysis before the decision of reforms
lack of experts having complete knowledge of reforms' design, its implementation and then to improve through evaluation
lack of skilled workforce in the new arrangement
Reforms was considered a comfort of rich countries
high poverty level in the country not a good pre-condition for reform
A perception that reforms were only aimed to benefit foreign businessmen
Threat of army intervention decreased commitment to reforms among legislature
Shortage of skilled parliamentarians to draft right reforms
Existence of personal rent seeking among parliamentarians
Delay in legislation drafting due to insufficient and inefficient rules of business
Poor law and order situation reduced the enthusiasm among private sector
Reform is a way to extract kickbacks and commissions for politicians and bureaucrats
Government had low fiscal space to support poor in case of exposure to high prices
No technological innovation
High dependence on generation projects utilizing imported thermal fuels
No utilization and development of domestic resources
Lack of commitment to institutional change among minister for power and heads of public utilities
Lack of skills and education in minister and utilities heads
Existence of corruption in public sector utilities
Corrupt and inefficient beaurocracy in public sector utilities and ministries
Increased opposition to reforms due to worsening of performance of the power sector in early phase

Lack of awareness among people
lack of laws for innovations in governance
High pressure on govt. for subsidization
Govt. reduced interest in power sector's investments
culture of electricity theft and nonpayment of electricity bills
strong unionism among employees of utilities
A regional characteristic for not accepting change easily
Insufficient private investments in all sub sectors of the sector
laws not sufficient to attract private investment in distribution and transmission
Inefficient competition commission to curtail market power, to introduce and maintain competition at retail and wholesale
Lack of advanced skills and technology in the regulatory agency
non clarity of roles among different organizations due to inefficient legislation
weak regulatory authority due to extensive external involvement
inefficiency of regulatory authority in price determination at all nodes of the value chain
Bureaucratic style of running utilities
Conflict with India
Pakistan not being an attractive place for foreign investors
Political instability over successive years
Insufficient first step of reforms i.e. corporatization
inability of regulatory authority to provide lucrative incentives to private sector through effective regulation
Inefficient regulations for attracting new technologies
shortage of highly educated and trained human resource in the regulatory authority
Lengthy and costly process for contract enforcement
Lack of state writ
Weak market forces
Monitoring of regulation and competition not according to the demand of reforms
Weak coordination system between supply and demand
Appointment of regulator is highly politicized
Chairman of the regulatory authority and its members not independent in decision making
The officials of the regulatory body are not equipped with the knowledge of latest technology on regulation
The prices are not fair
poor implementation of laws relating to property rights protection and contract enforcement
Insufficient laws to protect private property rights and enforce private contracts
Parliamentarians and feudal support electricity thieves of their areas
No fair and equitable criteria to set prices
Lack of confidence between public and private sector
Subsidies system do not benefit poor
Lucrative contracts to early projects
internal resistance from sector specific beurocracy of utilities against reforms
No audit of private projects regarding their capacity and production
Courts cause delay to reforms due to stay orders
Lack of political desirability due to poor economic and political situation
Lack of financial support to projects running short of operating finance
Lack of political feasibility of the reform to garner public support

Govt. inability to pay subsidies at right time
Absence of a stable and strong governing coalition
No feedback for policy improvement
Ineffective and unstable rules governing legislative and executive bodies
Lack of research activities in sector's reform
Opportunistic behavior of the political organizations
Balance of payment issue reduced commitment to reform
Uncertainty in the business environment due to political rent seeking behavior
Reforms just meant to get the tranches of IMF and World Bank loans
Reforms package was complex and time consuming
Insecurity to private investment
Path dependence of irreversibility of economic policies and reforms
Majority of population living in rural areas create more needs for investments but less return
less bargaining power among reforms' executive for reforms implementation
Extreme opposition to reforms from employees of vertical utility
Incoherency between reforms design and implementation framework
Provinces not ready to reforms
deadlock during different reform phases due to conflicts, lack of compromise solutions and sufficient political support
Weak industrial base in the country
Difference of opinions on reforms by different political parties
High fluctuations in currency exchange
Absence of reforms champions to suppress powerful sentiments against reforms among general public
Lack of legislation on adaptation of new economic system
Strong opposition to reforms thereby disrupting or delaying the implementation of reforms
Lack of training to judiciary to decide cases relating to inter-relationships between people and utilities; utilities and companies; regulator and utilities and between regulator-companies
Top- down approach to reform implementation on all stakeholders
extensive blackouts in the country
economic, social and cultural differences among stakeholders
Government failure to show the benefits of reforms to the public
past experience, awareness and education among stakeholders
Deadlock of financial transactions among different stakeholders of the power sector
variance of perception among stakeholders about net economic gain and loss in future
Reduced interest of government in improving recovery of electricity bills from resourceful persons
Nonpayment of electricity bills by government's important offices and buildings
International image of the country as a hostile place to international community
Unclear and insufficient rules for the creation of a regulatory agency
Financial dependence of regulatory agency over government's resources
Lack of transparency in regulatory affairs
Lack of autonomy of regulatory agency
Lack of coordination among different energy sectors
Poor infrastructure in areas indicated for setting up power plants
Absence of accountability mechanism for regulatory agency
High cost to access raw material for power plants
Buildup of circular debt in the whole value chain

Lack of safeguards to uphold the independence of regulatory agency
High costs to access necessary information from the regulatory agency and other government organizations
Difficulty to find well trained human resource
Lack of judicial authority with regulatory agency
Social aspects not well covered in reforms' agenda
Over lapping of judicial and administrative authority of regulatory agency with judicial and executive authorities of the country
Low industrial demand in the time of excess electricity during late 1990s' discouraged further reforms
An irresponsive regulatory agency to changed institutional environment
Missing corporate governance rules from the public sector enterprises
Involvement of political decision makers in price regulation
Lack of enthusiasm for reforms
Less authority of regulatory agency in protecting all stakeholders including producers, suppliers and consumers
A system of central administration in the political system is a big barrier to decentralization
Political parties oppose reforms on the fear of losing votes from their political inductees who may lose jobs
Lack of innovations in rules making regarding new technologies
Lack of a clear economic system
The perception of national assets hinder reforms
continuity of primitive and protected methods of price setting for producers and suppliers
Lack of honesty among public officials
Public officials sacrifice national interests over personal gains
Electricity never considered as a commodity to be traded in a market
absence of rules and regulations to invoke competition among producers based on efficiency
Legislation provide insufficient securities to innovations
Parliamentarians are not trained on new system, its implementation process and the way it will show results
Inefficient communication and reporting system in regulatory agency and utilities
Banking system not well integrated with power sector
politically motivated over staffing in utilities
Lack of legislation for companies to import all kind of technologies necessary for up gradation and building new plants
strong resistance from within utilities against reforms due to politically motivated unionism
Strong control of power market by cartel of private projects restrict entry of new projects
Lack of clear and focused rules and regulations for effective and increased interaction at different levels
Cartel of private power projects resist to change in status quo
Weak interactions between government-regulator, government-firm, government-consumer, firms-regulator, firm-firm, firm-consumer, regulator-consumer
reduced adaptability of stakeholders to new environment
Lack of R&D activities to develop new laws and policy instruments for attracting investment in distribution and transmission system
Great harmony of interests among big business groups and politicians
Improper and inexperienced transition management
Banks do not favor the development of indigenous resources such as coal, hydro and wind
Weak governments threaten businessmen to invest in long term projects
information constraints for business transactions in unstructured environment
Insecurity of job to employees after reforms
Tariffs as non-cost reflective and non-remunerative
Strong inclination among unbundled groups to integrate with WAPDA

Existence of strong civil liberties for labor unions, trade unions, etc.
Policy was imposed from outside
Demonstration effect of regional performance in reforms
Policy of reforms was misused for political scoring
obstacles in feedback learning mechanism for reforms' implementers
Population dispersion increased investment needs
Unstructured conflict resolution rules and mechanism
Wrong way to implement reforms
high cost of doing business
Less time given to corporatize the power utility before unbundling
staggering capital market
Not right persons appointed before initiating reforms
inter and intra state hurdles in capital movement
Conflicts among provinces over natural resources
Insufficient funds available to implement reforms
instability in exchange rate
Reforms should have been devised by the parliament
Reforms lacked commitment from governments of time
Public interests were not protected in rendering early contracts
less integrated financial sector with power sector
More leverage was given to private companies
Terms and conditions of contracts did not match with existing and future realities
Those type of lucrative contracts were not possible to be extended for next governments
inability of the judiciary to prevent expropriation
Financial meltdown weakened resolve for reforms
Poor history of judiciary in enforcement of contracts and protection of property rights
Exposure of judiciary to political interference
Enhanced external involvement in reforms implementation
inefficient fuels market
Slow and costly access to judiciary for conflict resolution
power sector faces failure in institutional reforms due to failure in related energy industries
Inefficient and insufficient electricity law
inheritance of social trait of likeness for law breakers from British India
not considering nonpayment of utilities bills as immoral act
Inefficient rules for tariff determination at each node
Political involvement in tariff determination
Lack of laws to inhibit power theft
Ethnic and sectarian polarization
path dependency of inefficient functioning among ex-employees of WAPDA
Privatization is considered as a sale of national assets and propagated wrongly by interest groups
Local private investors stayed away from investing in power sector

Loading of Notions on the Four Discourses

Areas of Consensus and Disagreement

Participants of the Q sorting process have consensus on the notions 6, 10, 15, 17, 23, 30, 31, 32, 33, 34, 36 and 37. They agree jointly that above mentioned notions have been important in blocking the process of institutional reforms in the power sector of Pakistan. First of all, all the participants of the study agreed with the notion that implementation of the template of institutional reforms has not been compatible with the institutional endowments of the country (6).

Since advent of new technologies in the power sector has been an important driver of institutional reforms to increase sector's efficiency; however, consensus also developed that regulations has been insufficient to attract new technologies in the sector (10). Culture of electricity theft and nonpayment of utilities' bills in the country has also been a consensual notion among the participants (15). All the participants showed agreement that lack of necessary safeguards to ensure the freedom of the regulatory authority has played important role in undermining the institutional reforms (17). In addition, they also recognized mutually that political interference has weakened the performance of the regulatory authority (23). As a result of unbundling, new organizations were formed within the power sector which lacked clear rules to determine their mutual interactions (30). Experts also believed that laws to restrict power theft have been inefficient (31). After unbundling, contracts were awarded to all the players in the power sector including private generators, public generators, distributors and transmitter. In addition, all the new comers from private sector are awarded contracts; however lengthy process of enforcement of contracts has deterred private sectors' involvement in the power sector of Pakistan (32). All the respondents believed that implementers of reforms have been facing difficulty in learning from their past experiences (33). They also agreed that utilities and regulatory agency have often disseminated false information regarding their actual performance which is an important barrier to reforms (34). Often economic policies have reversed in Pakistan. It has remained a routine that every incoming government brought her own economic philosophy, by which they downgraded the economic policy of previous government (even in some cases they dishonored the investment contracts made by the previous government). Respondents believed that such economic behavior by successive governments has created problems for the reforms' policy (36). In

their last consensual notion, they believed that wide spread corruption in utilities and ministries has been an important barrier to reforms in the power sector of Pakistan (37).

All the respondents have shown disagreement on notions 9, 13, 21, 25 and 27. All disagreed that threat of army intervention in the country has affected commitment to electricity reforms in the country (9). A general disagreement was also observed on the impact of high cost of doing business on electricity reforms (13). A concept that delays of population census for last couple of decades has impacted the electricity reforms; however this notion received general disagreement by the respondents (21). All the four discourses did not endorse the perception that legislators have weak commitment due to rent seeking (25). They also disagreed that lack of rules of business has been an impediment to legislation relating to electricity reforms (27).

Loadings on Discourse A

Discourse A with 23 % explanatory variance, has distinguished notions 3, 4, 7, 14, 16, 24, 40, 42, 46, 49 and 51. In addition, other valuable notions for the discourse are those which are strongly agreeable and strongly disagreeable (or lying on the extreme sides of the scale). Here, discourse A gives most importance to notions 15, 32 and 38 whereas completely no importance to 9 and 41 notions (Table 1).

Table 1: Discourse A. Distinguished, strongly agreeable and strongly disagreeable notions

Distinguished	Strongly agreeable	Strongly disagreeable
3, 4, 7, 14, 16, 24, 40, 42, 49, 51	15, 32, 38	9, 41

Discourse A agrees significantly that problems in interactions among different stakeholders (such as regulator-government, government-firm, firm-firm, consumer-regulator and consumer-firm) impacts on electricity reforms (40). This poor interaction among stakeholders might be due to information constraints (46). Such constraints in information may result in raising the transaction costs among the stakeholders which may significantly impact the time and costs attached with enforcement of contracts among interacting parties (32). An information constraint due to low literacy rate has created misunderstanding among consumers about the benefits of reforms (51). In addition, a weak governance structure has also resulted in increasing the opportunistic behavior among different players of the power sector. Firstly, politicians may by utilizing their influence in the affairs of the sector induct their political affiliates into the utilities (38). Secondly, employees of the utilities may have indulged in aiding consumers for electricity theft (15).

Factor A disagrees with the notions which reveal the importance of politico-economic endowments. Firstly, it disagrees with the notion that lack of education in the minister for power and utilities' head is blocking reforms (3). Alongside it also disagrees that minister for power and utilities heads lack will to reform (7); however this factor is silent on the notion of shortage of highly educated and skilled human resource in the regulatory agency (16). Discourse disagrees with the notion of shortage of skilled parliamentarians to draft right reforms (49). Threat of army intervention to decrease commitment for reforms among politicians also received extreme disagreement from discourse A (9). Impact of regional geo-political situation and difference of economic, social and cultural values among people has been unimportant for discourse A (14, 24). Discourse A also considered that the notion of poor institutions from colonial power is not important for the reforms (14). Discourse disagrees with the perception that tariffs for different segments of the power sector are not cost-reflective and non-remunerative (41). It also disagrees with the notion that subsidies to power sector cause problem to the reforms (4). The respondents held the view that unless governance structure is improved by reducing electricity thefts and other leakages, subsidies shall neither be removed, nor the burden of electricity theft shall be put on the shoulders of the consumers by increasing electricity prices for those who pay electricity bills.

Loadings on Discourse B

Discourse B with a 10 % variance has distinguished notions 1, 5, 8, 11, 22, 28, 29, 35, 38, 47 and 48. This discourse agrees strongly with the notions 15, 18 and 39 whereas dis-agrees strongly with 8, 9 and 41 (Table 2).

Table 1: Discourse B. Distinguished, strongly agreeable and strongly disagreeable notions

Distinguished	Strongly agreeable	Strongly disagreeable
1, 5, 8, 11, 22, 28, 29, 35, 38, 47, 48	15, 18, 39	8, 9, 41

Discourse B reveals that reforms were incongruent with the starting conditions of the electricity sector. This has been aided by a number of distinguishing notions and strongly agreeable notions. Notion 39 strongly maintains this discourse. Sector was endowed with a number of conflicts regarding distribution of the resources which required resolution before reforming power sector (18). Another important feature of the pre-reform power sector was the culture of electricity theft and nonpayment of utilities bills by the public sector

organizations and the general public at large (15) which resulted in subsidization of the sector. Top down approach or a stepwise design to reforms (48) has remained in tension with the implementation framework (35) which means that implementation framework which consisted of pre-reform ingredients has lack of coherence with the top-down approach for reforms. Due to internal situation of the sector, external involvement at any level of the reform has created problems for the reforms (22).

Discourse B remains neutral when it comes to the notions 1 and 28. Since this discourse is more related to the relationship between sector's starting conditions and reforms, therefore it communicates neutrality on concepts relating to those aspects which come into play in the later phases of reform such as rules for competition and regional affinity in reforms.

This discourse also disagrees to a number of notions. It disagrees that political aspects have been important for reforms. Initially, it disagrees that lack of strong governing coalition has remained a problem (47) It further holds that neither the fear of losing public support (5) and nor the threat of army intervention has affected the political commitment to reforms (9). Discourse B disagrees with the notion that poor law and order situation in the country has impacted reforms (29). Insufficiency of laws relating to property rights and contracts enforcement has also not been problem to the reforms (8). This discourse also disagrees with the notions which highlight issues relating to the employees such as political over-staffing in utilities (38) and labor unions among employees has created barriers to reforms (11). In last, this discourse disagrees with the notion (41) like discourse A that tariffs are non-remunerative and non-cost reflective for different segments of the sector.

Loadings on Discourse C

Discourse C with 7 % variance has distinguishing notions 4, 5, 7, 11, 12, 14, 18, 20, 21, 22, 24, 41, 43 and 50. Moreover, this discourse has strong agreement with notions 16, 23 and 31 whereas strong dis-agreement with 47 (Table 3).

Table 2: Discourse C. Distinguished, strongly agreeable and strongly disagreeable notions

Distinguished	Strongly agreeable	Strongly disagreeable
4, 5, 11, 12, 14, 18, 20, 21, 22, 24, 41, 43, 50	16, 23, 31	47

Discourse C is strongly loaded by the notion 23 which communicates that extensive external involvement has contributed to a weak regulatory agency which is a strong barrier to institutional reforms. In addition, government has shown little commitment to reforms due to the fear of losing public support (5). An essence of the reforms is to strengthen the regulatory body but political compromises have dragged the regulatory authority in opposite direction. This regulatory authority has also remained short of a highly educated and skilled human resource (16). Lack of a necessary accountability mechanism has equally contributed to weaken the regulatory authority (12). Due to the weaknesses in the regulatory authority, it has remained inefficient to perform its tasks rightly. Being an advisory body to the government on legislations relating to the electricity sector, it has not performed effectively to help in drafting competent laws to contain power theft (31). Regulatory authority has also remained inefficient in devising a more practicable formula for tariffs determinations (41). Regulatory authority has granted operating licenses to all the unbundled utilities to function under corporate rules and have financial autonomy but due to poor regulatory governance, utilities have continuously remained unable to recover their costs and have persistently depended on public subsidies (4). This discourse also agrees with the notion that deadlock during different phases of the reforms has affected the pace of reforms (18). In addition regional geo-political situation has also impacted the reforms (14) in terms of investment shortage despite the fact that regulatory body has provided generously long term contracts to power investors. Discourse remains neutral on the notion of political desirability in minister for power and utilities' heads (7) and also on external involvement in reforms' implementation.

This discourse disagrees with some notions. It disagrees strongly with the notion that economic, social and cultural differences among people have impact on reforms (24). It disagrees too with the notion that integration between financial and power sectors has been an issue form reforms (20). Similar to other discourses, it also disagrees with the notion that country lacked strong governing coalition which could impact reforms (47). Again population census in this discourse has nothing to do with reforms (21). Lack of GDP per capita and commitment to reforms also received disagreement in this discourse (43). Discourse develops disagreement that functions of regulatory authority have overlapped with other authorities (50). A slight disagreement was also observed on the matter of unionism among employees (11).

Loadings on Discourse D

Discourse D with 15 % explanatory variance has distinguished notions 2, 19, 26, 39, 42, 49 and 51. Alongside, this discourse also has strongly agreeable notions 5, 37 and 38 and strongly disagreeable 9, 25 and 27 (Table 4).

Table 3: Discourse D. Distinguished, strongly agreeable and strongly disagreeable notions

Distinguished	Strongly agreeable	Strongly disagreeable
2, 19, 26, 39, 42, 49, 51	5, 37, 38	9, 25, 27

This discourse builds around the notions that governments have been less committed to reforms due to the fear of losing public support (5). The utilities which were loaded heavily with politically motivated recruitments (38) have deeply harbored corruption among its employees (37). Discourse D disagrees strongly on the notion that politicians use electricity sector for financial rent seeking (25). It also disagrees on the concept that legislation on electricity is delayed due to inefficiency of rules of business (27). The system is neither deficient of rules and mechanism for conflict resolution among stakeholders (19) nor it is short of skilled parliamentarians to draft a right set of reforms (49) as there are many senior and highly educated lawmakers which also have support of concerned departments to draft legislation. Moreover the notion that politicians have weak commitment to reforms due to threat of army intervention is strongly rejected (9). Discourse remains neutral on the notion that reforms suffered due to weak political parties which were unable to raise public support (2). Thus the discourse has revealed that it is the notion of public support and not financial rent seeking and threat of army intervention which structure the behavior of politicians on electricity reforms. This discourse also disagrees that ethnic and sectarian polarization has impact on reforms (26). It slightly disagrees with the notion of lack of coherence with sector's starting conditions (39).

In addition, the notion of poor institutions from colonial power has been disregarded by the discourse (42) along with low importance to ethnic and sectarian polarization (26).

[206]

Appendix 17: Questionnaire from power sector private investors

Private Power Industry Survey (Pakistan)

1. Please read carefully and answer each question from the questionnaire below. Your feedback will be of great importance for overall success of this research exercise.
2. This survey is purely part of a research assignment by Department of Economics, University of Gujrat. The information collected through this survey will only be restricted to academic accomplishments and the usage of information for all other purposes will be strictly banned.

Please indicate what position you currently hold. *

- ☐ Owner/CEO
- ☐ Senior Executive (General manager, VP, CFO, Executive Director)
- ☐ Manager/Director
- ☐ Sales Representative or Technical Personnel
- ☐ Administrative Personnel
- ☐ Independent Consultant
- ☐ Other:

Where is your company's located? *

Please write down the city and province of company's location.

How do you relate the following variables for selecting the location of the plant? *

Please select the most suitable option for each of the variables which describes best your preference for current location

	Not Relevant	Little Relevant	Relevant	Highly Relevant	Most Relevant
Local government support	☐	☐	☐	☐	☐
Close to demand market	☐	☐	☐	☐	☐
Fuel supply	☐	☐	☐	☐	☐
Tax incentives	☐	☐	☐	☐	☐
Local infrastructure	☐	☐	☐	☐	☐
Environmental regulations	☐	☐	☐	☐	☐
Easy grid connectivity	☐	☐	☐	☐	☐
Law and order situation	☐	☐	☐	☐	☐

What is current status of the plant? *

Please indicate one of the stages below.

- ☐ fully operational

- ☐ semi operational (operating partially)
- ☐ under construction
- ☐ in planning stage

Which of the following categories best describes the technology in use in your company? *

Choose one that is most applicable to your company.

- ☐ Thermal (Furnace oil based)
- ☐ Thermal (Diesel based)
- ☐ Thermal (Gas based)
- ☐ Thermal (Coal Based)
- ☐ Thermal (Dual i.e. gas and diesel)
- ☐ Hydel
- ☐ Wind
- ☐ Solar

How do you relate the following variables for preferring above mentioned technology of production? *

Please select the most suitable option for each of the variables which describes best your preference for particular technology

	Not Relevant	Little Relevant	Relevant	Highly Relevant	Most Relevant
Low initial investment	☐	☐	☐	☐	☐
Less period required to operationalize the plant	☐	☐	☐	☐	☐
Company's expertise in that technology	☐	☐	☐	☐	☐
Low costs of closing down this type of technology or low sunk costs	☐	☐	☐	☐	☐
Unclear rules and regulations for other technologies	☐	☐	☐	☐	☐
Lucrative incentives	☐	☐	☐	☐	☐
other	☐	☐	☐	☐	☐

Please explain if other

Which form of plant's specific investments are planned to be made during next couple of years? *

Please choose one or more types for potential investment

- ☐ Building new plants

- ☐ Extension of current plant
- ☐ Refurbishment of existing plant
- ☐ Just running the plant as it is
- ☐ other

Please explain if other

Page 2

After page 1 [Continue to next page](#)

How would you rate the importance of below mentioned barriers to private investment in the power sector of Pakistan? *

Please rate each barrier mentioned below according to your exposure.

	Not important	Little important	Important	Much important	Most important
Ambiguity of relevant laws and regulations	☐	☐	☐	☐	☐
Electricity tariffs	☐	☐	☐	☐	☐
Protection of property right	☐	☐	☐	☐	☐
Incapacity of dispatch system	☐	☐	☐	☐	☐
Unsustainable fuel supply	☐	☐	☐	☐	☐
Insufficient contract enforcement	☐	☐	☐	☐	☐
Poor law and order situation	☐	☐	☐	☐	☐
Corruption	☐	☐	☐	☐	☐
Bureaucratic hurdles	☐	☐	☐	☐	☐
Trade restrictions	☐	☐	☐	☐	☐
Power theft	☐	☐	☐	☐	☐
Lack of coordination	☐	☐	☐	☐	☐
Circular debt	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If other then please explain

How would you rate the below mentioned features of investment environment in the power sector of Pakistan as compared to other developing countries? ²

Please rate each feature mentioned below from 1 to 5 according to your perception (1= inferior, 5= superior).

	inferior			superior	
Quality of infrastructure	☐	☐	☐	☐	☐
Quality of workers	☐	☐	☐	☐	☐
Stability in government policies	☐	☐	☐	☐	☐
Efficient dispatch system	☐	☐	☐	☐	☐
Financial incentives	☐	☐	☐	☐	☐
Contract enforcement	☐	☐	☐	☐	☐
Ownership regulation	☐	☐	☐	☐	☐
Currency convertibility	☐	☐	☐	☐	☐
other	☐	☐	☐	☐	☐

If other then please explain?