

Learning from Power Sector Reform

The Case of Pakistan

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Abstract

Pakistan's power sector underwent a substantial, if protracted, reform process. Beginning with an independent power producer program in 1994, the full unbundling of the national vertically integrated power and water utility, the Water and Power Development Authority, and the establishment of a regulatory entity, the National Electric Power Regulatory Authority, followed in 1997, paving the way for the eventual privatization of one major distribution utility, Karachi Electric, in 2005. Plans to privatize the remaining distribution utilities were shelved following the controversy surrounding the Karachi Electric transaction. A single buyer model has been in operation since the sector restructuring, with the Central Power Purchasing Agency fully separated from transmission and dispatch (the National Transmission and Dispatch Company) in June

2015. Despite these major steps, Pakistan has continued to suffer from inadequate capacity and other constraints, leading to large and frequent blackouts. At the heart of the impasse is the so-called "circular debt" crisis, whereby distribution utilities struggling to collect revenues and meet regulatory targets for transmission and distribution losses default on their payments to generators, and the sector is periodically bailed out by the government once losses accumulate to intolerable levels, at high cost to the exchequer. This dynamic has undermined incentives for utilities to improve their efficiency, while discouraging generators from investing in new capacity to address supply shortages. In the meantime, little has been done to accelerate access to electricity to the significant share of unserved population in rural areas.

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Learning from Power Sector Reform: The Case of Pakistan

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JEL Codes: L9; Q4

¹ This paper is based on data collected and interviews conducted in Pakistan by Fariel Salahuddin. It also benefited from considerable guidance and input from the World Bank Country Team: Rikard Liden, Mohammad Saqib, Anjum Ahmad, Anh Nguyen Pham, Defne Gencer and Richard Spencer.

Foreword

“Rethinking Power Sector Reform” is a multiyear global initiative of the Energy & Extractives Global Practice that provides an updated assessment of power sector reform experiences across the developing world. The initiative aims to revisit and refresh thinking on power sector reform approaches, in the light of accumulated evidence about the performance of countries undertaking different types of reforms. The goal is to reignite the policy debate around reform approaches by articulating a new vision that incorporates lessons learned over the past 25 years. It also reflects on how recent technological trends and business models that are disrupting the sector may call for a new thinking on reform strategies.

Since the 1990s, a standard set of policy prescriptions for power sector reform has been widely used. These include vertical and horizontal unbundling of power utilities; private sector participation; creation of an independent regulator; achievement of cost recovery pricing; and the introduction of competition in power generation. While this package of reforms was, at least partially, adopted by several developing countries, momentum and uptake slowed considerably in the 2000s. There is a need to revise approaches in the light of 25 years of experience, evidence, and technological disruptions to provide practitioners with a flexible frame of reference that can help identify the types of reforms needed to improve the power sector in different country contexts.

Supported by the World Bank’s [Energy Sector Management Assistance Program](#) (ESMAP) and the [Public – Private Infrastructure Advisory Facility](#) (PPIAF), the initiative works with different partners and experts across the World Bank Group (WBG) and beyond to generate evidence, analysis and insights on key themes of interest to power sector reform practitioners and decision makers globally: cost recovery, utility governance and restructuring, power markets, regulation, and political economy. Findings and recommendations on each of these themes will be included in a forthcoming Flagship Report.

The initiative is strongly evidence-based, grounding its research in an in-depth exploration of the 25-year power sector reform journey of 15 World Bank Group client countries that represent a wide diversity of geographies, income levels, and approaches to reform. The selected countries are Colombia, the Dominican Republic, the Arab Republic of Egypt, India, Kenya, Morocco, Pakistan, Peru, the Philippines, Senegal, Tajikistan, Tanzania, Uganda, Ukraine, and Vietnam.

An important output of the project is a series of case studies – of which this is one – that provide a narrative of the reform dynamics in each country and evaluate the impact of reforms on key dimensions of sector performance including security of supply, operational efficiency, cost recovery and energy access. For a subset of countries that pursued deeper reforms – Colombia, India, Peru and the Philippines – the project also includes a series of free-standing case studies that evaluate the experience with wholesale power markets. The purpose of the case studies is to reflect upon the experiences of individual countries with a view to extracting lessons of

broader interest to the global community. It is not the role of these papers to recommend any particular way forward for the countries in question.

These case studies, which constitute companions to the synthesis of the Flagship Report, are being published in the Policy Research Working Paper Series of the World Bank. As such, the case studies represent the views of the authors alone and should not be attributed to the World Bank or to any other person or institution.

Abbreviations and Acronyms

AEDB	Alternative Energy Development Board
APEPDCL	Andhra Pradesh Eastern Power Distribution Company Limited
APSPDCL	Andhra Pradesh Southern Power Distribution Company Limited
CCI	Council of Common Interest
CESU	Central Electricity Supply Company
CPEC	China-Pakistan Economic Corridor
CPGCL	Central Power Generation Company Limited
CPI	Consumer price index
CPP	Captive power plant
CPPA-G	Central Power Purchasing Authority (Guarantee) Ltd.
DISCO	Distribution Company
FATA	Federally Administered Tribal Areas
FESCO	Faisalabad Electricity Supply Company
GENCO	Generation Company
GEPCO	Gujranwala Electric Supply Company
GoP	Government of Pakistan
GW(h)	Gigawatt (hour)
HESCO	Hyderabad Electric Supply Company
IESCO	Islamabad Electricity Supply Company
IMF	International Monetary Fund
IPP	Independent Power Producers
JDVVNL	Jodhpur Vidyut Nigam (Jodhpur Power Distribution Limited)
Jl	Jamaat-e-Islami
JPCL	Jamshoro Power Company Limited
JVVNL	Jaipur Vidyut Nigam Limited (Jaipur Power Distribution Limited)
KAPCO	Kot Addu Power Company Limited
KE	K-Electric
kms	kilometers
LESCO	Lahore Electricity Supply Company
LPGCL	Lahore Power Generation Company Limited
MEPCO	Multan Electric Supply Company
MOWP	Ministry of Water and Power
MYT	Multi Year Tariff
Nap	Not applicable
NEPRA	National Electric Power Regulatory Authority
NPGCL	Northern Power Generation Company Limited
NTDC	National Transmission and Dispatch Company
PC	Privatization Commission
PEPCO	Pakistan Electric Power Company

PESCO	Peshawar Electric Supply Company
PML(N)	Pakistan Muslim League (Nawaz)
PPA	Power purchase agreement
PPIB	Private Power and Infrastructure Board
PPP	Pakistan People's Party
PTI	Pakistan Tehrik-e-Insaf
Rs	Rupees
SBP	Single Buyer Plus
SCADA	Supervisory control and data acquisition
SEPCO	Sukkur Electric Supply Company
TDS	Tariff differential subsidy
TESCO	Tribal Electric Supply Company
WAPDA	Water and Power Development Authority
WESCO	Western Electricity Supply Company
WPPO	WAPDA Private Power Organization

1 Introduction: Slow, stalling reform process dominated by ‘circular debt’

At the beginning of the 1990s Pakistan had a vertically integrated national power system. It first endorsed a sector reform program in 1992 following a period of severe power shortages, and in 1994 IPPs were allowed to enter the sector, which they did by adding 4,500 MW. However, the planned step to unbundle the sector took six years to happen and only two of these unbundled companies have been privatized until now, despite a further strong commitment to do so by the incoming government in 2013. The thermal Kot Addu Power Plant was partially privatized in 1996 with a further sale of some of the government shareholding in 2005, and the one full privatization that did occur was of the historically separated vertically integrated Karachi Electric Supply Company (now referred to as K-Electric - KE). A regulatory authority (NEPRA) was established in 1997, but tariff setting for consumers was retained by the government.

For much of the period since the introduction of the first sector reform plan, Pakistan has continued to suffer from shortages of power, so severe at times that this has led to public demonstrations. Inextricably linked with this problem has been the policy towards the pricing of electricity. Subsidies have been large and increasing, leading to a situation where public investment in capacity cannot be afforded. At the same time there has been great public resistance to any increase in the tariffs. The low efficiency of the operation of the power sector coupled with a pricing policy that did not fully cover costs has at times led to high values of the circular debt (see Box 1) and non-payment to IPPs. In 1988 and again in 2013 the government negotiated loans with the IMF which set conditions on the reform of the power sector designed to reduce the amount of this debt.

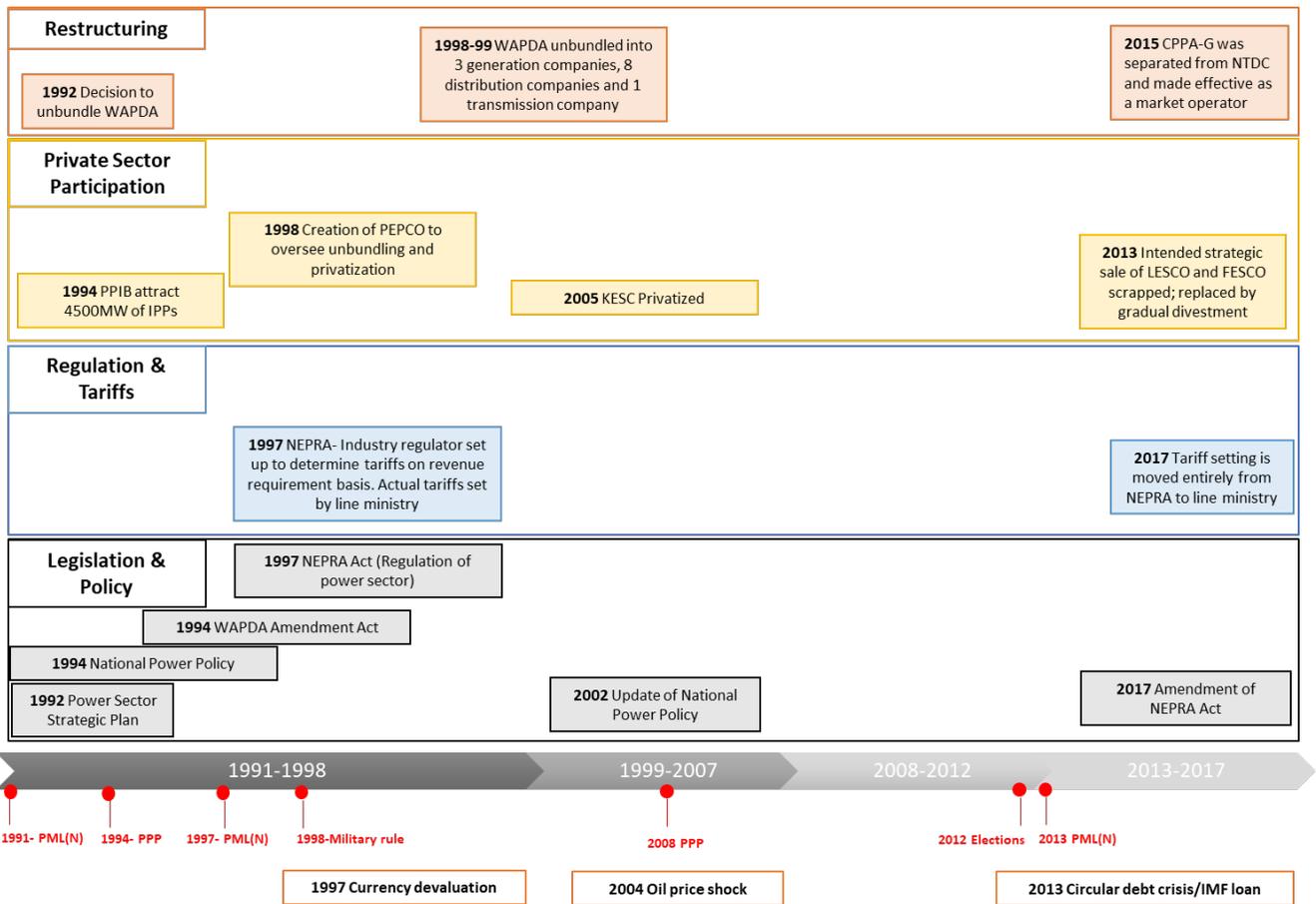
Box 1: Definition of Circular Debt

Circular debt was officially defined by the Economic Coordination Committee of the Cabinet in 2014: “The circular debt is the amount of cash shortfall within the Central Power Purchasing Agency (CPPA) which it cannot pay to power supply companies. The overdue amount is the result of: (a) the difference between the actual cost and the tariff determined by the National Electric Power Regulatory Authority (Neptra) which is the distribution company’s loss over and collections under that allowed by Neptra; (b) the delayed or non-payment of subsidies by government; and (c) delayed determination and notification of tariffs. It is the government’s policy to reduce, limit to a certain amount which would be reduced over time, and eliminate the causes of circular debt.” National Power Tariff and Subsidy Policy Guidelines 2014.

Figure 1 presents simple timelines of the main reform events since 1990 grouped by restructuring, private sector participation, regulation and tariffs, and legislation and policy. Additional timelines indicate the episodes used for describing the evolution of the power sector, the changes of government,² and major external shocks to the sector.

² Pakistan Peoples’ Party = PPP; PML(N) = Pakistan Muslim League (Nawaz).

Figure 1: Pakistan’s power sector reform timeline

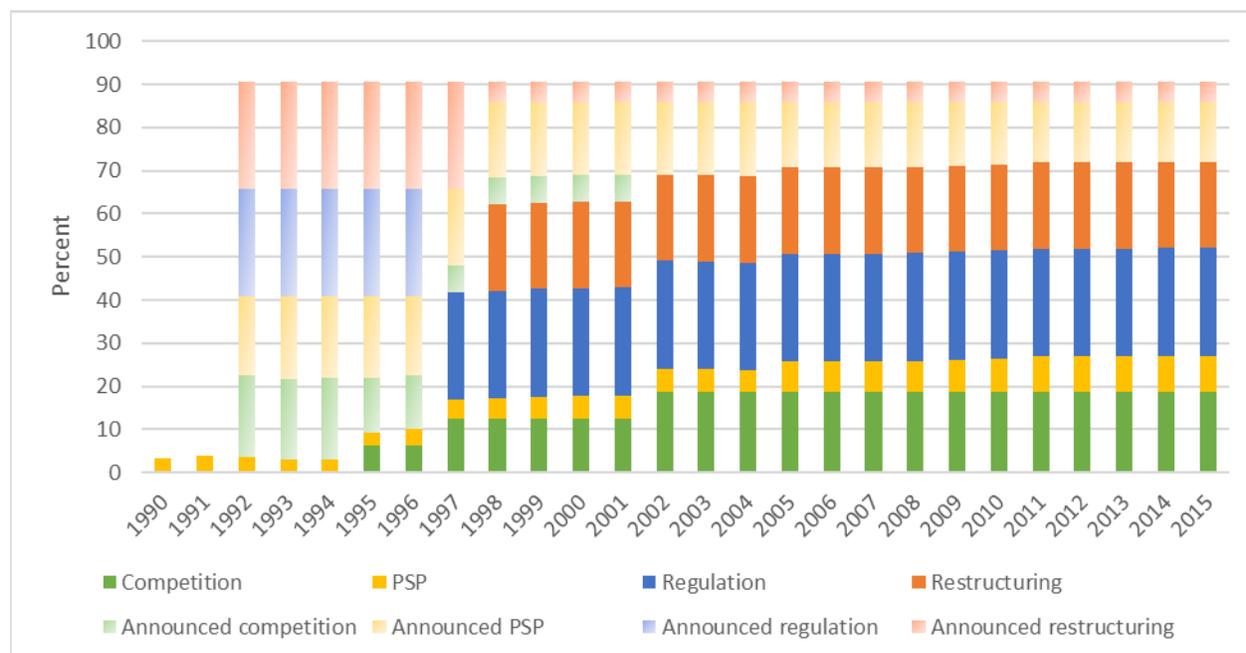


This paper sets out to explore Pakistan’s power sector reform experience drilling down into the dynamics between sector development, performance, and key (attempted) reform interventions, with special focus on sector planning and procurement, access and accessibility, tariff setting and regulation, and utility performance. As part of a wider global study of power sector reform, the primary objective of the paper is to draw lessons from Pakistan’s story that are of wider relevance to policy makers and reform practitioners, rather than to offer recommendations for Pakistan itself. The paper begins with a detailed, chronological account of its development and reform history. From here, the paper turns to consider the performance and development of the power sector over the past decades, probing into the reasons for Pakistan’s troubled reform experience. The final, concluding section, offers reflections on some of the factors underlying the Pakistan power sector story.

2 The development and reform history of the power sector

The standard package of reforms prescribed by international donors in the 1990s included four principal components: restructuring (vertical and horizontal unbundling of power utilities); private sector participation; creation of an independent regulator; and competition in power generation. The index of announced reforms and actual reforms illustrated in figure 2 shows that good starts were made in private participation, regulation, and unbundling, resulting in a sharp jump in the reform index in 1997 and 1998, but that subsequently these reforms have not been followed through along the lines expected under the Washington consensus.³ The following is a detailed history of the development of power sector reforms in the country. The success of the reforms taken will be examined in the next part of this study.

Figure 2: Actual and announced reforms in Pakistan, 1990-2015



Source: Rethinking Power Sector Reform.

PSP = private sector participation.

2.1 Political context

A highly significant aspect of Pakistan's 70-year political journey was its first stable and complete democratic transition in 2013. The Pakistan Peoples' Party completed its full five-year term in office, handing over power to the Pakistan Muslim League (N). Before 2013, no democratically

³ In order to aggregate across the four dimensions of power sector reform considered in this study, a simple Power Sector Reform Index is constructed. The index gives each country a score on an interval of 0 to 100 on each dimension of power sector reform. The scores are based on giving equal weight to each step on each dimension of the reform continuum. The average of the four 0-100 scores is used to provide an overall summary of the extent of reform. For more on the index, see the annex.

elected government had successfully completed its term—elected governments were disrupted either through military coups or calls for early elections.⁴ This long-standing uncertainty is a significant underpinning that has influenced socio-political and economic development in the country and continues to influence policy-making in energy and infrastructure.

Historically Pakistan has been governed by the Pakistan Peoples’ Party (PPP), the Pakistan Muslim League (Nawaz)—PML (N)—and the Pakistan Army. Pakistan Tehrik-e-Insaf (PTI) emerged as a third political party in the 2013 elections and was elected to power in 2018. Until 2013, and since the late 1980s, PML (N) and PPP have alternately been in power, their terms interspersed by a military led government during 1999-2008. The two older parties have followed significantly diverging political and economic ideologies. PPP, with its populist, social-democratic stance, has been economically conservative, while PML(N) has been more economically liberal. These diverging ideologies, coupled with the rapid exchange of political power between these primary stakeholders, has had a large influence on the privatization and nationalization of economic assets in the country.

Pakistan’s economic policy has also been significantly influenced by regional politics. The country’s economic trajectory has been buffeted simultaneously by the security implications of being a strategic regional actor and the resulting financial and political aid that has poured into the country. A deteriorating security situation has resulted in dampened growth. Simultaneously, politically-linked bilateral development aid and policy and reform-based lending from multi-lateral agencies have not only buoyed the economy but also influenced the economic reform process.

2.2 Sector development

2.2.1 The years before 1990

In 1947, at the time of the partition of the sub-continent and the creation of Pakistan, the installed capacity in the country was 60 MW. The sector came under a formal planning process after the first Five-Year Plan (1955-1960) was developed by the Planning Commission. Until this time, Pakistan’s power sector consisted of a single hydropower station and a few integrated transmission lines that connected a few load centers, and a separate vertically integrated company supplying Karachi (Karachi Electric Supply company – KESC) and serving 15 percent of national demand. There was no integrated national grid or interconnection between the various power plants. The first mega power sector generation projects added to the energy infrastructure inherited by Pakistan at partition were carried out in the 1960s. All planning in this period was conducted through ‘five-year plans’ which laid out the infrastructure and social needs and the

⁴ A further full transition was completed in 2018.

plan to meet them. It was as part of the First Five Year Plan that the vertically integrated Water and Power Development Authority (WAPDA) was created in 1958 as an autonomous and statutory body under the administrative control of the federal government for the purpose of coordinating and giving a unified direction to the development of schemes in the water and power sectors, which were previously being dealt with by the respective Electricity and Irrigation Departments of the Provinces. This was also the period when the World Bank became involved in Pakistan and helped develop the master plan for an integrated power system through the *“Water and power resources of West Pakistan: a study in sector planning”*. All these landmark developments occurred under Pakistan’s first round of military rule.

This period is generally perceived as one of high economic growth⁵ with rapid industrialization, modernization of agriculture practices and development of infrastructure. Construction of the Tarbela (1969) and Mangla Dams (1961) began in this period, adding about 2500 MW capacity to the grid by 1977. However, this period is also credited with exacerbating income inequality in the country. The creation of the Pakistan Peoples’ Party’s (PPP) was deeply influenced by this milieu of growth accompanied by increasing inequality. Its mandate was therefore left socialist leaning and traditionally catered to a voter base of students, workers, and rural population. In the 1970 general elections, Zulfikar Ali Bhutto, the founder of PPP, energized its electoral base with a manifesto centered on addressing this inequality. One of the major economic reforms in his election manifesto called for nationalization of private industrial assets of the country. In the aftermath of Bhutto’s election as President in 1971, with a public that was *‘emotionally charged, politically enlightened and highly conscious of their right to co-exist with the so-called affluent section of population,’*⁶ the newly-elected PPP government passed the *“National Economic Reform Order”*, which resulted in the immediate nationalization of a number of industrial plants, including from the energy sector the private components of Karachi Electric, Multan Electric Power Company (MEPCO), and the National Refinery.

A significant event that highlighted the need for, and eventually led to WAPDA’s unbundling, was the observation that the integrated power system was becoming too large to be handled by WAPDA alone. The fourth five-year plan (1970-1975) pointed to *“serious doubts having been expressed about the ability of WAPDA to shoulder the responsibility of retail distribution of power, along with the construction of major power and irrigation facilities. Consideration, therefore, should be given to the bifurcation of the power wing from WAPDA.”* The plan also proposed an alternative strategy to hand over the retail distribution to an ‘autonomous’ power corporation.⁷ However, in 1977 a military coup led to a period of stagnation with respect to the power sector.

⁵ GDP growth averaged at 8.5 percent.

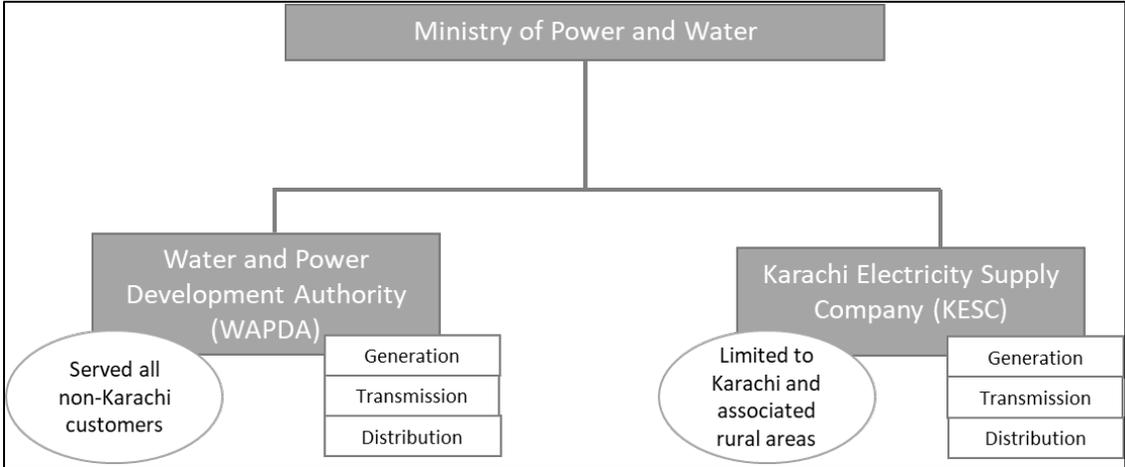
⁶ Salahuddin, A.F.S. *Development Planning and Financing (in the Context of Pakistan)*. Ferozsons, Karachi. 1973 (p.51).

⁷ Husain, Khurram. *“A Question of Power”* DAWN [Karachi] 12 April 2015.

By the mid-1980s the problems with the huge integrated power system were becoming obvious. There were breakdowns, power outages, and shortages in the country. This was also the period that construction work on Kalabagh Dam was proposed as a continuation of the vision for the sector as captured in the World Bank’s report. However, this proposal led to immediate reaction and political dissent from the North West Frontier Province and between Sindh and Punjab and the project was stalled. As the energy demands of the country rose and WAPDA made little progress to impact the country’s growing supply-demand-gap, the need for private sector investment in the sector became apparent. Following the severe power outages in 1986 the government used IMF assistance to deal with the chronic and unsustainable fiscal and external account deficits partly linked to the subsidized tariffs charged to consumers.

The sector organization in 1991 is shown in figure 3, with the government owning all of the power sector, but the vertically integrated KE (then KESC) operating independently of the rest of the sector managed by WAPDA.

Figure 2: Power sector organization, 1991



2.2.2 1992 –1999 Laying the foundations for sector reform

The severe power shortages, together with growing skepticism of WAPDA’s ability to handle the power sector, led the incoming PML(N) government to issue the “Power Sector Strategic Plan for Restructuring and Reform” in 1992 with the aim of unbundling, regulating and privatizing the existing generation and distribution components, to attract private sector investment and improve sector efficiency. Before this plan could be implemented there was a change of government and the PPP came to power in 1993.

The new government reacted to the power shortages in the same way as had the PML(N) before them and one of its first aims was to expand generation capacity through private sector

investment, and the 1994 National Power Policy was formulated to achieve this. The new law adopted in 1994 (“Policy Framework and Package of Incentives for Private Power Generation Projects in Pakistan”) aimed to attract private capital to the sector and to standardize the conditions for investment for IPPS. It introduced a number of key provisions⁸:

- The standardization of contracts for supply of energy
- Remuneration for all electricity at US 5.7 cents linked to the exchange rate between the Pakistan rupee and the US dollar, including an allowance for the US inflation rate and potential fluctuations in raw material prices.
- Surrender of decision-making powers to the project’s implementing institution with regard to size, technology, energy source, and siting of the power plant.
- Power-grid connection and supply guarantee for the required primary energy sources.
- Exemption of IPPs from numerous forms of taxation (capital-gains tax, income tax, turnover tax) and duties.
- Guaranteed acceptance of supplied power and delivery of required primary energy sources.

At the same time the government also created a new state-owned institution—the Private Power and Infrastructure Board (PPIB)—whose main function was to provide advice and guidance for the implementation of power plant projects. It negotiated the implementation agreement and provided support in negotiating fuel supply and power purchase agreements. It also provided guarantees to private investors for the performance of government entities (WAPDA, KE), monitored litigation and international arbitration on behalf of the Government of Pakistan, and assisted the regulatory authority in determining and approving tariffs for new private power projects.⁹

The potential unbundling of WAPDA, envisaged in the 1992 Strategic Reform Plan, began with the enactment in 1994 of the “WAPDA Amendment Act.” This amendment allowed WAPDA to prepare to “privatize or otherwise restructure any operation of WAPDA except hydel generating power stations and the national transmission grid.”¹⁰

The 1994 policy marks a milestone on Pakistan’s power sector landscape. Although the policy opened up the power market to the private sector, attracting \$5 billion in investment and adding almost 4,500 MW of generation capacity, the cost-plus tariff methodology it enshrined is credited as being the inception point of the circular debt crisis (box 2), and of the oil-heavy power

⁸ AEDB. “Power Sector situation in Pakistan”. 2005.

⁹ The PPIB, which currently is located within the Ministry of Energy, has induced 33 independent private power projects, of 10515 MW and investment of US\$ 9.4 billion by 2018.

¹⁰ “Regulatory Due Diligence Report Transition of Government...”. USAID Power Distribution Program, June 2015.

generation mix. The policy not only placed the currency risk with the off-taker but also placed the onus of fuel supply for these IPPs with the government as well. The policy guaranteed a fixed return over the life of the project regardless of the efficiency and performance of the plants. Because fuel cost was a pass-through in the tariff, and the policy favored developers who were willing to build plants that could be brought online fast, most of the plants brought online were oil-based. The shortage of supply, and the government's urgent need to address the crisis, led to the adoption of a policy with far-reaching consequences.

Box 2: The meaning and causes of the circular debt in Pakistan

"The term 'circular debt' is used somewhat differently by various entities in Pakistan. In essence the term is understood to be the amount of cash shortfall within the CPPA, which it cannot pay to power supply companies. This short fall is the result of (a) the difference between the actual cost of providing electricity and the revenue realized by the DISCOs from sales to customers, plus subsidies; and (b) insufficient payments made by DISCOs to CPPA out of the revenue realized since they give priority to their own cash flow needs." (Planning Commission of Pakistan and USAID, 2013).

"Circular debt is created in the power sector when end-customers (both public and private) do not pay their electricity bills to distribution companies, and the GoP is not able to fully furnish its commitment to fund subsidies. As a result, the distribution companies are unable to pay their purchase cost to the CPPA/single buyer, who is in return unable to fill its obligation to power generation companies. And the power generation companies...fail to pay fuel suppliers. The fuel suppliers in turn default on their payments to refineries, gas producers, and international fuel suppliers. The term 'circular debt' is based on the fact that two gas utilities...are also in government ownership." (C. Trimble, N. Yoshida, and M. Saqib, 2011).

World Bank and IMF reports use the term "intercorporate debt" or "intercompany arrears."

The Brent oil price was \$16 a barrel in 1994 but by 2004 it had risen to \$38 a barrel (without inflation adjustment). As a result of the heavy dependence on oil and the drastic depreciation of the rupee in the wake of Pakistan's nuclear test in 1998, Pakistan's generation mix was the most expensive in the region. Later, during the 2010-2013 circular debt crisis marked by fuel supply shortages, the 1994 IPPs, despite being some of the most expensive generation, were supplied fuel on a priority basis.

In 1995 the government issued another policy: "Policy Framework and Package of Incentives for Private Sector Hydel¹¹ Power Generation Projects in Pakistan". This policy was aimed at attracting private investment into small hydropower projects (under 300 MW) to offset the large number

¹¹ Hydel means hydroelectric.

of thermal plants inducted under the 1994 policy.¹² This policy failed to attract any investment, mainly because the feasibility studies were to be funded through a Hydel Fund that never got established. Additionally, the government sponsors for the small hydels were provincial governments, which were perceived not to be as reliable as the federal government.

In 1996 the government undertook the partial privatization of the Kot Addu power plant, selling 36 percent of WAPDA's shareholding to a strategic investor. A further 18 percent was sold to the general public in 2005, and the company was listed on regional stock exchanges.

In 1997 the PML(N) returned to power and the policy towards the power sector continued with the actual unbundling of WAPDA—the power wing was unbundled into 12 incorporated state-owned entities comprising three thermal generating companies (GENCOs), one National Transmission and Dispatch Company (NTDC), responsible for both transmission and the single-buyer market clearing entity, and eight regional distribution companies (DISCOs). Later, one generation company (GENCO IV) and two distribution companies, the Tribal Areas Electricity Supply Company (TESCO) and Sukkur Electric Supply company (SEPCO), were created. Hydel generation and water management remained with WAPDA.

In 1997, under the “Regulation of Generation, Transmission and Distribution of Electric Power Act”, the National Electric Power Regulatory Authority (NEPRA) was established to develop a regulatory framework to ensure “safe, reliable, efficient and affordable electric power to the electricity consumers of Pakistan” (and to) “facilitate the transition from a protected monopoly service structure to a competitive environment.”¹³ In addition to granting licenses for generation and distribution, NEPRA was tasked with calculating generation, transmission and distribution tariffs on a revenue requirement basis. However, its tariff setting authority was limited because the distribution tariff actually charged differs from this calculated tariff and is notified by the Ministry of Water and Power (MOWP).

The PML(N) administration took exception to the excessive debt Pakistan's state-owned WAPDA owed the IPPs. A hold was placed on many payments from WAPDA to IPPs and high-profile public hearings were initiated to determine how IPPs had been able to charge the government unjustifiably high prices—WAPDA faced a \$1.6bn bill from IPPs in 1998. This action reduced the attractiveness of Pakistan for foreign investors. In 1998 Pakistan conducted its own nuclear tests after India had tested several nuclear devices. The carrying out of these tests, in the face of international opposition, led to a currency crisis. Pakistan appeared to run the risk of sovereign

¹² The most important features of this policy are noted in: waterinfo.net.pk/sites/default/files/knowledge/Hydel Power Policy; and <http://www.nepra.org.pk/Policies/Hydel percent20Power percent20Policy percent201995.pdf>
¹³ <http://www.nepra.org.pk/mission.htm>

default but then agreed to a package of measures to stabilize the situation with assistance from the IMF to reschedule its debt.

The Pakistan Electric Power Company Limited (PEPCO) was created in 1998 with a transitional stewardship role to oversee the unbundling and privatization of WAPDA components, to manage the transition of WAPDA from a bureaucratic structure to a corporate, commercially viable and productive entity, and to manage the thermal generation plant formerly managed by WAPDA. Ironically, later PEPCO has been considered to be an institutional hindrance to the reform process, where its continued influence over the operations of the unbundled entities has made the boards and management of the GENCOs, NTDC and the DISCOs largely ineffective.¹⁴

2.2.3 1999 –2007 Military rule and the first full privatization

In 1999, the political landscape changed dramatically when General Musharraf seized power in a coup and assumed the Presidency, while remaining head of the army.

The 1994 national power policy was updated in 2002 and the revised policy introduced further tax incentives. Responsibility for smaller generation projects (less than 50 MW) now rested with provincial governments. Additionally, the fuel supply guarantees previously granted under the 1994 policy were removed. The counter-party to the new Power Purchase Agreements (PPAs) was moved from WAPDA's Private Power Organization (WPPO) to NTDC's Central Power Purchasing Authority (CPPA). The unbundled entities of WAPDA were granted generation, transmission, and distribution licenses by NEPRA in 2001–2002. Hydel generation and water management remained with WAPDA.

In 2003, the government established the Alternative Energy Development Board (AEDB) and in 2006, the "Policy for Development of Renewable Energy for Power Generation" was issued. The policy aimed at attracting private investors to set up small hydro, wind and solar PV plants, and set a target of achieving 10 percent of generation mix from renewable energy resources. The policy was successful in attracting interest in wind IPPs.

In 2005, 73 percent of KE was sold to a consortium of private investors. This initial privatization was conducted by the Privatization Commission (PC). However, the usual approval process and deliberation by the Council of Common Interest (CCI) did not take place prior to the sale, and this is one of the aspects being challenged in an ongoing court case against KE.

14 Siddiqui, Usama. "Power Sector Reforms: Pakistan Struggles to Overcome the Power Crisis." *The Express Tribune*. April 25, 2011.

2.2.4 2008 –2017 Sector reform stagnates

After the resignation of Musharraf in 2008, the PPP became the governing party. At this time, the power system was operating as a single buyer model, where the CPPA purchased power from all the GENCOs, IPPs, WAPDA hydro, and other producers; pooled the electricity; and sold it to the DISCOs in proportion to their peak demand on the last day that the system met peak demand. KE bought a fixed amount of power according to a decision of NEPRA and a contract between CPPA and NTDC. It was envisaged that the present single buyer model would eventually transform into an open access competitive market.

By 2011 circular debt was crippling the energy sector as IPPs threatened to call in sovereign guarantees because of non-payment. Table 1 highlights the growth of circular debt and indicates the main components of circular debt over the period from 2006 to 2012. Total debt increased throughout this seven-year period, but in absolute terms the increase during 2012 of Rs.335 billion was far greater than previous increases (USAID, 2013). The breakdown into components of this debt identifies several important items:

- Unpaid bills from consumers increased rapidly and by 2012 were the single largest source of debt increase from non-collection. Provincial governments and Federally Administered Tribal Areas (FATA – i.e. TESCO) also saw substantial non-collection.
- The subsidy arising from the government’s decision to hold prices charged by DISCOs below the cost recovery tariff as calculated by NEPRA was the single largest component of the circular debt and fluctuated as input costs (particularly oil) changed.
- Delays in determining and notifying tariffs in 2012 made a large contribution to the total. The tariff determinations for the nine DISCOs were delayed by nine months and there was then a further month’s delay for publication. These tariffs were largely based on 2010–2011 costs, while the actual fuel cost was 52 percent higher than the previous year.
- The tariff setting formula used by NEPRA to calculate cost-recovery tariffs included an allowance for “normal” transmission and distribution (T&D) losses. To the extent that actual losses were greater than allowed losses the excess contributed to circular debt. In 2012, five of the nine DISCOs had actual losses exceeding allowed losses by more than 3 percentage points.
- The fuel price adjustments are caused by delaying adjustments to monthly fuel price changes in the formula used to calculate tariffs. In periods of falling prices this item can be negative.

Table 1 : Growth in circular debt (Billion Rs)

	2006	2007	2008	2009	2010	2011	2012
Stock of debt at start of year	84.1	111.3	145.0	161.2	235.7	356.7	537.3
<i>Non-Collection</i>							
Federal Government	0.2	0.4	0.1	0.2	1.8	1.6	0.4
FATA	10.9	6.4	9.4	10.2	(78.3)	4.3	13.2
Provincial Governments	2.3	0.8	5.1	7.2	16.7	36.1	15.8
Private consumers	9.1	8.0	9.6	19.9	25.6	39.3	54.6
Others	1.0	1.6	1.5	4.2	5.5	1.8	2.9
CPAA receivables from KE	3.8	16.8	26.7	(11.9)	44.0	(1.8)	13.8
Total non-collection	27.2	33.7	52.5	29.8	(24.7)	81.3	100.7
<i>Tariff and subsidy issues</i>							
Tariff notification delay	NA	NA	NA	NA	NA	NA	72.2
Fuel price adjustments	NA	NA	NA	NA	NA	20.1	33.3
DISCOs TDS claims less actual dispersed	NA	NA	(36.3)	39.7	134.8	48.7	106.0
Allowed T&D losses less actual	NA	NA	NA	5.0	19.9	21.8	22.8
Total tariff and subsidy issues	NA	NA	(36.3)	44.7	154.8	90.6	234.2
Total circular debt at year end Billion Rupees	111.3	145.0	161.2	235.7	365.7	537.5	872.4
Total circular debt at year end Billion US\$	1.85	2.39	2.29	2.88	4.24	6.23	6.52

Source: Causes and Impacts of Power Sector Circular Debt in Pakistan. March 2013. USAID and Planning Commission of Pakistan.

The magnitude of the stock of circular debt by the end of 2012 (US\$ 6.52 billion) was such that action was desperately needed to avoid the consequences of so much underpayment to the various companies in the supply chain.

The elections in 2013 marked the first time that a party (PPP) had run its full term, and when PML(N) won the election this was the first transfer of power between parties on a regular basis. The power crisis was one of the primary election discussion points among the contestants—violent protests had broken out in various parts of the country due to power outages in 2011, 2012 and 2013.

The incoming government was ideologically opposed to international assistance and the party had campaigned on a platform of economic autonomy but had little choice except to negotiate a loan with the IMF.¹⁵ The previous PPP government had failed to meet the terms of the previous IMF loan and the country was still struggling to repay billions of dollars of that loan. As a condition of the new \$5.3 billion loan, the IMF insisted on a complete overhaul of the energy sector with a focus on privatization and power tariffs. Because of the loan, the government cleared \$4.8 billion of the stock of circular debt in 2013.¹⁶ Although the government was unable to ensure that no further increases in power sector arrears were incurred, by 2015/2016 the incremental arrears

¹⁵ *IMF and Pakistan agree to a \$5.3 Billion Bailout*. Declan Walsh and Salman Masood. New York Times, July 4, 2013.

¹⁶ Although government statistical sources mention circular debt, there does not appear to be a continuous series of data that would permit a simple extension of Table 1 to earlier and to more recent years. “Dynamics of Circular Debt in Pakistan and its Resolution”. S. Ali and S. Babar. 2010, *The Lahore Journal of Economics* (15) pp.61-74.

were almost zero.¹⁷ However, there was an upturn in flows of arrears in 2016/2017. In coordination with the IMF, the World Bank together with the Asian Development Bank and the Japan International Cooperation Agency also provided credits to help avoid the crisis and to support reform of the sector. With the passage of the most immediate crisis government commitment frayed, and steps that would have supported future [privatizations were put off.

The revised power policy, formulated in 2013, outlined the newly elected government's road map for the power sector. Though this policy has been criticized for being ambitious and unrealistic, it retained the essentials of the reform plan set out in 1992. In addition to reaffirming the government's focus on privatization of the DISCOs, it also stipulated the reform of CPPA as a corporate entity separate from NTDC's transmission and system operation business.¹⁸ The 2002 reform plan clearly had envisioned the transition of the market structure from a single buyer model to a single buyer plus (SBP) model culminating in a centralized wholesale power market with competitive commercial arrangements.¹⁹ The SBP model will allow bilateral contracts between buyers and sellers to be added to the Single Buyer framework. The NTDC was restructured to permit the creation of an independent market clearing body.²⁰

The new government came in with the intention of privatizing all the DISCOs plus some generation—the Lahore Electricity Supply Company (LESCO), the Islamabad Electricity Supply Company (IESCO) and the Faisalabad Electricity Supply Company (FESCO) were to be in the first wave. However, political and economic concerns resulted in the privatization plans being scrapped. These concerns included the government's belief that the preceding privatization experience with KE had not resulted in the targeted outcomes of lower subsidy burden and improved service provision to end-consumers—see Box 3.

¹⁷ IMF 2017: *Pakistan Staff Report for the 2017 Article IV Consultation*.

¹⁸ In 2009, the CPAA Guarantee Ltd (CPAA-G) was incorporated as a government company.

¹⁹ See the CPAA-G website: <http://cppa.gov.pk/Home/SingleBuyer>. This model is also known as a “bilateral contracts model”. L. Lovei. 2000. The Single Buyer Model. Note 225, The Private Sector Infrastructure Network, The World Bank.

²⁰ NTDC was required to reorganize its operations into four streams: market clearing (CPPA), Transmission and Network Operator (TNO), System Operator (SO) and Contract Registrar and Power Exchange Administrator (CRPEA).

Box 3: Why did Pakistan’s experience of privatizing KE not lead to further privatization?

The most important view that emerged from in-country interviews was that current experience with privatization (that of KE) has not yielded the results that were the rationale for the strategic sale of DISCOs. The objectives were:

- Reduction of the fiscal burden of subsidies given to power sector by the treasury
- Improvement of the operational efficiencies of the entities, improving financial sustainability
- Improvement in the service provided to the consumer (general public)
- Reduction in the tariff charged to the consumer linked to a reduction in the costs of the entity

The privatization has been judged a limited success according to these objectives, for several reasons:

- KE is still not fully reliant on its own generation and instead relies on 650 MW supplied by the NTDC under the amended implementation agreement drafted during sale to Abraaj Capital in 2009. At the time of shortage this supply should have been available for general use.
- KE still receives a Tariff Differential Subsidy (TDS), the difference between the NEPRA-determined cost-based tariff and the uniform tariffs notified by the GoP. In 2015, this amounted to US\$ 418 million. The government felt that increased operating efficiency could have reduced costs and hence reduced the subsidy.
- It is believed that KE has not delivered the expected better quality of service to the public. Interviewees pointed to the lower-income service areas that still experience severe power outages, ostensibly because they are also the areas with high pilferage.

A theme of the interviews was that KE’s 2005 privatization did not proceed according to regular rules and procedures.

Industrial customers’ perspective on the privatization is more favorable—they speak of improved experience post-privatization, while maintaining a complaint regarding high tariffs. Before 2005 there were considerable power outages that had forced most textile factories to convert to captive generation based on natural gas or diesel oil. Prior to privatization, load-shedding decisions were based on political motivation, where constituency politics played a pivotal role and vote-casting residential customers were given priority service over industrial consumers. Post-privatization the system of allocating power cuts to areas of high pilferage and low recoveries is seen to be effective. Industrial consumers that have the highest bill recoveries and high revenues have experienced a considerable reduction in load-shedding.

However, it is precisely this strategy of targeted load-shedding that is being brought up in the hearing against KE in a petition filed by the KE unions in the High Court of Sindh. The case gained political support from opposition parties in the light of general elections in 2018. This case brings a new issue into consideration regarding whether ‘public utilities providing basic amenities’ can legally be privatized. Another petition challenging the legitimacy of KE’s privatization was filed in the Supreme Court in 2015. This petition bases its argument on the procedural irregularities of KE’s privatization in 2005 and its subsequent sale to Abraaj Capital in 2009. The petition argues that there were irregularities including:

- No approval from Council of Common Interest (CCI) was taken as per constitutional requirement
- The sale price was sold below value
- The bidding process was unlawful and collusive
- Negotiated sale was in violation of rules of privatization.

It is also important to note that KE faced some difficulties in trying to improve performance. Collection of bills proved especially difficult, as its employees have been threatened and beaten. Billing is now outsourced, and outages have become targeted to reward areas of high compliance to put pressure on areas where collection is poor.

Additionally, political opposition from other political parties and the workers’ union mounted as the 2018 election year drew closer. As a result, the government shifted the privatization mode

for LESCO and FESCO from strategic sale to gradual divestment through capital markets,²¹ which had been expected to continue over the following three to five years.²² However, as the election approached, the government put aside any discussion of privatization.

The subsidy²³ that arises from the difference between NEPRA calculated and MOWP notified distribution tariff was one of the major points of discussion in the Government of Pakistan-International Monetary Fund (IMF) 2013 loan negotiation and the World Bank Credits. As a result, MOWP increased the notified end-user tariffs over the subsequent years, but even so subsidies continued to occur. In recent months the Ministry of Water and Power exerted pressure on NEPRA for upward revision of the Feed-in-Tariffs for coal powered plants, almost a year after the determinations had been made and announced.

NEPRA's independence and autonomy have recently been limited through the enactment in May 2018 of an Amendment to the NEPRA Act making it subservient to the Policy and Plan approved by CCI and the federal government respectively and NEPRA's decisions are appealable before the Appellate Tribunal. This came in the wake of tariff disagreements between MOWP and NEPRA related to a number of power projects under the China Pakistan Economic Corridor (CEPC)²⁴ and to the Multi-Year Tariff (MYT) granted to Karachi Electric. Other aspects of NEPRA's powers are proposed to be strengthened. The proposed change from differentiated to uniform tariff setting by NEPRA for distribution licensees wholly owned and controlled by a common shareholder is a retrograde step with respect to encouraging efficiencies and transparency for publicly owned DISCOs.

The 1994 energy policy put the exchange risk and the responsibility of fuel supply on the off-taker. In the subsequent thermal generation policy (2002 policy), fuel supply risk was reverted to the IPPs. However, this was reversed in the 2015 power policy where imported coal projects privately financed have the option of applying for a fuel supply agreement with the government. This fuel risk was also then replicated in the wind power projects that were commissioned under the 2006 renewable energy policy; wind-risk was placed with the off-taker. However, the new tariffs for wind projects are now placing the wind risk with the private investors and IPPS.

The biggest challenge to private investment in the power sector in recent years has been on the renewable energy side where the grid capacity has been a constraining factor. For solar projects,

21 Staff. "Process for FESCO's Share Offering Initiated." *Dawn*. N.p., 15 Oct. 2016. Web.

22 GoP's Letter of Intent to IMF. *TWELFTH AND FINAL REVIEW UNDER THE EXTENDED ARRANGEMENT FOR PAKISTAN*. Rep. no. 16/325. International Monetary Fund, Oct. 2016.

23 This 'notified' tariff is uniform across all the consumer categories across DISCOs. It is the lowest tariff determined for the most efficient DISCO. This gap between the two is filled by an 'Inter-DISCO tariff differential subsidy' (TDS). In 2015-2016, the GOP paid PKR 117.8 billion²³ (USD 1.1 billion) as TDS (2.6 per cent of annual budget).

24 In 2015, China and Pakistan signed the China Pakistan Economic Corridor Agreement to commence work on projects worth \$46 billion, with fast-track energy projects comprising \$21.5 billion.

the MOWP has been slow in notifying the solar feed-in tariffs determined by NEPRA, which have been revised in recent years from 14 cents to 9 cents and were stopped in early 2017. Some solar developers, including Chinese private developers, have taken this issue to court.

In 2016, the feed-in tariffs notified by the government for imported coal were not extended; instead all upcoming projects on imported and local coal will be inducted through competitive bidding process. In 2015, the first private transmission license was given to a private company for setting up and transmission of captive power (Fatima Group) and a tariff for private transmission for the Lahore-Matiari line was issued by GOP after being determined by NEPRA. In a bid to promote the development of a rooftop solar market, the Pakistan government approved net metering regulations on 1 September 2015 which allows all domestic, commercial and industrial owners of distributed solar and wind generation under 1MW to sell surplus electricity to the grid.

Direct electricity sales between private power producers and bulk end users were permitted in 2014. NEPRA issued guidelines for wheeling of power in June 2016 which are expected to open up opportunities for private developers to provide power directly to consumers, who present lower default risk than utilities who have been struggling with high debt loads since 2010.

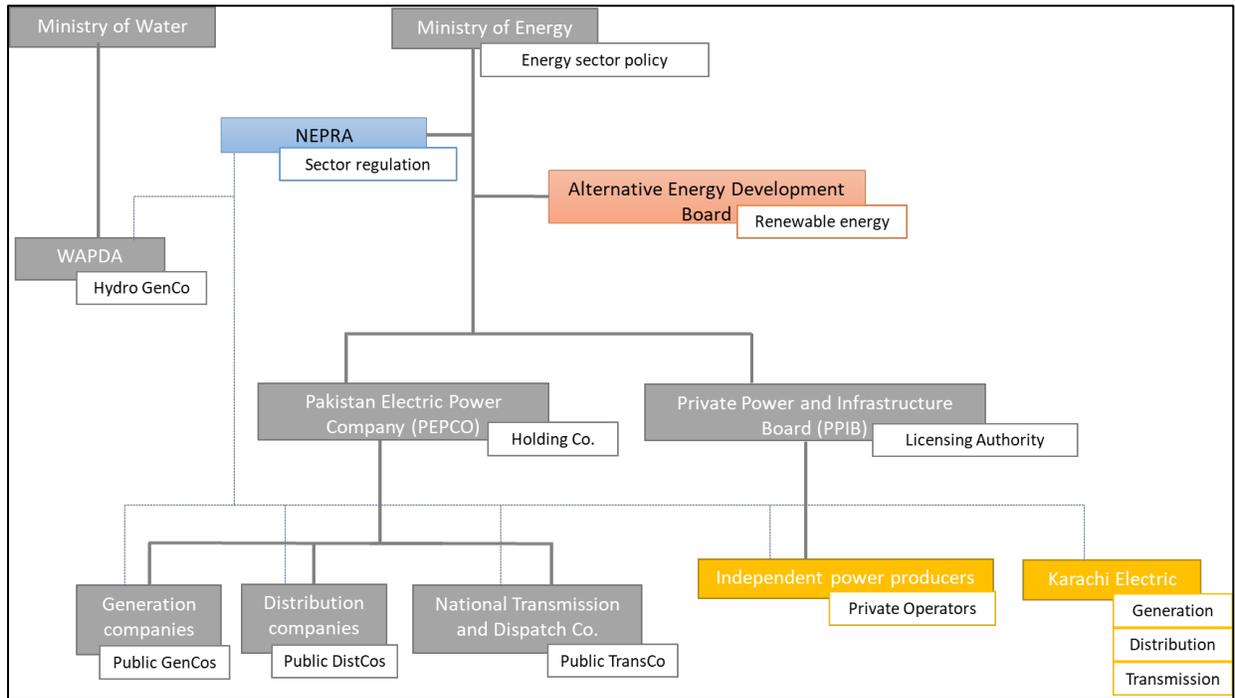
In 2017, a separate Ministry of Water Resources was created and WAPDA was placed under it, while all aspects of power are now under the Ministry of Energy (Power Department).

The changes made to the structure of the sector since 1991 can be seen by comparing the organizational structure of the power sector at the end of 2017 as shown in figure 4 and the organizational structure at 1991 (figure 3). The main policy reports and legislation concerning the sector during the period 1992 –2017 are shown in table 2.

Table 2: Major policies and legislation related to power sector

Policies	Legislation
1992 Power Sector Strategic Plan for Restructuring and Reform	1994 WAPDA Amendment Act
1994 National Power Policy	1997 The Regulation of Generation, Transmission and Distribution of Electric Power Act–NEPRA Act
2002 Update of National Power Policy	
2006 Alternative and Renewable Energy Policy	
2013 Revised Power Policy	2018 Amendment of NEPRA Act

Figure 3: Organizational structure of the power sector in Pakistan, 2017



3 The impact of the reforms on sector performance and institutions along four dimensions

Having charted Pakistan's reform experience, this section turns to consider the implications for sector performance and development. This evidence-based analysis first considers improvements in Pakistan's power sector performance over the period 1992-2017 along four key dimensions:

- Security of supply
- Access and affordability
- Efficiency and financial viability
- Tariffs and cost recovery

For each of these categories quantitative measures of performance are discussed, and then an evaluation from the institutional standpoint is provided. The assessment of sector performance can be carried out across two groups of utilities. There are the unbundled GENCOs and DISCOs that still are state owned and overseen by PEPCO, and then there is the privatized KE. For generation there are also several IPPS but data on their performance are limited.

At the beginning of the 1990s, when the reform story begins, there were three outstanding problems for the power sector. First, there was a lack of capacity leading to outages and loss of output throughout the economy. Second, the state-owned and managed energy utility was inefficient, bill collection was extremely low (despite the highly subsidized consumer tariffs) and T&D losses were large. Third, the utility was not fully compensated for losses larger than the subsidy, thus leading to a cumulative indebtedness that reduced the sector's ability to expand, discouraged potential investors once the sector was opened to IPPs, and periodically led to major disruption in the sector.

3.1 Security of supply

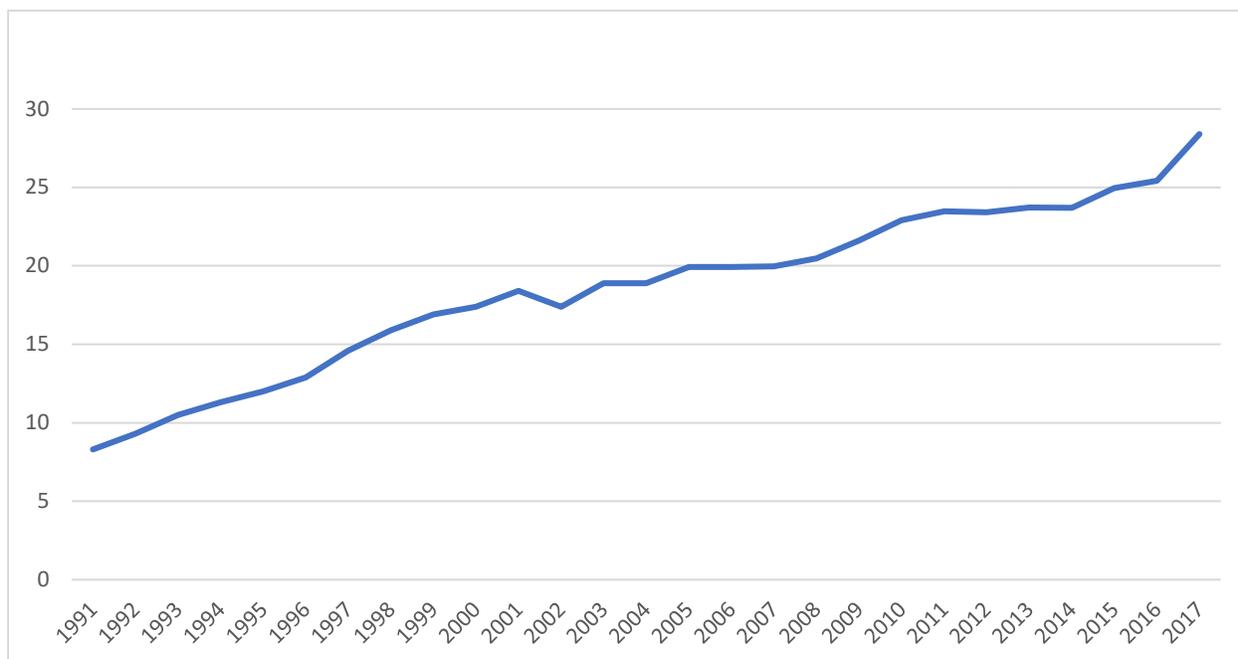
Security of supply has been a major issue for Pakistan since before the drive for sector reform began. The magnitude of the deficit in capacity has had large costs to the economy but the government has been unable to find a way of eliminating this problem.

3.1.1 Performance

Over the period of study, from 1991 to 2017 the installed generation capacity from all sources increased from 9 to 28 gigawatts (figure 5). The annual growth rate was high between 1991 and 1998 (8.3 percent) and substantially lower thereafter (2.8 percent). This modest growth of capacity post 1998 was not adequate to meet Pakistan's needs. Demand was driven by a number of factors, including rising income, increasing population, increasing access, and low consumer

tariffs thanks to the government’s subsidy policy, and peak demand rose by 5.1 percent per annum between 1998 and 2016.

Figure 4: Installed generation capacity (GW), 1990-2017



Source: NEPRA, State of Industry Report (various issues); and Pakistan Bureau of Statistics, Census of Electricity Establishments (various issues).

The ownership of generation capacity by type in 2017 is shown in table 3 and the importance of IPPs is evident. The private ownership of generation increased steadily from a zero share of total generation capacity prior to 1994, when IPPs were first allowed to enter the sector, to 31 percent in 2006 just prior to the privatization of KE, and to 38 percent in 2017.

Table 3: Generation capacity by ownership type in 2017 (MW)

Ownership type	Capacity (MW)	Share of total capacity (percent)
WAPDA hydel	6902	24
IPP hydel	214	1
Thermal GENCOs with PEPCO	5897	21
KE own thermal	1874	7
IPPs connected with PEPCO	10566	37
IPPs connected with KE	252	1
CPPs/SPPs connected with KE	87	0
Nuclear	1142	3
Renewable connected with PEPCO	1465	4

Total	28399	
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Source: NEPRA, State of Industry Report 2017.

In order to attract the much-needed private investment, Pakistan introduced competition in the sector by unbundling WAPDA. Table 4 indicates that vertical unbundling has been extensively adopted in Pakistan, similar to the levels in the comparator Indian states but substantially higher than the benchmark Rethinking study average. The degree of horizontal unbundling, the key step for competition, is lower than the degree of vertical unbundling in Pakistan but is above the benchmarking value and two of the comparator Indian states. Private sector participation is below the benchmarking values both overall and for distribution and transmission.

Table 4: Comparing the extent of utility restructuring in Pakistan and its comparators, 2015

	India, AP	India, Odisha	India, Raj	Pakistan	International Benchmark
Utility Restructuring	57%	73%	57%	73%	45%
Vertical Unbundling	80%	80%	80%	80%	55%
Horizontal Unbundling	33%	67%	33%	67%	34%
Pvt sector participation	13%	21%	14%	19%	24%
<i>PSP in Generation</i>	39%	63%	39%	40%	41%
<i>PSP in Distribution</i>	0%	0%	1%	9%	16%
<i>PSP in Transmission</i>	0%	0%	2%	8%	14%

Note: Scores based on index developed for the Rethinking Power Sector Reform Project. For more details go to project website at http://www.esmap.org/rethinking_power_sector_reform

PSP = private sector participation

While the 11 GW of capacity added by the IPPs in the two decades since the sector was opened has to be seen as a success for the power reform policy adopted, in fact it was inadequate to meet all of Pakistan's needs. Despite this increase in capacity from the private sector and an increase of 4GW from the public sector, there have been power shortages and blackouts for much of the period.

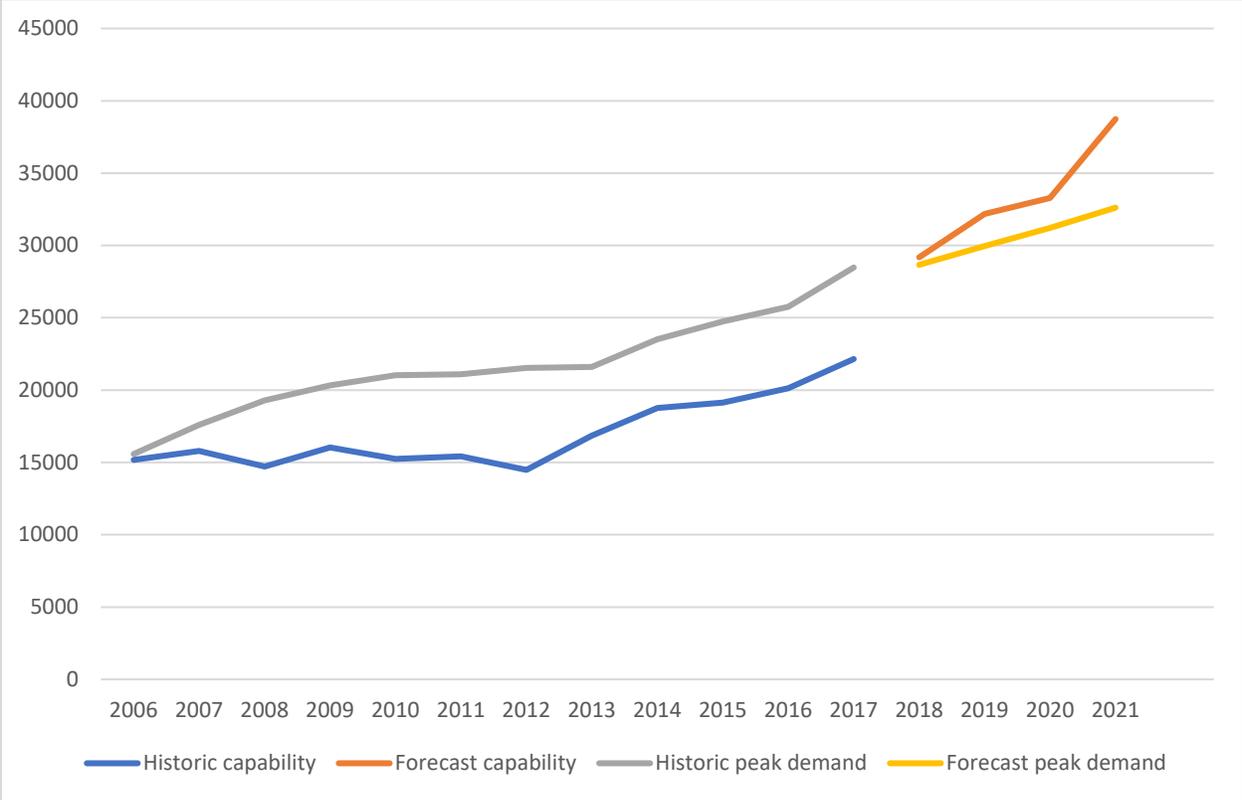
The balance between the potential supply of electricity and the peak demand for it during a year is taken as an indicator of the adequacy of supply.²⁵ The data sources for Pakistan measure potential supply by generation capability (availability) rather than by capacity so that the difference between capability and peak demand is the system's surplus or deficit.²⁶ Peak demand and generation capability are measured over NTDC's system and KE's system, and data were available for the 2007–2017. In addition, predictions made in 2017 for the period 2018–2021 are provided in the most recent State of Industry Report published by NEPRA. Figure 6 shows that since 2007 and until 2017 there had been a substantial and persistent deficit with a maximum of

²⁵ Fuel shortages as well as capacity constraints also contributed to the deficit.

²⁶ Availability includes plants that are both functioning and are not currently off-line for maintenance. The reserve margin equals 1 minus peak demand/available capacity.

around 6 GW (almost 25 percent of peak demand) in 2012 which had been scarcely reduced by 2016 (the reserve margin was around -20 percent). However, the large amount of new investment coming on stream, partly as a result of the China-Pakistan Economic Corridor (CPEC) initiative, indicates that the deficit is expected to disappear in 2018 and a surplus will emerge thereafter.

Figure 5. Capability and peak demand between 2006 and 2021 (MW)



Source: NEPRA, State of Industry Report (various issues)

Two factors help explain this persistent deficit—the inefficiency of the public generation companies (GENCOs), and the lack of investment despite the shortage of supply. Table 5 compares the ratios of dependable to installed capacity for the four GENCOs created from the unbundling of WAPDA to those of four of the IPPs. According to NEPRA in the 2016 State of Industry Report, the loss of dependable capacity of the GENCOs since their commissioning is due to lack of timely overhauling, missing annual scheduled maintenance routines, and poor operating schedules. The IPPs, by contrast, were able to maintain capacity through timely O&M. Had the GENCOs been better run, then the available capacity would have been higher and the deficit smaller.

Table 5: Ratio of dependable to installed capacity for public and private generation companies

	2014	2015	2016
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GENCO-I (JPCL)	0.81	0.81	0.81
GENCO-II (CPGCL)	0.70	0.80	0.55
GENCO-III (NPGCL)	0.78	0.80	0.85
GENCO-IV (LPGCL)	0.20	0.20	0.20
Rousch Power	0.96	0.96	0.96
Lalpir Power	0.97	0.97	0.97
Uch Power	0.94	0.94	0.94
Liberty Power	0.97	0.97	0.97

Source: State of Industry Report 2016.

This huge shortage of supply, relative to peak demand, has had large impacts on the reliability of the power sector. Load shedding has been substantial for several years, by all the unbundled sector DISCOs, as shown in table 6. The sole private sector firm (KE) was among the better performers, indicating that its policies for purchasing power from various IPPs may have been better matched to demand.

Table 6: Average daily load shedding (hours) for distribution utilities

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Peshawar - PESCO	4.9	4.8	4.8	2.5	2.3	3.2
Tribal - TESCO	-	-	10.5	8.0	7.7	-
Islamabad - IESCO	5.6	5.6	5.0	4.0	4.0	3.3
Gujranwala- GEPCO	3.6	3.2	3.2	4.0	4.0	3.3
Lahore - LESCO	2.1	0.7	3.5	2.3	1.7	2.0
Faisalabad - FESCO	7.0	7.8	7.3	4.3	3.5	3.2
Multan- MEPCO	9.0	9.0	10.0	4.3	3.2	3.4
Hyderabad - HESCO	3.8	7.3	3.8	4.0	3.3	4.5
Sukkur - SEPCO	4.0	2.0	2.0	1.0	1.0	2.3
Quetta - QESCO	10.5	11.1	10.5	3.4	2.8	3.9
KE	2.0	2.4	2.3	1.1	1.3	2.5

Source: NEPRA, State of Industry Report 2016

In addition to these announced and unannounced cuts in supply, information was collected by the NEPRA to calculate the System Average Interruption Frequency Index (SAIFI), and the System Average Interruption Duration Index (SAIDI) for each of the DISCOs. Only the Islamabad (IESCO) utility was able to meet the allowed limits set by the regulator (SAIFI = 13 per annum; SAIDI = 14 minutes). However, the report published by the regulator²⁷ indicates that there were considerable inaccuracies in the collection of these data by the DISCOs and that these statistics cannot be taken as realistic.

²⁷ Performance Evaluation Report of All Distribution Companies for 2015-2016. National Electric Power Regulatory Authority.

The impact of the unreliability of the power supply in Pakistan is also confirmed by data obtained between 2013 and 2015 from the World Bank’s Enterprise Survey (2013) as shown in Table 7.²⁸

Table 7: Comparative Performance of Pakistan on power supply reliability

	Pakistan	South Asia	All
Firms experiencing electrical outages (percent)	81	66	59
Number of outages in a typical month	75	24	6
Average duration of outage (hours)	17	5.3	4.5
Average losses as percent of annual sales	34	11	5
Percent of firms owning or sharing a generator	65	45	34
Average percent of electricity from generator if available	41	24	21
Firms identifying electricity as a major constraint (percent)	75	46	31

Source: World Bank Enterprise Surveys.

Putting all these facts together it appears that, although Pakistan was able to attract a modest amount of private investment into the generation sector, this was inadequate given the rate of growth of demand. The costs of the supply unreliability were high. With such an evident gap between existing supply and demand there were clearly important factors discouraging the entry of more IPPs. The GENCOs were not able to finance much expansion given the poor performance of the sector, while the magnitude of “circular debt” and the inability of some IPPs to be paid fully or on time, which in 2011 had led some to threaten to call in sovereign guarantees, is likely to have played an important role in deterring the entry of more IPPs. The persistence of different governments in continuing to set the actual tariffs below those calculated by the regulator to consumers so as to limit price rises through the provision of subsidies, despite pressure from multilaterals to reform this aspect of the management of the power sector, made it clear that there could be substantial risks of entering the Pakistan power sector. As is demonstrated below, the DISCOs had been operating inefficiently for a long period, thus throwing more burden on the government which wished to hold tariffs below costs. This too, may have limited the enthusiasm of possible new entrants.

However, the predictions for the next five years show the capacity deficit disappearing in 2018, and a substantial surplus of nearly 5GW appearing by 2021, and this is in the context of demand growing by around 5 percent per annum (equivalent to an increase of about 5GW). Since the government has not changed its policies towards the sector with respect to price setting or the management of the public-sector utilities, some other explanation must be sought. In April 2015 the China-Pakistan Economic Corridor (CPEC) initiative was announced. The original valuation of the infrastructure projects included was \$46 billion, and the total has since risen to \$62 billion.

²⁸ Data for Pakistan are for 2013-2015, while data for other countries are based on the most recent year in which a survey was undertaken.

Of this approximately \$35 billion will be allocated to energy projects. These include coal-fired power plants, a dam, a solar power park, and a gas pipeline eventually expected to link to the Islamic Republic of Iran. Together these projects are expected to create about 17 GW of capacity of which an “early harvest” of 10GW by 2020 was expected.

The projects will be financed in part through concessionary loans from the Chinese at interest rates as low as 1.6 percent, in part by some interest free loans, and also by private consortia financed by the Exim Bank of China at interest rates of 5-6 percent.

Understandably, the GoP is optimistic that such a large investment program will bring about major improvements in the sector’s performance. However, Kugelman (2015) argued that while this increased generation capacity can be expected to remove the costs of supply shortages it will not remove the underlying problems of the sector.²⁹ The inefficiencies of the distribution sub-sector (high T&D losses, low bill collection) have proved deep-rooted, and subsidized electricity has been seen as a social “right” by many, leading to increased circular debt. These factors suggest that even with a large increase in generation capacity other policies to improve sector performance will be required.

3.1.2 Institutions

Pakistan does have a Generation and Transmission (G&T) master plan, developed in 2011, and an update was prepared in 2013-2016. However, neither was adopted by MWP— also there is no integrated energy plan.

The NTDC is responsible for developing the plan, but lacks the capacity to do, so that external consultants were used. Of more concern is the fact that the plan was not adopted—some projects being developed are not in fact part of the plan. As shown in Table 8 the scores on generation and transmission planning are low at 29 percent and 25 percent respectively when compared to the average of all countries covered in the survey. Also, a comparison with India indicates that on planning for both generation and transmission Pakistan has fallen well behind where it might have been expected to be.

Table 8: Institutional arrangements for power sector planning and procurement in Pakistan and comparators, 2015³⁰

²⁹ Kugelman, 2015. “Easing an Energy Crisis that Won’t End” in “Pakistan’s Interminable Energy Crisis: Is there any way out?” Woodrow Wilson Center, 2015.

³⁰ For the more detailed planning and procurement index, see the annex.

	India	Pakistan	International Benchmark
Generation Planning	57%	29%	56%
Transmission Planning	75%	25%	72%
Procurement of Generation	95%	100%	85%
Transmission Procurement	83%	100%	64%

Source: Note: Scores based on index developed for the Rethinking Power Sector Reform Project. For more details go to project website at http://www.esmap.org/rethinking_power_sector_reform

On procurement for both generation and transmission Pakistan gets the maximum score but this conceals a different reality. Despite allowing for international competitive bidding Pakistan has struggled to attract investment in generation—there is still a large deficit in generation (about 4GW in 2017). The China-Pakistan Economic Corridor is now bringing large generation capacity (according to their website 14 projects worth over \$18 billion and with 11.1 GW capacity are at various stages of development/construction) but none of these have been awarded through international competitive bids or auctions—all have been awarded through direct negotiations between the Government of Pakistan and the Chinese Government/Project company. Thus, while the country allows for good practices in procurement these are hardly followed in practice.

3.2 Access and affordability

Access and affordability are key variables when considering the benefits of the electricity system to the poorer members of society. Governments in developing countries often find it difficult to increase access while keeping electricity affordable. First, the households most eager to be connected have the highest incomes and may well live in the same area making it easier on a per household basis to supply this group who tend to purchase larger amounts of electricity. Second, the costs of connection are higher to more remote areas and these tend to have lower incomes and consume less electricity. Thus, the last households to be connected will tend to be those of least interest to the utility, so that some government support may be needed to ensure access moves towards the 100 percent mark.

Access is defined by the existence of a connection to the grid by a household—all members of the connected household are counted as having access. Affordability is usually defined by the household having to spend less than a given fraction of income to purchase a given amount of electricity. When the household spends more for this quantity, or purchases less for the given expenditure, then at the given prices electricity is said to be “unaffordable”. In practice such a calculation tends to be carried out only when a large-scale expenditure survey is available.

3.2.1 Performance

Access data are usually derived from household expenditure surveys, but these are not available annually and are typically based on modest sized samples. Only in census years can a solid estimate of the total population and average household size be obtained. However, a population census does not usually enquire about items such as access to mains electricity. For this, the

records of the distribution companies may be fairly accurate with respect to the number of households connected. Hence, to obtain a yearly estimate of access it is necessary to interpolate between successive census years, and to extrapolate beyond the most recent census year. These considerations are important in the case of Pakistan.

The World Bank's World Development Indicators shows access increasing steadily from 59 percent in 1990 to 98 percent in 2014, although a study of South Asia pointed out that, while access rates are nearly 100 percent in urban Pakistan, in certain parts of rural Pakistan rates are still very low.³¹ However, a summary of the 2017 population census has just been released and this points to a rather different access rate.³² According to previous estimates the population in 2016 was 198 million, with an average household size of 6.45. The power system statistics indicated that 22.8 million households were connected to the grid, giving an access rate of 74 percent. The new census (the first for 19 years) indicated that in 2017 the population was 207 million with 32.2 million households (average household size of 6.43). If the number of connections were 22.8 million then the access rate would be 71 percent. A breakdown by region indicated that in Punjab the access rate was 92 percent, in Sindh 37 percent, in Balochistan 24 percent, and in Khyber Pakhtunkhwa 71 percent. Some households have solar home systems or other forms of off-grid supply and the access to electricity from all forms of supply will be higher than the grid connected values.

The State of Industry Report for 2017, published by NEPRA, also provides some related information through statistics for each DISCO for each of the years from 2012 to 2016 of the percentage of villages in their area that have not yet been electrified. These statistics seem questionable in several cases. The percentages of total electrified villages fell in some cases or rose and then fell. The total number of villages covered by some DISCOS changed dramatically from year to year, and without a clear trend.

The picture for access is then one dominated by uncertain statistics. The estimate of 98 percent access for 2014 would indicate that the government had been extremely successful in bringing electricity to the population, while a value of around 70 percent in 2017, when the value for 1990 may have been around 60 percent, suggests modest progress. It is noticeable that there was no major rural electrification scheme or policy that could have explained an increase to 98 percent access and, given that the state-owned DISCOs have not been run efficiently, it would be strange if they had managed to increase the access rates so markedly with no government assistance. The indications are that the lower access figure is the more plausible and that utilities have made only modest progress in improving access.

On **affordability** there is limited material available. The retail pricing approach adopted in Pakistan involves an estimated revenue-required tariff determined by NEPRA, and a notified tariff (which is the one actually paid) determined by the government. The former takes into account

³¹ In the Dark: How much do power sector distortions cost South Asia.?" 2016, World Bank Group.

³² <https://saadiaqayyum.wordpress.com/2017/09/07/census-shows-the-real-state-of-pakistans-electrification/>

fuel costs, reasonable assessed T&D losses and other costs, and is calculated to yield sufficient revenue to cover such costs when there is 100 percent bill collection (recovery). The difference between the notified tariff and the estimated cost-based tariff (the Tariff Differential Subsidy—TDS) is paid by the government to the utilities. In practice T&D losses have been worse than assumed in the NEPRA calculation, and bill collection less than 100 percent. This means that losses will be incurred since the notified tariff plus the TDS will be insufficient to cover actual costs. These losses become circular debt when companies with insufficient revenues fail to fully pay their suppliers. However, because in the long run the government is responsible for this debt through its ownership of state-owned companies, and circular debt has been periodically paid off (providing an implicit guarantee of a government bailout), the incentive for the managers of the loss-making DISCOs to improve performance is weak.

From the standpoint of consumers, the crucial magnitude is the “notified” price of electricity. For households there is an increasing block tariff (IBT), with the prices of the slabs being uniform throughout the country.³³ The impacts on households depend on the relative slab step sizes and heights. The evolution of notified tariffs over time is shown in Table 9 . The tariffs on the lowest slabs (less than 100 kWh) have increased by smaller percentages over time than the larger slabs, suggesting an attempt to provide relatively more protection to small users while the cost of electricity rose. During the period 2008 to 2016 the consumer price index rose by 95 percent, and the final row of Table 9 shows the ratio of the percent tariff increase to the percent CPI increase for each slab of the tariff structure. The tariffs for the two lowest slabs rose less rapidly than the CPI indicating that the real cost of electricity fell for consumers whose total consumption was less than 100 kWh/month. The tariffs for slabs above 100 kWh increased in real terms, indicating a modest overall rise in the real cost of electricity to all but the poorest households.

Table 9: Notified residential tariff structure (Rs / kWh)

	Up to 50 kWh	1 – 100 kWh	101 – 300 kWh	301 – 700 kWh	Above 700 kWh
1 July 2008	1.40	3.08	4.08	6.53*	7.79*
25 February 2009	1.40	3.29	4.96	8.03	10.00
1 October 2009	1.40	3.49	5.26	8.50	10.00
1 January 2010	1.66	3.91	5.89	9.52	11.87
1 July 2010	1.79	4.20	6.34	10.24	12.77
1 October 2010	1.83	4.28	6.47	10.44	13.03
1 November 2010	1.87	4.36	6.60	10.65	13.29
15 March 2011	1.87	4.45	6.73	10.65	13.29
6 May 2011	1.87	4.54	6.86	10.65	13.29
16 May 2012	2.00	5.79	8.11	12.33	15.07
11 October 2013	2.00	5.79	8.11/12.09 [^]	16.00	18.00
10 June 2015	2.00	5.79	8.11/10.20 [^]	16.00	18.00

³³ Time of day pricing is practiced in some jurisdictions and time of use meters are required for loads of 5kW and above.

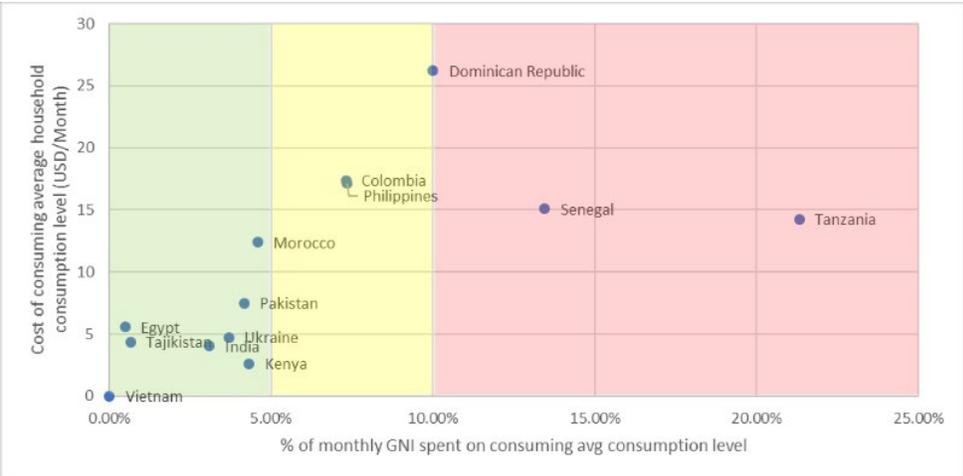
24 June 2016	2.00	5.79	8.11/10.20 [^]	15.45	17.33
Ratio 2016/2008 tariff	1.42	1.88	2.50	2.37	2.22
Tariff ratio/CPI ratio	0.73	0.96	1.28	1.22	1.14

Source: State of Industry Report: various issues. * In this year the upper limit for this slab was 1000 rather than 700 kWh. ^ In these years there were slabs from 100 – 200 kWh, and from 200 – 300 kWh.5.79

Trimble et al. (2011) analyzed the residential tariff structures in March 2008 and March 2011 to shed light on the benefit incidence of the tariff structure. The unit cost of electricity in 2008, as calculated by the NEPRA formula, was estimated to be Rs 8.21, while in 2011 the average cost had risen to 9.57 Rs/kWh. The difference between the average tariff paid and the average cost is the subsidy per unit.³⁴ This study indicated that in 2008 all households were receiving some subsidy on all units consumed, because the average cost was above the price charged for the top slab. By 2011 the structure had become more progressive, and households consuming more than 300 kWh/month paid more than cost on some units, so that there was some element of cross subsidy. A benefit incidence analysis of the tariff structure revealed that in 2008 the richest 20 percent of households received the largest share (38 percent) of the subsidies, while the poorest 20 percent received 9 percent of the subsidy, and the poorest 40 percent received 23 percent. By 2011 the share of subsidies received by the richest 20 percent had declined to 30 percent, but the tariff structure was clearly not well designed as a policy to benefit the poor (Trimble et al. 2011).

Further insight as to affordability of the current tariffs is provided in figure 7 that compares affordability across the rethinking power sector reform project countries. In Pakistan, to purchase the average amount of electricity the bottom 40 percent of households would have to use 4.18 percent of their income, bringing it just under the acceptable level of 5 percent.

Figure 7: Affordability of average consumption in Pakistan, 2016



Source: RISE 2018

³⁴ The average tariff is a weighted average of the different slab tariffs. Even when there is no increase in the tariffs for the slabs, the average would increase over time as the weight attached to higher slabs increases with increasing household consumption.

3.2.2 Institutions

As mentioned above, Pakistan’s performance on access is clouded in uncertain statistics. However, we do know that there is no specific rural electrification agency or fund with a mandate to improve access rates. Not surprisingly the country has a low score on the energy access regulation indicators for new connections, solar home systems, and for mini-grids (Table 10). There are no incentives or requirements for utilities to expand access, and off-grid solar is not yet regulated. Grid connected roof-top solar has just been provided with a tariff and consumers of all DISCOs can now use net metering.

Table 10: Regulatory framework for electricity access in Pakistan and comparators, 2015³⁵

	India, AP	India, Odisha	India, Raj	Pakistan	International benchmark
Energy Access Regulation	81%	78%	81%	16%	56%
<i>Regulation of New Connections</i>	75%	66%	77%	48%	65%
<i>Regulation of solar home systems</i>	100%	100%	100%	0%	66%
<i>Regulation of mini-grids</i>	67%	67%	67%	0%	44%

Note: Scores based on index developed for the Rethinking Power Sector Reform Project. For more details go to project website at http://www.esmap.org/rethinking_power_sector_reform

3.3 Efficiency and financial viability

The low efficiency of the electricity sector in Pakistan has been a feature of the country for many years. The creation of the independent regulatory body (NEPRA) and the unbundling of WAPDA led to regular collection and publication of statistics concerning various aspects of the operation of the sector, including separate reports on performance evaluation for the state-owned DISCOs and for KE.

To evaluate the performance of state-owned companies it was decided to concentrate on information for a single DISCO for those indicators where information on the aggregate of all DISCOs was not published in the annual State of Industry Reports. Such information was published in company reports and websites but does not cover the whole period from 1998 (the year of unbundling). There are only minor differences in the institutional set-up for the various DISCOs, so that the performance of one can stand as a reliable indicator for all, and therefore for the publicly owned sector as a whole. As a guide to the relationship between institutional factors and performance of the state-sector, the case of LESCO was examined. This was one of the three candidates for privatization under the incoming government of 2013, suggesting that it was considered a “good” performer at that time. In NEPRA’s 2015-2016 Performance Evaluation Report LESCO was ranked third out of the ten DISCOS.

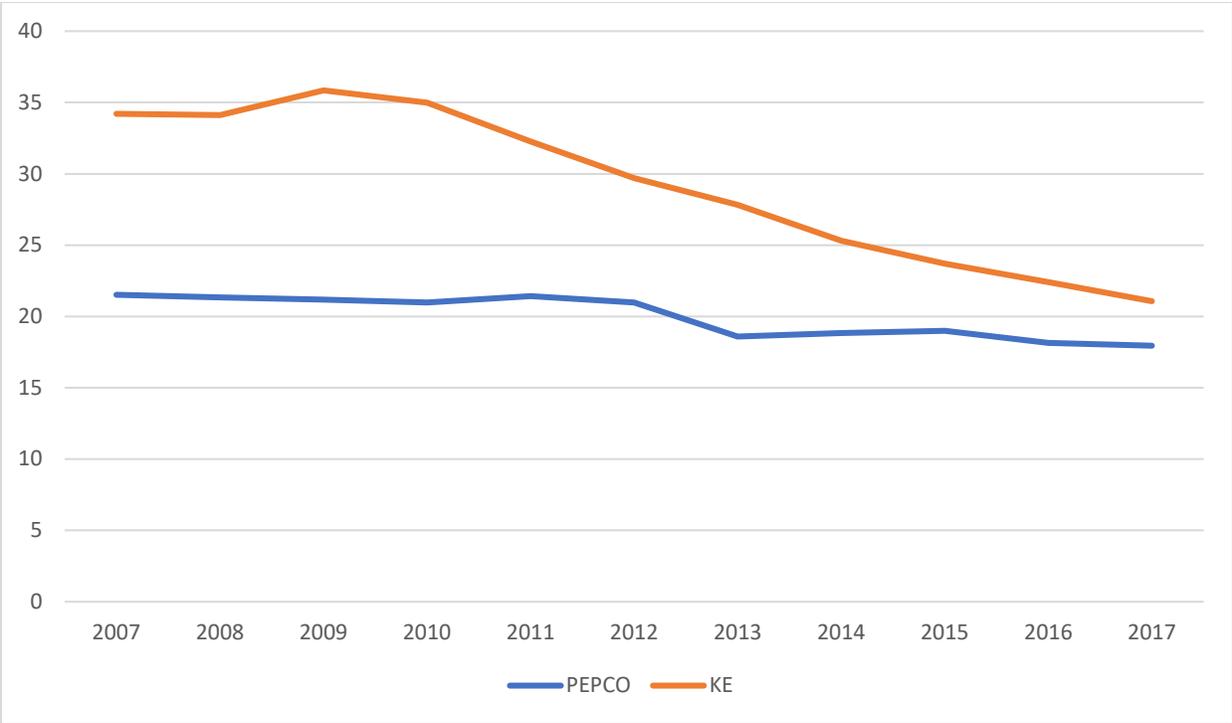
3.3.1 Performance

³⁵ For the detailed access regulation index, see the annex.

The assessment of **operational efficiency** depends on data availability. Some information on transmission and distribution losses for the system as a whole is available from the beginning of the period studied, and separate data is available for KE (privatized in 2005) and PEPCO (the DISCOs that had been unbundled in 1997). Figure 8 compares the evolution of T&D losses of these two groups and reveals several important features. The overarching finding is that during the whole period T&D losses were generally large and even at their lowest point (2016) did not drop below 20 percent for either the public sector or the private sector.

The privatized utility KE has seen a steady improvement, particularly from about 2009 onwards, with losses falling from an extremely high 35 percent to about 20 percent. The change in ownership, following a management takeover in 2009 by Abraaj Capital, appears to have improved this aspect of efficiency, albeit from an exceptionally high level of losses. There has been only modest improvement in the performance of the state-owned DISCOs in the 16 years shown. This suggests that there has not been an effective incentive to these utilities to improve performance.

Figure 8: T&D losses for public sector DISCOs and for Karachi Electric (percent)



Source: State of Industry Reports, various years.

One of the policy tools that was intended to improve this aspect of performance was the way in which the revenue-requirement tariff calculated by NEPRA set a target rate for T&D losses for each DISCO. If the actual loss turned out to be larger than the target, then the DISCO would not be recompensed for this in the TDS. It was hoped that by incremental tightening of the target rates over time the actual rate would improve as the DISCOs tried to avoid making deficits.

Table 11 gives the actual loss rates for each DISCO³⁶ for the period 2004 – 2017, and the target rates for the period 2012 – 2016. Certain DISCOs (IESCO, GEPCO and FESCO) have had low rates for the whole period and have shown a slow improvement and have followed the gradually tightening target values, but others (PESCO, SEPCO, QESCO) have shown no improvement and have consistently overshoot the targets. For this aspect of performance, the use of target loss rates does not seem to have been effective in improving efficiency.

Table 11: Actual and target T&D losses for DISCOs 2004 – 2017 (percent)

		PESCO	TESCO	IESCO	GEPCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	KE
2017	A	32.6	15.4	9.0	10.2	13.8	10.6	16.9	30.8	37.9	23.1	21.7
	T	26.0		9.4	10.0	11.8	9.5	15.0	20.5	27.5	17.5	20.9
2016	A	33.8	19.0	9.1	10.6	13.9	10.2	16.5	26.5	37.9	23.9	22.2
	T	26.0	20.0	9.4	10.0	11.8	9.5	15.0	20.5	27.5	17.5	15.0
2015	A	34.8	21.7	9.4	10.7	14.1	11.0	15.5	27.1	38.3	23.1	23.7
	T	26.0	22.3	9.4	10.0	11.75	9.5	15.0	20.5	27.5	17.5	
2014	A	33.5	27.4	9.5	11.0	13.4	11.3	17.5	26.5	38.6	21.9	25.3
	T	26.0	18.5	9.4	10.0	9.0	9.5	15.0	15.0	17.0	18.0	
2013	A	36.0	-	9.5	11.2	13.5	10.9	17.9	27.7	39.1	20.6	27.8
	T	28.0	-	9.5	10.5	12.0	10.8	15.0	22.0	28.0	18.1	
2012	A	36.0	-	9.5	11.2	13.5	10.9	17.9	27.7	39.5	20.9	29.7
	T	28.0	-	9.5	10.5	12.0	10.8	15.0	22.0	28.0	18.0	
2011	A	40.2	-	9.7	12.0	13.3	11.2	18.3	33.8	-	20.4	32.3
2010	A	37.0	-	9.8	11.0	13.7	10.9	18.9	34.8	-	20.7	35.0
2009	A	37.4	-	10.8	10.7	13.3	10.7	18.4	35.1	-	20.4	38.5
2008	A	36.1	-	10.3	11.2	12.5	11.1	18.5	35.9	-	20.8	33.8
2007	A	35.2	-	12.2	11.6	12.8	11.6	18.6	37.0	-	21.3	34.2
2006	A	34.1	-	13.2	10.2	13.1	11.6	20.5	39.2	-	20.7	37.5
2005	A	32.1	-	12.9	12.4	13.2	10.1	20.3	37.0	-	19.6	38.1
2004	A	31.41	-	10.9	12.2	14.1	10.4	17.0	35.3	-	14.3	41.6

Source: State of Industry Reports, various years. A= actual; T = target; - indicates no data.

The T&D loss data provide an interesting case where a state-owned utility had been unbundled but that no further reform step has been taken. The parallel existence of KE, that was privatized during the reform period, also provides a valuable contrast. On this variable the data strongly support the hypothesis that unbundling by itself does not improve performance, even when a price structure is used that makes inefficiencies explicit and visible. The profit motive, introduced by privatization, appears to be linked to limited efficiency improvement.

An indicator of the degree of **commercial efficiency** is rate of “recovery” (percent of billing collected), which is available for all the DISCOs for several years.³⁷ Table 12 presents a similar picture to Table 11. Many of the DISCOs (PESCO, HESCO, and QESCO) had low or very low

³⁶ The 2016 State of Industry Report notes that two sources have been used for data on T&D losses. One source is the total of DISCOs under the supervision of PEPCO, and the other is the DISCOs themselves. The latter source has been used where it could be identified.

³⁷ The Annual State of Industry Reports provide information for the different series over varying time periods, so it is not possible to construct all tables for the same years except by shortening many of the series used.

recovery rates and there was no clear trend of improvement for these utilities. A second group (GEPSCO, IESCO, LESCO, FESCO and MEPCO) reported high or almost perfect recovery rates.

The privatized utility (KE) showed a billing loss of about 10 percent throughout the period with no trend improvement, unlike its experience with T&D losses during the same period. This was worse than the higher performing group of DISCOs and does not directly support the argument that privatization leads to improved performance.

Table 12: Recovery percentages for DISCOs 2008 – 2016 (percent)

	PESCO	IESCO	GEPSCO	LESCO	FESCO	MEPCO	HESCO	SEPCO	QESCO	KE
2017	89	92	96	99	97	96	94	110	44	90
2016	88	91	99	99	100	100	72	55	72	88
2015	88	100	97	96	100	102	78	58	33	90
2014	86	120	96	98	100	96	79	59	42	91
2013	84	94	98	98	99	92	81	54	32	89
2012	83	96	99	96	100	97	69	51	36	91
2011	82	94	99	98	100	98	59	-	41	86
2010	85	96	96	93	97	94	60	-	76	100
2009	87	97	95	96	97	96	68	-	80	100
2008	92	98	98	98	99	97	77	-	86	-

Source: State of Industry Reports, various years.

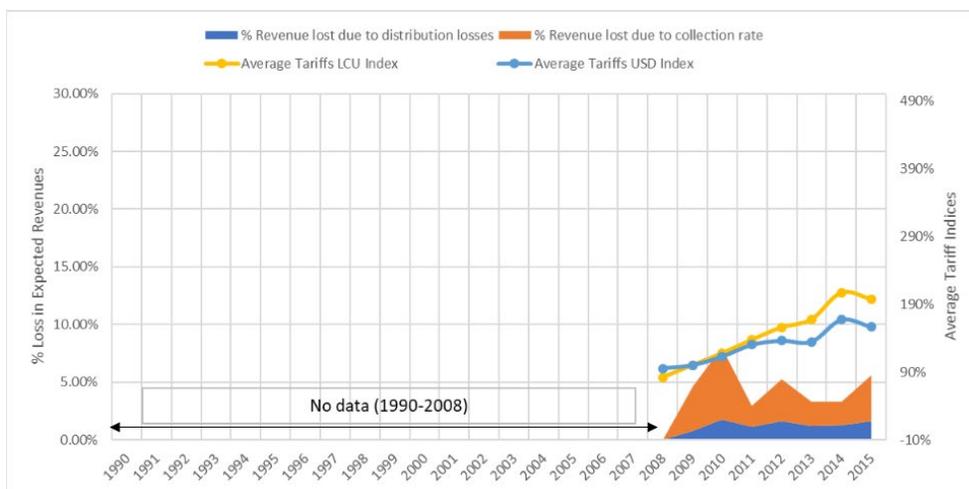
These findings lend weight to the argument that unbundling alone is not likely to improve performance, but it would be desirable to examine other indicators of performance to see whether they present a similar picture. NEPRA collected data on nine indicators for its performance evaluations. T&D losses and recovery rates have been described above. For SAIDI and SAIFI, NEPRA commented in its 2015-2016 report³⁸ the data appeared so inaccurate for these measurements that it was excluding these indicators from its overall assessment score for each of the DISCOs. The overall indicator did include the average time to make new connections, and the number of fatal accidents, but omitted the average duration of load shedding, the number of complaints, and the system faults occurring within the distribution system. It is notable that on the method of scoring adopted, KE came fifth out of ten. Although this calculation was carried out for a single year, and full details of the calculation of the scores used for ranking were not provided, this result does not speak strongly to the superiority of private sector ownership versus state ownership.

A further level of analysis can be provided for LESCO and KE the two utilities whose performance was examined in greater detail. In particular, the T&D losses in excess of an efficiency benchmark of 5 percent and collection losses for these two utilities are quantified in monetary terms and expressed as a percentage of utility revenues, allowing their financial magnitude to be compared. Data for LESCO are limited to only six years (2009-2015), however throughout this period the

³⁸ Performance Evaluation Report of all Distribution Companies for the Year 2015-2016. NEPRA.

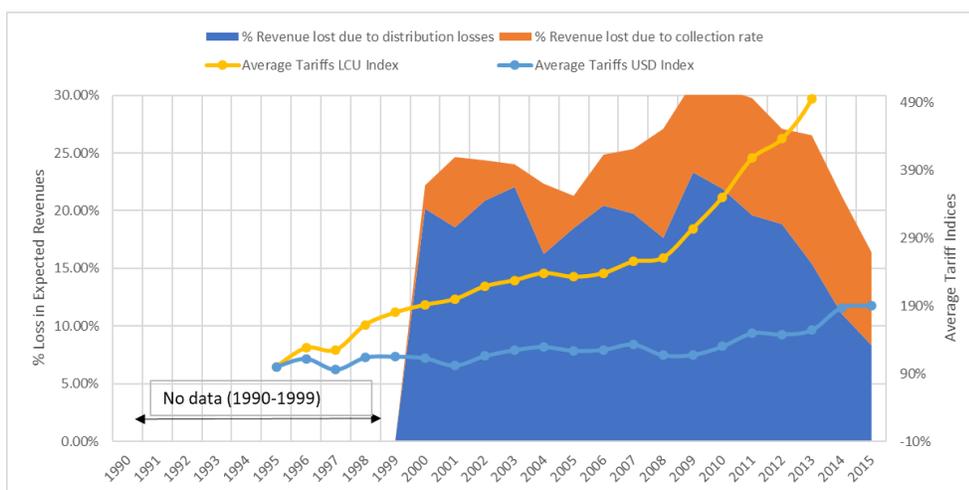
combined value of inefficiencies is kept generally below 5 percent of revenues, with collections responsible for the bulk of the inefficiency in financial terms³⁹ (figure 9). By contrast, aggregate inefficiencies for KE are about three times as large at around 17 percent of revenues in 2015. Nevertheless, this represents an important reduction from over 30 percent in 2010, with the largest improvements coming from a halving of the financial value of T&D losses, with much less progress on revenue collection (figure 10).

Figure 9. Evolution of LESCO’s operational inefficiencies and average tariffs, 2009-2015



Source: Rethinking power sector reform project

Figure 10. Evolution of KE’s operational inefficiencies and average tariffs, 2009-2015



Source: Rethinking power sector reform project

3.3.2 Institutions

The commercial and operational performance of the DISCOs could reflect corporate governance practices. To explore this relationship, corporate governance parameters are compared between

³⁹ Distribution efficiency is defined as the percentage of the revenues of an efficient utility that are captured by the utility in question, and captures the shortfall attributable to both technical and commercial losses.

the public utility LESCO, the private utility KE and several Indian benchmarks. This comparison covers a number of different dimensions of corporate governance, including autonomy and accountability, and management practices (including financial discipline, human resources, and information technology).

The overall **corporate governance** of LESCO scores at 56 percent—below that of the average utility in the study and below three of the six comparator utilities from India (Table 13). The composition of the board until 2016 was not in compliance with the Securities and Stock Exchange Commission of Pakistan (SECP)'s Public Sector Companies Corporate Governance Rules of 2013, which it is supposed to follow. The autonomy of LESCO's board is also severely constrained because most major strategy and investment decisions are taken by the Ministry of Water and Power, leaving only HR decisions as the main area for Board intervention. As a privatized utility, KE does not face the same limitations on the operation of its board receiving a score of 94 percent.

Table 13: Corporate governance of utilities in Pakistan and comparators, 2015⁴⁰

	Odisha, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Overall Utility Governance	68%	26%	52%	52%	63%	63%	52%	90%	63%
Corporate Governance	86%	13%	47%	47%	67%	67%	56%	94%	62%
<i>Accountability</i>	83%	25%	50%	50%	67%	67%	67%	100%	60%
<i>Autonomy (SOEs)</i>	89%	0%	44%	44%	67%	67%	44%	89%	63%

Note: Scores based on index developed for the Rethinking Power Sector Reform Project. For more details go to project website at http://www.esmap.org/rethinking_power_sector_reform

Table 14 shows that LESCO scores 50 percent on **financial discipline**, nine points worse than the international benchmark, while KE scores 79 percent almost 20 points above the international benchmark. The low financial discipline score for LESCO reflects the fact that the utility faces constraints on raising new capital from bonds or equity. Although it does not have its public service obligations laid out explicitly, it does score well on transparency and the quality of its financial accounting. KE, being a private utility does not face any constraints on raising capital other than its own performance. KE's internal financial and accounting practices are in line with national and international standards and we can see that the utility has higher than average scores on financial discipline (see annex).

However, KE faces financial discipline challenges arising from payables to and receivables from the Government of Pakistan (GOP) and government agencies and enterprises (SOEs). There is an accumulation from before 2010 of bills owed by 'strategic' consumers, Karachi Water & Sewerage Board and the City District Government of Karachi, both of which it is contractually bound to

⁴⁰ For the detailed utility governance index, see the annex.

service. At the same time, KE owes NTDC payment for the 600MW that it receives from the grid, and owes Sui Southern Gas Company and Pakistan State Oil for fuel supply.

Table 14: Utility management index of utilities in Pakistan and comparators, 2015⁴¹

	Odisha, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Utility Management	50%	40%	56%	56%	60%	60%	48%	86%	64%
<i>Financial Discipline</i>	43%	36%	53%	53%	64%	64%	50%	79%	59%
<i>Human Resource</i>	70%	40%	43%	43%	36%	36%	43%	86%	62%
<i>Information and Technology</i>	36%	43%	73%	73%	80%	79%	50%	93%	71%

Note: Scores based on index developed for the Rethinking Power Sector Reform Project. For more details go to project website at http://www.esmap.org/rethinking_power_sector_reform.

The performance of the two utilities with respect to **Human Resources (HR)** is along similar lines—LESCO struggles to meet average scores while KE scores much above those. Notably it is able to pay bonuses to reward good performance. However, even at KE managers cannot hire or fire staff without higher level approval (see annex).

For LESCO decisions concerning middle management and above are taken by PEPCO, as well as decisions pertaining to all staff hired prior to WAPDA unbundling. Poor scores on management autonomy and performance review of employees contribute to an overall performance score of 43 percent for HR practices. The difference between KE and LESCO is important since it relates to the abilities of the two utilities to respond to poor performance and the need for change. After the 2013 decision to start the privatization of LESCO, new senior management were appointed on competitive private sector pay-scales.

KE scores highly (89 percent) on **Information and Technology (IT)**, well above the average, using the latest energy management, customer care, and corporate care IT solutions. LESCO scores well below average and importantly does not have a SCADA system or a call center to manage customer complaints (see annex).

Putting together the evidence from these various indicators shows that LESCO’s corporate governance environment falls short in many ways relative to that enjoyed by KE. Comparisons with the Indian state-owned utilities are also mixed. Much of the poor institutional performance is linked to the way in which LESCO (and the other DISCOs in Pakistan) are managed by the state—big decisions on finance, employment and pricing are all taken out of the DISCOs’ hands and instead are taken at a higher level. The incentives for management to improve performance are weak. Management is restricted in what it is allowed to do, and there is no corporate penalty for poor performance because of the way in which circular debt has been underwritten by the government’s actions.

Governance indicators for the private utility KE look to be considerably stronger than those for LESCO across all aspects considered, indicating a higher degree of managerial autonomy in this

⁴¹ For the detailed utility management index, see the annex.

case. Nevertheless, in this case, the stronger corporate governance framework for KE does not seem to translate into stronger performance on operational and commercial efficiency, indicating that legacy issues of power theft and non-payment of bills may be playing a much larger role in determining the utility's performance.

However, what is most striking about this analysis is that despite significant limitations in the governance structure of LESCO relative to KE, the former's performance on operational efficiency is substantially better than the latter's.

3.4 *Tariffs and cost recovery*

3.4.1 *Performance*

The analysis of **cost recovery** and **financial viability** focuses two utilities: K-Electric (KE) is a privately owned vertically integrated generation, transmission, and distribution company with 2.5 million connections in Karachi and the surrounding region. Lahore Electric Supply Company (LESCO) is an unbundled distribution company (formerly part of WAPDA) with 3 million connections in Lahore, Kasur, Okara and Sheikhpura.

The revenue gap in a power utility can be measured using the quasi-fiscal deficit (QFD), a measure that compares the revenues that would be captured by an 'ideal utility' that charges cost recovery tariffs, fully collects revenues and keeps distribution losses to a technical minimum (5 percent), with the revenues captured by the actual utility. This gap can be decomposed according to the portion attributable to under-recovery of costs through depressed tariffs, the portion attributable to the under-collection of revenues due to commercial inefficiencies, and the portion attributable to excessive distribution losses.

In 2016, the QFD attributable to LESCO and KE combined is about USD 310 million or just 0.1 percent of the GDP. This is significantly lower than the 2013 QFD at USD 1500 million or 0.65 percent of the GDP (figure 11). This major reduction does not arise from any major improvement in collection or distribution losses, which remain at more or less the same level, but can be attributed to a sharp fall in oil prices during the period.⁴²

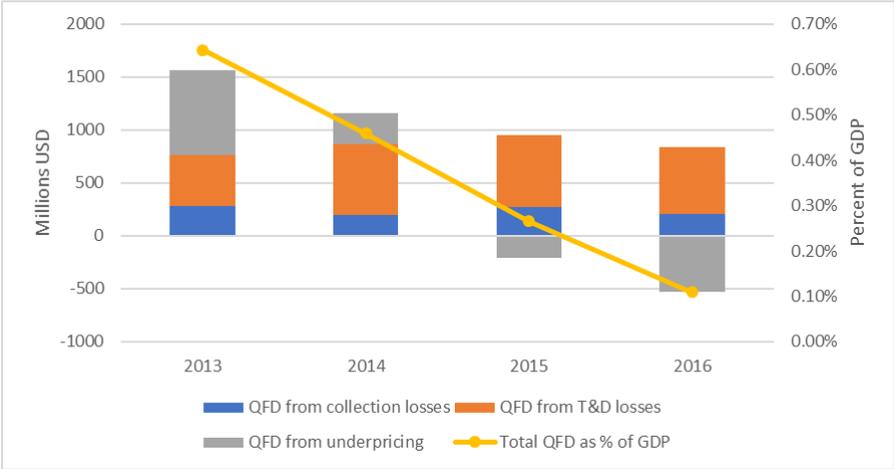
The system of tariff setting in Pakistan also makes it very difficult to analyze the overall QFD trends. Revenues for utilities are based on NEPRA determinations and government notifications which lag several months or at times years and therefore include adjustments to compensate for shortfalls in prior years. Thus, in 2013 underpricing is a major contribution to the QFD (USD 800million), which in 2016 turns into a surplus (USD 526 million) due to subsequent compensatory tariff revisions.

Nevertheless, it is clear from figure 11 that the QFD attributed to under-collection and excessive system losses have remained around the same level throughout the four years indicating difficulties being faced by the utilities in improving their performance. This is borne out by KE's experience. After the management takeover of K-Electric by the Abraj group, the utility adopted

⁴² Average crude oil prices fell from \$105/bbl. in January 2013 to \$29/bbl. in January 2016. Pakistan's power generation mix is heavy on oil and it impacts the costs substantially.

a controversial policy of supplying power regularly to areas that paid 80 percent of their dues, and not providing regular power to other areas. In response, employees responsible for collections were threatened, beaten, or killed. KE then began to outsource collections to a third party, and collection rates improved but remain a recurring issue for the utility.

Figure 11: Quasi-fiscal deficit attributable to KE and LESCO, 2013-2016



Source: Rethinking power sector reform project

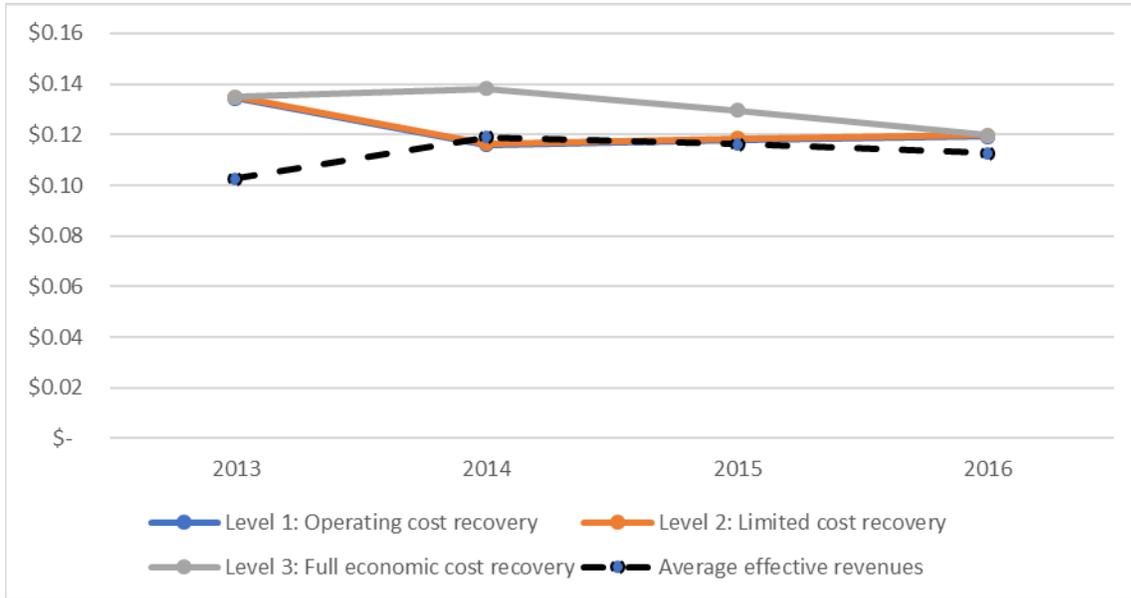
The financial viability of the sector largely depends on achieving cost-reflective tariffs. To assess Pakistan’s progress toward cost recovery, a detailed analysis of KE and LESCO financials was conducted for the past four years. The analysis sets benchmarks for three levels of cost recovery: (i) operating costs only; (ii) operating costs plus limited capital costs, such as debt service; and (iii) full capital costs on current and planned future investments. The financial viability analysis does not account for costs associated with service delivery that are covered separately by other parties, for example if a donor provides concessional capital. In a second stage, the analysis evaluates the sector against a full-cost-recovery benchmark that incorporates any costs that are currently subsidized. Data for the analysis were available only for the period 2013–2016.

Figure 12 shows average tariff revenues for each year 2013-2016 compared to the three levels of cost recovery. Both the utilities present a somewhat different picture. LESCO (figure 12a) sees a substantial increase in average revenues in (about 2 cents) 2014 that combined with a drop in operating and limited capital costs brings it above level 2 cost recovery. By 2016, the utility is close to full capital cost recovery level with average revenues at USD 0.11 while the full capital cost recovery level at USD 0.12.

On the other hand, KE (Figure 12b) sees a substantial drop in operating and financial costs starting in 2013 that bring the full cost recovery level down from USD 0.18 in that year to USD 0.12 by 2016. This also takes the utility close to full capital cost recovery without a substantial rise in tariffs.

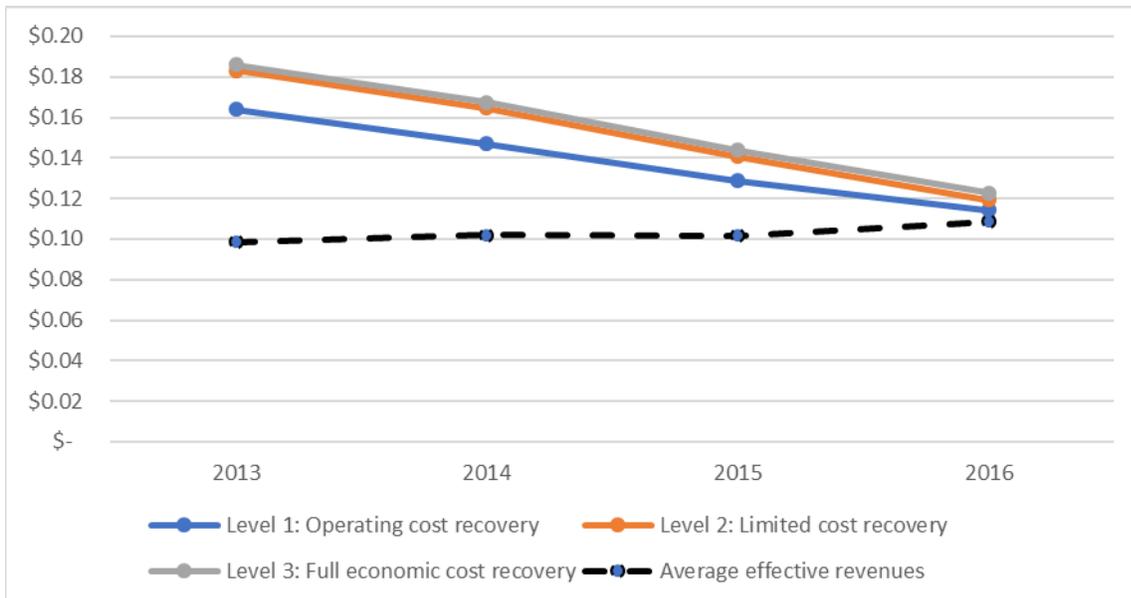
Both the images indicate a downward trend in the cost recovery benchmarks over this period, driven by a significant reduction in costs due to falling oil prices.

Figure 12 a): Evolution of full financial cost recovery for LESCO, 2013-2016



Source: Rethinking power sector reform project

Figure 12 b): Evolution of full financial cost recovery for KE, 2013-2016



Source: Rethinking power sector reform project

While a utility may recover costs through the average tariff level, it remains pertinent to examine whether all customer groups are facing cost recovery tariffs. Figure 13 shows the average tariff revenue for each customer class compared to cost-recovery levels A1-A3. Figure 14 compares

the percent of consumption for each customer class to the percent of revenue from that class. It becomes clear that industrial and commercial customers of both utilities pay electricity tariffs substantially higher than those faced by residential and agricultural customers; in fact, industrial and commercial customers appear to be paying well above the full capital cost of service delivery. KE has larger cross-subsidies to residential customers than LESCO. KE's residential customers made up 51 percent of consumption but only 37 percent of revenues. Both commercial (23 percent) and industrial (37 percent) customers' shares of revenue exceeded their shares of consumption (13 percent for commercial and 30 percent for industrial). LESCO's residential customers made up 40 percent of consumption but only 35 percent of revenues. Commercial customers' share of revenue (12 percent) exceeded consumption (8 percent), but the industrial share of revenue was only 1 percent more than its share of consumption.

Figure 13: Average tariff revenue and cost recovery level by customer group, 2016

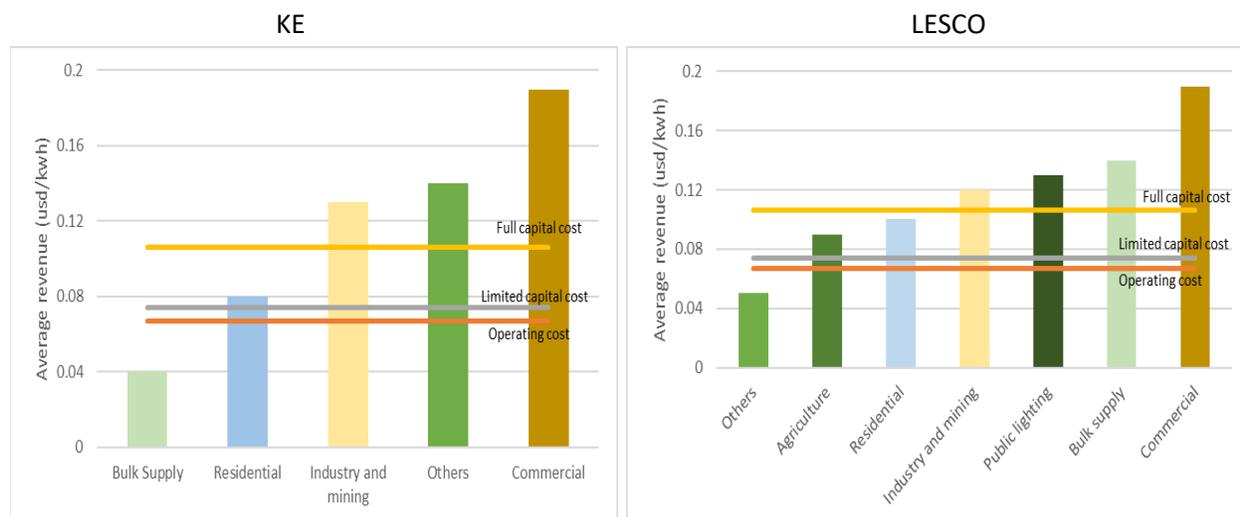
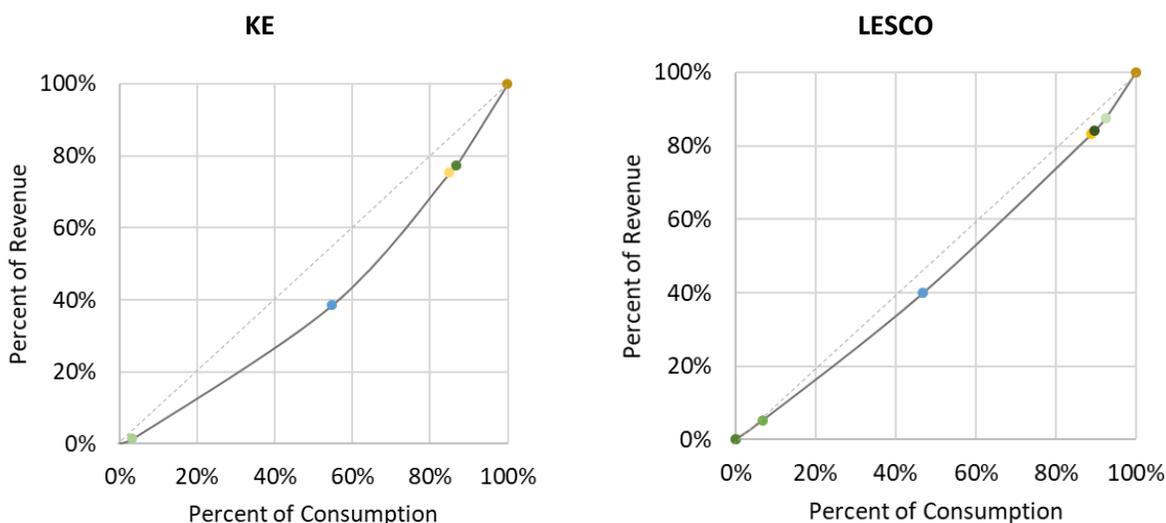


Figure 14: Percentage of revenue against percentage of consumption by customer group, 2016



Source: Rethinking power sector reform project

Subsidies to the sector have not been phased out as planned, and distribution companies have argued for higher subsidies: these are provided to distribution companies in the form of a tariff differential subsidy (TDS), which compensates distribution companies for the difference between the NEPRA-determined cost-based tariff (accounting for only efficient costs) and the uniform tariffs (based on the costs of the most efficient distribution company). The government envisioned that as distribution companies were privatized, the efficiencies of private management would result in lower costs and therefore lower subsidies. However, after almost

ten years of privatization, KE is still receiving a subsidy. In 2015, TDS to KE amounted to USD 418 million. Total TDS subsidies provided to the sector in 2016 (including KE and Ex-WAPDA DISCOs) comprised 0.4 percent of GDP. Distribution companies disagree with the calculation of the subsidy, claiming that the estimation of actual costs is too low, in part due to it only including efficient costs. This leaves a shortfall in cost recovery, even with the subsidy.

The sector suffers from circular debt and difficulty securing financing for needed investments, which is a major problem in the sector. Distribution companies often don't have the cash to pay the National Transmission and Dispatch Company (NTDC), because of low collections, shortages in cost-recovery (even with the subsidies), or lack of timely payment of subsidies. NTDC then cannot pay power producers, and power producers cannot pay fuel suppliers. KE's debt service coverage ratio was below 1 in 2010-2014 but increased gradually to 1.25 in 2015/16. Its payables are still very high, equaling 56 percent of revenues in 2015/16. KE payables include what it owes to NTDC for the 600MW it receives from the grid and payables to fuel suppliers. Its payable days outstanding have remained above 200 throughout the entire period observed. LESCO's debt service coverage ratio has fluctuated above and below 1 in the observed period, with much more manageable payables at 15 percent of revenue and payable days outstanding equal to 52 in 2014/15.

KE is contractually obligated to provide uninterrupted service to Karachi Water & Sewerage Board and City District Government Karachi, but their unpaid bills have been accumulating since before 2010. KE has high levels of uncollected accounts receivable, totaling 52 percent of revenues in 2015/16, with receivable days equal to 190. Government and autonomous bodies make up 56 percent of trade receivables and 55 percent of KE's total receivables. LESCO performs better than most of the country's distribution companies in terms of receivables, because a large portion of its customers are industrial consumers, which tend to make timely payments. In 2015, receivables were 25 percent of revenues, with receivable days equal to 91.

Privatization has helped to improve KE's financial performance (figure 15). KE became profitable in 2011/12, after the 2009 management takeover by Abraaj Capital, which removed bottlenecks, allowing for the addition of new generation capacity and recovery of the poor financial situation. Steady improvement can be seen in each year's net profit margin (which increased from -7 percent in 2010/11 to 17 percent in 2015/16) and EBITDA margin (which increased from 3 percent to 23 percent).

LESCO has had more erratic financial performance, with wide swings in profits in the years observed (figure 16). Profits show wide variation during the period but most of this is attributable to exceptionally poor performance in 2012. A few years showed positive profits but were then followed by a return to losses.

Figure 15: Financial performance of KE, 1994-2015

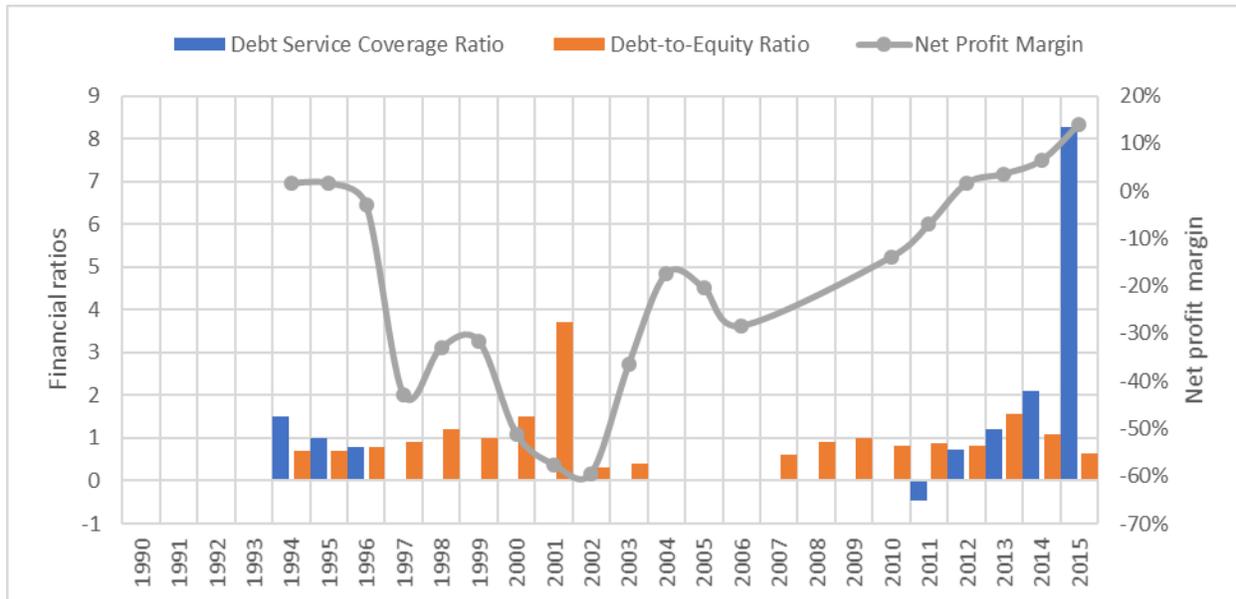
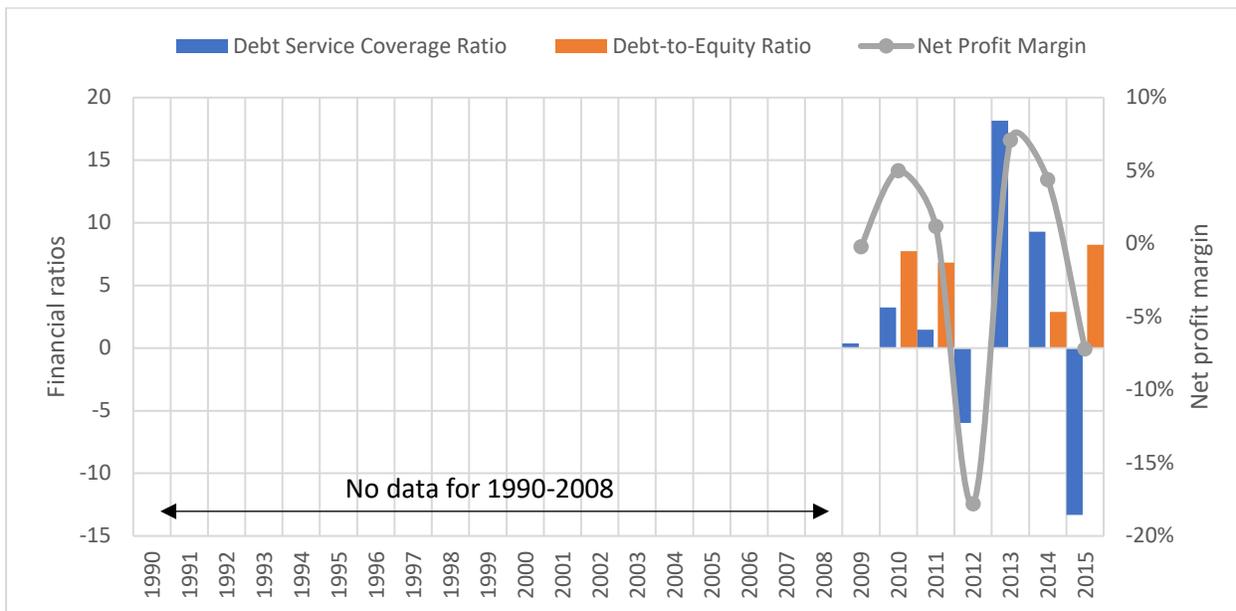


Figure 16: Financial performance of LESCO, 2009-2015



Increasing access and energy demand have resulted in shortages, which are managed through load shedding. Frequent outages have led some industrial customers and wealthy residential customers to use self-generation. This is not a sustainable financing solution to increase generation to the level needed. Sector entities are mostly not creditworthy and have trouble securing financing, meaning that sector investments typically require the financial support of the government or donor organizations. KE has a double A credit rating from JCR-VIS Credit

Rating Company Limited and currently has loans from both commercial financial institutions and the Government of Pakistan. LESCO does not have a credit rating. A summary of financial indicators is shown in Table 15.

Table 15: Summary of financial indicators for LESCO and KE, 2015

	LESCO	KE	Global comparator *
Net profit (loss) margin	-5 percent	17 percent	-12 percent
EBITDA margin	-9 percent	23 percent	6 percent
Current ratio	3.16	0.98	0.79
Debt service coverage ratio	-9.96	1.25	-4.56
External Financing Index Ratio ⁴³	-2.79	-0.26	6.92
Investment as a percent of revenues	-8 percent	15 percent	18 percent
Government transfers as a percent of utility revenue	10 percent	21 percent	6 percent
Net capital cost recovery ratio ⁴⁴	68 percent		16 percent

* Note: Sample average is derived from the Rethinking Power Sector Reform Project data observatory and includes data from Tanzania, Senegal, Peru, Colombia, Pakistan, the Philippines, Vietnam, Kenya, Uganda, Tajikistan, the Indian states of Rajasthan, Odisha, and Andhra Pradesh, and Egypt

3.4.2 Institutions

The regulator, **National Electric Power Regulatory Authority (NEPRA)**, was created in 1997 through Act N°40 and its main responsibilities are to issue licenses for generation, transmission and distribution of electric power; to establish, and enforce standards to ensure quality and safety of operation and supply of electric power to consumers; to approve investment and power acquisition programs of the utility companies; and to determine tariffs for electricity generation, transmission, and distribution.

The performance of the regulatory system is evaluated from two standpoints. First, an evaluation is made of the de jure performance by comparing the laws, rules, and regulations in place with various criteria that would be desirable in an ideal system. Second, a de facto evaluation incorporates actual behavior. The various performance tables, as well as including the score for the Pakistan regulatory system, include the average score across all the countries included in the

⁴³ *External financing index ratio* measured as net cash flow from financing divided by the net cash flow from operations.

⁴⁴ *Net capital cost recovery ratio* is the percent of full capital costs that can be recovered through tariff revenues net of operating costs.

Rethinking Study and those of three Indian states. An overall performance index is constructed by taking averages of the different sub-components.⁴⁵

Performance of regulation is assessed on: regulatory governance, represented by accountability and autonomy aspects (table 16); on regulatory substance, represented by tariff regulation, quality regulation and market-entry regulation (table 17).

3.4.2.1 Accountability

NEPRA's performance on regulatory accountability is comparable to the global sample, although it lags somewhat behind India, primarily due to the more limited scope of regulatory oversight (Table 16). Independent third-party evaluation of the regulator and requirements to involve nongovernment stakeholders in regulatory decision making process are the main differences between the two countries.

According to the 1997 Act, NEPRA shall prepare annual reports. The report shall be submitted to the Council of Common Interests and to the federal government, but there have not been independent non-governmental evaluations of NEPRA.

With respect to **legal appeals**, there are legally established processes to allow regulated companies or other affected parties to challenge or appeal decisions of the regulatory entity. The process is established under the NEPRA (Procedure for filing appeals) Regulations, 2012. However, the appeal organism is the same regulatory authority, which, at the very least, casts doubts on NEPRA's accountability. However, entities dissatisfied with the NEPRA appeals process can resort to the courts, and the case law established has a significant effect on what NEPRA does.

As regards the regulator's **transparency**, the annual report is also available on their website, along with the state of industry report. Moreover, according to NEPRA Act, the regulator shall maintain public files open in convenient form for public inspection. This Act also establishes that NEPRA shall maintain complete and accurate books of accounts of its actual expenses and receipts, which shall be audited annually by the Auditor General of Pakistan.

There are also several rules, procedures and guidelines which provide transparency to the distinct regulatory processes. For tariffs, NEPRA issued in 2015 Guidelines for determination of consumers end-tariffs, containing the methodology and process (Annex). Once companies file their tariff petitions with NEPRA for the determination of their consumer end-tariffs, the regulator invites the public to make comments on the submissions of the companies. Afterwards, when necessary, it conducts a public hearing to enhance transparency and accountability. In the case of licensing, the procedures to apply, modify, suspend or revoke a license, as well as other provisions regarding their issuing, are clearly specified in the law and in specific rules and regulations.

⁴⁵ Scores in this section are based on the index developed for the Rethinking Power Sector Reform Project. For more details, go to project website at http://www.esmap.org/rethinking_power_sector_reform.

NEPRA’s decisions must be made publicly available, whether they are binding or not. The regulator’s decisions are advisory regarding tariffs and binding on the other regulatory matters under its mandates. Where NEPRA plays a purely advisory role, its recommendations are required to be made publicly available, as well as the responses of the government body receiving the recommendations. Moreover, if the government body receiving the recommendations rejects or modifies them, it is required to provide a public explanation for doing so.

Table 16: Formal regulatory governance in Pakistan and comparators, 2015⁴⁶

	India, AP	India, Odisha	India, Raj	Pakistan	International Benchmark
Regulatory Governance	68%	68%	68%	72%	59%
Accountability	91%	91%	91%	79%	83%
<i>Regulatory Oversight</i>	100%	100%	100%	67%	81%
<i>Legal Appeals</i>	100%	100%	100%	100%	100%
<i>Transparency</i>	73%	73%	73%	70%	67%
Autonomy	75%	75%	75%	92%	71%
<i>Decision-Making Autonomy</i>	100%	100%	100%	92%	79%
<i>Budgetary Autonomy</i>	50%	50%	50%	100%	80%
<i>Leadership Autonomy</i>	50%	50%	50%	75%	66%
<i>Managerial Autonomy</i>	100%	100%	100%	100%	59%

Source: Data collected for the Rethinking Power Sector Reform Project.

3.4.2.2 Autonomy

NEPRA’s performance on regulatory autonomy at 92 percent is relatively high compared to Indian and wider international benchmarks (Table 16). This can be largely attributable to a greater degree of budgetary and leadership autonomy. NEPRA has the power to determine its own structure and allocation of budget while the Indian regulators do not. Also, NEPRA’s budget is entirely funded from levies and taxes while in India the regulator’s budget comes directly from the government budget.

NEPRA grants licenses for electricity generation, transmission, and distribution; determines tariffs, rates, charges, and other terms and conditions for supply of electric power services by the generation, transmission and distribution companies and recommends them to the federal government for notification. According to the NEPRA Act, it shall prescribe and enforce performance standards for generation, transmission and distribution companies; and prescribe procedures and standards for their investment programs.

For the regulator’s **autonomy**, it is reported that there are no formal provisions under which a ministry or other government body can overturn NEPRA’s decisions. Nevertheless, it should be noticed that the main substantial decisions – i.e. on tariffs, rates and charges — are subject to

⁴⁶ For the detailed regulatory governance index, see the annex.

Ministry approval. As previously stated, the regulator must recommend determined tariffs which must, in turn, be notified by the Ministry (and, only then, become binding). Moreover, the Ministry may require NEPRA to reconsider its determined tariffs or charges. Its **funding** is established by law (NEPRA Act) and is taken from license fees, the cost of which ultimately falls on consumers. Also, the NEPRA Act also mentions grants from the federal government (including an initial grant of 100 million rupees) as one of the sources from which NEPRA shall be funded.

On **leadership autonomy**, NEPRA was created through an Act, so that the legal basis for the entity's existence is primary legislation. According to the survey, the regulator enjoys the power of allocating its own budget but does not have the power to determine its own organizational structure and rules, these being determined by the Ministry of Energy. According to the NEPRA Act, the regulator's leadership, composed of a chairman and four members, is selected by the federal government based on nominations by the provinces.

Their tenure is fixed (four years) and can be renewed once. For their professional profile, the chairperson shall be an eminent professional of known integrity and competence with at least 20 years of related experience in law, business, engineering, finance, accounting, economics, or the power industry; and every member shall be a professional of known integrity and competence with at least 15 years of related experience in law, business, engineering, finance, accounting, economics or the power business. The NEPRA Act also states the reasons for chairperson and member removal. They may be removed by the federal government from their office if, on an inquiry by the Federal Public Service Commission, they are found incapable of performing the functions of his office by reason of mental or physical incapacity or have been found guilty of misconduct.

The NEPRA Act considers the situations for the period that follows having been part of the regulator leadership. Specifically, the chairperson and members shall not enter the employment of, or accept any advisory or consultancy relationship with, any person engaged in the generation, transmission or distribution of electric power in Pakistan or any related undertaking; or have any direct or indirect financial interest or have any connection with any company connected with the provision of electric power services for a period of two years thereafter.

In practice, according to the survey, NEPRA has a fair degree of financial and administrative autonomy; with clearly laid out legislation in the form of the NEPRA Act that enshrines its functions and autonomous role in, mainly, granting licenses and overseeing quality of service of its licensees.⁴⁷ Nevertheless, it should be pointed out that even if regulator's decisions on quality of service are legally binding, in practice, there is no reliable sanction if the distribution company fails to meet the standard. Also, it is highlighted that while in previous years NEPRA was the sole determinant of tariffs and there was no external influence exerted on it, in recent years,

⁴⁷ It is acknowledged that NEPRA does take directions from the Ministry of Water and Power in some issues, such as in the case of imposing a fine on K-Electric during the 2015 heatwave.

particularly in the wake of power projects under the China Pakistan Economic Corridor (CPEC), the government has been influencing the tariffs that NEPRA is determining.⁴⁸

3.4.2.3 *Tariff regulation*

When it comes to tariff regulation, the quality of Pakistan's regulatory framework on paper is comparable to that observed in the comparator countries (Table 17).

Regulatory objectives for tariff setting (i.e. allocative efficiency, productive efficiency, equity, and financial sustainability) are acknowledged and clearly specified in sectoral laws, specifically in NEPRA Act. The generation and transmission tariffs are determined on a cost-plus basis. Distribution companies, on the other hand, are given a multi-year performance tariff based on a revenue requirement.

The detailed description of the calculation of the distribution tariff is given in the annex. This states that an annual (or multi-year) tariff should recover prudently incurred costs by the distribution company. The determination of this revenue requirement shall consider power purchase costs (including generation and transmission costs) and a distribution margin. The guidelines indicate that the power purchase costs shall include a fuel component, variable operating and maintenance costs, capacity charges, and transmission charges. The distribution margin, on the other hand, shall include (but will not be limited to) the post-tax rate of return on rate base, depreciation and the costs of operations, maintenance, repairs, salary, wages, benefits, travel, vehicles and other costs.

The consumer tariffs that NEPRA determines for each distribution company (based on this revenue requirement) differ from those that are notified by the MOWP and are actually charged to consumers. These notified tariffs are related to the tariff determined for the most efficient DISCO and are uniform across all the consumer categories of the different utilities. The gap between the tariff arising from the revenue requirement for each DISCO and the notified tariff is filled by a tariff differential subsidy (TDS) from the government. Finally, there are no regulatory mechanisms to compensate generators for the provision of firm capacity or ancillary services and utilities are not compensated for the costs of stranded assets.

Regulated companies are required to submit financial information according to regulatory accounting standards. These are established through the NEPRA (Uniform System of Accounts) Rules, 2009.

Table 17: Formal regulatory substance in Pakistan and comparators, 2015⁴⁹

⁴⁸ For example, the re-evaluation of a feed-in-tariff for coal and of the Lahore- Matiari transmission line. While the tariff rules allow for a 30-day period for challenges to tariff determination, the coal FIT and wheeling tariff for the private transmission line were re-evaluated more than a year after initial tariff determination. This re-evaluation was conducted after pressure from the Ministry of Water and Power.

⁴⁹ For the detailed regulatory substance index, see the annex.

	India, AP	India, Odisha	India, Raj	Pakistan	International Benchmark
Regulatory Substance	76%	76%	79%	83%	76%
Tariff Regulation	75%	75%	75%	83%	77%
<i>Regulatory Framework for Tariffs</i>	100%	100%	100%	100%	90%
<i>Determination of Tariffs</i>	50%	50%	50%	67%	64%
Quality Regulation	83%	83%	92%	100%	75%
<i>Quality of Service Standards</i>	100%	100%	100%	100%	82%
<i>Quality of Service Enforcement</i>	67%	67%	83%	100%	68%
Market Entry Regulation	71%	71%	71%	67%	77%
<i>Permitting New Entrants</i>	75%	75%	75%	100%	90%
<i>PPA Approvals</i>	67%	67%	67%	33%	57%

Source: Data collected for the Rethinking Power Sector Reform Project.

3.4.2.4 Quality regulation

When it comes to quality of service regulation, at least on paper, Pakistan’s regulatory framework is comparatively well structured, particularly with regard to the creating of enforcement measures (Table 17).

For **quality regulation**, there are specific written and publicly available quality of service standards for quality of product, supply, and commercial service. Although utilities are legally required to meet them, and there are fines for non-compliance, utilities struggle to do so due to technical challenges. Fines for non-compliance are enforced in practice and whenever a utility fails to meet the standards, this is disclosed to the public.

For **quality of service enforcement** regulated entities are required to report various indicators, such as SAIDI, SAIFI, voltage indicators, and distribution losses. These are independently validated and reviewed by NEPRA. There are “Guaranteed Standards of Performance” for individual consumers and “Overall Standards of Performance”. The latter provide the underlying indicators of assessment of supply reliability, quality of supply, and safety of electric power supply that a distribution company provides to its consumers. Distribution companies are required to maintain information on all power supply interruptions and on all consumer complaints. More importantly, the rules establish that each distribution company shall supply to NEPRA an Annual Performance Report on specified lines.

Summing up, there is a wide, comprehensive quality regulatory framework, with specific and publicly available requirements of information, including formats, processes, and consequences of non-compliance.

Although the performance de jure of the quality regulation is high, some qualifications must be made. It seems that, in practice, even if there are fines for failing to meet quality of service standards, these are seldom applied and there is no reliable sanction if the distribution company fails to meet standards.

3.4.2.5 Market Entry Regulation

When it comes to market entry regulation, Pakistan's framework lags somewhat behind the global comparators, largely due to the limited role played by the regulator in the approval of new Power Purchase Agreements (Table 17).

Although licenses for generation, distribution, and transmission are available for private companies; new entrants in the power market have until recently been limited to the generation segment. It was only in 2015 that a license was granted to a private transmission company.⁵⁰

The procedure for allocating licenses is by application and is publicly stated in the legal framework. These rules state licenses' fees, terms and renewal, revocation and suspension; licensees' accounting practices and audit, provision of information, fines and penalties, resolution of disputes, among others.

According to the survey, there is a legally specified period in which the regulatory entity must approve or refuse a license application, and most applications are responded to in time.

NEPRA is responsible for monitoring compliance with the terms of licenses (or permits), having the authority to impose penalties for violating their terms (or other contractual violations). These penalties are, according to the survey, formally written and publicly available. However, they are seldom applied.

Finally, there are provisions to force companies to relinquish licenses or permits for a legal or contractual violation, though, as with penalties for violating contractual terms, they are seldom applied.

With respect to PPA approval, according to the analyzed material, the power acquisition process is regulated by NEPRA regarding clearance for the power procurement to qualify as prudent, and its costs pass through to regulated electricity retail tariffs. This clearance must be obtained prior to start negotiation of a new PPA, and when the negotiation is completed, the requests related to new PPA are made public on the regulator's website. NEPRA's review and clearance is based, in accordance to regulations, on least cost considerations, although under historical shortages new contracts have been justified in closing the demand-supply gap. NEPRA is not involved in the review and approval of the contract, but it determines the generation tariff that will apply to a power plant and that the PPA must follow. Therefore, the commercial contracts cannot include provisions inconsistent with the tariff determination, as such provisions would be invalid. The regulated obligation to inform NEPRA and obtain clearance applies to the purchaser.⁵¹

For distributed generation (DG), the "National Electric Power Regulatory Authority (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations" (2015) specify the

⁵⁰ Apart from the vertically integrated K Electric Limited, which was privatized in 2005.

⁵¹ Currently the Disco or the Central Power Purchasing Agency (Guarantee), CPPA-G.

rules for connecting these generators to the main grid. The regulator is responsible for determining whether distributed generators can sell power back to the utility.

An important difference between de facto behavior and de jure regulation was identified in the survey. It was argued that in practice, in the generation segment, new entrants (particularly solar) have faced difficulties in getting through the various initial stages of approval. Two major roadblocks are related to land allocation for wind and solar. For both, the number of Letters of Intent (LOIs) issued with associated land allocation rights are greater than the land available and the interconnection potential of the grid; thus, only private developers with strong connections with government have had land identified and allocated and thus been able to move on to the next stage of conducting the necessary feasibility studies.

The second road block is the interconnection permit which is given based on the inter-connection study. The time allowed for comments from NTDC on the study is 30 days. In some cases, NTDC reverted with comments after one year. During the revision of the solar tariffs some private IPPs were held up until the FIT (feed-in-tariffs) time lapsed and the next round of feed-in-tariffs were announced. NTDC's Planning department, which is responsible for interconnection permits, is seen to be heavily influenced by the Ministry in terms of granting interconnections permits and has been used to delay processes. Although it is stated that utilities are required to connect eligible DG assets to the grid within a specified period, this is not generally met.

3.4.2.6 Overall assessment of performance of regulation

Table 18 summarizes Pakistan's regulatory performance in de jure aspects, which describe what is stated in the legal and regulatory framework, and de facto aspects, which try to capture experts' comments and perceptions of the actual performance of the various aspects of regulation.

The overall de jure performance score of 60 percent is high and indicates that Pakistan has put in place a system of regulation that includes many of the desirable features for the structure of the power sector adopted. A comparison with the de facto scores shows Pakistan performing substantially worse on regulatory practice than on the de jure basis. While some of the actual practices that differ from the rules on paper have been highlighted above, some of the main differences are summarized below.

Table 18: Overall de jure and de facto scores for regulation

Indicators	De Jure	Perceived
Overall Regulation	60%	37%
Regulatory Governance	72%	61%
Accountability	79%	85%
<i>Regulatory Oversight</i>	67%	67%
<i>Legal Appeals</i>	100%	100%
<i>Transparency</i>	70%	89%
Autonomy	92%	72%
<i>Decision-Making Autonomy</i>	92%	62%
<i>Budgetary Autonomy</i>	100%	100%
<i>Leadership Autonomy</i>	75%	75%
<i>Managerial Autonomy</i>	100%	50%
Regulatory Substance	83%	61%
Tariff Regulation	83%	83%
<i>Regulatory Framework for Tariffs</i>	100%	100%
<i>Determination of Tariffs</i>	67%	67%
Quality Regulation	100%	71%
<i>Quality of Service Standards</i>	100%	75%
<i>Quality of Service Enforcement</i>	100%	67%
Market Entry Regulation	67%	29%
<i>Permitting New Entrants</i>	100%	25%
<i>PPA Approvals</i>	33%	33%

Source: Data collected for the Rethinking Power Sector Reform Project.

Decision-making autonomy is much lower de facto than de jure and this is attributable to the fact that the government has recently been influencing the tariffs determined by NEPRA and has proposed to remove all tariff setting authority to the Ministry. Managerial autonomy is also lower de facto because of the transfer of administrative control of NEPRA to the Ministry of Water and Power.

Notably, Pakistan's tariff regulation system is perceived to function in practice close to what is intended on paper. However, both the quality of service standards and the quality of service enforcement have lower de facto scores than de jure scores. Utilities try to comply with these standards but struggle to do so due to technical challenges, while fines to meet these standards are seldom imposed, and financial incentives to meet customer service standards are ignored.

Market entry regulation has a much lower score de facto than de jure in respect of permitting new entrants. Solar and wind have faced difficulties in getting through the initial stages of approval. More letters of intent associated with land allocation rights than the land available or the interconnection potential of the grid have been issued, so that only developers with strong links to the government have had land identified and allocated so that they can move on to

feasibility studies. NTDC has also been slow in commenting on interconnection permit requests (taking much longer than the 30 days specified in the regulations) and has been influenced by the Ministry in its decision making.

The combined influences of these shortcomings mean that the overall de facto regulation index is 37 percent compared to the de jure index of 60 percent, and this difference must be considered when evaluating the extent to which Pakistan followed a traditional reform approach. The de jure regulatory structure adhered fairly closely to that which would have been recommended to a country wishing to follow the traditional reform approach, but in fact the actions of the government substantially weakened the way by which regulation was applied.

4 Conclusion

The problems of the Pakistan power sector—inadequate supply and a very large cost to the budget—have been widely acknowledged, and from the beginning of the 1990s a reform strategy was adopted and slowly implemented. The national power company was unbundled and prepared for privatization, IPPs were attracted into the system, a quasi-independent regulator was established, and two companies (the vertically integrated KE and Kot Addu generation) were privatized. Recently the purchasing authority (CPPA-G) was fully separated from transmission and dispatch (NTDC).

Despite these proactive reform measures the country has continuously suffered from inadequate capacity and other constraints, leading to large and frequent blackouts. Some of the government-owned DISCOs have struggled with bill collection, often falling far short of the 100 percent target set by the government. T&D losses have continued at high levels with little improvement and have generally exceeded the “target” rate used in determining the subsidy that is paid to DISCOs. This has led to continuing losses and the creation of circular debt (where companies fail to pay their suppliers because they have no cash or prefer to retain cash to cover their own losses). The government has paid off some or all the cumulated circular debt on a few occasions, and this has created further problems. The utilities have seen that there is no long-term consequence to operating in an inefficient fashion; potential new entrants for urgently needed capacity may have been discouraged by the history of late payment to suppliers by the DISCOs; and the total cost to the government of subsidizing consumers has been larger than planned. A recent development in the sector has been the agreement of a multi-billion dollar investment package financed in part by the Government of China, that is expected to support a large and rapid expansion in generation capacity and shortly lead to a surplus of capacity.

International financial institutions have played an important role in supporting the power sector, particularly at times of crisis linked to the use of subsidies and the weak financial performance of the state power sector. Large credits from the World Bank supported an IMF package designed to improve the financial performance of the sector, and to move the sector towards the introduction of more privatization and competition. Although the government was slow to reform the sector, changes have been made, such as the separation of CPPA and NTDC.

A summary of performance and institutions for the main aspects of reform agenda (security of supply, access and affordability, efficiency and financial viability, tariffs and cost recovery, and regulation) is presented below and in table 19 .

Pakistan had made little progress until recently on **security of supply** due to an absolute shortage of generation capacity, made worse by the failure to maintain and operate the nationally-owned generation, transmission and distribution capacity in the optimal fashion. Although IPPs have played an important role in adding new generation plant, their efforts have fallen short, since the government has not yet been able to make the sector sufficiently attractive to investors. Further, the government has no integrated energy plan that would identify the best energy mix. Renewables, although apparently encouraged by the regulatory system, have in practice found it difficult to enter the sector because of planning delays, and the recent unexpected fall in renewable energy prices has acted as a further brake on entry.

On **access**, the picture is clouded by uncertainty arising from contradictions between alternative data sources. There has been no obvious electrification plan designed to increase access during this period, nor were the distribution utilities in a strong enough position to undertake this on a large scale without government support. The evidence appears to support the view that little was done to improve access, and a current value of 70 percent grid access based on company connections data and a recent census is more plausible than the 98 percent rate based on household surveys. Accepting this view leads to the conclusion that there is a large amount still to do in connecting remote or poorly located households.

Affordability is strongly influenced by the subsidies provided to the distribution utilities to bridge the gap in revenue they incur by charging subsidized tariffs. There has been a clear trend of setting the rate of increase of tariffs for the lowest consumption bands well below that on the higher use bands, thus providing a relatively larger support to the poorest users. Calculations for the 2008 and 2011 tariffs indicated that the tariff structure was becoming more progressive. At the earlier date all households were receiving some subsidy on all the units they consumed, while by 2011 households consuming more than 300 kWh/month paid more than the cost of supply for some units, thus creating an element of cross subsidy. In 2008, the richest 20 percent of households received 38 percent of total subsidies and the poorest 20 percent received 9 percent, while by 2011 the share of the richest had fallen to 30 percent. By 2016 the poorest 40 percent of households would have had to spend 4.2 percent of their income to purchase the average quantity consumed in the country.

On **efficiency and financial viability**, the performance of many of the distribution utilities with high T&D losses and low collection rates has been weak and shows no signs of improvement, despite the use of efficiency targets set by the regulator. Notably, the one private sector company (Karachi Electric) was able to improve on its extremely poor performance pre-privatization, but at present performs no better than the average of the publicly owned utilities. The financial

viability of these companies has been supported by the government policy of eventually paying off debts created by operating at such low levels of efficiency.

Tariffs and cost recovery have been impacted by the operation of the semi-independent regulator in a roundabout fashion. The revenue requirement determined by the regulator includes efficiency targets specific to each distribution utility that can be altered over time. The difference between the “nominated” tariff determined by the Ministry and the revenue requirement is the Tariff Differential Subsidy for that utility.⁵² The regulator has also determined the tariffs for generation and transmission. However, the regulator does not determine the “nominated” tariffs and these are what consumers are charged and carry fiscal implications as well as welfare impacts on households. While Pakistan’s regulatory framework embodies many good practice elements on paper, a significant number of these fail to be fully applied in practice. In particular, enforcement of service quality is weak and unnecessary delays in market entry regulation have been discouraging entry for renewable projects.

Table 19: Summary evaluation of Pakistan’s power sector reform efforts

	Performance	Institutions
Security of supply	Chronic power shortages due to severe shortage of supply, caused by a lack of generation capacity, as well as poor maintenance of existing infrastructure. Situation is changing as new Chinese-funded investment is coming on stream.	Circular debt crisis has discouraged generators from building new capacity due to high risks of non-payment. Moreover, there is no institutional structure to drive the implementation of power system planning and associated procurement.
Access & affordability	Data on access levels is hard to interpret but it appears that progress on improving access was slow, and that much remains to be done. Affordability improved for the poorest households as real tariffs fell for low consumption levels. Real tariffs generally rose slowly over the last decade, but much of the benefits from these subsidized tariffs went to higher income households.	There is no high-profile policy targeting increased access: no obligations for connections and no penalties for slower connection rates than mandated. Off-grid renewables (including solar home systems and mini-grids) have no supportive regulation.
Efficiency and financial viability	T&D losses were very high for some utilities, and bill collection was also	Regulatory targets to improve efficiency have been ineffective due to a lack of

⁵² *Reforming Electricity Subsidies in Pakistan: Measures to Protect the Poor*. T. Walkers, S. Sahin, M. Saqib, and K. Mayer. The World Bank: Policy Paper Series on Pakistan PK 24/12, 2014.

	problematic. State-owned generation suffered from low availability rates partly due to lack of maintenance. The sole privatized utility did reduce losses, but only to a standard met by the average state-owned utilities.	managerial incentives, and the soft budget constraint created by periodic government bailouts of the sector. Utilities have not widely adopted good practices for governance and management.
Tariffs and cost recovery	Tariff setting is largely determined by the government to continue a policy of subsidization of consumers. Real tariffs have risen only slowly and become slightly more progressive.	The role of the regulator in tariff setting is limited to determining required revenues, with tariff decisions remaining with the government. While the regulatory framework is relatively good on paper, it is not fully implemented in practice.

The experience of Pakistan points to some important lessons for the adoption of a reform program to improve the delivery of energy services in other countries.

First, implementing a full power sector reform can take much longer than anticipated. The speed of power sector reform varies substantially across countries, with some adopting a ‘big bang’ approach that sees all the major reforms enacted in the space of a few years. In Pakistan, however, the reform journey proved to be a lot longer. The case for restructuring of WAPDA, with a view to private sector participation, was first identified in the early 1970s and reiterated in various policy statements subsequently. However, unbundling did not actually take place until some 20 years later in 1998, and the first distribution privatization of Karachi Electric did not materialize for a further decade until 2005. Despite aspirations to proceed with further distribution privatizations, no further transactions have taken place, and the transition toward the intended competitive power market remains at the single buyer stage. The long drawn out nature of the reform process in Pakistan is understandable in view of the frequent changes of government and a general lack of political consensus around the reform agenda and illustrates the difficulties of reforming in such a challenging context.

Second, structural reforms may be of no avail if they are not accompanied by a commitment to make progress towards cost recovery. Pakistan took major steps towards the unbundling, privatization and regulation of the power sector, as well as allowing entry into the generation sector. However, these reforms are premised on the principle of cost recovery that allows the different actors in the sector to establish a reliable payment process that supports trade along the power supply chain. However, in Pakistan, this political commitment to cost recovery was not present and successive governments maintained and even increased consumer subsidies to the

sector. This prevented the payment of generators and was responsible for the ensuing chronic power supply crisis.

Third, the creation of a competent regulatory body will have limited impact if government is not willing to cede it some authority on key decisions or to dispense with large consumer subsidies to the sector. In Pakistan, the regulator, NEPRA, only has tariff-setting authority over generation and transmission tariffs, and even this is in the process of being removed. Distribution tariffs are set by the ministry, albeit with some reference to revenue requirements determined by the regulator, but without any strong commitment to the notion of reducing consumer subsidies. Neither does NEPRA have any authority over the process by which utilities procure power from IPPs. Thus, while the regulatory framework is well conceived on paper, and the regulator has built up significant technical capability, it fundamentally lacks the authority to perform the main function for which it was established.

Fourth, incentive-based regulation is of limited effectiveness when regulating public utilities and an overall sector that is not run on commercial principles. A central issue in Pakistan has been the weak operational efficiency of the distribution utilities. The regulator sought (reasonably enough) to address this by setting tariffs based on benchmark efficiency levels. However, since utility managers do not face performance-based remuneration, this approach was not able to alter their behavior. Even more so, given that utilities could simply make up any revenue shortfall resulting from efficiency targets, by defaulting on generators, in the knowledge that these would eventually be bailed out by government.

Fifth, privatization of distribution utilities does not always deliver the anticipated benefits. The privatization of Karachi Electric proved to be highly controversial and is still being contested in the courts more than a decade later. The fact that the transaction was conducted under emergency procedures contributed to public discontent and illustrates the importance of due process in transactions of this kind. Moreover, the persistence of power shortages after over a decade of private ownership continues to affect public sentiment and leads to a culture of non-cooperation with the company that makes it harder to improve operational performance. Even though efficiency indicators started to improve after a change of ownership in 2009, they remain below those of many of the public utilities in the country, with revenue collection stuck at 88 percent and transmission and distribution losses at 22 percent.

Sixth, to achieve the full benefits from a reform program it is necessary that there is strong and consistent political support. Without this, the process becomes attenuated and the goals of reform are lost, while various groups seek to benefit from steering policies in a direction beneficial to themselves.

To conclude, Pakistan's experience illustrates how, even when a substantial package of structural reform measures is implemented, they may not be enough to positively impact sector performance, if they are not accompanied by a commitment to the principle of cost recovery and an associated hardening of the budget constraint faced by actors in the sector. This lack of financial discipline not only harms the public finances, but also damages the real economy by allowing serious power shortages to persist due to lack of investment incentives.

5 Annex: Formula for calculation of revenue requirement tariff for DISCOs.

According to the Guidelines for Determination of Consumer-end-Tariff (Methodology and Process), issued by NEPRA in January 2015, the formula for the determination of the revenue requirement for the distribution company is as follows:

$$RR_D = PPP_D + DM_D \pm PYA_D$$

Where

RR_D is the eligible distribution company's revenue requirement

PPP_D is the power purchase cost for an eligible distribution company

DM_D is the distribution margin for an eligible distribution company

PYA_D is the prior year adjustment for an eligible distribution company:

The formula for the determination of the power purchase cost shall be:

$$PPP = PP_{(Ec)} * Q_{(p)} + PP_{(cc)} + TC$$

Where

PPP is the power purchase price

$PP_{(Ec)}$ is the energy charge part of PPP

$Q_{(p)}$ is quantity purchased by the company

$PP_{(cc)}$ is the capacity charge part of PPP

TC is the transmission cost

The formula for the determination of the distribution margin for the distribution company shall be:

$$DM_D = RB_D * RORB_D + D_D + E_D + t_D + ORC_D$$

Where

DM_D is the eligible distribution company's Distribution Margin

RB_D is the eligible distribution company's rate base

$RORB_D$ is the eligible distribution company's cost of capital

D_D is the eligible distribution company's depreciation expense

E_D is the eligible distribution company's expenses including but not limited to operation, maintenance and human resources

t_D is the eligible distribution company's federal and provincial taxes (allowed as pass through)

ORC_D is the eligible distribution company's other regulatory costs including other income.

Forecasted and /or projected Generation Capacity Charge Component of the power purchase price shall be the NEPRA approved rates and the contracts between CPPA or its successor and the IPP and shall be allocated to the DISCO according to the following Authority's approved Transfer Price Mechanism.

The generation cost will be transferred to the DISCOS according to the Transfer Price Mechanism (TPM) as prescribed by the Authority in its determination with respect to NTDC.

$$XTC = XCTC + XETC$$

Where:

XTC = Transfer charge to XWDISCOs & KE

XCTC = Capacity Transfer Charge to XWDISCOs & KE

XETC = Energy Transfer Charge to XWDISCOs & KE

$$XCTC = (CpGenCap + USCF) / XWD$$

Where:

CPGenCap = the summation of the capacity cost in respect of all CPGenCos in Rs for a billing period minus the amount of liquidated damages received during the month.

USCF = the fixed charge part of the use of system charges in Rs per kW per month.

XWD = the sum of the maximum demand of the XWDISCOs & KE in kW recorded during a billing period at all the delivery metering points at which power is received by the XWDISCOs & KE.

$$XETC = [CpGenE (Rs)] / XWUs (kWh)$$

Where:

CPGenE = the summation of the variable charge rate (Rs per kWh) approved for each of the CPGenCOs times the energy in kWh procured from the respective CPGENCO during the billing period.

XWUs = the summation of the energy units (kWh) recorded at the delivery metering point of all the XWDISCOs & KE during a billing period.

Energy transfer charge shall be calculated on the basis of units delivered after adjusting target transmission losses up to a maximum of 3 percent.

Finally, in accordance with the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, the mechanism for monthly fuel charges adjustment will be:

$$\text{Fuel Price variation} = \text{Actual Fuel Cost Component} - \text{Reference Fuel Cost Component}$$

Where:

Fuel Price variation is the difference between actual and reference fuel cost component.

Actual fuel cost component is the fuel cost component in the pool price on which the DISCOs are being charged by CPPA in a particular month; and

Reference fuel cost component is the fuel cost component for the corresponding month projected for the purpose of tariff determination.

Multi-Year Tariff adjustments

As stated in the Guidelines for Determination of Consumer-end-Tariff (Methodology and Process) issued by NEPRA in January 2015, under a Multi-Year Tariff, the following adjustment mechanisms would be relevant:

O&M Expense Adjustment

The O&M part of Distribution Margin shall be indexed with CPI subject to adjustment for efficiency gains (X factor). Accordingly, the O&M will be indexed every year according to the following formula:

$$O\&M_{(Rev)} = O\&M_{(Ref)}x[1 + (\Delta CPI - X)]$$

Where:

O&M(Rev) = Revised O&M Expense for the Current Year.

O&M(Ref) = Reference O&M Expense for the Reference Year.

Δ CPI = Change in Consumer Price Index published by Pakistan Bureau of Statistics latest available on 1st July against the CPI as on 1st July of the Reference Year in terms of percentage.

X = Efficiency factor

RORB Adjustment

RORB adjustment will be made in accordance with the following formula/mechanism:

$$RORB_{(Rev)} = RORB_{(Ref)}x \frac{RAB_{(Rev)}}{RAB_{(Ref)}}$$

Where:

RORB(Rev): Revised Return on Rate Base for the Current Year.

RORB (Ref): Reference Return on Rate Base for the Reference Year.

RAB(Rev): Revised Rate Base for the Current Year.

RAB(Ref): Reference Rate Base for the Reference Year.

Depreciation Expense

Depreciation expense for the current year will be assessed in accordance with the following formula/mechanism:

$$DEP_{(Rev)} = DEP_{(Ref)} \times \frac{GFAIO_{(Rev)}}{GFAIO_{(Ref)}}$$

Where:

DEP(Rev) = Revised Depreciation Expense for the Current Year.

DEP(Ref) = Reference Depreciation Expense for die Reference Year.

GFAIO(Rev) = Revised Gross Fixed Assets in Operation for the Current Year.

GFAIO (Ref) = Reference Gross Fixed Assets in Operation for the Reference Year.

Other Income

Other income for the current year will be assessed in accordance with the following formula/mechanism:

$$OI_{(Rev)} = OI_{(1)} + (OI_{(1)} - OI_{(0)})$$

Where:

OI(Rev)= Revised Other Income for the Current Year.

OI(1)= Actual Other Income as per latest Financial Statements .

OI(0)= Actual/Assessed Other Income used in the previous year.

6 Annex: Detailed RPSR Indices

A. Global reform index

The standard package of reforms prescribed by international donors in the 1990s included four principal components: restructuring (vertical and horizontal unbundling of power utilities); private sector participation; creation of an independent regulator; and competition in power generation.

In order to aggregate across the four dimensions of power sector reform considered in this study, a simple Power Sector Reform Index is constructed. The index gives each country a score on an interval of 0 to 100 on each dimension of power sector reform. The scores are based on giving equal weight to each step on each dimension of the reform continuum (see tabulation below). The average of the four 0-100 scores is used to provide an overall summary of the extent of reform.

Regulation	No regulator = 0		Regulator = 100		
Restructuring	Vertically integrated = 0	Partial vertical unbundling = 33	Full vertical unbundling = 67	Vertical & horizontal unbundling = 100	
Competition	Monopoly = 0	IPPs = 25	Single Buyer Model = 50	Bilateral Contracts = 75	Competitive market = 100
Private Sector Participation	0.5*(Percentage of generation capacity with private sector participation) + 0.5*(Percentage of distribution utilities with private sector participation)				

B. Generation and transmission planning index for Pakistan and comparators, 2015

	India	Pakistan	International benchmark
Generation Planning	57%	29%	56%
Country has a generation master plan	○	○	94%
Country has an overall energy plan	●	●	65%
Competent entity is responsible for producing the plan	○	○	88%
Inter-governmental committee oversees the planning unit	●	●	29%
Power generation system plan is mandatory	●	●	19%
Plan leads to timely initiation of procurement	○	●	38%
Planning process is transparent and participatory	○	●	59%
Transmission Planning	75%	25%	72%
Competent entity is responsible for producing the plan	○	○	100%
Explicitly linked to power generation plans	○	●	88%
Plan is mandatory	●	●	29%
Planning process is transparent and participatory	○	●	71%

C. Generation and transmission procurement index for Pakistan and comparators, 2015

	India	Pakistan	International benchmark
Procurement of Generation	95%	100%	85%
There is a framework for procurement	○	○	82%
Country allows International competitive bidding or public auctions for procurement	○	○	94%
Types of procurement methods allowed			
<i>Unsolicited bids</i>	●	●	29%
<i>Direct negotiation</i>	●	○	47%
<i>International competitive tendering</i>	○	○	88%
<i>Public auctions</i>	○	●	41%
<i>Stand-alone capacity market</i>	●	●	0%
Auction design score	0.86	NAP	80%
Country uses public auctions for procurement	○	●	41%
Clear and comprehensive established rules	○	NAP	100%
Credible penalties for violating the rules	○	NAP	86%
Guarantees and penalties to ensure timely completion	○	NAP	86%
Standard, non-negotiable contracts	○	NAP	86%
Stapled financing terms or risk mitigation instruments	○	NAP	86%
No concerns regarding the transparency and fairness of the auction	●	NAP	14%
Efforts to inform and attract bidders to the auction	○	NAP	100%
Transmission Procurement	83%	100%	64%
There is a framework for procurement of new transmission lines	○	○	59%
Methods used to procure new transmission-	●	○	69%
<i>Competitive tender</i>	○	○	65%
<i>Direct negotiation</i>	●	●	24%
All projects are awarded to the incumbent transmission company	○	●	47%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

D. Access policy framework index for Pakistan and comparators, 2015

	India, AP	India, Odisha	India, Raj	Pakistan	International benchmark
Regulation of New Connections	75%	66%	77%	48%	65%
Roles of regulator, utility, rural electrification agency clearly defined	1.00	1.00	1.00	0.00	93%
Utilities have regulatory obligation to connect new customers	1.00	1.00	1.00	0.00	94%
Regulatory entity has authority to approve connection charges for new customers	1.00	1.00	1.00	0.00	71%
Connection charges are set using shallow entry	0.00	0.00	0.00	NAP	58%
Government provides subsidy for new connections	1.00	1.00	1.00	1.00	53%
Connection has to be provided in a specified time	1.00	1.00	1.00	1.00	94%
Regulatory entity monitors time taken to provide new connections	NAV	0.00	1.00	1.00	44%
Regulator has authority to levy penalties for not connecting customers on time	NAP	NAP	1.00	0.00	71%
Time taken to provide connections publicly available	0.00	0.00	0.00	0.00	24%
There are connection charges	1.00	1.00	1.00	1.00	94%
Customer pays limited connection charges	0.50	0.25	0.25	0.25	43%
Connection charge is publicly available	1.00	1.00	1.00	1.00	71%
Regulation of solar home systems	100%	100%	100%	0%	66%
Minimum technical standards and post-installation warranty requirements for solar home systems	1.00	1.00	1.00	0.00	71%
Regulator reviews and approves prices of surplus SHS sales of electricity to the grid operator	1.00	1.00	1.00	0.00	62%
Regulation of mini-grids	67%	67%	67%	0%	44%
Privately owned mini-grids legally allowed to operate	1.00	1.00	1.00	0.00	81%
Clear options for mini-grid operator when the interconnected grid reaches the area, including compensation	0.00	0.00	0.00	0.00	7%
Subsidy or other mechanism to help mini-grid operators recover their costs	1.00	1.00	1.00	0.00	47%

E. Corporate governance- accountability index for Pakistan and comparators, 2015

Corporate governance	Orissa, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Accountability	83%	25%	50%	50%	67%	67%	67%	100%	60%
Private or public shareholders appoint board	○	●	●	●	●	●	●	○	36%
Transparent process exists for Board selection	●	●	○	○	○	○	●	○	36%
Board members cannot be removed at will	●	●	●	●	●	●	●	○	29%
Chairperson & CEO are separate positions	○	○	●	●	○	○	○	○	75%
Function of Company Secretary exists	○	○	○	○	○	○	○	○	82%
Board Sub-Committees for different issues	○	●	○	○	○	○	○	○	68%
Audit committee of the Board	○	●	○	○	○	○	○	○	71%
Board Code of Conduct exists	○	●	○	○	○	○	●	○	64%
Requirement to declare conflicts of interest	○	●	●	●	○	○	○	○	75%
Utility has carried out any third party transactions in last five yrs	○	●	●	●	●	●	○	○	46%
Minority shareholders' rights are protected	○	●	●	●	●	●	○	○	39%
Utility publishes an Annual Report	○	○	○	○	○	○	○	○	93%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

F. Corporate governance- autonomy index for Pakistan and comparators, 2015

Corporate governance	Orissa, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Autonomy (SOEs)	89%	0%	44%	44%	67%	67%	44%	89%	63%
Board is the final body to take decision on-									
Defining corporate strategy	○	NAP	○	○	○	○	○	○	96%
Approving business plans	○	NAP	○	○	○	○	○	○	96%
Setting and monitoring performance objectives	○	NAP	○	○	○	○	●	○	92%
Selecting, appointing and overseeing the CEO	○	NAP	●	●	●	●	○	○	56%
Raising capital from debt	○	NAP	●	●	○	○	●	○	68%
Raising capital from equity	○	NAP	●	●	●	●	●	○	48%
Major capital expenditures	○	NAP	○	○	○	○	●	○	88%
Deciding and implementing tariff adjustments	●	NAP	●	●	●	●	●	●	24%
Human resource hiring and firing decisions	○	NAP	●	●	○	○	○	○	72%

G. Utility management- financial discipline index for Pakistan and comparators, 2015

Utility management	Orissa, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Financial Discipline	43%	36%	53%	53%	64%	64%	50%	79%	59%
Utility has a credit rating	●	●	○	○	○	○	●	○	36%
Utility can issue new bonds	●	●	●	●	○	○	●	○	36%
Utility can issue new equity	●	●	●	●	●	●	●	○	26%
Utility pays dividends to shareholders	●	●	●	●	●	●	●	●	29%
Public service obligations are explicitly defined	●	●	○	○	●	●	●	●	46%
PSO is publicly disclosed	NAP	NAP	●	●	NAP	NAP	NAP	NAP	38%
PSOs are costed	NAP	NAP	●	●	NAP	NAP	NAP	NAP	0%
PSOs are compensated by government	NAP	NAP	●	●	NAP	NAP	NAP	NAP	0%
Utility required to meet financial performance targets	●	●	●	●	○	○	●	○	52%
System of internal financial controls exists	○	○	○	○	○	○	○	○	96%
Internal audit function exists	○	○	○	○	○	○	○	○	93%
Utility is subject to state auditing procedures	○	●	○	○	●	●	○	●	71%
Financial accounts are produced	○	○	○	○	○	○	○	○	96%
Financial accounts are audited by external auditor	○	○	○	○	○	○	○	○	93%
Financial accounts are publicly disclosed	●	●	○	○	○	○	○	○	79%
Financial accounts meet national standards	○	○	○	○	○	○	●	○	82%
Financial accounts meet international standards	●	●	●	●	●	●	○	○	57%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

H. Utility management- human resources index for Pakistan and comparators, 2015

Utility management	Orissa, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Human Resource	70%	40%	43%	43%	36%	36%	43%	86%	62%
Annual staff performance reviews exist	○	○	○	○	○	○	○	○	93%
Employees receive performance related bonuses	○	●	●	●	●	●	●	○	70%
Employees can be fired for poor performance	●	●	○	○	●	●	○	○	79%
Government employment regulation don't apply	●	●	●	●	●	●	●	○	26%
Wages not based on government pay scales	●	●	●	●	●	●	●	○	48%
Staff training policy exists	○	○	○	○	●	●	●	○	86%
Managers are free to hire employees	NAV	NAV	●	●	●	●	●	●	12%
Managers are free to fire employees	NAV	NAV	●	●	●	●	●	●	24%
Managers can execute budget	NAV	NAV	●	●	●	●	○	○	60%
Managers can implement investment projects	NAV	NAV	●	●	○	○	●	○	44%
Recruitment involves advertisement of positions	○	○	○	○	○	○	○	○	71%
Recruitment involves short-listing candidates	○	○	○	○	○	○	○	○	89%
Recruitment involves interviewing candidates	○	●	○	○	●	●	○	○	82%
Recruitment involves reference checks	○	●	●	●	○	○	●	○	75%

I. Utility management- information & technology index for Pakistan and comparator, 2015

Utility management	Orissa, India		AP, India		Raj, India		Pakistan		International benchmark
	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	
Information and Technology	36%	43%	73%	73%	80%	79%	50%	93%	71%
SCADA system	●	○	○	○	○	○	●	○	93%
IT system to support incidence resolution	●	●	○	○	○	○	●	○	75%
IT system to support distribution management	●	●	○	○	○	○	○	○	79%
IT system to support energy management	●	●	○	○	○	○	○	○	64%
Geographic Information System (GIS)	●	●	○	○	○	○	○	○	78%
KPIs are used to monitor quality of supply	○	○	○	○	○	○	○	○	100%
Advanced Metering Infrastructure (AMI)	●	●	○	○	●	●	●	○	52%
Accurate customer database	○	○	○	○	○	○	○	○	96%
Call center for dealing with customer complaints	○	○	○	○	○	NAV	●	○	96%
Website for submission of customer complaints	○	○	○	○	○	○	○	○	85%
Customer satisfaction regularly monitored	●	●	●	●	○	○	●	○	59%
Commercial management system (CMS)	●	●	●	●	●	●	●	○	41%
Resource Management System (RMS)	●	●	●	●	●	●	●	●	35%
KPIs are used to monitor commercial cycle	○	○	○	○	○	○	○	○	86%
KPIs are used to monitor corporate resource management	NAP	NAP	●	●	○	○	NAP	NAP	54%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

J. Regulatory governance- accountability index for Pakistan and comparators, 2015⁵³

		India	Pakistan	International benchmark
Accountability		91%	79%	83%
Regulatory Oversight		100%	67%	81%
Regulator's objectives formally stated in law		○	○	100%
Regulator required to report on its activities		○	○	88%
Independent third party evaluations of regulator have taken place		○	●	56%
Legal Appeals		100%	100%	100%
Legally established process to challenge/appeal regulatory decisions		○	○	100%
Transparency		73%	70%	67%
Publicly available annual reports		○	○	94%
Recommendations are required to be made public		NAP	○	33%
Government body receiving recommendations required to respond publicly		NAP	○	33%
Regulator is required to publish its decisions on-	End-user tariffs	○	○	100%
	Licensing generation or supply	○	○	100%
	Wholesale or PPA prices and contract terms	○	○	100%
	Market design	○	NAP	100%
	Oversight of regulated utilities	○	○	85%
Regulatory decision-making process legally requires the participation of non-government stakeholders in case of-	End-user tariffs	○	●	69%
	Licensing generation or supply	○	●	69%
	Wholesale or PPA prices and contract terms	●	●	38%
	Market design	●	NAP	30%
	Oversight of regulated utilities	●	NAV	38%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

⁵³ The three Indian states follow similar regulatory structures and thus have similar scores. They are presented here as a single entity.

K. Regulatory governance- autonomy index for Pakistan and comparators, 2015

		India	Pakistan	International benchmark
Autonomy		75%	92%	71%
Decision-Making Autonomy		100%	92%	79%
Areas where entity has a mandate to regulate-	End-user tariffs	○	○	100%
	Quality of supply and service	○	○	100%
	Electrification or increased access to energy	○	●	53%
Decision of the regulatory entity are legally binding in the area of-	End-user tariffs	○	○	88%
	Grid access charges	○	○	87%
	PPA/wholesale prices	○	○	92%
	Quality of supply/service	○	○	87%
	Market design	○	NAP	50%
	Licensing	○	○	85%
	Utility oversight	○	○	71%
Government body rejecting or modifying regulatory decisions needs to make its reasons public		NAP	○	17%
Law precribes decision making process for-	End-user tariffs	○	○	94%
	Grid access charges	○	○	81%
	Quality of supply/service	○	○	87%
Budgetary Autonomy		50%	100%	80%
Funding for regulator established by law		○	○	100%
Percentage of regulator's budget that comes from levies or taxes		0	1	59%
Leadership Autonomy		50%	75%	66%
Legal basis for existence is primary legislation		○	○	100%
Power to determine own organizational structure and rules		●	○	50%
Power to determine the allocation and use of budget		●	○	44%
Legal requirements or restrictions regarding professional profile of leadership		○	○	94%
There is a fixed term for the leadership of the regulatory entity		○	○	88%
Legal provisions under which leadership an be removed from		○	○	75%
Current leadership of entity connected to government or utilities		●	●	25%
Over 60% of employees are in technical positions		●	●	57%
Managerial Autonomy		100%	100%	59%
Pay scale not linked to govt pay scale or is 90% of utility pay scale		○	○	53%
Not required to follow govt employment regulations		○	○	63%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

L. Regulatory substance- tariff regulation index for Pakistan and comparators, 2015

	India	Pakistan	International benchmark
Tariff Regulation	75%	83%	77%
Regulatory Framework for Tariffs	100%	100%	90%
Objectives in determining tariffs mentioned explicitly in policy or legal mandate	○	○	100%
Principles of tariff-setting clearly articulated	○	○	88%
Authority over the tariff level	○	○	94%
Clear definition of “cost recovery”	○	○	88%
Legitimacy of costs is used as a basis for tariff calculations	○	○	88%
Tariff-setting based on a clearly specified regulatory framework	○	○	88%
Frequency and schedule of revisions determined by law or regulation	NAP	NAP	75%
Determination of Tariffs	50%	67%	64%
Publicly available written formula is to be used for tariff setting and utilities are legally required to adhere to it	○	○	88%
Avoid passing-through inefficient costs to customers	○	○	76%
Requirement to submit financial information according to set standards	●	○	53%
Users bear the costs of incentive mechanisms for renewable energy generation	○	○	75%
Regulatory mechanisms to compensate generators for the provision of firm capacity or ancillary services	●	●	58%
Utilities are compensated for the costs of stranded assets	●	●	25%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

M. Regulatory substance- quality of supply index for Pakistan and comparators, 2015

	India	Pakistan	International benchmark
Quality Regulation	83%	100%	75%
Quality of Service Standards	100%	100%	82%
Requirement to meet quality of service standards	○	○	100%
Specific quality of service standards are formally written and publicly available for- quality of the product, quality of the service and customer service	○	○	97%
Performance on quality of service standards is public	○	○	71%
Fines for failing to meet quality of service standards	○	○	59%
Quality of Service Enforcement	67%	100%	68%
Requirement to report technical data on a periodic basis	○	○	100%
Regulator specifies how to collect technical performance data	●	○	71%
Regulator reviews or validates technical performance data	●	○	47%
Automated information management systems are required to measure the quality or reliability of the power supply	○	○	71%
Measurements of the quality or reliability of power supply are made public	○	○	65%
Financial incentives to meet customer service standards or increase customer satisfaction	○	○	53%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

N. Regulatory substance- market entry index for Pakistan and comparators, 2015

	India	Pakistan	International benchmark
Market Entry Regulation	71%	67%	77%
Permitting New Entrants	75%	100%	90%
Responsible for monitoring compliance with the terms of the license or permit	<input type="radio"/>	<input type="radio"/>	88%
Authority to impose penalties for violating license or permit terms	<input type="radio"/>	<input type="radio"/>	100%
Penalties are formally written and publicly available	<input checked="" type="radio"/>	<input type="radio"/>	80%
Provisions to force companies to relinquish licenses or permits for violation	<input type="radio"/>	<input type="radio"/>	100%
PPA Approvals	67%	33%	57%
Legally required to approve all power sales contracts either directly or indirectly	<input type="radio"/>	<input type="radio"/>	59%
Approve or refuse a proposed PPA in a legally specified period of time	<input type="radio"/>	<input checked="" type="radio"/>	60%
Authority over the process by which utilities can select or procure power from IPPs	<input checked="" type="radio"/>	<input checked="" type="radio"/>	50%

<input type="radio"/>	Satisfactory result
<input checked="" type="radio"/>	Unsatisfactory result
NAP	Not applicable
NAV	Not available