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Managing Non-Technical Losses and Theft in Utility Contracts

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Perhaps one of the greatest challenges in successfully operating a PPP related to utility services is to effectively deal with “non-technical losses” – a euphemism for theft – of utility services. These are due primarily to illegal connections to existing networks, tampering or bypassing with metering equipment or refusal to pay for service. Depending on the sector and the country, the rate of non technical losses can be over 50% of output, which causes a significant challenge to the viability of a PPP project and hinders development of infrastructure to extend services to under-served areas and improve services to existing customers.

Ultimately, the burden of these losses is carried by paying customers with higher tariffs, the tax payer through subsidies and/ or the poor with deficient, if at all existent, service.

Below are some examples, by no means exhaustive, of innovative initiatives to address non-technical losses by sector:

In response, various countries have taken a combination of legal and practical measures to address the problem. Given the essential nature of some utility services and the rampant extent of the problem, traditional courts may be reluctant to enforce the theft of utility services as a common theft offense. Some have enacted legislation specifically recognizing the theft of utility services as a separate criminal offense and in some cases establishing special administrative courts and judicial measures to enforce these new laws. Others have worked actively with consumers and community leaders through town halls and public relations campaigns to address concerns of inadequate service, employ local laborers for improvement projects and improve metering equipment.

Electricity

India and Andrah Pradesh Province

- Reforming the Power Sector - This note gives a general background of the main initiatives for controlling electricity theft and improving revenue in the Andrah Pradesh region launched in January 2000. These included primarily: the enactment of legislation making electricity theft a separate offence, creating separate enforcement mechanisms, streamlining anticorruption efforts of utilities and reengineering business processes to improve service. Published by Bhavna Bhatia and Mohinder Gulati on September 2004.
- The Electricity Act of 2003 (Federal), as amended in 2007 – Indian federal law which codifies electricity theft as a separate offence. Sections 135 through 139 illustrate the various electricity theft offenses and Sections 153 to 157 deal with the establishment, by state governments, of "Special Courts" for the administration of prosecutions for these specific offenses. This Act enables officers of the utility company to search for illegal connections, gather evidence and seize instruments and devices used for the illegal connections, so long as it is done in compliance with protections under the criminal code, and prepare a complaint to be given to a magistrate for prosecution. It also makes theft of electricity a cognizable offense punishable by up to three years in prison, which enables the police to make an arrest without a warrant.
- Andhra Pradesh Electricity Regulatory Commission (Electricity Supply Code) Regulation No.5 of 2004 - specify conditions for disconnection of service due to non-payment in Section 4.8. and procedures and consequences for tampering, distress or damage to electrical plant, lines or meter under Section 7.
- General Terms and Conditions of Supply of the Distribution and Retail Supply Licensees within the State of Andhra Pradesh – guidelines proposed by the electricity distribution companies and approved by the regulatory body that specify the procedures to monitor and enforce electricity theft, as described in Clause 10.

South Africa

- South African Revenue Protection Association (SARPA) - In South Africa, utilities involved in the supply of electricity, water, communication and related services as well as contractors, manufacturers, and consultants involved in the field of revenue protection have formed a not-for-profit association dedicated to promoting "the exchange of information and finding of solutions in the field of protecting the income and assets of utilities against pilfering, misallocation and misappropriation". Related papers and presentations on this topic are posted.

Turkey

- Turkey – Criminal Code (unofficial English translation) – Turkey has focused on industrial and large scale consumers. In its Section 184, it provides for a period of imprisonment, from 1 to 5 years, for anyone who illegally constructs or continues to operate a building with an illegal electrical connection

France

- France French had originally sought to rely on the general provisions of the Constitution regarding protection of property but, as the jurisprudence was not clear on the issue, a specific offence was created under the Code Penale – Article 311-2

Algeria

- Code Penal Art. 350 - A new article 350 was introduced into the Code Penale in 2006 (by loi no.06.23 du 20 decembre 2006) to include fraudulent extraction of water, electricity and gas as theft, punishable

from 1 to 5 years in prison and fines from 500 to 20.000 dinars.

Water

- While water is deemed an essential resource, there has been an increasing appreciation of properly treated water as a resource that has both value and cost. In order to ensure a safe water supply and to protect such supply, some countries have enacted provisions prohibiting the tapping of water works and diversion of treated water.

Cambodia

- Law on Water Resources Management of the Kingdom of Cambodia , enacted on 29 June 2007 – In its Articles 36 – 39, this law outlines penalties for tampering with water works and tapping water resources without a license.
- Phnom Penh Water Supply Authority: An Exemplary Water Utility in Asia. This article briefly describes some of the measures undertaken by the water supply authority of Phnom Pehn, Cambodia, to reduce non-technical losses from over 70% to less than 6%, August 2007.

Colombia

- Cartagena, Colombia Case Study – Through the creation of a Public-Private Partnership, AGUACAR, the water and sanitation utility in the city of Cartagena, Colombia, significantly reduced nontechnical losses. The initiatives of the company were geared towards engaging the local community. AGUACAR began immediate service to those not connected to the system by establishing a system of water truck deliveries to serve low-income communities and hired local laborers to work on improvement works. The financing for these came in part from a restructuring of the tariff system, to incorporate cross-subsidies, under which more affluent customers helped subsidize the water rates to lower income families.

Additional Laws and Regulation

Energy Laws and Regulations

General Materials

- World Bank Paper: Electrification and Regulation - Principles and a Model Law (pdf)
- World Bank/ PPIAF: Handbook For Evaluating Infrastructure Regulatory Systems (pdf)

Materials discussing Power Purchase Agreements ("PPA"s)

- An Analysis of Independent Power Projects in Africa: Understanding Development and Investment Outcomes
- SARI: Final Report on Wholesale Electricity Prices in South Asia 2003 (pdf)
- NERC: Notice of Proposed Rulemaking PPA for Captive Customers

Sample Laws and Regulations

I. Sample Laws

Australia

The Australian electricity market is governed by a relatively complex regime of regulatory instruments, and provides a good example of a more deregulated and market-oriented model of power sector regulation. The electricity networks on the Australia eastern seaboard are operated as a single market and principally regulated through:

- Uniform National Electricity Laws and Regulations passed by each of the participating states (see for example National Electricity (South Australia) Act 1996 and National Electricity (South Australia) Regulations).
- National Electricity Rules made by a market regulator, Australian Energy Market Commission ("AEMC").

Electricity is supplied and traded in a common, regulated market through a large number of private participants (e.g. generators and retailers) rather than through a centralized government monopoly. The national electricity regulatory regime addresses the following core subject matters: access to the electricity network, market operations, network security and planning, metering and dispute resolution. A separate regulator, Australian Energy Regulator ("AER"), is responsible for enforcement actions under the electricity laws, regulations and rules. While a third regulator, Australian Energy Market Operator ("AEMO") is responsible for operation of the electricity market.

Electricity networks along the western and northern seaboards of Australia are operated as separate markets with their separate regulatory regimes.

Brazil

Legislação Básica Do Setor Elétrico Brasileiro (pdf) (Basic Law of Brazilian Energy Sector) - This guide reviews relevant Energy Legislation in Brazil. It is a recent comprehensive document published by Brazil's National Energy Agency "Agência Nacional de Energia Elétrica – ANEEL" Published June 2010, in Portuguese.

China

In China, the legal environment for PPP energy projects has rapidly progressed. The legal framework is a sophisticated system with distinctive hierarchies.

There are national laws, ministerial regulations, guiding opinions, measures and procedures, local rules and regulations, self-regulation rules of the industry and internal governance rules for each of the state-owned power companies and grid companies. Interestingly, use is also made of the concept of 'trial' rules and procedures, whereby new concepts are introduced for stakeholder comment, before becoming fully effective.

Egypt

Electricity Laws (in Arabic)

The Egyptian Electric Utility and Consumer Protection Regulatory Agency (“EgyptERA”) is an independent government agency established by law, empowered to regulate, supervise and develop electricity generation, consumption, transmission and distribution. Its website has links to production licenses, distribution licenses, and licenses for both production and distribution (in Arabic).

Jordan

Electricity Law (in Arabic and English) - This legislation is designed to foster the development of independent power producer (“IPP”) projects in Jordan, with a view to the eventual establishment of a competitive power market, subject to regulation by an independent Electricity Sector Regulatory Commission. This legislation was issued by the government in 2002 as a "Temporary Law", pending

approval by the Jordanian Parliament. This approval has not yet been given, although the Parliament did debate the law in March 2008, before sending it to the Parliament's Energy Committee for further study. However, notwithstanding this “temporary” status, the law has been in full legal force since 2003, and it governs the operation of the power generation and distribution companies in Jordan, as well as the Jordanian Electricity Sector Regulatory Commission (“ERC”). The website of the Jordanian Ministry of Energy and Mineral Resources has links to other relevant laws and regulations.

Kenya

Kenya Energy Act 2019 - This Act provides for the establishment of energy sector entities and regulates the production, supply and use of energy. Additionally, it establishes the Energy and Petroleum Regulatory Authority ("EPRA") as the successor to the Energy Regulatory Commission (“ERC”). Like the ERC, the EPRA has explicit authority over imports and exports of electricity. It also has an expanded mandate that includes regulation of upstream petroleum and coal. Relevant regulations for petroleum, electricity and renewable energy can also be found on EPRA’s website.

Laos PDR

The Lao power sector regulatory framework is characterized by the highly integrated level of state involvement in the production and supply chain. The primary state-owned utility Eletricité du Laos (or EDL), acts as the monopoly offtaker for the domestic market, as well as the operator of the transmission and distribution infrastructure and owner of the majority of the country’s generation capacity (although EDL’s stake in the generation sector has been partially privatized). The Electricity Law 1997 (as amended) is the principal legislation regulating the energy sector in Laos. Among other things, the Electricity Law sets out:

- the requirement for an Electricity Development Plan (which sets out the long term strategy for developing the Laotian energy sector) to be prepared by Eletricité du Laos (the Laotian state owed electric power utility);
- the regulatory requirements for electricity generation, transmission and distribution; and
- the regulatory scheme for private investments into power projects (which requires a concession from the government).

The Electricity Law is supplemented by a number of policies promulgated by the regulator:

- Power Sector Policy, which sets out a number of long term strategic goals, including the promotion of PPPs in hydropower sector and increasing the electrification rate in Laos;
- National Socio-Economic Development Plan, which sets out medium term development goals relating to the energy sector;
- Renewable Energy Development Strategy; and
- Policy on Sustainable Hydropower.

The Asia Development Bank has also published a roadmap which provides an overview of the regulatory landscape in the Laos energy sector.

Mozambique

Law No. 12/2022 on Electricity. This Law applies to the production, storage, transport, distribution, marketing and consumption of electricity, including its import and export and repeals Law No. 21/97 concerning production, transport, supply and sale of electric power, and creating the National Council for Electricity (“the 1997 Electricity Law”) (in Portuguese) – this Law establishes the governmental framework for electricity in Mozambique.

Until May 2017, the Ministry of Mineral Resources and Energy (“MIREME”) was the governmental entity responsible for energy policy, planning and regulation. However, the Parliament has since approved the

creation of the Energy Regulatory Authority ("ARENE") to regulate electricity tariffs, competition in the energy sector, licenses and concession contracts. As well as taking over the regulatory functions of MIREME, ARENE replaced the Conselho Nacional de Electricidad ("CNELEC"), a consultative body with considerably narrower powers.

Namibia

Government Electricity Act 2000 repealed by Electricity Act of 2007 as amended in 2016 (Net Metering Rules)– These Acts establish the Electricity Control Board ("ECB"). The ECB's core mandate is to exercise control over the electricity supply industry, regulate electricity generation, transmission, distribution, supply, import and export. The ECB's website has links to rules and regulations and licensing arrangements (including application procedure and licenses issued).

Philippines

The Philippine power sector underwent significant privatization following the passage of the Electric Power Industry Reform Act of 2001 ("EPIRA"), which now provides the principal regulatory framework for the Philippine electricity industry. It provides a good example of a developing economy whose power sector has transitioned (in the relatively recent past) from a largely state-operated model to a market-oriented model. Among other things, the EPIRA:

1. organizes the industry into four sectors – generation, transmission, distribution and supply – and sets out the way in which these sectors will be regulated;
2. adds certain policymaking, planning and monitoring functions to the responsibilities of the Department of Energy ("DOE");
3. creates an independent, quasi-judicial regulatory body, the Energy Regulatory Commission ("ERC"), to promote competition, regulate market development and enforce the rules and regulations of the EPIRA;
4. privatizes significant sections of the National Power Corporation's business (a state owned utility which operated across the generation, transmission and distribution sectors);
5. establishes the Wholesale Electricity Spot Market ("WESM"), regulated by an independent market operator; and
6. promotes rural electrification.

The DOE has also developed a number of supplementary plans and policies, including:

- the Power Development Plan 2017-2040, which sets out future plans for development and serves as a guide for industry developers in search of investment opportunities;
- the 2018-2027 Distribution Development Plan, which provides the 10-year outlook on demand and supply requirements of distribution utilities, planned capital expenditure and projected energy sales; and
- roadmaps setting out short-, medium- and long-term objectives for sectors including electric power and renewable energy.

The Asian Development Bank has also published a roadmap which provides an overview of the regulatory landscape in the Philippines energy sector.

Singapore

The Energy Market Authority is a statutory board under the Singaporean Ministry of Trade and Industry. Its main roles are to ensure a reliable and secure energy supply, promote effective competition in the energy market and develop a dynamic energy sector in Singapore. The Electricity Legislation and Regulations and Gas Legislation and Regulations can be found on its website.

Spain

Spain provides a good example of a developed civil law jurisdiction which has adopted a market-oriented approach to regulating of the power sector. The principal piece of legislation regulating the Spanish electricity sector is Law 24/2013, of 26 December, on the electricity sector ("Law 24/2013").

The main purpose of Law 24/2013, pursuant to the objectives of European Directive 2009/72/EC (repealed by Directive (EU) 2019/944) is to set out the principles and provisions governing the electricity sector, with the objective of:

1. guaranteeing a minimum quality in the electricity supply at the lowest cost possible;
2. ensuring the economic and financial sustainability of the electricity system; and
3. fostering an effective level of competition in the electricity industry, all in accordance with environmental protection principles.

The principal features of the electricity system in Spain can be outlined as follows:

- Generation is a liberalized activity developed by private operators who sell the electricity generated to the pool at market prices or to specific customers by means of bilateral agreements (Power Purchase Agreements or "PPAs").
- Market price is settled through daily and intra-daily auctions carried out in the wholesale / spot market.
- System operation, market operation, transmission and distribution activities are regulated activities:
    - Transmission is carried out under a single TSO scheme. Red Eléctrica de España, S.A. ("REE") is the sole transmission agent and system operator ("TSO").
    - OMI-Polo Español S.A. ("OMIE") is the electricity market operator.
- The National Commission for Markets and Competition ("CNMC") is the national regulatory authority of the Spanish energy markets according to Law 3/2013.

At State level, and apart from Law 24/2013, the main pieces of implementing legislation are:

- Royal Decree 1955/2000, of 1 December, on regulation of transmission, distribution, commercialization, supply and authorization procedure for electricity facilities;
- Royal Decree 2019/1997, of 26 December, organizing and regulating the electricity production market; and
- Royal Decree 413/2014, of 6 June, on electricity generation by means of renewable, cogeneration and waste facilities.

Most Autonomous Communities have also passed legislation developing several issues of State legislation in relation to the authorization process in their territories.

South Africa

Electricity Regulation Act 2006 - An act to establish a national regulatory framework for the electricity supply industry; to make the National Energy Regulator NERSA the custodian and enforcer of the national electricity regulatory framework; to provide for licences and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

Tanzania

Electricity Act 2008 – This Act provides for the facilitation and regulation of generation, transmission, transformation, distribution, supply and use of electric energy; cross-border trade in electricity and the planning and regulation of rural electrification.

Additionally, the Act authorizes the Energy and Water Utilities Regulatory Authority ("EWURA") to award licenses, approve and enforce tariffs and fees, approve licensees' terms and conditions and approve initiation of the procurement of new electricity supply installations.

The section on regulation of rural electrification authorizes EWURA to:

1. vary the nature of its regulation depending on the characteristics of the entity performing the electrification; and
2. delegate regulatory responsibilities to other entities.

EWURA's website includes links to other regulatory tools and information on licensing and registration.

In January 2020, Written Laws (Miscellaneous Amendments) No 1 Bill 2020 was presented to the Tanzanian Parliament. The Bill proposes that the Electricity Act 2008 shall be amended by establishing a Commissioner for Electricity Affairs who will be appointed by the President and advise the Minister of Energy on specified matters.

Uganda

Electricity Act 1999 (with later amendments)- An act to provide for the establishment of the Electricity Regulatory Authority; to provide for its functions, powers and administration; to provide for the generation, transmission, distribution, sale and use of electricity; to provide for the licensing and control of activities in the electricity sector; to provide for plant and equipment and for matters relating to safety; to liberalize and introduce competition in the electricity sector; to repeal the Electricity Act, Cap 135 and the Uganda Electricity Board (Special provisions) Act, Cap. 136; to provide for a successor Company to the Uganda Electricity Board, and for connected purposes. The Electricity Regulatory Authority Web site includes links to licenses and application forms as well as regulations and standards and a Uganda proforma power purchase agreement (PDF).

See also Uganda's PPP Act in relation to the power sector.

Vietnam

One of the key long-term objectives of the Vietnamese government in the power sector is to establish a competitive electricity market. Although this process is already underway, all segments of the sector (generation, transmission and distribution) continue to be dominated by the state utility Vietnam Electricity (EVN) and its subsidiaries. However, PPPs are playing an increasingly important role in introducing private sector participants into the power sector and creating a more competitive electricity market.

The Electricity Law of 2004 (as amended in 2012 and 2018) is the principal legislation regulating the electricity sector in Vietnam. Among other things, the Electricity Law sets out:

1. the regulatory requirements for electricity development investment and planning;
2. policies and measures to encourage and accelerate conservation in electricity generation, transmission, distribution and use;
3. the electricity market including its principles, market participants, and market operation and control;
4. the conditions and requirements for operating in the electrical sector; and
5. pricing and licensing rules.

The Electricity Law is supplemented by a number of guiding decrees, decisions, and circulars issued by governmental authorities.

The Asia Development Bank has also published a roadmap which provides an overview of the regulatory landscape in the Vietnam energy sector.

Zambia

Energy Regulation Act 2019 – This Act repeals and replaces the previous Energy Regulation Act 1995. The Act provides for the licensing of enterprises in the energy sector and redefines the functions of the Energy Regulation Board.

While the Energy Regulation Board continues to have a role in issuing licenses and monitoring competition levels within the energy sector, pursuant to the 2019 Act, it will also have a role in monitoring the efficiency and performance of licensees; imposing administrative penalties when license conditions have been violated; and approving, reviewing and regulating power purchase and supply agreements.

The Energy Regulation Board website has links to a number of standards and guidelines, including other energy legislation, the Zambian Distribution Grid Code and Power Purchase and Supply Agreements Regulatory Review Guidelines.

II. Regulations

Regulation in Practice - Evaluation of Regulatory Systems

Regulatory systems often do not operate as planned because frequently there is a big gap between what is written in the law and what is implemented in practice. In situations where the regulatory system is not operating well, the World Bank often recommends independent and public evaluations of the system.

Such evaluations have now been performed several countries or regions (Mongolia, Brazil, the Eastern Caribbean and India). A roadmap for performing such evaluations can be found in the World Bank/ PPIAF Handbook For Evaluating Infrastructure Regulatory Systems (pdf)

Sample Evaluations:

USAID Evaluation of the Mongolian electricity regulator (2006) (pdf)

Evaluation of ANEEL, the Brazilian electricity regulator

Evaluation of the Jamaican regulatory system

Small Grid and Off-Grid Connected Renewable Generators

Please find below some useful documents and links:

- IREC Guide For Connecting Small Distributed Generators To The Main Grid (pdf) - IREC is at North Carolina State University. For more, please visit IREC.
- IREC Model Interconnection Standards and Procedures for Small Generator Facilities (pdf)

Tanzania

- Small Power Project Archived Documents
- Mini-Grids: Standardized Tariff Methodology for sale of Electricity to the Mini-Grids under the standardized ppa for small power producers (2009)
- Main Grid**:** Standardized Tariff Methodology for sale of Electricity to the Main Grid under standardized ppa for small power producers (2009)
- Standardized Small Power Purchase Agreements:
    - main grid connection
    - isolated mini grid connection

Namibia

- Power Purchase Agreement (PPA) - Example 5 short-form power purchase agreement developed for small scale power projects in Namibia- Standard short-form power purchase agreement developed for small scale power projects in Namibia. This is part of a suite of documents including a fuel supply agreement that can be found on Web site of Namibia Electricity Control Board.
- Power Purchase Agreement (PPA) -pdf - Power purchase agreement developed for medium scale wind power projects in Namibia.

Bangladesh

Policy Guidelines for Small Power Plant in Private Sector (pdf)

Rural Electrification Funds

To generate solutions for rural electrification in Africa, an innovative program, the Africa Electrification Initiative (AEI), seeks to create and sustain a living body of practical knowledge and a network of practitioners in the area of design and implementation of rural, peri-urban and urban on-grid and off-grid electrification programs. Find sample practical operational documents from around the globe and more here.

Theft of Electricity / Non-Technical Losses

Perhaps one of the greatest challenges in successfully operating a PPP related to utility services is to effectively deal with “non-technical losses” – a euphemism for theft – of utility services. These are due primarily to illegal connections to existing networks, tampering or bypassing with metering equipment or refusal to pay for service. Depending on the sector and the country, the rate of non technical losses can be over 50% of output, which causes a significant challenge to the viability of a PPP project and hinders development of infrastructure to extend services to under-served areas and improve services to existing customers. Find legislation and practical measures here.

Useful Links

Click on the links below to find legislation, regulations, regulatory decisions for each of the following countries:

- Australia - Australian Energy Regulator (AER)
- India - Central Electricity Regulatory Commission (CERC)
- India - Guajarat Electricity Regulatory Commission (GERC) (English and Guajarati)
- Pakistan - National Electric Power Regulatory Authority (NEPRA)
- Singapore - Energy Market Authority
- Spain - Comision Nacional de Energia (English and Spanish)
- Spain - the Electricity page (Spanish) on the website of the Spanish Ministry for Ecological Transition and Demographic Challenge (*Ministerio para la Transición Ecológica y el Reto Demográfico*) provides a broad overview on the electricity sector including FAQ sections on a number of topics (renewable energy, access and connection to the grid, self-consumption).
- UK - Office of Regulation of Electricity and Gas
- US Federal Electricity Regulatory Commission (FERC)

Related Content

- **Power and Renewable Energy PPPs**
- **Energy Laws and Regulations**
- **Energy Licenses and Licensing Procedures**
- **Energy Agreements**
- **Rural Electrification Funds: Sample Operational Documents and Resources**
- **Climate-Smart PPPs**
- **Gender & Energy Projects**
- **Further Reading on Energy and Power PPPs**

Additional Resources

- Contracting Tools for Non-Revenue Water Reduction
- PPP Legal Foundations - Further Reading
- Legislation and Laws - General and Sector Specific
- Regulatory Systems and Sector Overview