

The Context:

After debating for nearly ten years on how to reform the electricity supply industry, the Electricity Act No 20 of 2009 has come into operation in April 2009. The Public Utilities Commission of Sri Lanka (PUCSL) has been empowered to regulate the electricity supply industry through licensing. The Act provides mainly for regulatory reforms and there are no significant institutional or structural reforms for the industry stipulated in the Act.

Highlights of the Electricity Supply Industry: Sri Lanka serves grid electricity to about 80% of households, and a further estimated 3% of households use off-grid systems. About 40% of electricity is used in households, a further 40% in manufacturing industry and the balance is used in the commercial sector. Delays in adjusting the electricity prices to reflect the rising costs, have caused the state-owned electricity utility to report losses since 1999. The national average electricity price in 2007 was 10.72 LKR/kWh, and increased to about 15 LKR/kWh by mid-2008, and is estimated to be about 14 LKR/kWh at present (2009), making the prices to be among the highest in the region.

Sector Outlook: The sector outlook is positive in the medium to long term, with the lower cost power plants Upper Kotmale (hydro) and Puttalam (coal) under construction, and the second coal-fired power plant planned in Trincomalee, which are expected to assist electricity prices to be reduced in real terms, to a regionally competitive level. Significant potential remains to further reduce network technical and commercial losses to achieve savings, to rebalance tariffs and make them cost-reflective, and to improve managerial efficiency, supply reliability and service efficiency.

Electricity Generation: Sri Lanka's electricity development was initially focussed on developing conventional hydropower resources. Commencing in year 1950, a total of 1205 MW of medium and large-scale hydropower generating capacity has been built, to supply the national grid. (Table 1). In year 2007, 59.8% of energy in the national grid was sourced from oil-fired thermal power plants (Table 2), and the balance 40.2% from renewable sources.





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Table 1- Power Plants in Operation in the Sri Lanka National Grid by end 2007

Power Plants	Installed Capacity (MW)	Share of Total Capacity	Gross Energy Dispatched to the Grid in 2007 (GWh)	Share of Total Energy	
Hydro and other renewable					
CEB Hydro Power Plants	1205.0	50.1%	3,602.9	36.7%	
Small Power Producers (Hydro)	117.1	4.9%	342.8	3.5%	
Small Power Producers (Biomass, solar)	2.1	0.1%	1.3	0.0%	
CEB Wind Power Plant	3.0	0.1%	2.3	0.0%	
Total hydro and other renewable	1327.2	55.2%	3,949.2	40.2%	
Thermal Power Plants					
CEB Thermal Power Plants	528.0	22.0%	2,335.5	23.8%	
IPP Thermal: Petroleum	550.1	22.9%	3,528.5	36.0%	
Total thermal power plants	1078.1	44.8%	5,864.1	59.8%	
Total Grid connected power plants	2405.3	100.0%	9813.3	100.0%	
on Data Book, CEB, 2007					

Note: Installed capacity data as of end December 2007 Sources:

- 1. CEB Long-term Generation Expansion Plan Dec 2005
- 2. Sales and Generati

Note: The oil-fired Kerawalapitiya power plant (Stage 1: 200 MW) was commissioned during year 2008.

CEB: Ceylon Electricity Board IPP: Independent Power Producers

Table 2-Sri Lanka Generation Capacity share on the Grid by Source (2007)

Primary Source	Installed Capacity (MW)	Share of Total Capacity	Gross Energy Dispatched to Grid in 2007 (GWh)	Share Total Energy
Hydro	1,322.1	55.0%	3,945.6	40.2%
Biomass, Solar	2.1	0.1%	1.3	0.0%
Wind	3.0	0.1%	1.3	0.0%
Fossil Fuel(oil)	1,078.1	44.8%	5,864.1	59.8%
Total	2,405.3	100.0%	9813.3	100.0%

Power transmission, distribution, customers and sales: CEB owns and operates the entire electricity transmission network that operates at 220 kV, 132 kV, and most of the two sub-transmission networks of 33kV and 11kV. Some 11 kV lines are owned and operated by Lanka Electricity Company (LECO). CEB distributes electricity to 89% of the customers while LECO feeds the balance. LECO was established in 1983 to distribute electricity in areas previously served by Local Authorities (Municipal Councils, etc;). LECO purchases electricity from CEB and distributes among retail and bulk customers in their designated areas, between Galle and Negombo along the western coastal belt. There were 4,301,197 electricity customers served by the national grid by end 2007. Household customers were the largest group (88%). Commercial customers (all public and private offices, shops, commercial buildings, schools, hospitals, etc.) were a further 10%. Industrial customers accounted for 1%.

Table 3-CEB and LECO Sales (GWh)

Customer Class	2003	2004	2005	2006	2007
Households	2,392	2,594	2,859	3,056	3,178
Religious	42	45	49	51	50
Industry	2,412	2,530	2,686	2,901	2,911
Commercial	1,212	1,323	1,465	1,633	1,864
Street Lighting	103	106	141	125	136
Total Sales	6,160	6,599	7,201	7,766	8,139
Sales Growth	12.9%	7.1%	9.1%	7.9%	4.8%

Progress with Access to Electricity: A total of seven rural electrification projects have been implemented by CEB, that has catalised the rapid electrification of the country, now reaching about 80% of all households. Most non-electrified households use kerosene for lighting. The number of households with no electricity connection and using kerosene for lighting in 2003/4 was estimated in the consumer finance survey to be 25%, or about 1.25 million households.

Electricity Tariffs: Table 4 gives an analysis of the electricity prices over 2001-2007 of the average electricity prices to different classes of customers of CEB, shown in both LKR and equivalent USCts, to enable comparison with international prices.

Table 4- Electricity Prices in Sri Lanka 2001-2007

Year	LKR/USD	Recidential		Commercial		Industrial		Streetlights		Total	
		LKR/KWh	USCts/kWh	LKR/KWh	USCts/kWh	LKR/KWh	USCts/kWh	LKR/KWh	USCts/kWh	LKR/KWh	USCts/kWh
2001	93.16	3.94	4.23	8.74	9.39	6.29	6.75	5.70	6.12	5.48	5.88
2002	96.73	5.17	5.34	11.30	11.68	7.99	8.26	7.35	7.60	7.25	7.49
2003	96.52	5.54	5.74	11.86	12.29	8.38	8.68	7.80	8.08	7.68	7.96
2004	101.92	5.53	5.43	11.86	11.64	8.40	8.24	7.84	7.70	7.66	7.52
2005	100.50	5.64	5.61	11.88	11.82	8.36	8.32	7.82	7.78	7.71	7.67
2006	103.96	7.12	6.85	13.55	13.03	9.33	8.97	8.82	8.48	8.99	8.65
2007	110.62	9.00	8.14	15.52	14.03	9.62	8.69	11.89	10.75	10.56	9.55

- Notes: 1. Electricity rate is total sales income to Ceylon Electricity Board from each customer class divided by the elctricity sold.
 - 2. LKR/USD rate is the average rate for the year published by the Central Bank of Sri Lanaka.
 - 3. Toatl selling price includes all sales by CEB, including bulk sales to LECO.

Electricity Utility Financial Performance: CEB is the dominant market player, who owns or procures all the generation into the national grid. With generation costs being the dominant component of costs, analysis of CEB costs provide a strong indication of the cost structure, and answers to some of the questions about Sri Lanka's relatively high electricity costs and CEB's inefficiency, if any. For example in 2005, the tariff income caused the average earnings of 7.71 LKR/kWh, whereas the revenue requirement was 9.62 LKR/kWh to satisfy the cashflow requirements of that year. It is clear that out of the total operating costs of LKR 69,717 million in year 2005, LKR 56,398 million (81%) was for power generation requirements. At the time of writing, for year 2009, these costs have reached about double the levels of 2005.

Future Electricity Generation: Sri Lanka's hydroelectric potential, for both large and small developments for power generation, is limited. All the small hydropower development sites in the capacity range of 250 kW to 10 MW have either been developed already or in various stages of development. A few large projects beyond the 10 MW limit allowed in the Small Power Producer (SPP) program, and micro-hydro power projects remain to be developed, but there too, the total potential is limited.

Sri Lanka's energy mix in the generating system, would change from the present oil-dominant status to be coal-dominant, over the next five years. The share of hydropower is estimated to reduce from 40.2% in 2007 to 19.5% by 2020, while coal-fired thermal generation is estimated to reach 70.9% by 2020. Oil-fired thermal generation which accounted for 59.8% of energy input to the grid in 2007, would be phased out and will provide 9.6% of energy by 2020. This generation mix would be slightly altered owing to the contribution from non-conventional renewable energy sources, which are targeted to serve 10% of grid electricity requirements by year 2015, and develop further. Figure 1 shows the expected stabilisation of costs in constant terms and under different assumptions on inflation.

22 20 18 16 fotal Cost (LKR/KWh) 14 12 10 8 6 - Oil: 50 Coal: 80 Inflation: no 4 - Oil: 50 Coal: 80 Inflation: yes 2 - Oil: 100 Coal: 130 Inflation: yes 0 2008 2010 2012 2014 2016 2018 2020

Figure 1-Expected Cost Profile of Sri Lanka Power Sector

Note: The calculated costs are per kWh sold, assuming the long-term generation expansion plan would be implemented on schedule. The costs would meet all the cashflow requirements of CEB, and CEB would breakeven every year, if the tariffs match the average costs. Oil prices are in USD per barrel, coal prices are in USD per tonne, delivered to Sri Lanka. Inflation and currency depreciation assumed to be the average of 2002-7.

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Issues and Challenges Faced by the Electricity Sector:

The significant challenges faced by the electricity sector are,

- (a) ensuring countrywide access to electricity, and to raise the required finances
- (b) achieving a cost-reflective tariff structure and targeted subsidies
- achieving lower, regionally competitive electricity prices
- (d) adhering to the long-term generation expansion plan, in the midst of commercial, political and social pressure
- (e) establishing accountability of business-lines and business units
- (f) establishing transfer pricing across business lines
- (g) streamlining planning and procurement
- (h) improving reliability and service quality
- (i) improvement of customer service
- (j) improving safety in electricity supply and use
- (k) transparency of operations and information availability

Electricity Act: The first Electricity Act was in 1950, and later amended as Electricity (Amendment) Act (Chapter 205) in 1957. In 1969, Ceylon Electricity Board Act established the Board, transferring the all central government and some local government electrical undertakings to the new board along with their staff. The need to restructure the electricity sector was identified as part of a solution to numerous problems faced by the electricity sector in the latter part of 1990s. After much debate within and outside Parliament, the Electricity Reform Act of 2002 was approved, to implement restructuring and regulatory reforms. This Act of 2002 was to repeal the Ceylon Electricity Board Act and specified vertical unbundling of the CEB with a single buyer model for transmission, and further unbundling of distribution to five different companies. Regulation of the sector and these independent business units were to be handed over to an independent regulatory body. For this, the Public Utilities Commission of Sri Lanka Act of 2002 established the PUCSL to regulate certain utility industries including electricity. The Electricity Reform Act of 2002 was not implemented. PUCSL continued to function from 2003, without a mandate to regulate the electricity industry. The new Sri Lanka Electricity Act was approved in 2009 and is operational from April 2009.

Functions of PUCSL: The broad functions under the Electricity Act of 2009 are, (a) Overall administration of the Act by PUCSL (b) Policy guidelines to be issued by the Minister (c) Licensing for electricity generation, transmission and distribution (d) Sector efficiency and competition (d) Consumer protection and pricing (e) Planning and implementation (f) Transparency and publication of information (g) Conservation of electricity.

The proper functioning of PUCSL is crucial for the successful implementation of the Electricity Act. The Act specifically mentions the following broad functions of PUCSL.

- (a) Advise the government on matters related to the electrical industry
- (b) Regulate the implementation of the Codes of Practice and other requirements specified by the Act
- (c) Approve technical and operational codes developed by the licensees
- (d) Regulate tariff and other charges levied by licensees and other electrical undertakings
- (e) With the consultation of licensees, publish the rights and obligations of consumers
- (f) Collect and record information on the electricity industry
- (g) Set and enforce technical and other standards related to safety, quality, continuity and reliability of electricity supply and metering
- (h) Promote efficient use and conservation of electricity
- (i) Prepare a regulatory manual and update it from time to time
- (j) Consult those who are affected by the decisions of the commission

However, the relatively low level of restructuring introduced by the new Electricity Act of 2009 compared with the Electricity Reform Act of 2002 would result in CEB remaining almost the same in structure, with the potential of being too large and diverse to be effectively regulated in manner demanded by modern regulatory standards. PUCSL needs to be prepared to counter these challenges and emerge as a strong body, if it is to fulfill the role the country is expecting it to perform.

In the new Electricity Act, the aspects that need to be taken into consideration in setting the broad policy guidelines has been specified, so that a consistency is maintained between different governments in setting their electricity industry policies. These include meeting the electricity needs for a sustainable economy, fuel diversity and cost reflective prices.

Licensing: An important feature of both the present and the previous Electricity Acts is the requirement for licensing of participants in the electricity industry. All those who are involved in electricity generation, transmission and distribution are required to obtain a license from the PUCSL. According to the Electricity Act of 1950, the licences were issued by Ministry of Power and Energy, though, largely limited to paper work, without any monitoring or follow-up. With the new Electricity Act, the licenses have attained a significant status as a tool capable of governing the entry and performance of industry participants.

Only the following persons are eligible to apply for a license for generation capacity of more than 25MW: (i) CEB (ii) a local authority (iii) a company where the government or a public company holds more than 50% of shares (iv) A company incorporated under Companies Act of 2007 in which shares are held by, (a) the government (b) a public corporation (c) a company having government majority shares (d) a company having

a government subsidiary holding majority shares. In case of (iv) above, the number of shares (as decided by the Secretary to Treasury with the concurrence of Minister of Finance) has not been specified.

The Act does not specify the shareholding requirements for power plant capacities less than 25 MW meaning that the ownership of such power plants is not bound by the requirements of a shareholding by the government or connected parties.

Only a transmission licensee is allowed procure electricity from a generation licensee, and the Act further states that an application for a transmission license can only be made by the Ceylon Electricity Board (Section 8(1).

This effectively specifies a single buyer model for transmission and allows CEB to maintain the overall control of the electricity sector. However, the requirement for application by the CEB for the transmission license instead of an automatic awarding, provides PUCSL with the opportunity to enforce any regulatory conditions as a part of the licenses.

Application for a distribution license can only be made by, (i) the CEB (ii) a local authority (iii) a duly incorporated company in which the Government has more than fifty percent of shares, (iv) a cooperative society

The above criterion for a distribution license application has kept little space for a new entrant to the distribution business in Sri Lanka. Private sector participation is restricted through the requirement of government majority shares, while cooperative societies owning and maintaining distribution facilities within off-grid village hydro schemes are allowed to obtain distribution licenses through the provisions in (iv) above. Another feature of the distribution license is the allocation of geographical areas for the licensees based on their present and planned presence in electricity distribution. This way, an electricity consumer is constrained to obtain the supply only from the distribution company designated for the area.

CEB Power SPP Power IPP Power Off-grid **Plants Plants Plants** Micro Hydro (Mini Hydro, etc.) Generation Licensees **CEB Transmission Network** Transmission Licensee **Distribution Licensees** New **LECO CEB Distribution** Government Off-grid Regions Owned Co-operative Companies, Co-Societies opertaives Consumers in Consumers in ? Off-grid Villages **CEB Distribution LECO Areas** Areas **Electricity Consumers** Tariff Payment

Electricity Supply

Figure 2 - The Structure of the Electricity Industry Implied by the Act



Publication of Information: An important requirement of the new Electricity Act is the performance reporting by licensees. The need for operational and performance data to be made available to PUCSL, and thereby to the public, brings in the useful attribute of transparency and performance monitoring to the electricity sector. Electricity sector data is presently published through several annual publications. However, the channels of access the general public have to this information, and the depth and the quality of the data provided in these publications are far from perfect.

Electricity Pricing: An important aspect of the new Electricity Act are the provisions to establish cost reflective pricing for the electricity sector. One of the main reasons for the poor financial performance of the electricity sector for nearly a decade is the adverse (and ad-hoc) pricing policy dictated by the different governments over the years. The Electricity Act allows the licensees to set tariffs in accordance with a cost reflective methodology approved by the PUSCL.

Consumer Protection, Safety and Quality of Supply: A new set of regulations on standards to be maintained in providing new electricity connections and the quality of electricity supply is a core regulatory tool specified in the new Act. These regulations would include the quality of electricity services. Distribution licensees would be compelled to adhere to these standards, while any lapses can be brought to the notice of PUCSL, for immediate rectification and compensation.

Planning and Implementation: A critical component of the electricity industry is the planning of investments and operations. Though short term planning is essentially an operational activity of individual licensees, medium to long term plans at national level needs an integrated approach. The new Electricity Act has assigned the transmission licensee this important role of overall planning and implementation to meet future demand. As the sole transmission licensee, CEB is held responsible for forecasting the future national demand, planning and development of its own transmission system and procuring new generation plants to meet the forecast demand.

Specific Policy Recommendations to Implement the Electricity Act

General:

- i. The Minister should finalise and publish the policy guidelines issued to the PUCSL, in terms of section 5 of the Electricity Act.
- ii. PUCSL should finalise and publish its operating manual, and many other similar manuals and guidelines to be followed by licensees, such as for (i) system planning (ii) tariffs (iii) safety (iv) customer service and power quality (v) safety (vi) reporting formats.

Licensing:

The relevant provisions are stated in chapter III (Part I: Licensing) and chapter X (Transitional Provisions) in the Electricity Act.

- (a) Based on the transitional provisions, Ceylon Electricity Board has been issued with one generation license, the transmission license, and four distribution licenses (one for each distribution region). The provisional licenses end in October 2009. The 15-year licenses to be granted to CEB there onwards, should be equally disaggregated into four distribution regions, to enable PUCSL to monitor and implement the provisions of the Act. This recommendation is linked to the recommendation of tariffs, where the tariff submissions will be done separately by each one of the six CEB licensees. The PUC should further stipulate in the licenses that (i) accounts for each generating plant be maintained separately (ii) different parts of the transmission business be separately accounted for (iii) each CEB "Area" (about 40) maintain separate accounts. Owing to the large volume of work required to separate-out and establish asset registers and boundary metering, the PUCSLs license may provide a period of three years (with intermediate milestones) to achieve the full separation of accounts by each licensee.
- (b) All grid connected power generating companies (nine IPPs and estimated to be over 80 SPPs) should follow the licensing procedure. The legal requirement for the government or a government entity to be a shareholder in all generating licensees should be resolved in case of existing generation licensees.
- (c) Exemptions (Generation): Using the provisions in the Electricity Act, PUCSL requires to exempt all (i) standby generators and (ii) renewable energy-based off-grid generating systems (stand-alone units such as solar panels and isolated mini-grids such as a community hydropower facility), using the provisions in Section 10 of the Act, but establish a mechanism to ensure that information about the capacity and energy output of such facilities are reported to PUC, and that safety procedures and codes of practice are followed.
- (d) Special considerations (off-grid distribution systems): Licensing the large number (reported to be over 300) of community mini-grids, and tariff filings, would be difficult both for their operators and to the PUC. A simplified mechanism to implement light-handed regulation to such community networks should be formulated.

Publication of Information:

The Act has specific provisions to specify information disclosure to be included in all licenses. All information should be published in a web site managed by PUCSL, and selected information may be published in printed form:

- (a) Generation Licensees: For each power plant, monthly total energy and maximum capacity delivered, water (for hydropower plants) or fuel used, operating hours, planned and forced outage hours, reliability indices, total manpower, power plant net efficiency, accidents and safety violations
- (b) Transmission Licensees: Monthly inflow and end-of-month level in each reservoir, water value calculation, energy purchases and sales, transfer price of energy from each power plant to the grid (separated into capacity, fuel and maintenance charges), applicable merit order in plant dispatch, partial and total outages of the transmission system, frequency excursions, technical and investigative reports on major events affecting distribution licensees, reliability indices, network losses and targets, accidents and safety violations

- (c) <u>Distribution Licensees</u>: Reliability and customer service indices (actual and targets), energy purchases and sales, demand, number of customers, network losses (actual and targets), accidents and safety violations
- (d) Immediate measures: PUCSL should request the licensees to publish available information (CEB statistical digest, Sales and Generation Data Book, and similar information from LECO and other generation licensees, and the annual reports of CEB and LECO), as a first step towards transparency of operations and transactions in the industry. Presently these documents are published but they are not in the public domain with easy access to the public.

Electricity Pricing:

As provided in Section 30 in the Act, PUCSL should request transmission and distribution licensees to (a) develop and submit a plan to move from the present tariff structure to a cost-reflective tariff structure, this transition being allowed to occur over a period of five years (b)submit the first tariff filing by a stipulated date, preferably within one year from the date of the Act becoming operational (ie April 2010).

PUCSL should establish the templates for tariff submissions by the licensees and a time table for tariff submissions, public review and announcement. A practice of revising the tariffs after the due process once a year on a fixed date would be ideal, and with the current schedule of activities, the ideal date for the first tariff revisions after the due process under the Electricity Act would be 1st July 2010.

Consumer Protection, Safety and Quality of Supply:

- (a) PUCSL should expeditiously review the safety manuals of all the licensees, approve and publish the same.
- (b) The appointment and training of safety inspectors need to be expedited, and their defined roles should match with the provisions in the approved safety manuals, both in regular activities and in the case of accidents.
- (c) The reporting of consumer complaints for regular supply interruptions require to be improved by all the distribution licensees (presently the quality of response and follow-up actions vary from place to place even within the same distribution licensee's area, with no standard complaints handling mechanism).
- (d) A mechanism to handle special complaints such as (i) regular blackouts (ii) regular brownouts (iii) damage to equipment caused by poor supply quality, should be well publicised, through the licensees' media as well as by PUCSL.

Engagement of the Public:

- (a) The PUCSL Act under section 29 requires the Commission to establish a Consumer Consultative Council, to actively engage with PUCSL and the licensees, on all aspects of the regulatory process involving consumers. PUCSL requires to make the council effective and active, to ensure the engagement of consumers from the early stages of the regulatory process.
- (b) PUCSL requires to immediately launch a publicity campaign, extending much further than the occasional press briefing held at present, to educate the public on PUCSL's role in the electricity industry, consumer rights/obligations, and the procedure for reconciliation of disputes.
- (c) It is necessary to educate the stakeholders, including their licensees, about their rights and obligations under the new licensing regime.
- (d) PUCSL should hold public consultations on the plans of licensees and tariff proposals. Until the tariff proposals are ready (as they are like to take some time), CEB transmission licensee already has generation and transmission plans, and the four CEB distribution licensees already have distribution plans, which have to be submitted to PUCSL under section 65(2) of the Electricity Act, and be subject to public consultations.

Conclusions: What does the electricity customer expect as the outcome of the new Electricity Act? As of now, he would probably have noted that there were some protests against the Act, and only a minority would know that the Act is indeed operational. A customer's first priority is a reliable electricity supply, at a regionally competitive price. He needs a regulator who gives a patient hearing to a range of complaints or comments he would like to make, ranging from a complaint on inaction of a licensee on his application for a new service connection, to a comment on, which primary sources Sri Lanka should use for electricity generation. The present structure of CEB and the previous Electricity Act have certainly not been able to fulfil this basic requirement. Beyond this first priority of the customer, other issues such as who owns CEB or an IPP, whether a market player holds a license or not, and whether the long-term plan was adhered to in ordering new power plants, are only of academic interest to a customer who already has an electricity connection.

The priority of a customer who has no access to electricity would be one basic question: when will I be given access? The success of the Electricity Act depends on whether the basic requirements of customers and prospective customers, namely access, reliability and affordability, can be fulfilled to a much greater level of satisfaction than before. All the three parameters can be measured and compared, against each other and against what other countries and similar utilities have achieved.

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