

## CHAPTER 1

### OVERVIEW AND CONTEXT SETTING

#### 1.1 INTRODUCTION

An overview of the electricity sector of India including its severe financial distress, cross subsidy in electricity tariff, flight of larger consumers from the distribution licensee's system, the desired policy framework of progression towards cost-of-service, together with the conflicting need to meet the societal objective of electricity supply to a large base of poor consumers, has been presented through this chapter. The business problem is also outlined, together with motivation for research and the structure of the thesis.

#### 1.2 OVERVIEW OF ELECTRICITY SECTOR OF INDIA

Electricity reform with a distinct market-orientation is sweeping through developing / transition economies from early nineties (Williams & Ghanadan, 2006). In the blueprint for development of the Indian economy as well, improvement of Indian electricity sector plays a pivotal role. For more than 20 years, this sector is undergoing changes and reforms, with opening up of the sector and progression towards a competitive environment. Yet, the fact stands out that in spite of these developments, Indian power sector has a staggering loss of Rs.3.8 trillion (Ministry of Power, Government of India, 2015).

##### 1.2.1 Societal objective of providing electricity to poor consumers

Developing economies face the challenges of demographics in their pursuit of providing electricity to the people. Population exerts significant stress on infrastructure and public services, and particularly upon electricity services (Mouton, 2015). Measured by any global benchmark, India has the highest number of poor populace in the world (Sethi, 2016). **India is the second-most populous country in the world**, with a population of about 1.28 billion in

2013, of which nearly 0.27 billion (21.25%) are under poverty headcount (World Bank). Both the number of consumers (actual and potential), as well as the number of poor people, with low capacity to pay, combine to make Indian electricity sector reform initiative a challenging task. While China, the most populous country in the world, is also going through a phase of reform of the sector, it has a dissimilar political regime and a different set of issues. Moreover, while China's population was about 1.38 billion in 2013, data places poverty headcount at around 0.15 billion (11.18%) (World Bank) i.e. India's poverty headcount is 79% more than that of China. **India's poverty headcount is the highest in the world** – incidentally, Indian poverty headcount is higher than the total population of Indonesia, which happens to be the fourth most populous country in the world (World Bank). These indicative statistics are merely to provide a perspective on the magnitude of the problem of the poor in India. The societal objective of making electricity available and affordable for this multitude is a major issue faced by the sector.

### **1.2.2 High level of subsidy and cross-subsidy in tariff structure and legal background**

In spite of reform developments, Indian power sector is beset with many problems, not the least of them being problems emanating from high and sustained levels of subsidy / cross-subsidy existing in the final consumer tariff and the inability of the sector to move towards a cost-to-serve model.

Experts opine that **progression of consumer tariff towards cost-of-supply can address many ills of Indian electricity sector.**<sup>1</sup> There is severe criticism of untenable tariff structures in India, alleging preference for political favouritism and subsidies to economic basis like return on rate base and cost-of-service. Inevitably, recovery of costs is severely impacted. **The concept of asking the users to pay for their cost-of-service remains to be accepted as**

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<sup>1</sup> National Electricity Policy, February 12, 2005 issued under Section 3 of the Electricity Act, 2003 in Clause 5.5.1 states that *“There is an urgent need for ensuring recovery of cost of service from consumers to make the power sector sustainable.”* (Ministry of Power, Government of India, 2005).

**a principle in India** and implementation of cost-of supply based tariff would partially address the issue of financial distress of the State Electricity Boards (Reineberg, 2006). Pricing policies in the electricity sector remained far detached from market related costs and as a result of cross subsidisation,<sup>2</sup> **the price of electricity for Indian households is amongst the lowest in the world whereas the price paid by Indian industry is amongst the highest in the world** (Peter, 2009). In this backdrop, current Indian policy instruments are also pushing heavily towards achieving cost-of-service tariff, with a modicum of protection for the lifeline consumers.<sup>3</sup>

The problem is familiar to all experts in the field. Over last few decades, in order to appease the multitude of people, residential and agricultural prices of power have been kept low in most States, whereas commercial and industrial tariffs have become disproportionately high and pricing of electricity for rural and residential sectors has become a significant political issue (Shahi, 2005). There is serious concern on extremely slow progress on tariff rationalisation (Kumar & Chatterjee, 2012). **Cross-subsidy** has been attributed to cause numerous maladies in the power sector by experts, including **high industrial tariff, leading to Indian industry losing its competitive edge and resulting in its inevitable sickness, proliferation of captive plants, which are not necessarily cost-effective, practice of using artificially low agricultural tariff as an inducement to influence the vote bank, free and below-the-cost power leading to misuse, over-use and wastage**, to name a few.

**Indian policy instruments and judicial reviews require cross-subsidy reduction and progression towards cost-of-supply.** The Electricity Act, 2003 recognised cross-subsidy as an issue and set the target of achievement of

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<sup>2</sup> Subsidy and cross-subsidy are two leitmotifs in Indian power sector. The two words are often used interchangeably in literature. However, subsidy is generally understood in the Indian context as external support, usually rendered by the State Governments, while cross-subsidy is the *inter se* support i.e. the support extended by the segments with higher capacity to pay to the segments with lower capacity to pay. There are associated issues of subsidy leakage, as revealed by literature.

<sup>3</sup> Lifeline or “Below Poverty Line” requiring societal support has been interpreted in Indian policy instruments as one consuming below a specified level of 30 kWh per month (Ministry of Power, Government of India, 2005).

“cost of supply” for all categories of consumers through progressive reduction and eventual elimination of cross-subsidy. While this position was somewhat diluted through subsequent statutory policies (the National Electricity Policy and the Tariff Policy) as well as subsequent amendment of the 2003 Act, the final position mandated by the Apex Court stands that the ultimate objective is to arrive at cost-of-supply.

“Cross-subsidy” features in the Statement of Objects and Reasons of the Electricity Act, 2003 with the statement that “*cross-subsidies have reached unsustainable levels.*”<sup>4</sup> The Preamble to the Act states that the Electricity Act, 2003, is “*An Act .... generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalisation of electricity tariff, ensuring transparent policies regarding subsidies ....*”<sup>5</sup>

The Constitution of India provides for a federal structure of government. Electricity is in the “Concurrent List”<sup>6</sup> where both the Union Government and the State Governments have concurrent jurisdictions. Distribution business of electricity, which reaches the ultimate consumer, is primarily the responsibility of the distribution licensees, who are localised in a particular State. Central policies and State policies, with distinct areas of overlap, have often been found to be different. Policies are also diluted time and again to imbue political overtones. Vis-à-vis the issue of jurisdiction, these distribution licensees are presently regulated by the State Electricity Regulatory Commissions (or Joint Electricity Regulatory Commissions, in appropriate States). It may be pertinent to note that these Commissions can be given directions on public policy by the respective State Governments, but cannot be directed by the Union Government under the governing 2003 Act.<sup>7</sup>

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<sup>4</sup> Clause 1.3 of The Statement of Objects and Reasons of the Electricity Act, 2003 (36 of 2003) notified on June 10, 2003.

<sup>5</sup> The Preamble to the Electricity Act, 2003, Ibid.

<sup>6</sup> Item 38 of List III—Concurrent List of the Seventh Schedule of the Constitution of India (The Constitution of India).

<sup>7</sup> Sections 107 and 108 of the Electricity Act, 2003.

Industry experts are of the view that the distribution licensees, mostly erstwhile State Electricity Boards, have always served the interest of populism in that particular State, particularly from the 1970's. Since independence, electricity has been accepted as a tool of development and misused as a measure of populism. In the process, the finances of the licensees, still mostly wedded to the respective State Governments and their policies, are in shambles (detailed subsequently in paragraph 1.2.3). **State policies encouraged cross-subsidy in electricity tariff** and cross-subsidy has been recognised as a tool for furtherance of political objectives. Such tool has managed to distort the landscape of the Indian power sector.<sup>8</sup>

While cross-subsidy in electricity tariff is not unique to India, its wide spread, extent, continued prevalence together with the inability of the implementation agencies to root out the problem in spite of recognition of the malady as well as sporadic efforts to address the issue, underscore the somewhat half-hearted and intermittent nature of such endeavours. In spite of a **clear direction in the original 2003 Act that cross-subsidies are to be eliminated** by the State Electricity Regulatory Commissions within a specified timeframe, this provision has already been watered down through subsequent amendments of the mother Act. The 2003 Act also attempted to prevent tampering with the tariff structure by incorporating **transparent provisions for subsidy** i.e., **outright monetary contribution to a segment of consumers instead of cross-subsidy across segments.**

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<sup>8</sup> The financial distress of the sector, governmental interference and enactment of the Electricity Act, 2003 to remedy the situation has been noted by the judiciary (apart from the industry experts). The Apex Court noted in the context that *“The statement of objects and reasons for the enactment of the Act, extracted above, would indicate a legislative realisation that the power sector in the country was in dire straits. This was largely on account of implementation of policy decisions to provide free or highly subsidised power to certain classes of consumers. In a regime wherein tariff was a matter of governmental dictation and directives providing free or subsidised power to one section at the cost of another or others and a host of such related decisions divorced from commercial and prudent practices had plunged the power sector into uncertainty and darkness. To remedy the situation, the Act of 2003 was enacted...”* This observation is in Paragraph 9 of Punjab State Power Corporation Limited Vs Punjab State Electricity Regulatory Commission & Others in Civil Appeal No. 4510 of 2006 dated February 10, 2015 available at <http://judis.nic.in/supremecourt/imgs1.aspx?filename=42362> last accessed on May 22, 2016.

On the issue of cross-subsidy, there are conflicting views from the customers' side. **The larger ones strongly advocate sharp reduction if not elimination of cross-subsidy**, while the **small consumers are unequivocal on the need for its continuation**. Distribution licensees are necessarily caught between such conflicting demands. Alongside, there is a pressure for **introducing competition in retail power sector**. **Upon fruition of this objective, it is probable that the large consumers shall discontinue taking power from the distribution licensees**. Available amount of cross-subsidy is thereby likely to fall sharply. Retail tariff for small consumers would inevitably increase in such a situation, which may be difficult to be offset by making grants (subsidy) from the State Government.

From the perspective of the distribution licensee, cross-subsidy is linked with the issue of flight of consumers to apparently more economic options of supply through in-situ captive or using the open access<sup>9</sup> of wires route and sourcing from captive sources or otherwise (often at a cost higher than the real cost of the licensee to serve the fleeing customer moving over to captive sourcing, but at a cost lower than the high cross-subsidising tariff paid by the erstwhile consumer), which in turn leaves the licensee with a lower consumer base. **Unless adequately compensated through some mechanism, it is in the interest of the distribution licensees to frustrate such flight of consumers as its unit-wise fixed cost is enhanced with a lower consumer base**. Therefore, the distribution licensees are putting up barriers to competition to retain its creamy layer of consumers.

The problem is compounded by the fact that **computation of cross-subsidy** is a contentious issue. **It could be assessed with reference to average tariff (as variance between the tariff paid by the consumer and average tariff of the licensee received from all consumers) or cost-of-supply (as variance**

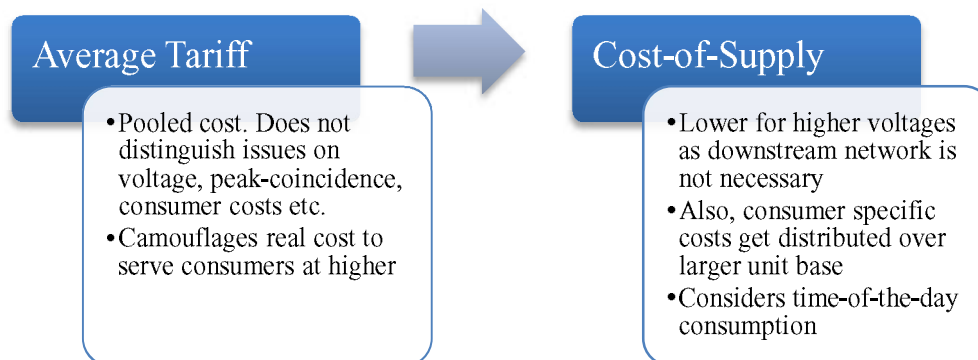
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<sup>9</sup> Open access is defined under Section 2(47) of the Electricity Act, 2003 as “*the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Appropriate Commission*”. In effect, a licensee or a consumer can procure power from any person through electric lines / wires of another licensee, subject to legal provisions.

between the tariff paid by a consumer and the actual cost to serve him).

Other options like marginal cost, real time pricing are also available, for calculation of the differential amount with respect to tariff.

**Table 1.1: Average Tariff (Average Cost-of-Supply) vis-à-vis Cost-of-Supply**



### 1.2.3 Indian power sector – financial perspective

To put the current Indian power sector in its proper perspective, it is essential to quote certain figures on the health of the sector and the existent subsidy in the system. The Ministry of Power, Coal and New & Renewable Energy, Government of India, puts the **accumulated loss of the distribution companies at Rs.3.8 trillion**, of which Rs.3.66 trillion was accumulated in the last six years (Ministry of Power, Government of India, 2015).

A picture of worsening financial position is available from earlier reports. The Report of the High Level Panel on Financial Position of Distribution Utilities<sup>10</sup> places accumulated losses of 15 States (excluding West Bengal, Chhattisgarh, Goa and all North-eastern states) accounting for 91% of India's power consumption at Rs.1.07 trillion as on March 31, 2010. Losses moved up from Rs.0.19 trillion on March 31, 2005.<sup>11</sup> Net loss before subsidy for the period 2006-10 was Rs.1.79 trillion. Post-subsidy, losses came down to Rs.0.82 trillion.<sup>12</sup> For the year 2010 alone, net loss before subsidy is Rs.0.57 trillion

<sup>10</sup> "The Report of the High Level Panel on Financial Position of Distribution Utilities", Shunglu, V.K. (Chairman), December 2011; Panel chaired by V.K. Shunglu, former CAG, and hence popularly referred to as the "Shunglu Committee Report".

<sup>11</sup> Paragraph 1.2 and 1.3, Ibid.

<sup>12</sup>

and Rs.0.27 trillion after subsidy.<sup>13</sup> The Report of the Thirteenth Finance Commission also recorded that “*Since one of the fundamental triggers for introduction of market reforms was the **bankrupt finances of the State Electricity Boards (SEBs)**, progress in expansion of power supply and introduction of market reforms needs to be accompanied by corresponding improvements in utility finances to prevent competitive markets from adversely impacting utility finances...*”.<sup>14</sup> Analysis of the financial position of the State power utilities reinforced that this dismal position has aggravated, as the net losses of State transmission and distribution utilities was at Rs.0.27 trillion for each of the years 2007-08 and 2008-09.<sup>15</sup> At 2008 Tariffs, net losses of State utilities ranges from Rs.0.68 trillion in 2010-11 to Rs.1.16 trillion in 2014-15.<sup>16</sup>

#### **1.2.4 Indian power sector – inefficiencies and welfare issues**

Indian policy of welfare economics points towards tariff of the low-end consumers being kept low, which does not harmonise with the concept of recovery of cost from the user. It is accepted by industry experts that a host of inefficiencies are contributing to the financial distress of the sector - high technical / commercial network loss levels, overall tariff inadequacy, loss financing and consequential impact on financial sectors, lack of competitive environment, bundling up of distribution and retail activities (where distribution is considered a “natural monopoly”, retail is competitive in most reform models), inability to recover voltage level-wise costs, to name a few. Additionally, cross-subsidising consumers are allowed to move out of a distribution licensee’s system through open access by paying an exit charge, to compensate for the loss due to such exit i.e. the surcharge is required to meet “current level of cross-subsidy”. **If reported cross-subsidy is, for any reason, lower than actual cross-subsidy, customers can walk out of the**

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<sup>13</sup> Table IV, Ibid.

<sup>14</sup> Paragraph 7.101, “Thirteenth Finance Commission 2010-2015”, Kelkar, V.L. (Chairman), Volume 1: Report.

<sup>15</sup> Table 7.3 Ibid.

<sup>16</sup> Table 7.4 Ibid.



**system by paying an artificially lower exit charge, impacting potential revenue of distribution licensees.**

While cross-subsidising customers find it attractive to exit a distribution licensee's supply system due to steep tariff, the loss-making licensees thwart competition as they would otherwise lose their prime bulk consumers. Tariff increase for other, so-called "poorer" consumers become difficult due to populist pressures.

Thus, **in the context of the country which has the highest poverty headcount and with the electricity sector in considerable financial distress, reform measures of the sector is a delicate process**, and may require to be handled with singular circumspection. A study of reform structures, with emphasis on removal of subsidy, together with an analysis of the lessons learned, particularly in the context of developing economies is warranted, and an attempt is necessary to chalk out a path forward, with special emphasis on the Indian perspective with its extensive vulnerable population.

### **1.3 CONTEXT: BUSINESS PROBLEM**

**Electricity distribution licensees in India are in financial distress due to a host of sector inefficiencies such as the issues of exiting prime customers, need to provide welfare tariff to large swathes of poorer segments, overall tariff inadequacy, technical / commercial incompetence etc. Policy objectives / implementation are not conducive towards bringing the sector back to financial solvency and meeting the declared goal of reform of the electricity sector.**

### **1.4 MOTIVATION FOR RESEARCH**

Distribution licensees are in deep financial distress. Cross-subsidising consumers are allowed to move out of a distribution licensee's system through open access by paying an exit charge, to compensate for the loss due to such exit i.e. the surcharge is required to meet "current level of cross-subsidy". In case reported cross-subsidy is artificially lower than actual cross-subsidy,

consumers can leave the system by paying an artificially lower exit charge, impacting potential revenue of distribution licensees.

Realistic determination of cross-subsidy is essential in the context of flight of consumers from the already financially stressed distribution licensees, which has the potential of destabilising Indian power sector. It is essential to undertake an estimate of cost-of-service, to arrive at any faithful assessment of cross-subsidy and to make associated policy decisions. The connected welfare issue of protecting vulnerable consumers is needed to be addressed to arrive at a comprehensive solution. The need for this research is to primarily fill this research gap.

## **1.5 STRUCTURE OF THESIS**

The Thesis covers seven chapters including the present Introduction Chapter on **Overview and Context Setting**. An overview of the electricity sector of India has been presented through this chapter. Worsening financial condition of the utilities, cross subsidy in electricity tariff, flight of larger customers from the distribution licensees' system, the stated policy framework of progression towards cost-of-service, together with the conflicting need to meet the societal objective of electricity supply to a large base of poor consumers, have been outlined. The business problem of financial insolvency and lack of effective policy initiatives together with the desire of arriving at a structured solution as a motivation for research, have been presented through this chapter.

### **Chapter 2: Literature Review**

Having introduced the need for addressing the issue of cross-subsidy in electricity tariff and for arriving at cost-of-service, as well as the necessity for making electricity affordable for the economically weaker section of consumers, this chapter discusses existing literature. The broad heads of review includes basic tenets of reform and reform expectations, cross-subsidy in electricity tariff, reform impact on small consumers, contextual global experience and valuation of cross-subsidy together with assessment of cost-of-service. It discusses in detail the experience of more mature electricity markets

as well as developing economies to cull out lessons to meet the issues and challenges in India in arriving at cost of supply, which is the central theme of the research. This chapter presents the rationale behind the research by discussing various cost-of-supply studies undertaken in India, identifying the gaps therein.

### **Chapter 3: Research Methodology**

The context of research having been established in the previous chapter, this chapter goes to explain the approach and methodology of undertaking the research. It explains the need for research, the research gap, the statement of the research problem, research questions, objectives of the study, the scope of research, the research methodology and the framework for research design, the theoretical underpinning derived through literature survey and outlines the methodology adopted for analysis of data.

### **Chapter 4: Discussion and Analysis**

This chapter deals with the analysis to find answers to the research questions. Analysis has been done using the methodology highlighted in the previous chapter. A detailed cost-of-supply model has also been developed through this study. This chapter uses the model to address some of the research questions and endeavours to find a solution to the issue of supporting the lifeline consumers in a reformed environment, particularly in the context of the country with the highest number of poor people in the world.

### **Chapter 5: Conclusions**

This chapter gives the findings, conclusions and recommendations of the study. Results of the analysis have been evolved in this chapter in the form of a suggestive framework.

### **Chapter 6: Contribution to Literature**

This chapter highlights the contribution of the research to existing literature.

### **Chapter 7: Scope for Future Research / Limitations**

It covers future scope of study as well as limitations of the present study.

The construct of the research is depicted in Table 1.2.

**Table 1.2:**

<b>Phase of Research</b>	<b>Chapter</b>
<b>Phase 1: Research Context</b> <b>This phase explains context of research and introduces the topics relevant to research</b>	<b>Chapter 1</b> Overview and Context Setting
<b>Phase 2: Research Review</b> <b>Extensive review of academic literature, journals, reports, legal framework, judgments, regulatory orders and other relevant literature has been carried out in this phase</b>	<b>Chapter 2</b> Literature Review
<b>Phase 3: Research Problem Development and Research Design</b> <b>Based on the Phase 2 Review, research problem / gap has been identified in this phase. The researcher has at this Phase drawn insights from the literature and defined objective of the research and the methodology to achieve the objective.</b>	<b>Chapter 3</b> Research Methodology
<b>Phase 4: Analysis and Model Development</b> <b>Secondary data has been analysed using various statistical tools. A cost-of-supply model using Excel tool has been developed at this stage.</b>	<b>Chapter 4</b> Discussion and Analysis
<b>Phase 5: Conclusions and Limitations</b> <b>Findings are discussed and contributions to literature are highlighted. Directions for future work are also mentioned.</b>	<b>Chapter 5</b> Conclusion
	<b>Chapter 6</b> Contribution to Literature
	<b>Chapter 7</b> Scope for Future Research / Limitations

**1.6 CHAPTER SUMMARY**

This chapter provides a brief sketch of the severe financial distress of the electricity sector of India and the burden of India's huge population, which over-stretches provision of electricity services. The business problem has been developed in this backdrop of worsening financial condition of the utilities, which is attributed to a host of sector inefficiencies including the issues of exiting prime customers and the need to provide welfare tariff to large masses of people. The necessity for undertaking an exercise for estimation of cost-of-service, to arrive at a realistic assessment of cross-subsidy in order to make associated policy decisions as well as arriving at a comprehensive solution for addressing the issue of protecting vulnerable consumers has been outlined. The chapter concludes with a brief structure of the thesis.