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CASE STUDY

Gas based power generation in India: Lessons from a transaction cost analysis

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ABSTRACT

We use a transaction cost framework to analyze the performance of gas-based private investments in two coastal Indian states – Andhra Pradesh and Gujarat. These states have a similar regulatory set-up and have seen bulk of the initial gas-based private investment being made. Yet they differ greatly in terms of actual generation. Andhra Pradesh's lack of success can be attributed to upstream regulation and arm's length contractual design. This created a weak demand response giving rise to high transaction costs. Whereas in Gujarat, upstream contractual design has ensured that demand response is strong enough to minimize transaction costs for utilities downstream. Our cases reiterate that alternative governance structures (competitive markets and hierarchical systems) need to be subjected to a comparative analysis of transaction cost minimization. Hence, the general policy of promoting competition may not be a strategic solution for India where adequate investment for annual supply of electricity is the real problem.

1. Introduction

In spite of nearly two decades of power sector reforms, there persists a serious electricity supply problem in India [1]. In 2010–11, the peak demand shortage[2] in India was 9.8% [2]. India has witnessed lesser than the expected inflow of private capital as compared to its reform siblings, the Latin American economies like Argentina and Brazil [3]. This is especially worrying for the generation segment. At the time of initiating the deregulation process (in the early 1990s), investments in electricity generation were mostly done by the government and there were no policies to encourage private investment [4]. But the first phase of deregulation, and thereafter the Electricity Act, 2003, enacted policies to attract more private investment.[3] Following that, there has been some improvement in the share of private sector participation in generation. The share of privately owned generating capacity in the total has increased from 12.7% at the end of the 10th plan period (2002–2007) to 27.1% at the end of the 11th plan period (2007–2012).[4] The share of gas and coal based thermal capacity (the real major avenues of private investment) in total generation has increased from 6.4% to 15% in the last ten years.[5] However, a closer look into the recent trends in coal and gas reveal an interesting picture. During the 11th plan period (2007–12) the capacity addition through private investment in gas based power generation was to the tune of 2530.5 MW (megawatts) but the proposed capacity addition in the 12th plan period (2012–2017) is zero.[6] While in coal the private investment was to the tune of 18,649 MW in the 11th plan period, in the 12th plan period it will be 43,270 MW, an increase of over 132%. The question then arises as to why there is no proposed private investment in gas-based generation in spite of the fact that projections indicate that gas availability from domestic sources alone will grow at an annual

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[2] In India, unlike developed countries, there are no dedicated peak load power plants. Therefore, the peak shortage (deficit in supply during the period of maximum use of electricity) is a reflection of inadequate base-load capacity.

[3] For policies to attract private investment, kindly refer to Sections 7 and 9 of the Electricity Act, 2003.

[4] Since 1950 (post–independence), India has followed a five year plan model for the Indian economy. Currently the twelfth plan period (2012–2017) is underway.

[5] These figures are own calculations based on Central Electricity Authority [26,27] reports.

[6] Source: Power Scenario at a Glance, [27].

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rate of 3% from the current plan period up to the year 2029–30?[7]

In the strategic development of electricity sector, empirical evidence has shown that the problem lies not so much in ownership as in how the sector is governed [5]. It is about the rule of law (formal institutions) and the certainty of investment conditions in electricity markets [6]. Potential private investors in new generation capacities look for stable market rules and long term contractual commitments [7]. Once investors enter into contracts with buyers for power purchase, both the parties are then governed by the terms of the contract. Any change in the terms of the contract can impose high transaction costs for the parties. These costs could come in the form of high priced alternate fuel (in case of non-availability of fuel), low retail tariffs, regulatory reversals and litigation, losses on stranded assets etc. Unless the risks of such costs are minimized either through a highly committed regulatory set-up or through long term contracts, private investors will not enter into the generation segment. And if they do, it will be through organizational arrangements which include some form of vertical integration. In fact, as Jamasb [8] points out, while private investments declined at some stage in the reform phase, in many countries there were tendencies towards vertical re-integration.

Broadly within the framework of transaction cost economics (TCE), we present the case of gas fuelled electric utility investments for one of the largest developing markets in the world, India. We show through a comparative analysis of two important federal states, Andhra Pradesh[8] and Gujarat how differences in the institutional arrangements for minimizing transaction costs led to differing results from a uniform policy for deregulation. These states have a similar regulatory set-up[9] and have seen bulk of the initial gas-based private investment being made. Yet they differ greatly in terms of actual generation. Andhra Pradesh's lack of success can be attributed to upstream regulation and arm's length contractual design. This created a weak demand response[10] giving rise to high transaction costs. Whereas in Gujarat, upstream contractual design has ensured that demand response is strong enough to minimize transaction costs for utilities downstream.

Since the neo-classical prediction, that markets are efficient is valid only under the assumptions of low transaction costs, we conclude that for India, where there are positive transaction costs, alternative governance structures need to be subjected to a comparative analysis and that neither a fully competitive electricity market system nor a state-owned (or privately owned) vertically integrated system can be prescribed as a general solution. For Indian power sector policy making, a more prudent approach, as shown by our analysis and similar to the arguments made by Pittman [9] for transition economies, is to compare the contractual context on a case basis and propose a compatible governance structure accordingly. The remaining paper is organized as follows. Section 2 lays down the essential elements of the TCE framework and its relevance for electricity sector performance. In Section 3 the case of private investment in the two Indian states of Andhra Pradesh and Gujarat is discussed which provides contrasting insights. Both the states have comparable electricity situations in terms of demand structure but have divergent institutional arrangements for operation. The purpose is to show in micro-analytic details the presence of contractual hazards and their corresponding consequences in Andhra Pradesh. Then using the case of Gujarat it is shown how they have a better design to avoid and respond to such hazards. In section 4, the insights from the TCE analysis of the investments in the two states are presented. Section 5 concludes with a summary and an outline for future research.

2. Transaction cost economics and electricity sector: a framework

Transaction costs, according to Williamson [10,11], are defined as the costs of writing, monitoring, verifying and enforcing a contract. Williamson specified variables which determined whether markets or hierarchies would lower the cost of a particular transaction. The TCE theoretical framework is founded on two key assumptions: bounded rationality and opportunism. Bounded rationality (as against the complete rationality assumption of neo-classical economics) refers to the fact that people are intendedly rational but limitedly so. Opportunism, as Williamson calls it, is the tendency of 'self-interest seeking with guile' where actors could potentially exploit contracting partners under unforeseen favorable circumstances. Under the conditions that these assumptions hold, the interplay of three core variables – asset specificity, uncertainty and frequency – determine what kind of transaction costs will be generated and whether a transaction will be carried out in the market or within a firm. If an asset is very specific to a particular transaction and has almost zero opportunity costs outside of it, then it is efficient to vertically integrate that asset. According to Williamson, all contracts are eventually incomplete because actors are boundedly rational and can never specify entire future contingencies. So if one party makes a very specific investment, and an *ex-post* situation arises where it generates rents for the other party, then it may behave opportunistically. In what is known as the 'fundamental transformation' [12], a contracting party with significant asset-specific investments could face an *ex-post* hold-up situation due to opportunistic behavior or contractual incompleteness. An efficient governance structure is that which minimizes these transaction costs.

Table 1 summarizes the most basic form of a TCE framework. Spot markets are an efficient governance solution when there are low asset specificities and uncertainty in the transaction for both parties. When asset specificity is not very high but uncertainty is, then long-term contracting or vertical integration both could be efficient ways to govern the transactions. When asset specificity is high and uncertainty is low, long-term contracts are preferable. But as transactions become increasingly complex involving higher degrees of asset specificities and uncertainties for both contracting parties, then vertical integration is an efficient governance structure.

TCE has often been used to describe industrial and regulatory behavior in the utility sector [9,13,14] . Public utilities, like electricity producers, are network industries. They require asset specific investments, there are significant economies of scale and the products are widely consumed. Specific investments mean that a substantial portion of investment is sunk (due to low potential for alternative use) and hence there is a lock-in where, once committed, the firm may be willing to operate at even lesser than average costs. Economies of scale imply that tendencies for natural monopoly will always be at the boundaries. Moreover, wide consumption means that the set of consumers will match the set of voters, thus implicating

[7] http://www.pngrb.gov.in/newsite/pdf/vision/vision-NGPV-2030-06092013.pdf accessed in July 2014.

[8] In June 2014, a new state 'Telangana' has been carved out from the state of Andhra Pradesh. For the present study when we refer to Andhra Pradesh, it means the undivided state.

[9] India has a federal system like US, where the tariff guidelines are set by the Central Electricity Regulatory Commission (CERC) and is same for all the state ERCs. The rate of return (RoR) on the cost of production was 16% on Net Fixed Assets (NFA) before the introduction of multi-year tariff (MYT) system. In Andhra Pradesh the MYT was adopted from FY 2007 and in Gujarat from FY 2009. Under the MYT, in Andhra Pradesh the utilities were allowed a rate of return on capital employed (RoCE) of up to 16% and in Gujarat up to 14% (CRISIL, 2010).

[10] By demand response we mean the ability of the generation utilities to vary production and pass on the cost burden to the end consumer via 'fuel cost pass through'.