

Chapter 3

Reforms and Reorganisation of Energy sector

3.1 Introduction

India's commercial energy sector came under the wave of reforms to address the fiscal problems, microeconomic issues relating to inefficiency and lack of availability in relation to requirements for sustaining high economic growth. The major thrust of the reform policy in energy sector, like many other sector, is to allow for greater role market forces. As a result, the energy sector is beginning to evolve as a competitive structure, from a situation of state-owned administrative departments. India's energy sector has become one of the cornerstones of India's economic reforms since 1990s. Though state ownership is still dominant, different agencies in the value chain have been gradually reshaping themselves as competitive corporate entities. State owned enterprises are increasingly adapting to operate under a market oriented framework compared to the administrative style of functioning before 1990s. Market development and economic reform policies have changed the set of incentives for government owned enterprises which now act more like independent strategic firms and less like government departments.

Introducing market forces in the energy sector is quite challenging as there are factors that can lead to market failure. Therefore, a credible regulatory regime assumes prime importance for proper functioning of markets in energy sector. Possibilities of market failure emerge because of lumpy and massive investment required to start

production facilities. This is on account of the fact that durable and immobile (sunk) investments reduce the threat of entry by raising the stakes of a battle for market share or control. They increase both i) the gains from winning since victor gets a monopoly and ii) the cost of losing since the loser forfeits his investment. The net effect is likely to discourage entry if the challengers are risk-averse or if potential gain from monopoly is small relative to investment that must be put at risk (Gómez-Ibáñez 2003, p. 9). As we will see in later sections that regulatory policy is not yet mature though the need of credible regulatory regime is felt by almost every expert.

After the liberalization of the 1990s, private ownership also began to emerge in the fuel supply chain, albeit unevenly:

- The rise of large private actors is definitely more in electricity than oil and gas or coal. Within the overall energy sector, electricity has experienced the largest change.
- Within states, the poorest states with the lowest institutional capacities experienced the fewest changes (one notable exception is the very poor state of Orissa, which privatized its electricity distribution in 1999, resulting in a managerial and regulatory failure (Siddiqui 2007).

The electricity sector has experienced the most intensive reforms. This led to increasing private ownership particularly in generation (nearly 24 percent of the total installed capacity¹). In addition to this two states, Orissa and Delhi have privatized their distribution system with 49% of the asset value still remaining with the respective state governments (respectively in 1999 and 2002).

The oil & gas sector has also been significantly liberalized to augment domestic production. Most of the distribution (retail sector) is still being operated under government control though there is a presence of private distributors owned by Reliance

¹this includes captive capacity additions (capacity added by end users for self use) by private sector also.

Energy Group in few states. In exploration and production (E&P) activities the state remains the dominant player but recently private players have been successful in winning bids for E&P (notably Reliance in the Bay of Bengal). Indian Oil and ONGC, which are government owned companies, are also very active in developing international partnerships in resource rich regions around the world. The refinery sector has also been liberalized and there are two major private players with a significant share of the total refinery capacity. The coal sector has seen by far the least changes in terms of market oriented reforms. The objective of the chapter is to look into specific sectors particularly coal and oil & gas sectors because these sectors become major input for electricity generation and as the economy matures we will see more of these resources being used in the electricity sector. Therefore policies of these sectors will have significant effect on the capacity additions and cost of power generation.

This chapter is divided into four sections. Next two sections cover the developments in coal and oil & gas sector respectively. Forth sections deals with electricity sector reforms. And the last section concludes the discussion.

3.2 Coal sector

Coal resources in India are of two distinctly different categories, coking and non-coking (also referred to as thermal/steam coal). Our resources of coking coal used in steel and other metallurgical industries are meager and of relatively poor quality. In comparison, high ash, low sulphur and low calorific value non-coking coal resources, which are best suited for thermal power generation, exist in fairly abundant quantities. Coal is the most important component of India's energy requirements (55% of the total primary energy requirements were met from coal in 2005). Coal is the most important fuel for electricity generation in India. Nearly 78.25% of India's coal is consumed by power industry. India's proven reserves are about 102 billion tonnes accounting for 6.7% of the world's total coal reserves. Most of the country's coal

reserves are in eastern region (Table 3.1). Recently, T. L. Shankar Committee report on reforms in coal sector has come up with the view that large amount of reserves that are still in non-proven category should be brought into proven category at a faster pace (Ministry of Coal 2005).

Table 3.1: Proven Reserves of Coal in Indian states as on 1st April, 2008 (in million tonnes)

States	Reserves	Share (%)
Jharkhand	37492.92	36.82%
Orissa	19221.59	18.88%
West Bengal	11584.09	11.38%
Chattisgarh	10419.32	10.23%
Andhra Pradesh	9007.13	8.85%
Madhya Pradesh	7895.96	7.75%
Maharashtra	5004.26	4.91%
Uttar Pradesh	765.98	0.75%
Assam	314.59	0.31%
Meghalaya	88.99	0.09%
Arunachal Pradesh	31.23	0.03%
Nagaland	3.43	0%
Total	101829.49	100%

Source: Ministry of Coal

<http://coal.nic.in/induction08.pdf>

The Fuel Policy Committee (1970) led by the famous Indian economist Sukhamoy Chakraborty², emphatically argued that coal should be the main source of India's energy needs as its most reliable and cheapest fuel. The coal sector was nationalized through various legal measures during the first half of the 1970s (Ministry of Coal 2007, p.9). It was justified on the grounds of inadequate investment, unscientific mining practices and poor working conditions for labor. Following Nationalization, the coal industry was reorganized into major public sector companies, namely Coal India Limited (CIL) which owns and manages all the old Government-owned mines of National Coal Development Corporation (NCDC) and the nationalized private mines

²He was one of the architects of Indian planning immediately after India's Independence

and Singreni Colliery Company Limited (SCCL) which was in existence under the ownership and management of the Andhra Pradesh state Government at the time of nationalization.

Table 3.2: Production of coal (in million tonnes)

	1970-71	1980-81	1990-91	1995-96	2000-2001	2004-05	2006-07
CIL	17.85*	100.86	189.68	237.27	268.14	323.58	343.37
SCCL		10.1	17.71	26.77	30.27	35.3	36.14
Private**	55.1	3.05	6.47	9.38	15.29	23.74	27.51
Total	72.95	114.01	213.86	273.42	313.7	382.62	407.02

*NCDC and SCCL only

**includes captive mines by private as well as government organisations Source: Ministry of Coal (2005) and Ministry of Statistics and Programme Implementation <http://mospi.nic.in/>

Since then this sector has remained dominated by government owned organizations (Table 3.2). Recently, pricing authority of the coal was given to Coal India Ltd (CIL), which is also the largest producer of coal through its seven subsidiaries³. The Government of India has stopped committing budgetary support to the Coal India Limited since 1995-96. But this does not mean corporatisation/autonomy for the CIL as it still directly operates under the administrative control of the Ministry of Coal. Therefore, its prices are usually fixed under the guidance of the ministry. Though the principles of fixing prices have not been set out explicitly, it is, in essence, determined on the basis of costs incurred in its production from different mines in a coal company plus a reasonable profit margin, in short, cost plus pricing (Ministry of Coal 2005, ch. 5). Legal provisions, from time to time as given below, were created to allow coal mining for captive end-use to meet the demand supply gap.

- In 1976 for iron and steel production and to permit the exploitation of isolated small patches by agencies approved by their respective State Governments.

³There are eight subsidiaries of CIL. Seven of them are production subsidiaries and the eighth one is Central Mine Planning & Design Institute Limited (CMPDI) which provides technical support to producing subsidiaries.

- In 1993 for power generation to induce investment to meet capacity shortage in power sector
- In 1996 for cement production

3.2.1 Plight of Captive Coal Mining policy

Captive mining policy was initiated to facilitate private entry in the coal sector to increase the production capacity. It is important to note that this provides an opportunity to independent (private) power producers to economise on transaction cost and inefficiencies that prevail in coal sector by vertically integrating with sources of fuel. But till now captive mining policy proved to be a non-starter. Mining blocks were awarded for captive end-use i.e., allotments were made with the condition that associated investment in either power, steel or cement production would be made.

In addition to this, captive miners are not eligible to sell their over production in the open market. They can sell their surplus to similar end users for other plants or to CIL at a price decided by CIL. There has been anxiousness among the experts that production has not started in many blocks that were awarded for captive mining. It is to be noted that under the best case scenario an open cast mine can be put into production only after 3 years (4 years for underground mines) provided it takes only six months to obtain: (i) mining leases; (ii) all necessary clearances including environmental clearance; and (iii) complete validation of the data in the Geological Reports. It is however, a well-known fact that such processes take anywhere between 2 to 5 years to complete. It may also be noted that achieving rated mine capacities could take another 2 to 4 years from the commencement of production.

Initially, the pace of awards of captive block were slow (only 46 blocks were awarded between 1993 and 2004). Out of these 46 blocks, 25 were awarded for power generation. Many blocks among this group are yet to start production. The slow performance is attributed to many factors. Some argue that most of these mines

were taken with no intention of development or end-use investment. The companies were just waiting for the policy to eventually allow free sale of coal in the open market (Kakkar 2005). But many are of the view that it gets delayed in the process of geological report, environmental clearance, land acquisition (Unknown 2008, Ministry of Coal 2005, p.47-49). Till now production has started in only in 14 of these 46 blocks. After 2004, 227 blocks have been awarded for the captive mining – 95 of them for power sector. Massive delays in operationalisation of these projects are again expected on accounts of above cited reasons (Ministry of Coal 2005, p.47-49). A total of 273 blocks have been awarded till now –159 to private sector and 114 to government sector. Sector and state wise distribution of awards of captive blocks are given in Table 3.3

Table 3.3: Ownership and end use wise Distribution of captive coal blocks since 1993 (in Numbers)

End Use	Private	Government
Power	52	67
Iron & Steel	97	4
Commercial	–	42
Cement	8	1
Isolated Patch	2	–
Total	159	114

Source: Ministry of Coal

<http://coal.nic.in/allblock050209.pdf>

3.2.2 Demand supply gap

Growth in coal demand has outstripped the growth in supply. The coal sector of India remained largely untouched by reforms, but is subjected to significant competition from foreign suppliers, particularly from Australia. The major users of coal i.e., the electricity generation industry and the steel industry have been complaining about the lack of competitive supply from domestic providers both in terms of quantity and quality. Most of the coal reserves are of low quality coal (i.e., low energy and high

ash content) – 82.7% of the total reserves are non-coking coal with very low gross calorific value (Table 3.4).

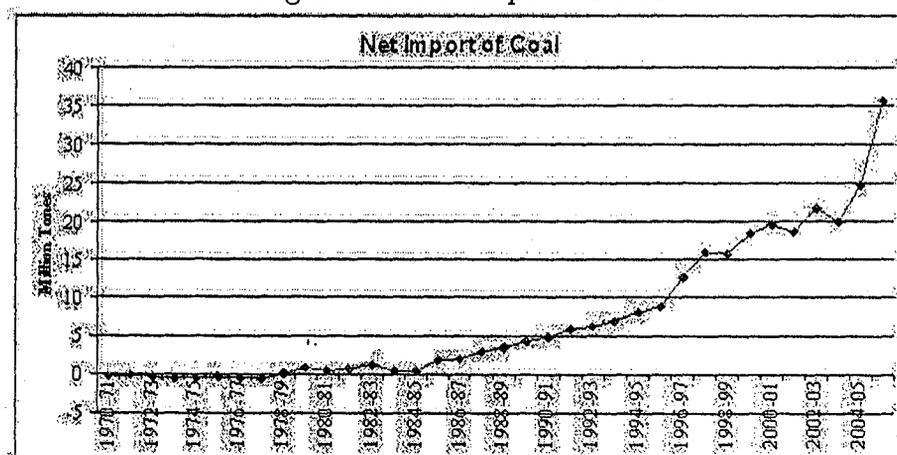
Table 3.4: Type of coal reserves in India as on 1st April 2006 (in million tonnes)

Type of Coal	Prime Coking	Medium Coking	Semi Coking	Total Coking	Non-Coking	Total
Proved Reserves	4614	11445	482	16541	79325	95866
Share (%)	4.81	11.94	0.5	17.25	82.75	100

Source: Ministry of Coal (2005)

As a result of this, domestic users of coal have shifted to Australian suppliers. The surge in imports (Figure 3.1) even after sufficient reserves at home to meet the demand has put the government under tremendous pressure to introduce changes in the coal sector. As yet, little has been done.

Figure 3.1: Net import of coal



Source: Ministry of Statistics and Programme implementation (MOSPI)
<http://mospi.nic.in/>

Coal will remain the most significant source for satisfying energy requirements for India in future as well. Even in best environment-friendly scenario Integrated Energy Policy report predicts that coal will contribute around 41% of the total requirements while in business as usual scenario it will contribute 54% of the total energy requirement. Given the current production rate and information about reserves India will

exhaust its coal resources within 120 years. Due to increased imports from Australia pressure on coal industry has been rising. It is in this regard that we see a steep rise in the award of captive blocks to end users in power and iron & steel industry –83% of the 273 captive blocks were awarded only after 2003. But speedy operationalisation of these captive blocks is still uncertain due to procedural delays on account of the above mentioned issues.

3.3 Oil & Gas Sector

India had 726 million metric tonnes of oil and 1055 billion cubic meters (bcm) of gas in proven reserves as of 2007, the second-largest amount in the Asia-Pacific region (behind China). The combination of rising oil consumption and fairly stable production levels (30 to 34 million tonnes (MMT)) leaves India increasingly dependent on imports (70 percent of total requirement) to meet its consumption needs. As a result of this, India is active in the international market for oil and gas as documented in chapter 2. Over the time many steps have been taken to increase domestic supplies in this sector. In the next section we examine the policies of this sector.

3.3.1 Regulatory Trajectory

Overall regulatory trajectory of oil & gas sector can be described in three phases. First phase can be described over 1971-1991. A shift during 1970s from the principle of import parity in pricing for the oil industry to an administered pricing mechanism (APM), with command-and-control instruments used to control the prices of the crude as well as finished petroleum products. Consequently, policies were introduced to attract private investment and technologies in the exploration and production (E&P) activities so as to supplement the efforts of the national oil companies (NOCs) even though there continued to be a preferential treatment for NOCs. Foreign oil companies such as Burmah Shell, ESSO, Caltex and Indo-Burmah Petroleum, which

virtually controlled the Indian oil industry, especially downstream, were nationalized by the government.

Since 1991, the government has embarked on a series of policy reforms designed to deregulate the sector and promote private participation. More than the rise of demand, the stagnation of production has been worrying. The main reason for a slow-down in supply is the decline in existing oil and gas fields. India produces approximately 820,000 b/d (barrels of oil per day), of which about 55% comes from the giant field of Mumbai High and its satellite fields; 18% from onshore fields in Gujarat; and 14% from the North-Eastern states of Assam and Nagaland. The production of the Mumbai offshore is declining since the field has been in production for nearly 30 years (efforts are on for enhanced recovery). As a result of the shortage in supply, there has been a rise in imports, which currently accounts for nearly 70% of the overall consumption and are expected to grow in future.

A policy document, the Hydrocarbon Vision 2025, was formulated by the Government of India to lay down policies for the hydrocarbons sector for the next 25 years. According to this document, the objective of the policies in the oil and gas sector would be to achieve “energy security, stability and sustainability”. Some of the significant guidelines in the document include the following:

- Exploration and production segment: Complete appraisal of sedimentary basins, absorbing/updating technologies, zero environmental impact.
- Refining and marketing segment: development of a globally competitive industry, creation of a free market and healthy competition, setting up of a common regulatory mechanism for downstream and natural gas.
- Natural gas: to become the preferred fuel for the future, bridge demand-supply gap through imports of piped and liquefied natural gas.

Thus, the demand-supply gap has to be addressed through large investments, both of capital and technology, so as to boost production levels and meet the growing

demand. That leaves a large scope open for private sector participation. But we can consider that this sector is still highly regulated even after its (moderate) efforts to liberalization during the early 1990s. The sector today can indeed be divided into three vertical stages:

3.3.2 Exploration and Production Sector

Exploration and production of oil and gas in the economy is dominated by state-owned enterprises, although the government has taken steps in the recent years to deregulate the hydrocarbon industry and encourage greater private/foreign involvement. India's state-owned Oil and Natural Gas Corporation (ONGC) is the largest oil company, and also the country's largest company overall by market capitalization. The Government of India's holding after issuing of shares in ONGC is 74.1 percent. ONGC is the dominant player in India's upstream sector, accounting for roughly three-fourths of the country's oil output during 2006 followed by Oil India Ltd, another Government of India (GoI) owned company (Table 3.5). In order to boost hydrocarbon explorations in the country, the Government of India introduced a New Exploration Licensing Policy (NELP) in the year 1997-98. The main objective of the NELP is to attract the latest technology and investment in exploration from national or international E&P companies. The policy allowed for 100% foreign equity, streamlined permitting processes, and most significantly, granted producers the right to sell gas at market prices. Companies like Reliance, Cairn Energy, British Gas, Essar Oil, Videocon, Prize Petroleum (50% stake in Prize Petroleum is Owned by a GoI owned company etc), are engaged in the exploration and production (E&P) of oil and natural gas in the country. Of these Reliance has discovered the most, oil and gas resources in the deep-waters of the Krishna-Godavari basin. The peak gain from the two fields is expected to be around 9,400 barrels of oil per day (b/d) and the gas production, 2.7 mcm/d (million standard cubic meters per day).

India's search for reliable supply of oil and gas from abroad has motivated her to

Table 3.5: Prime mover wise crude oil and natural gas production in 2007 (in MTOE)

Company	Crude Oil			Gas			Grand Total
	On Shore	Off Shore	Total	On Shore	Off Shore	Total	
OIL	3.11	0	3.11	2.08	0	2.08	5.19
ONGC	8.06	17.99	26.05	5.41	15.24	20.65	46.7
Private*	0.16	4.67	4.83	1.04	5.44	6.48	11.31
Total	11.33	22.66	33.99	8.53	20.68	29.21	63.19

* includes joint venture companies

Source: Modified from Ministry of Petroleum and Natural Gas (MoPNG)

<http://petroleum.nic.in/petstat.pdf>

acquire equity stakes in E&P projects overseas through overseas investment arms of National Oil companies. ONGC's subsidiary ONGC Videsh is the most significant of them, as discussed in section 2.8.2

3.3.3 Refinery Sector

The refinery sector has seen significant development in terms of private sector participation. By the end of March 2007, two private players namely Reliance Refinery at Jam Nagar, Gujarat (operative since 2000) and Essar Oil limited at Vadinar, Gujarat (operating since November 2006) owned nearly 22% and 7% of the total installed capacity (149 million tons) in the country respectively. India's Share in refinery installed capacity was 3.4 percent of the world total in 2005. Due to significant capacity additions in the refinery sector, India is a net exporter of petroleum products since 2002. Exports mostly come from private refining capacity in Gujarat, initially launched by Reliance but with a presence of foreign companies as well (Total, Shell). But a new geographical location is now being developed on the eastern coast in Visakhapatnam (which is a project led by Total in technical partnership with Mittal Steel). An incentive for investment in export-oriented refinery capacity is maintained through a differential tariff regime. Tariffs on imports of petroleum products are higher (10 percent) than crude imports (5 percent) which translates into an effective rate of protection of 40 percent for the refinery sector (MoPN 2006, p. 6).

3.3.4 Retail Marketing Sector

Finally, oil products are sold to the public at large through an extensive retail network run by three major companies owned by the federal government. Private entry in this sector has been limited because of the complex pricing regime in place. Prior to the dismantling of the Administered Pricing Mechanism (APM), effective from April 2002, the government had an oil coordinating committee with the responsibility of maintaining an oil pool account. Under the oil pool, certain petroleum products like aviation turbine fuels, petrol and diesel were priced higher to cross-subsidize kerosene, LPG and naphtha. However, it was decided to directly subsidise the supply of kerosene and domestic LPG. The oil marketing companies (OMCs) were to adjust the retail selling prices of the other products in line with international prices during this period. However, in compliance with Government directions, the OMCs did not make adjustment in the prices of kerosene and domestic LPG, resulting in substantial losses on these two products. With the sharp rise in prices at the international level, the burden of subsidy on PDS kerosene and domestic LPG soared to Rs 250 billion. In addition to this, the Government took back the control of price setting for petrol and diesel, and restrained the 'pass-through' of the international prices to domestic consumers. The study by Graczyk (2006b) claims that a large proportion of the taxes and levies are going to government exchequer instead of financing of subsidies. The report of the Committee on pricing and taxation of petroleum products recommended an increase in the retail prices of LPG and kerosene, restructuring of taxes and prices of petroleum products and better targeting of subsidies to reach their intended beneficiaries. The main recommendation of the report is to change the pricing formula from import parity to trade parity. The proposed trade parity principal reflects the fact that petroleum product exports have increased strongly since 2002. Refinery gate prices and retail prices would then be determined on a weighted average of the import parity price (80%) and the export parity price (20%). The formula would be adjusted annually (MoPN 2006).

3.3.5 Gas Sector

Gas contributed to 7.6% of the total commercial primary energy requirement (379.2 mtoe) in 2005. Gas supplies are mainly used for power generation and in fertiliser manufacturing (Table 3.6). Gas is a relatively clean fuel for power generation. After the liberalisation of power generation in 1991 gas is being increasingly chosen by the private sector. Nearly 11% of the total installed capacity and actual generation of electricity was gas based in 2004-05. The supply of gas is limited because of the limited production at home as well as the limited possibility of imports due to limited capacity of LNG (liquified natural gas) terminals and non existence of any transnational gas pipeline. In addition, imported gas through LNG terminals is unable to compete with coal as fuel for power generation(Phadke 2001). Because of the NELP policy a dualistic market for gas has come in existence; one with strict quantitative allocations at subsidized prices controlled by the public sector and another one based on market principles controlled by the private sector and joint venture (JV) operators(Jackson 2005)⁴. It is expected that the share of public gas in India's overall gas supply position is expected to reduce while the share of private gas is expected to increase due to the fact that more and more exploration blocks are awarded to private parties thereby shifting the balance towards an open and competitive gas supply market(Graczyk 2006a).

the prospect of gas as future fuel for power generation are not yet certain. This is on account of uncertainties about transnational gas pipe line development (see Section 2.8.2p. 44), necessary transport and distribution infrastructure at domestic level, world gas supply prices and coal sector policies, as coal is the major competing fuel for gas. Due to different assumptions about these factors projections, done by various studies for the future prospect of gas sector widely differ (for details see Graczyk 2006a). Sreenivas et al. (2007) claim that there has been lack of transparency

⁴Quantitative allocation of gas to different sectors of the economy is decided by an inter-ministerial committee called Gas Linkage Committee (GLC)

Table 3.6: Industry-wise Off-take of Natural Gas in India (in %)

	1990-91	2000-01	2002-03	2003-04	2004-05	2005-06	2006-07
Power	28.47	31.59	35.08	37.14	39.31	38.29	38.14
Industry	6.48	10.30	9.81	10.03	11.60	12.18	10.22
Tea plantation	0.70	0.54	0.40	0.46	0.46	0.49	0.54
Domestic use	0.39	1.20	2.18	0.30	1.11	0.24	1.41
Captive use	13.90	17.96	18.05	15.74	16.06	16.27	16.05
Other energy use	0.00	0.14	0.45	4.09	0.75	3.61	0.13
Fertilizer Industry	43.96	30.44	26.55	25.53	26.56	25.02	27.09
Petro-Chemicals	3.20	2.80	3.43	3.65	4.02	3.79	4.39
Others	2.90	5.03	4.05	3.07	0.12	0.12	2.04
Total (mcm*)	12766	27860	29964	30905	30775	31025	31368

*mcm is million cubic meter.

Source: Petroleum Statistics, Ministry of Petroleum and Natural Gas

<http://petroleum.nic.in/petstat.pdf>

and fairness in the pricing for gas that were found in Krishna-Godavri basin by Reliance.

Therefore, we see that the power sector faces significant bottlenecks from input front. Both coal and oil & gas are yet to develop credible regulatory trajectories that will help stakeholders to make decisions that are free from regulatory risk. In addition, given the limited capacity of CIL and procedural delays in captive mining of coal will keep the supply of coal restricted in near future. The second most important source of electricity after coal is hydro power. Many government reports claim that a large potential for hydropower remains untapped. But realistic assessment of what is actually possible (or economically competent) after controlling for resettlement and rehabilitation issues is seldom done. This aspect assumes importance under the light of the new resettlement and rehabilitation policy announced by the Government of India in 2007 which may take shape of a legal mandate in near future.

3.4 Electricity Sector

Electricity being the most modern and sophisticated fuel for end users, its importance in advanced societies is huge. Almost every activity in developed countries are dependent on electricity. As India's economy reaches higher levels of development we see secular increase in the share of electricity in the basket of final consumption of energy (Table 3.7).

Table 3.7: Growth of energy supply and electricity during 1980-81 to 2004-2005

	Unit	1980-81	1991-92	2001-02	2004-05
TPCES	mtoe	92.623	193.8	300.44	364.4
Final energy available	mtoe	68.764	130.7	171.37	194.23
TPCES to electricity	mtoe	28.824 (31.1%)	75.4 (38.9%)	122.82 (40.8%)	180.83 (49.63%)
Final electrical energy used	mtoe	6.953	17.5	27.2	38.42
Electricity in total final energy	%	10.1	13.4	15.9	19.8
Conversion and T& D losses	%	75.9	76.8	77.9	78.9

TPCES is total primary commercial energy supply

Source: Sengupta & Siddiqui (2007) and Energy Balances of Non-OECD Countries, 2004-05, International Energy Agency, Paris.

Under the Constitution of India, electricity is a joint responsibility of the Central and State governments: with policy being the prerogative of the former and the latter enjoying the right to operate the sector. This industry evolved as a vertically integrated industry under the ownership of the State Electricity Boards (SEBs) and Electricity Departments (EDs) in every state of India. They virtually owned every generation, transmission and distribution asset. Slowly these SEBs began to be used as political tool by the respective state governments (Dubash & Rajan 2001). Politicians in office usually reduced tariff for agricultural and domestic consumers without any earmarking of how much subsidy had to be paid by the Government to SEBs. As a result of this, SEBs soon faced financial losses. Due to these problems, India's power sector witnessed the first initiative – the World Bank helped India to create National Thermal Power Corporation (NTPC) and National Hydro Power Corpo-

ration (NHPC) during the second half of the seventies under the ownership of the Government of India. SEBs were expected to buy power from these companies. After the creation of these companies the World Bank has always funded projects through these organizations. The idea was to make SEBs pay for every unit of power they needed. The end result of such policy was that SEBs continued with ever increasing losses because under the above mechanism there was nothing that made state governments responsible for the financial viability of the SEBs. On the other hand, the NTPC continued earning profits along with capacity growth. In India, this distorted the real situation from the original intentions of the Constitution, to the advantage of the central government. Today, the NTPC is the most dominant player in the power generation market of India. A part of its installed capacity growth was due to asset transfers from the SEBs in cases of default. In 1989 Power Grid Corporation of India Ltd (PGCIL) was incorporated under the ownership of the central government to coordinate the interstate transfer of electricity.

In the early 1990s, comprehensive reforms in the electricity sector were initiated, which gradually allowed private and foreign investment in almost every segment of the industry. Initially, in this phase, generating capacity additions got the priority by seeking private/foreign participation. The performance of the generating sub-sector improved but at the cost of unintended effects in other sub-sectors. On the other hand, it failed to attract the expected capacity installations. By the end of 2006-2007, only 24 percent of the total installed capacity came from private sector. Lack of financial viability of the SEB's was cited as the major reason for failure of generation capacity addition programme. As a result of this, focus shifted to reforming SEBs by the end of mid 90s. Many SEBs were unbundled vertically as well as horizontally. Orissa and Delhi went to the extent of privatization of distribution assets. Independent regulators were mandated by a special act in 1998 that would decide the tariff of electricity at bulk and retail levels. The step was taken to remove the SEBs from the virtual control of the governments in matters of tariff and other executive functions.

The total installed capacity of electricity generation was 157 GW for the year 2006-07. Most the electricity was generated through coal fired thermal plants (72%). Electricity sector consumes 73% of the total coal produced in the country. The next important contributions to electricity generations come from hydro plants (14%), followed by gas fueled plants (10%) and the rest (4%) comes from diesel, nuclear and renewables. The electricity sector still faces with shortages. Peak capacity and energy shortages for electricity in 2006-07 were estimated to be 14.8% and 8.4%, respectively. This has forced many industrial units to build generation capacity for their own needs generally known as captive plants or non-utility plants (Table 3.8).

Table 3.8: Fuel wise installed capacity of Non-Utilities as on 31.02.05

Fuel	Gas	Hydro	Steam	Diesel	Wind	Total
Capacity (MW)	2866.4	58.93	8903.16	7126.86	147.22	19102.57
Share (in %)	15.01	0.31	46.61	37.31	0.77	100

Source: CEA (2006)

<http://www.cea.nic.in/>

In addition to this many households do not have access to electricity. According to the latest information available from the Census of India, 44 percent of the houses were yet to have electricity in their homes in 2001 (Table A-10p. 215). The evolution of the sector can best be understood in larger terms of the struggle between the federal and the state levels. As electricity has seen the largest systemic changes, we examine this sector more closely.

3.4.1 Retreat of the States or Consolidation of the Centre in Power Sector

In the face of the factual pre-eminence of the states, an attempt by the Centre to regain the upper hand started right from the 80s. The creation of the National Thermal Power Corporation and of the National Hydro Power Corporation (NHPC), the set-up in 1992 of Powergrid as a 'Central Undertaking' for developing interconnec-

tions between the States and building a single national network out of the five Indian electrical regions, reinforced the Government of India in the direction of the earlier near-monopoly previously held by state governments in implementing electricity policies.

This come back of the Centre has been very successful, since, in 2008 it controlled 32% of the generation (as against 64% for the SEBs and 4% for the private sector up to 1999). Power Finance Corporation – created as a public body in charge of financing projects for the SEBs outside the classic public investment financing systems – has established some conditionalities on loans aimed at institutional reforms, along with a system of control over their implementation. In this context, one question that becomes relevant is, to what extent can the recent evolution in this sector be explained by the influence of the forces internal to India and to what extent are they due to the external pressure exercised by lending organizations?

In 1991-92, the Government of India decided to open up the generation of power to private investment, including foreign investment. The Centre having acquired greater control over generation than it had over the transmission and distribution networks, found it simpler and quicker at the time to open up generation alone. Moreover, this enabled it to avoid entering into a debate over the matter of a public service on a network enjoying a status of natural monopoly at the level of states. Regulations guaranteed a 16% rate of profit on equity to independent (private) producers, as against the earlier regulation of 3% of profit on total assets employed. Despite that, out of the 20 GW that was expected from the private sector by the Planning Commission for the Eighth Plan (1992-97), only 2.7 GW were added. However the question is not always just of regulation, but also of technological and investment choices. The reports by the Planning Commission, as well as experts' analyses have long lamented that investment choices by the public sector tend to favour the construction of new power plants to a better maintenance or restructuring of existing infrastructure. There has been little economic assessment of this untapped potential,

except for calculations of Ruet (2006a). He calculated and compared internal rate of return of rehabilitation projects (transmission, plant load factor, reduction of losses) vis-a-vis generating capacity addition.

Table 3.9: Profitability of alternative strategies to bridge the energy gap (%)

Strategies	Internal rate of return (%)		
	1997 Actual tariffs	1997 at tariffs to cover costs	2002 Actual tariffs
New plants	4	7.5	8.6
Mixed strategy - 45% New plants - 55% Correction of PLF of old plants	10.5	18.5	13.4
Mixed strategy - 30% New plants - 70% technical losses improvement	13.5	18.6	19.2
Elimination of non-technical losses	135	347	339

Source: Ruet (2006a)

Even at subsidized tariffs that prevailed during early stage of reforms (1997), rehabilitation strategies were economically more viable than capacity addition; an adjustment in tariffs would have made them quite profitable. In 2002, after subsequent tariff increases had happened, these measures would have still been profitable – simply because the objective situation of the network had worsened and the potential for better management had widened (Table 3.9). Retrospectively, one can even see that a regulatory regime based on tariffs covering costs has been detrimental to genuine incentives to lower the cost. Detailed treatment on incentive effects of cost based tariff regulation is done in next chapter.

Indeed, what can be considered as a second phase of the reforms, initiated in 1995, brought out unexpected results on the relations between the Centre and the States. In 1996, the Chief Ministers of the states and the representatives of the Government of India met and it was decided that the states which so desired, could also open up transmission and distribution to private investors. It was also agreed in principle that

a Central Electricity Regulatory Commission (CERC), and State Electricity Regulatory Commissions (SERCs) would be created, independent of governments. This agreement however did not fix the modalities for the setting up of these Commissions nor their attributions. It is notable that while the conference was encouraged by the World Bank and while it marked symbolically the turning point in the “globalization” of the sector, the Government of India organized it at a time when it was experiencing no particularly pressing financial problem, and was not bound by any loan conditionality. As for the states, a former Joint Secretary for Power, acknowledged during a conversation that the Chief Ministers did not really feel greatly bound by this declaration, which opened up a possibility of an inflow of private capital but without specifying the constraints it would bring on the Commissions. A legal Act has finally established the creation of these Commissions in 1998.

This opening up to private capital and disengagement of the states has several advantages for the Centre. It is, in the last resort, the financial guarantor of the States, and the burden of public investments in deficit sectors is considered too heavy today as compared to the small operational control that it exercises over them. This absence of control proceeds from two factors. Firstly, the tariff and redistributive policies appear ill-adapted to the objectives of the Centre, the subsidies going more to the rich farmers than to the poor peasants, whereas the social cost of the sector is large since a not negligible share of the budget transfers is used up by the power sector at the expense of direct social programmes (Gulati & Narayanan 2000). Secondly, the use of the sector for local electoral ends does not bring it any direct advantage at the Centre and even works against it keeping in mind the fragmented political situation in India. That is why the Government of India has extended to all the generators, and therefore to itself, the possibility of formulating tariffs on the principle of a profitability of 16% of the assets and imposing cuts on the SEBs which are bad debtors. The effect has been to place its company, NTPC, acknowledged, moreover as being technically efficient, in a favorable situation. This has also resulted in accentuating the financial pressure

on the SEBs and therefore the pressure exerted by the Centre on the states, thus forcing them to undertake reforms.

The states on their part have tried to oppose the views of the Centre concerning the Regulatory Commissions, and the Electricity Regulatory Commissions Act that were adopted in 1998 without fixing a minimal tariff (but while maintaining most of the other characteristics, which by itself constitutes a forward thrust by the Centre). The Commissions have since 1998 gradually been set up in most of the states. Ultimately, only Orissa (in 1999) and Delhi (in 2002) have undergone privatization of the distribution of electricity. Both experiments have shown that improvements are longer to come than anticipated. The analysis in the next chapter would show that incentive effects these changes in the power sector.

3.5 Conclusion

Reviews of coal and gas sector show that credible regulatory trajectory that will reduce regulatory uncertainty is yet to emerge. Effective functioning of the market in energy sector is conditioned upon a good regulatory regime in place due to the nature of investment that is required for the development of energy sector. Massive amount of sunk and durable investment in energy sector inevitably leads to imperfect market structure creating possibilities for the abuse of market power. On the other hand uncertainties regarding supplies of coal and gas are significant. The procedural delays in starting production from captive coal mines and uncertainty about transnational and domestic pipelines for gas and international gas prices make it difficult to project the directions in which capacity additions will take place. Therefore, a part of the failure in adding capacities in power generation can be attributed to uncertainties of input market. The large literature on India's electricity reforms that exists today fails to address the problems that exists in input markets. Future studies in this direction would help us to know the extent to which failure in achieving capacity

additions can be attributed to policies of power sector and uncertainties in the input market.