



## ENVIRONMENTAL CHALLENGES TO THERMAL POWER INDUSTRIES: AN EXPLORATORY STUDY IN INDIAN CONTEXT

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### ABSTRACT

Power Industries has been and continues to be a major contributor to the economic growth of most of the developed and developing countries. Power sectors, in particular represents one of the industries with highest environmental impact and has been subject to increasing pressure from new economic, energy saving and environmental issues. Gracefully many technologies to reduce the environmental burden and greening the supply chain in Power Plant sector have been developed. Yet implementation of these technologies is not free from challenges. In this paper, an attempt is made to explore environmental challenges faced by Indian thermal power industries. For this, a field study was carried out by arranging interviews of experts of select power industries. The results indicate that top management commitment and support; training and awareness of internal people, unacquainted society, and poor legislation are the few important challenges for effective implementation of environmental management practices in Indian power industries.

**KEYWORDS:** Power Sector, Environmental Management.

### INTRODUCTION

Over the years worldwide concern for the environment has been gaining much attention. The concept of *environmental protection and resource management has traditionally been given due emphasis and woven* in all phases of life in India. These practices forced people to live with perfect harmony with nature. Nevertheless, changing lifestyle, increasing pace of urbanization, industrialization and infrastructure development have caused environmental pollution and degradation (Chopra et al, 1993). Industrial activities which lead to environmental pollution has raised the concern of promoting more environmentally friendly production in order to mitigate the impacts of pollution. Further it has been reported that environmental problems associated with significant amount of waste and emissions from various activities have forged organizations, phasing competitive, regularity and community pressure to move towards environmental strategy and to explore it. However, most of the adopted given strategy, especially in developing countries, remain to be the traditional one. The traditional approach does not eliminate pollutants effectively.

Some researchers have tried to identify and categories the firms environmental behaviors (Hunt & Auster, 1990; Roome, 1992; Aragon –Correa, 1998; Henriques & Sadorsky, 1999; etc). Others have emphasized the motivations and obstacles to mplementation of green strategy (Porter & Van der linde, 1995; Henriques & Sadorsky, 1996; Reynaud, 1997; Sharma 2000 etc). Various environmental management practices such as, ISO 14001 certification and cleaner production have been implemented by various industries. As a more systematic and integrated strategy, green supply chain management (GSCM) has emerged as an important new innovation that helps organizations develop ‘win- win’ strategies that

achieve profit and market share objectives by lowering their environmental risks and impacts, while raising their ecological efficiency[R.I. van Hock, 2000]. Nearly every industry has been hit by green fever. The power industry is no exception.

Although, in the next future, the green revolution would affect every business activity, there exists some industry more liable for such change. The study focuses on power industries. The Power Industries, in particular represents one of the industries with the highest environmental impact and has been subject to increasing pressure from new economic, energy saving and environmental issues (Majumdar and Marcus, 2001). Thermal power plant performs various activities such as crushing of coal, processing and transportations. In comparison with other sectors potential social and environmental issues associated with TPPs are both significant and complex to manage. Use of command and control technologies, unskilled etc; which ultimately negatively affects environment that making the sector most polluting. Implementation of various activities with proper planning and strategy, we can reduce negative impacts.

### Power Generation in India

The recent forecast by Goldman Sachs Global Research projects indicates that the Indian economy will be the second largest in the world by 2050 i.e. next to that of China. It has scaled up India’s position projected in their 2003 report. It projects an 8% growth of Gross Domestic Product (GDP) till 2020. Though India has made tremendous progress in the post independence era, she faces formidable challenges in meeting the energy needs of the country. The energy sector and more so the Indian power sector will have the formidable challenge of helping the country sustain this growth. Energy of the desired

quality, in various forms and produced in a sustainable manner and at competitive prices, has to be provided if the pace of development is to be maintained. To sustain the present economic growth rate of 8% to 10% over the next 25 years and to meet the lifeline energy needs of all citizens, India needs to increase its primary energy supply three to four times and its electricity generation/distribution/supply capacity five to six times their 2003–2004 levels. With 2003–2004 as the base, India’s commercial energy supply would need to grow from 5.2% to 6.1% per annum while its total primary energy supply would need to grow at 4.3% to 5.1% annually. By 2031–2032 power generation capacity must

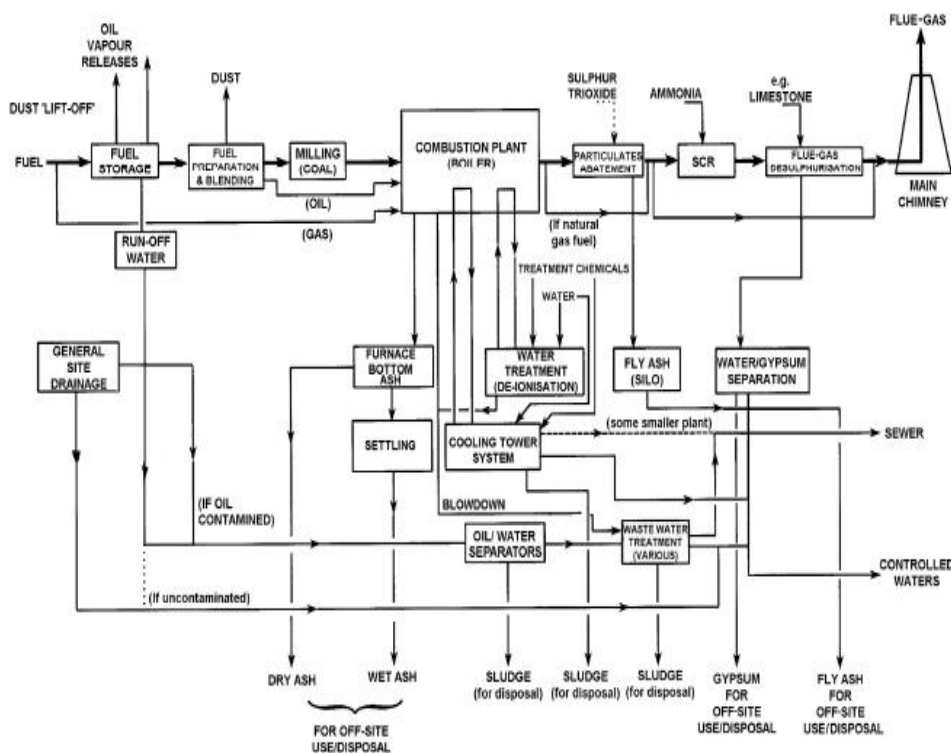
increase to nearly 800 000 MW from the current capacity of around 160 000 MW inclusive of all captive plants. Similarly, the coal requirement, the dominant fuel in India’s energy mix, will expand to over 2 billion tonnes/annum based on the domestic quality of coal. Meeting the energy challenge is of fundamental importance to India’s economic growth imperatives and its efforts to raise its level of human development. If we take the base year of 2006–2007, the projected energy requirement (at 8% or 9% growth rate) as per the projection of the Ministry of Power, Government of India will be as in Table 1.

**TABLE 1:** Projection for Electricity Requirements (As per Ministry of Powers)

Year	Billion kWhr		Installed capacity(GW)	
	8 %	9 %	8 %	9 %
2006-2007	700	700	140	140
2011-2012	1029	1077	206	215
2016-2017	1511	1657	303	331
2021-2022	2221	2550	445	510
2016-2027	3263	3923	655	785
2031-2032	4793	6036	962	1207

To meet these requirements, the country has to pursue all the available fuel options and forms of energy, both conventional and nonconventional. Further, she has to exploit all energy resources and seek new and emerging energy sources, besides pursuing technologies that maximize energy efficiency. The role of hydro, nuclear and renewable sources of power become important. It appears that coal shall remain India’s most important energy source till 2031–2032 and possibly even beyond.

But Indian coal has a very high ash content that adds to the environmental and health problems. The growth in Indian Power industries due to suitable policy and investment climate supported by favorable demand has intensified the adverse impacts on environment. Figure1 is a generalized flow diagram of a boiler based thermal power plant and its associated operations.



**FIGURE 1:** Flow diagram of a boiler based thermal power plant and its operations

## METHODOLOGY

The objective of study is two folded. First, to understand the threat faced by thermal power industries in context with environment and second is to explore the corresponding challenges. For the purpose, six thermal power industries were selected from three states of India. Personal visits were made to these selected industries to collect data. Data were collected by interview and

## RESULTS AND DISCUSSION

Findings of interview were analyzed to understand separately the threats and then challenges. Threats and challenges in the context of environmental management are summarized below.

**Environmental Threats:** Following are the important environmental threats.

### Air Pollution

SO<sub>2</sub>, NO<sub>2</sub> green house gases and fly ash released from Power industries have the potential to pollute the air. Fly ash is produced as a result of coal combustion in thermal power plants. fly ash is defined as a heterogeneous mixture of amorphous and crystalline phase and is generally fine powdered of ferroaluminosilicate material with Al, Ca, Fe, Na and Si as the predominant elements. Certain elements like Boron, Mo, S and Se are characteristically enriched in fly ash particle [Adriano, Page et al, 1980]. Besides that dust produced from crushing of coal and from movement of heavy vehicles also contributes to air pollution.

### Water Pollution

The quality of the available quantity of fresh water is continually deteriorating because of pollution resulting from the unplanned development activities. Waste water generated from TPPs contains significant concentration of contaminants such as phosphate, ammonia dissolve solids, metals and Hydrazine. In addition to thermal pollution, effluents (such as waste water effluents are generated from demineralizer backwash, resin regenerator, boiler blow down, ash transport, runoff from coal and ash piles) and discharges from accidents and spills from thermal power plants can pollute local water bodies, including ground water.

In addition to being used as a coolant, a large volume of water is also consumed for making ash slurry – the water requirement is about five times the amount of ash. The water used for the fly ash slurry is generally not recycled, increasing both the consumption of water and generation of wastewater effluents.

### Noise Pollution

A cumulative effect of the various activities like, turbine generator and auxiliaries, boilers and auxiliaries such as coal pulverizers, reciprocating engines, fans and duct work; pumps, compressors, condensers, precipitators including rappers and plate vibrators, cooling towers, crushing, and material transportation, produces huge noise and vibrations in the plant area leading which results in hearing loss, other health related problems and loss of performance.

### Other Miscellaneous Threats

The most popular negative socio economic impacts identified in thermal power plants in the visited sectors are health safety (e.g. Impact of electromagnetic fields or

observation technique. Twelve key executives of environment management cell of industry were interviewed. Interview was arranged mentioning the purpose and it was purposely unstructured in order to explore and understand the prevailing situation in depth. Name of executives and organizations are not mentioned here because of the confidentiality reasons.

labor safety), accidental hazards and changes in land use due to the pressure of the development

### Environmental Challenges:

There are many possibilities to reduce the environmental problems of ongoing activities yet implementation of these technologies faces lot of challenges. Following are the important challenges to environmental management practices in thermal power industries in India. .

### Technical Challenges

The Technical challenges of the power sectors in India include low efficiency of thermal power plants. Approximately 35% of India's population is still without electricity. Many of the thermal power plants are not operating to their full potential because they are not aware about the latest version of technologies or fail to identify the areas where these advanced technologies could be utilized. Especially small-scale industries in India, lacks the technical or financial capabilities for proper exploitation, development, or processing. They also often lack sufficient mechanical equipment and adequate maintenance facilities which reduces output per unit input and increases waste production. Many small scale industries are not subjected to government regulations, and as much of small scale activities are carried out illegally, is thus difficult to monitor and control [M.K.Ghose].

### Unacquainted Society

The society, including citizens, politicians and bureaucrats are not familiar enough regarding the environment issues and cause. This lack of awareness is compounded by the low levels of literacy and the poor mass media concern. Workers and trade union leaders are generally not aware of occupational health problems. Managements also are little aware of opportunities for cost savings in the areas of waste reduction or elimination of pollution, energy efficiency and prevention and mitigation of accidents.

### Faint Employee's Obligations

Most of the power industries do not have proper and effective performance evaluation system, they also do not have proper rewarding scheme for the employees to motivate them to be held responsible for protecting the environment. The roles, responsibilities and authority of the staff are neither properly defined nor communicated to all organizational members. This leads to confusion among staffs regarding their responsibilities and poor motivation towards environmental protecting practices.

### Deficient Management Commitments

Top management in most of the power industries is less concerned over environmental issues and reluctant to allocate adequate financial, technological and human resources to implement the green management practices. There is also an inevitable amount of hesitancy by top management towards implementation of green management practices as it involves huge amount of documentation work and a serious non-compliance

uncovered during environmental auditing process might lead to social outcry or, even legal action. [A. H. Quazi]

#### **Economical Hindrances**

Financial barrier is the biggest barrier in implementation of any environmental practices. Study reveals that environmental management practices need high levels of funding. Specifically, some companies spend over 20% of their total revenue in adopting environmental measures, employee environmental training and appropriate equipment. The same has been reported by I.E. Nikolaou, and K.I. Evangelinos.

#### **Poor approach of Implementation**

Indian Thermal power sectors lacks effective monitoring system, whose primary purpose is to access actual environmental performances against the stated environmental policies, objectives and targets,. Administrative delays, apathy and inadequate personnel training and lack of inter-departmental co-ordination during implementation prevent environmental protection and improvement. Short term focus is another contributing factor in failing to achieve the desired environmental culture.

#### **Poor Legislation**

A frequently changing regulatory climate of India, obstructs long-term environmental plans, and discourages power plants from implementing greener management practices. For smaller plants, which already have limited resources, from a business management and economics standpoint, rather than wasting time, energy, capital, and resources to re-establish proactive corporate environmental "position", it makes more sense to simply operate in line with the standard set by the environmental legislation, and to change operations only when necessary[Hilsona G]. Corruption and a lack of political will also play its role in nonperformance of these and related pollution control measures [M.K.Ghose]. Enforcement is a key drawback with regulatory arrangements in the sector. It is better enforcement, rather than more regulations that can begin to remedy the ills plaguing the sector today.

#### **CONCLUSION**

This research attempts to explore challenges to implement environmental management practices in power industries in Indian context. Study indicates poor top management commitment and unawareness of employees and society are the critical challenges. Indian organization must have to realize the importance and benefits of identified challenges. This will help them to evaluate the degree to which these challenges are present in their organizations. Indian power industries have to evolve suitable strategies to address these challenges. The present study has been conducted by interviewing only select power industries. Future study may be conducted by increasing the sample size so that result obtained can be generalized and common strategy may be evolved to address these challenges suiting to needs of Indian thermal power industries.

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