



Implementation of green supply chain management in India: Bottlenecks and remedies



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ARTICLE INFO

Article history:
Available online 2 June 2016

Keywords:
Green supply chain management
Power industry
Bottlenecks
Remedies

ABSTRACT

The Indian power industry has entered a transition from traditional operations to modern practices. An analysis of developments in Punjab shows how state-owned power companies have been in the vanguard in implementing a holistic model of green supply chain management that reduces losses and inefficiencies while also addressing environmental concerns.

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1. Introduction

With their insatiable appetite for power, developed and developing economies all across the world are gearing up to augment their power generation capacities, at a potentially serious threat to the global environment. The power industry has been identified as the second-largest polluting industry, owing to greenhouse gas emissions caused by burning fossil fuels. The pollution caused by the industry is not limited to generation, but is manifested all through the supply chain. Thus, what is called green supply chain management (GSCM) finds extensive application in the power industry, and has the potential to deliver cleaner energy coupled with economic gains for organizations that adopt it. The concept, as applied to the power industry, has matured over a period of time, as various theories and models have been developed by researchers. Yet, there are still relatively unexplored areas of this discipline that could yield even greener supply chains.

Power companies are waking up to the fact that green operations are not only eco-friendly but make acute business sense, too. In India, a few power companies have reworked their supply chains, but much remains to be done by many others. The opportunities created by intensive GSCM practices for state-owned power companies (SOPCs) justify a comprehensive study of the area.

Until recently, the lion's share of activity has occurred at the state electricity boards (SEBs); few efforts have been made by the majority of power companies. Though the PSUs owned by the central government as well as new privately owned generators

have exhibited interest in GSCM practices, the role of SEBs and other state-owned, state-level power utilities has not been very encouraging. Though constrained by regulations and a competitive market structure, the SOPCs are gearing up for a major push to absorb GSCM – not only because it addresses environmental concerns, but for the substantial savings it provides. With a sudden rise of environmental awareness over the past decade, a consensus is forming that issues of environmental pollution accompanying industrial development should be addressed together with supply chain management, thus contributing to the initiative of GSCM (Sheu et al., 2005).

This research looks to meet the following objectives:

- To study the existing supply chains of SOPCs in the state of Punjab, and
- To identify bottlenecks in the adoption of GSCM measures.

A study on GSCM practices prevalent in SOPCs, along with the areas where improvisation and modernization can be done, will help the SOPCs' managements in decisively dealing with the problems of losses and inefficiencies in a number of operational domains, while also addressing the environmental concerns.

2. Material and methods

GSCM is an environmentally conscious approach to the traditional concept of supply chain management, identifying eco-friendly practices at all steps of the supply chain (Walker et al., 2008). GSCM encompasses all phases of a product's life cycle, from extraction of raw materials to its designing, production, and distribution phases, and then to the use of the product by

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consumers and its eventual disposal. Though the concept started getting acclaim in academic circles around the end of the 1980s, it was in the 1990s that it gained popularity among corporate and manufacturing enterprises as environmental management got integrated with ongoing SCM operations (Srivastava, 2007). But adoption is far trailing potential because it is a relatively recent concept, and because of the cost and technical complications attached to it. The implementation of GSCM practices is expected to result in improved environmental performance as measured by reductions in air emissions, effluent waste, solid waste, and consumption of toxic materials (Green et al., 2008). GSCM finds its applications not only in the manufacturing industry but in the service sector as well. The term “green” in GSCM refers to sustainability in the supply chain through low emissions and recycling strategies for waste generated. Green SCM is getting more attention as a sustainable development mode for modern enterprises and is seen increasingly as a part of broader corporate social responsibility (CSR) initiatives (Ravishankar 2011).

2.1. The relevance of GSCM to the power sector

The electricity sector in India had an installed capacity of 253.389 GW as of August 2014, making it the world's fifth-largest. The country's annual electricity generation capacity has increased in last 20 years by about 120 GW, from about 66GW in 1991 to over 253.389 GW in 2013.¹ The International Energy Agency estimates India will add between 600 GW and 1200 GW of additional new power generation capacity before 2050. This will have a huge detrimental impact on the environment, unless companies and users switch over to more eco-friendly ways of power generation, transmission, distribution, and consumption. In short, the need for an environmentally friendly supply chain is of paramount importance.

The energy sector around the world is plagued by three major problems: rising energy demand, aggregate technical and commercial (AT&C) losses, and the adverse environmental impact. GSCM, to a substantial extent, provides a solution to all these problems, as listed in Table 1.

2.1.1. Increasing energy needs

Along with the transportation sector, the power sector is identified as one of the two largest sources of greenhouse gas (GHG) emissions worldwide. With economies on an upswing in recent years, more prominently in developing economies like India, there is a serious threat to the environment in the coming decades. This will put extreme pressure on the energy resources of the country, and threaten a subsequent swelling of GHG emissions. This calls for adoption of high-end green technologies, infrastructure, and practices that augment fuel efficiency and also addresses environmental concerns as much as possible.

2.1.2. Aggregate technical and commercial losses

Inefficient supply chains, apart from their detrimental impact on the environment and the ensuing complications, are also responsible for mammoth losses posted by power companies in terms of T&D as well as aggregate technical and commercial (AT&C) losses. According to the CEA, T&D losses on a national level in 2010–11 amounted to 23.97% while AT&C losses amounted to 16.15%.² The losses amount to billions of rupees of prospective

Table 1
Problems and solutions.

PROBLEM	SOLUTION
Increasing energy needs	Sustainable development
Losses (AT&C)	Increased efficiencies
Environmental impact	Eco-friendly operations

revenues that might have been saved. Though existing technologies are not yet capable of fully eliminating the losses, a streamlining of the supply chain can cut losses down dramatically, resulting in huge monetary gains for power companies.

2.1.3. Environmental impact

With pollution worsening the lives of billions and creating massive losses for power utilities, it is important that new avenues of eco-friendly measures be identified and new technological developments undertaken to bring in greater efficiencies and cut down on emissions and losses. The pressure accompanying globalization has prompted industries to improve their environmental performance (Zhu and Sarkis, 2006). GSCM has greater relevance for the power sector than any other sector as there is tremendous scope for improvement in the existing supply chains.

An integrated power supply chain comprises three major sections: generation, transmission, and distribution. An addition section by the name of “end user consumption” also exists, and has a bearing on supply chain efficiencies. Each section has sub-elements carrying some association with environmental impact.

2.2. GSCM in SOPCs: why choose Punjab?

Punjab is one of India's more economically developed states, with a high rate of per capita energy consumption. The state's power sector has been instrumental in its economic growth, as much of the agriculture sector and small and medium-size enterprises (SMEs) thrive on power made available by the SOPCs. Any improvement in their supply chains is sure to translate into perceptible growth in the economy of the state.

The Punjab State Power Corporation Limited (PSPCL) and Punjab State Transmission Corporation Limited (PSTCL) are also representative of modern power utilities operating in India, which have been transformed into corporations from their erstwhile avatar of being an SEB. The erstwhile SEB, the Punjab State Electricity Board (PSEB), was bifurcated into PSPCL and PSTCL in 2010 on the recommendations of the Central Electricity Regulatory Committee (CERC), thereby presenting an appropriate option to study a state power utility. Further, their relative youth makes them more conducive to identifying and proposing changes than those which are old and characterized by a rigid pattern of operations. The findings of the study on these SOPCs should be more or less applicable to SOPCs in other states.

In a nutshell, the SOPCs of Punjab are nearly ideal choices for a study related to GSCM implementation, since the two SOPCs are identified with the typical power utility set up in most states, and are on the threshold of reforming their supply chains with an intent to leave the remnants of operational mediocrity behind.

3. Theory

Electricity generation is by far one of the biggest culprits in global warming. Electricity generating plants account for one-quarter of all carbon emissions for which human activity is responsible – and their harmful emissions have shot up by 60% over the past two decades, especially as China and India have experienced rapid economic growth (Don Grant et al., 2013).

¹ www.fortunemediagroup.in/Grid%20World/Brochure.pdf.

² http://articles.economicstimes.indiatimes.com/2013-09-13/news/42042045_1_power-plants-atc-losses-additional-power.

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