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CONTENTS

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INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

REFERENCES

APPENDIX/ANNEXURE

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- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

POWER SECTOR REFORMS DURING GLOBALIZED ERA: SOME EVIDENCES FROM INDIAN ECONOMY

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ABSTRACT

India, the second most populous country in the world with its vibrant economy and impressive growth of GDP has been facing challenges in meeting its energy needs. Indian economy is at a critical stage of development, where energy requirement has been increasing at a phenomenal pace. Even though, large part of the developed world is struggling to recover from the recession, the relatively faster emerging country like, India are aiming to meet the requisite demand for energy by introducing different reforms both in energy sector and power sector. With the economic growth of India set to take off, the power demand is forecasted to rapidly mount in next 25 to 50 years. It is well known fact that electric power is an essential input for the sustained growth in different facets of economic development. With increasing economic activities followed by population growth, there is a shift from the use of non-commercial energy to commercial energy sources, particularly fossil fuels including electricity, resulted in surging demand outstripping the supply. In spite of being the fifth largest electricity producer in the world, India's per capita electricity consumption rates remain very low in comparison to many developing countries. As the economy grows, the power sector of the country has been undergoing a massive revamp from policy changes to investment pattern and restructuring the preference for sources of power. Some important steps in this regard in the globalized era in India include outlining the reform of the power sector restructuring the state electricity boards, liberalizing the generation of power with private participations, stepping up efforts to secure oil and natural gas by investing in overseas oilfields, international agreements on nuclear cooperation which includes supply of nuclear fuels, greater emphasis of other renewable energy sources etc. With these background, the authors have made an attempt to examine the salient features of power sector reforms and their impact an Indian economy in the globalized era.

KEYWORDS
Power Sector Reforms and Economic Reforms.

INTRODUCTION

India's energy-mix comprises both non-renewable (coal, lignite, petroleum and natural gas) and renewable energy sources (wind, solar, small hydro, biomass, etc.) Information on reserves of non-renewable sources of energy like coal, lignite, petroleum, natural gas and the potential for generation of renewable energy sources is a pre-requisite for assessing the country's potential for meeting its future energy needs. The changes in the reserves over time indicate the research and development going into the discovery of new reserves and the pace of their exploitation. They also facilitate in devising effective conservation and management strategies for optimal utilization of these resources. Energy is the very basic and prime requirement for the mankind. It is one of the major factors on which the economic, social and industrial growth of any country and civilization depends. With 8-9 percent of Gross Domestic Product (GDP) rate and 17.0 percent of world population, India is one of the biggest consumers of energy. In the population stats India stood in second position after china. Demand of energy requirement is directly proportional to the development rate and population growth rate of the country (Deepak Kumar-2012). Presently in 2011-12 the total installed capacity in India is 181.5 GW (including conventional and non conventional sources) with peak load demand of 136 GW. Out of this energy demand only 118 GW is met having a deficit of 13.0 per cent in energy generation (CEA-Central Electricity Authorities). The gap between energy demand and supply is the most serious issues in India. The main reasons for this trend are demographics and economics. India's economy is growing, thereby demanding more energy and electricity. The population is also increasing and causing shortage in energy resources. There is also massive urbanization and modernization, which is putting more pressure on energy resources and the environment which cannot be neglected. The deficit in energy is also caused by the in-efficient power system structure which includes the generation, transmission and load distribution. In India, the major sources of energy are the fossil fuels. To meet out the increased energy demand and to reduce the carbon emission, the generation system needs electricity reforms, power system restructuring, demand side management, more renewable energy research and development centre. The main objective of the paper is to emphasis on the current status of electricity production and electricity consumption, various reforms in power sector with their effects, consumption and tips for energy savings.

OBJECTIVES OF THE PAPER

1. To Study overall Growth Rate of Electricity Consumption in India
2. To Study evaluate Per capita Energy Consumption of India and Tamil Nadu
3. To Important Policy and Strategies reform of Electricity Sector in India

METHODOLOGY

The present study is an empirical and analytical exercise based on the secondary data. The overall Electricity performance of India and Tamil Nadu evaluated on the basis of the availability of a comprehensive set of data from the various published and unpublished sources, the data are collected from the administrative report, statistical at a glance of the Ministry of Power, Energy Statistics. The main aim of the study is to analysis the performance appraisal Ministry of Power and TNEB.

ANALYSIS OF THE STUDY

The study used only Secondary data for analytical purpose. Secondary data are obtained from various published and unpublished sources such as Energy statistics, Ministry of Power Statistical report, TNEB Statistical Hand book, Central Electricity Authority, Electric Power Survey Report and various annual reports. The Statistical tools used in the study were percentages, Simple linear regression and Growth model.

INSTALLED GENERATING CAPACITY OF ELECTRICITY

The total installed capacity for electricity generation in the country has increased from 16,271 MW as on 31.03.1971 to 206,526 MW as on March, 2011, registering a compound annual growth rate (CAGR) of 6.4 per cent. There has been an increase in generating capacity of 18654 MW over the last one year,

which is 10.0 per cent more than the capacity of last year. The highest rate of annual growth (11.3 per cent) from 2009-10 to 2010-11 in installed capacity was for Thermal power followed by Nuclear Power (4.8 per cent). The total Installed capacity of power utilities in the country increased from 14,709 MW in 1970-71 to 173,626 MW as on March, 2011, with a CAGR of 6.2 per cent over the period. The highest CAGR (7.1 per cent) was in case of Thermal utilities followed by Nuclear (6.1 per cent) and Hydro (4.4 per cent). At the end of March 2011, thermal power plants accounted for an overwhelming 64 per cent of the total installed capacity in the country, with an installed capacity of 131.2 thousand MW. Hydro power plants come next with an installed capacity of 37.6 thousand MW, accounting for 18.2 per cent of the total installed Capacity. Besides, non-utilities accounted for 15.9 per cent (32.9 Thousand MW) of the total installed generation capacity. The share of Nuclear energy was only 2.31 per cent (4.78 MW). The geographical distribution of Installed generating capacity of electricity as on March, 2011 indicates that Western Region (both central and state sector) accounted for the highest share (30.98 per cent) followed by Southern Region (27.35 per cent), Northern Region (26.88 per cent), Eastern Region (13.45 per cent) and North Eastern Region (1.35 per cent). Region wise growth in the installed capacity during 2010-11 reveals that Eastern Region registered the highest growth of about 18.21 per cent, followed by Northern Region (10.1 per cent) and Western Region (6.65 per cent). Among the States in the Eastern Region that accounted for the highest growth of 18 per cent, Odisha registered the highest (47.7 per cent) followed by Jharkhand (27.1 per cent). Among all the states Delhi registered highest growth (105.1 per cent) in the installed capacity followed by Odisha (48 per cent) and Jharkhand (27 per cent).

GRID INTERACTIVE RENEWABLE POWER

The total installed capacity of grid interactive renewable power, which was 16817 MW as on March, 2010 had gone up to 19971 MW as on March, 2011 indicating growth of 18.75 per cent during the period. Out of the total installed generation capacity of renewable power as on March, 2011, wind power accounted for about 71 per cent, followed by small hydro power (15.2 per cent) and Biomass power (13.3 per cent). Tamil Nadu had the highest installed capacity of grid connected renewable power (6500 MW) followed by Maharashtra (3005 MW) and Karnataka (2882 MW), mainly on account of wind power. As on March, 2011 out of total Biogas plants installed (41.98 lakh), maximum number of such plants installed were in Maharashtra (8 lakh) followed by Andhra Pradesh, Uttar Pradesh, Karnataka and Gujarat each with about 4 lakh biogas plants. Out of about 6.6 lakh Solar Cookers installed as on March, 2011, 1.7 lakh were installed in Gujarat and 1.4 lakh were installed in Madhya Pradesh. Further, as on March, 2011 there were 1,352 water pumping Wind mills systems installed and 6,975 remote villages and 1,871 hamlets were electrified.

GENERATION OF ELECTRICITY

TABLE-1 TRENDS IN INSTALLED GENERATING CAPACITY OF ELECTRICITY UTILITIES AND NON-UTILITIES IN INDIA (In Gwh)

Year	Utilities				Non-Utilities			Grand Total
	Thermal*	Hydro	Nuclear	Total	Railway	Others	Total	
1970-71	28162	25248	2418	55828	37	5347	5384	61212
1975-76	43303	33302	2626	79231	38	6657	6695	85926
1980-81	61301	46542	3001	110844	42	8374	8416	119260
1985-86	114347	51021	4982	170350	43	12997	13040	183390
1990-91	186547	71641	6141	264329	29	25082	25111	289440
1995-96	299316	72579	7982	379877	24	38142	38166	418043
2000-01	409940	74362	16902	501204	-	59638	59638	560842
2005-06	505001	101494	17324	623819	-	73640	73640	697459
2009-10	670965	106680	18636	796281	-	109693	109693	905974
2010-11	704323	114257	26266	844846	-	114224	114224	959070
Growth rate of 2010-11 over 2009-10	4.97	7.1	40.94	6.1	-	4.13	4.13	5.86
CAGR 1970-71 to 2010-11	8.17	3.75	5.99	6.85	-	7.75	7.74	6.94

Source: Central Electricity Authority, 2012

Note: * Thermal includes Renewable Energy Resources, Small Hydro Projects, Wind power, Biomass Power, Biomass Gasifier, Urban & Industrial Waste and Solar Power

The all India gross electricity generation from utilities, excluding that from the captive generating plants, was 55,828 Giga Watt-Hours (GWh) during 1970-71.(Table 1). It rose to 1,10,844 GWh during 1980-81, to 2,64,329 GWh during 1990-91 and to 8,44,846 GW during 2010-11. The CAGR during the period from 1970-71 to 2010-11, has been an impressive 6.9 per cent. The production of electricity from utilities has increased from 7,96,281 GWh during 2009-10 to 8,44,846 GWh during 2010-11, registering an annual growth rate of about 6.1 per cent. Total Electricity generation in the country, from utilities and non-utilities taken together, during 2010-11 was 9,59,070 GWh. Out of this 7,04,323 GWh was generated from thermal and 1,14,257 GWh was from hydro and 26,266 GWh was generated from nuclear sources. Total output from non-utilities was 1,14,224 GWh.

AVAILABILITY OF ELECTRICITY

TABLE-2 TRENDS IN AVAILABILITY OF ELECTRICITY IN INDIA (In Gwh)

Year	Electricity (GWh)	Electricity in Percentage
1970-71	27666	3.4
1975-76	35928	4.4
1980-81	49543	6.1
1985-86	56003	6.9
1990-91	77782	9.6
1995-96	80561	10.0
2000-01	91264	11.3
2005-06	118818	14.7
2009-10	125316	15.5
2010-11	140524	17.4
Growth rate of 2010-11 over 2009-10	12.14	-
CAGR 1970-71 to 2010-11(%)	4.04	-

Source: CEA-2012

Electricity availability is considered only for that electricity which is generated from Hydro and Nuclear sources. Without taking into account the transmission and distribution losses, the total availability is equal to the total generation, and this figure increased from 27,666 GWh during 1970-71 to 1,40,524 GWh during 2010-11, registering a CAGR of 4 per cent over the period.

CONSUMPTION OF ELECTRICITY

TABLE-3 CONSUMPTION OF ELECTRICITY (FROM UTILITIES) BY SECTORS IN INDIA (In Gwh)

Year	Industry	Agriculture	Domestic	Commercial	Traction and Railways	Others	Total Electricity Consumed
1970-71	29,579	4,470	3,840	2,573	1,364	1,898	43,724
1975-76	37568	8721	5821	3507	1855	2774	60246
1980-81	48,069	14,489	9,246	4,682	2,266	3,615	82,367
1985-86	66980	23422	17258	7290	3182	4967	123099
1990-91	84,209	50,321	31,982	11,181	4,112	8,552	190,357
1995-96	104693	85732	51733	16996	6223	11652	277029
2000-01	107,622	84,729	75,629	22,545	8,213	17,862	316,600
2005-06	151557	90292	100090	35965	9944	24039	411887
2010-11	272,589	131,967	169,326	67,289	14,003	39,218	694,392
Growth rate of 2010-11 over 2009-10	15.14	9.78	15.91	11.04	12.85	7.17	13.34
CAGR 1970-71 to 2010-11	5.57	8.61	9.67	8.29	5.84	7.67	6.98

Source: Central Electricity Authority 2012

The electricity consumption increased from 43,724 GWh during 1970-71 to 6,94,392 GWh during 2010-11, showing a CAGR of 6.98 per cent (Table 3). The increase in electricity consumption is 13.34 per cent from 2009-10 (6,12,645 GWh) to 2010-11 (6,94,392 GWh). Of the total electricity sales in 2010-11, industry sector accounted for the largest share (38.6 per cent), followed by domestic (23.8 per cent), agriculture (19.6 per cent) and commercial sector (9.89 per cent). However, it is seen that electricity consumption in domestic sector and agriculture sector has increased at a much faster pace compared to other sectors during 1970-71 to 2010-11, with CAGRs of 9.67 per cent and 8.61 per cent respectively. Loss of electricity due to transmission has increased from 17.55 per cent during 1970-71 to 32.86 per cent during 2000-01 and declined to 18.04 per cent during 2010-11 (Central Electricity Authority-2012).

PER- CAPITA ENERGY CONSUMPTION & ENERGY INTENSITY

Per-capita Energy Consumption (PEC) during a year is computed as the ratio of the estimate of total energy consumption during the year to the estimated mid-year population of that year. Energy Intensity is defined as the amount of energy consumed for generating one unit of Gross Domestic Product (At constant prices). PEC and Energy intensity are the most used policy indicators, both at national and international levels. In the absence of data on consumption of non-conventional energy from various sources, particularly in rural areas in the developing countries, including India, these two indicators are generally computed on the basis of consumption of conventional energy. The PEC has increased from 1204 KWh in 1970-71 to 4816 KWh in 2010-11, a CAGR of 3.44 per cent. The annual increase in PEC from 2009-10 to 2010-11 was 3.65 per cent. The Energy Intensity (at 1999-2000 prices) increased from 0.128 KWh in 1970-71 to 0.165 KWh in 1985-86, but it has again come down to 0.117 KWh (at 2004-05 prices) in 2010-11 (CEA-2012).

TABLE - 4 TRENDS IN PER CAPITA ENERGY CONSUMPTION IN INDIA AND TAMIL NADU (KWh)

Year	Per capita Energy Consumption In India	Per capita Energy Consumption In Tamil Nadu	Percentage Share of PEC in Tamil Nadu from India
2005-06	3497.6 (14.1)	631.4 (14.5)	18.0
2006-07	3727.2 (15.0)	671.9 (15.4)	18.0
2007-08	3928.2 (15.8)	717.1 (16.4)	18.2
2008-09	4171.6 (16.8)	733.5 (16.8)	17.5
2009-10	4646.9 (18.7)	778.6 (17.8)	16.7
2010-11	4816.4 (19.4)	818.8 (18.8)	17.0

Source: Central Electricity Authority-2012 and Dinamalar, April-2013

Above the table explain that PEC energy in India and Tamil Nadu, The PEC has increased from 3497.6 KWh in 2005-06 to 4816.4 KWh in 2010-11 in India, The PEC consumption In Tamil Nadu Increased from 631.4 KWh in 2005-06 to 818.8 KWh in 2010-11, but Percentage share of PEC in Tamil Nadu from India declined from 18.0 in 2005-06 to 17.0 in 2010-11.

ELECTRICITY REFORMS FOR CONVENTIONAL ENERGY SOURCES

The Union government has given top priority to the power sector in the infrastructural development strategy. The Power Policy announced in 1996 and subsequently modified by the GOI to uplift the national agendas has emphasized upon the crucial role of the power sector in achieving the targets of the 21st century. The major thrust of the government is to provide sufficient electricity primarily to the industrial and agriculture sector by 2010 although full and sufficient supply to all sectors of the Indian economy will remain dream. The policy is to attack on three major areas of the sector i.e. investment, institutions and management. In the past few decades, India is not in a position to meet the peak load demand and normal load demand of energy due to inefficient use of electricity, Aggregate Technical and Commercial (AT&C) losses, which leads to significant energy shortage and energy crises. During the period of heavy loads, the load scheduling is done by the regulatory authorities to make grid stable. These needless power cuts can be avoided by installing new efficient generating stations and by introduction of new reforms and restructuring existing power systems (including generation, transmissions, distribution). The restructuring of Indian power sector formally started in the year 1991 and after that up to 2007 a number of reforms have been introduced by Indian government. These reforms revolutionized the growth in power capacity, reliability in supply, growth in the revenue collection by streamline the working of state electricity boards across the country by unbundling them into separate transmission, generation and distribution sectors, establishment of the central electricity regulatory commission, rationalization of electricity tariff, increase in the oversea investments, increase in private power generating companies, and increase in healthy competition. These reforms are adopted made by government to decrease all the factors which actually degrade the power systems. The government succeeded to some extent to achieve the goals set for the power sector reforms. But, still a lot of work has to be done to achieve the ultimate goal. The aggregate technical and commercial losses of India in year 2003-04 were 36.64 percent which have been reduced to 27.15 percent in year 2009-10 (Ministry of Power). So, it is the need of the hour that these reforms are implemented more rigidly and effectively.

INDIAN INITIATIVE IN RENEWABLE ENERGY DEVELOPMENT

The reforms in Indian Power Sector started with the advent of Electricity Act 2003. The Electricity Act 2003, the policies framed under the Act, and also the National Action Plan of Climate Change (NAPCC) provide a roadmap for increasing the share of renewable in the total generation capacity in the country. With the participation of private sector there is increased competitiveness among the power producers and to meet this challenge and to increase the share of renewable following mentioned provisions and policies have been framed. Many authors have published their work on the status of renewable energy sector and their promotion policies being implemented in India

Electricity Act 2003: The Act has assigned the responsibility of promoting Renewable Energy to State Electricity Regulatory Commission (SERC). Under section 86 (1) (e) –SERC shall promote cogeneration and generation of electricity from renewable sources by providing suitable measures for connectivity with the grid and

sale of electricity to any person and also specify, for the purchase of electricity from such sources. Section 61(h) emphasize on tariff rate keeping in mind the cogeneration and electricity generation from renewable sources of energy.

National Electricity Policy (**NEP 2005**)**:** The policy focuses on increase in share of non conventional energy sources in the generation mix with participation from private sector. Tariffs rates to be decided by SERC so as to make purchase of power from non conventional sources preferable and thus create competition through bidding process; considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the commission may determine an appropriate deferential in prices to promote these technologies.

National Tariff Policy (NTP 2006): Tariff fixing so as to lower the Green House Gas emission and provide adequate incentives to the project developers. The appropriate commission shall fix minimum percentage for the purchase of energy from such sources taking in to account the availability in the region and its impact on retail tariffs.

National Rural Electrification Policy 2006 (**NREP**)**:** In remote villages where it is not possible to connect supply to grid, there is permission to use stand alone system. The isolated lighting technologies like solar photovoltaic can also be adopted.

Indian Electricity Grid Code-2010: Special provisions under Indian Electricity Grid Code 2010 (IEGC) for connection, operations, forecasting, scheduling and commercial settlement for wind and solar generating plants.

State Electricity Regulatory Commission (SERC): Under EA 2003, the SERCs set targets for distribution companies to purchase certain percentage of their total power requirement from renewable energy sources. This target is termed as Renewable Purchase Obligation. In order to ensure compliance to the RPO as specified by SERCs a provision to impose penalty on ECs upon failing to meet the RPO targets has also been kept by few states.

CONCLUSION

The basic problem of developed and developing countries like India is the lack of knowledge of the infrastructure since last several years due to intervening reasons. the country had a very poor infrastructure in terms of energy production and supply. The per capita consumption of energy was abysmally low and the access to energy was very inadequate for the common people. The economy was dependent largely on the non-commercial sources of energy for meeting the requirements of the households and on animal and human energy in case of agriculture and transport. During the 50 years that followed Independence, the demand for energy, particularly for commercial energy, registered a high rate of growth contributed largely by the changes in the demographic structure brought about through rapid urbanization, need for socio-economic development and the need for attaining and sustaining self reliance in different sectors of the economy. The demand of energy is increasing day by day. The ever increasing use of modern means of transport systems, changing lifestyles and mechanization of labor have led to sudden and very large spurt in the energy requirements. There are several choices available in selecting an alternate source, but the cost factor is high and each is suitable only in a particular area. Since the renewable sources of energy have inbuilt constraints of use. Almost 90.0 percent of the energy requirements have to for now be met from the finite sources available on this planet (Deepak Kumar-2012). With the impending energy crisis facing mankind, saving every bit of energy is of great importance. This saved energy can then be put to same useful use in future. One must remember energy saved is energy produced. Therefore one needs to practice sustainable sources of energy for consumption.

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