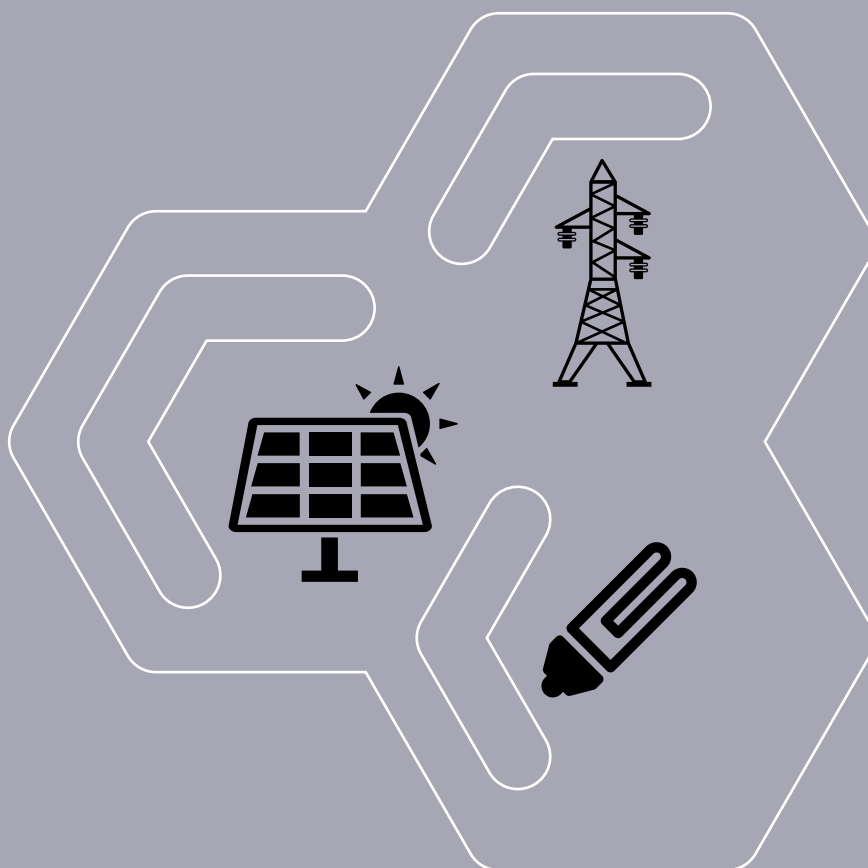
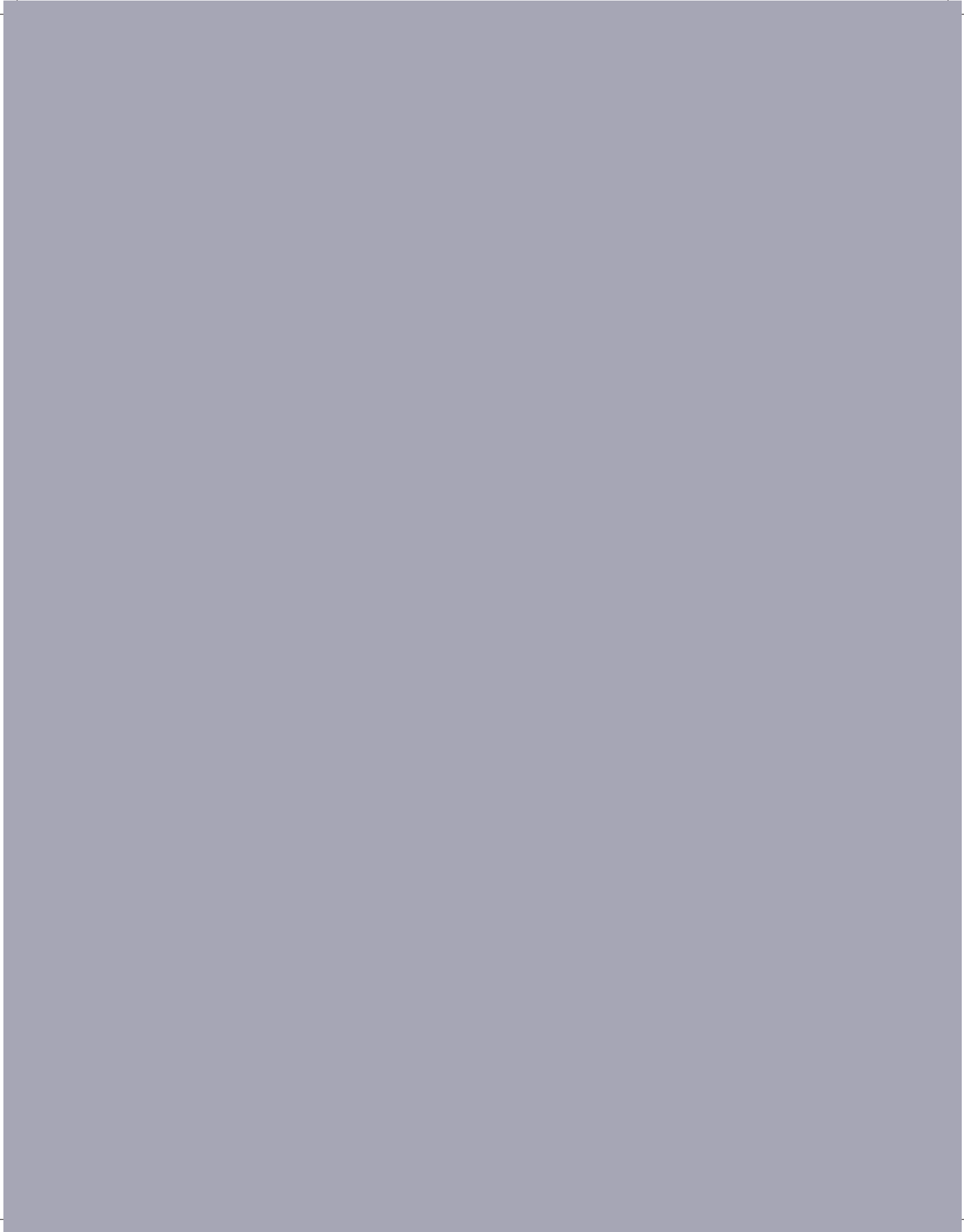




*Tracking Public Expenditure
Priorities for Low Carbon Strategies
in Power Sector in India*





contents

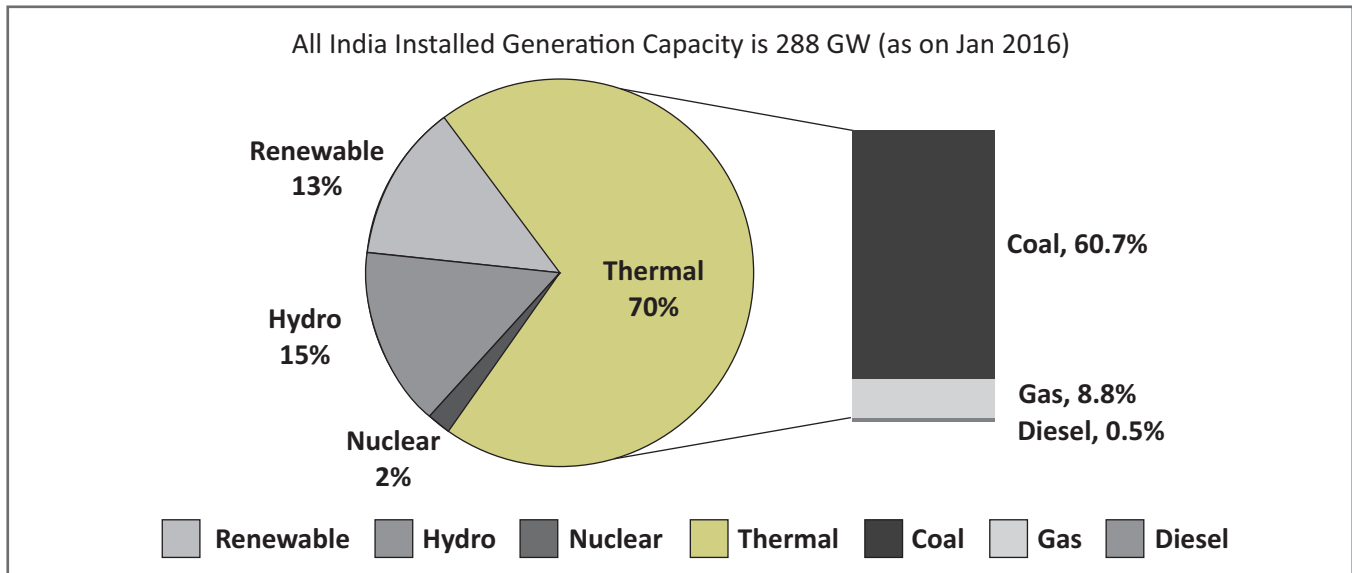
1. Context	2
2. Methodological Framework for Tracking Public Expenditure for Low Carbon Development of Power Sector	5
3. Framework defining Low Carbon Development Strategies for Power Sector	7
4. Budgetary Analysis	18
5. Conclusion	19
Annexures	
Annexure 1	20
Annexure 2	24

1. Context

Development of power sector is crucial to India's economic growth and development. The Government of India has set a target of doubling electricity generation by 2019¹. Besides domestic obligations of addressing the basic development needs in terms of achieving energy access for its entire population, the Government of India also needs to intensify its domestic efforts to meet its commitment made under Intended Nationally Determined Contribution (INDC) at COP 21^{2,3}. The commitment is to reduce emissions intensity per unit of GDP by 33 to 35 per cent by 2030 below 2005 level and to create an additional carbon sink of 2.5 to 3.0 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030⁴.

It is imperative for India to strategise the low-carbon economic development of power sector due to these two contending requirements, that are, to invest in power sector for improved energy access and second to strategies for fulfilling international commitment on climate change. India requires a special focus on mitigation of GHG emissions from coal-based power plants in the country for meeting its commitment on climate change. Currently, more than 61 percent of India's electricity generation is based on coal, and a significant fraction of new electricity supply in India is likely to be based on domestic coal derived from India's significant reserves. Currently, India has a total generating capacity of 288 Gigawatt⁵. The Indian power sector is fairly diverse with energy sources including coal, gas, diesel, nuclear power, hydro, and renewable energy. (See Figure1)

Figure 1: Percentage Share of Various Sources of Energy for Total Generation Capacity in India



Source: CEA, Power Sector Executive Summary, January 2016

¹ FICCI Press Release, December 2014, Available at: <http://ficci.in/pressrelease/1839/ficci-press-dec20-piyush-agm.pdf>

² In India, population without electricity was 237million and overall electrification rate is 81 percent in 2013. Source: The Electricity Access Database. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/>

³ The INDC centres around India's policies and programs on promotion of clean energy, especially renewable energy, enhancement of energy efficiency, development of less carbon intensive and resilient urban centres, promotion of waste to wealth, safe, smart and sustainable green transportation network, abatement of pollution and efforts to enhance carbon sink through creation of forest and tree cover.

⁴ Emission intensity is the average emission rate of a given pollutant from a given source relative to the intensity of a specific activity; for example the ratio of greenhouse gas emissions produced to gross domestic product (GDP). Emission intensities are used to derive estimates of air pollutant or greenhouse gas emissions based on the amount of fuel combusted or similar activity data.

⁵ CEA, Power Sector Executive Summary, January 2016

Coal based power plant are responsible for significant Greenhouse Gas (GHG) Emission. Analysis of CO₂ emission across sectors reveals that 37.8 percent of this was from the electricity generation, while 21.7 percent was from manufacturing in the industrial sector (including iron & steel, cement production and other industry). While CO₂ equivalent of emission from transport and residential sector was 7.5 and 7.2 percent of country's total CO₂ emission respectively, as per last report of INCCA Report in 2010⁶ (See Table 1).

Table 1: Emissions of Different Gases in Each Sector

Sector	CO ₂ eq (million tons)
Electricity	719.3
Transport	142.04
Residential	137.84
Other Energy	100.87
Cement	129.92
Iron and Steel	117.32
Other Industry	165.31
Agriculture	334.41
Waste	57.73
Total without LULUCF	1904.73

Note: Figure indicate percentage emissions from each sector with respect to total GHG emissions without Land Use, Land Use Change and Forestry (LULUCF)

Other Energy: includes GHG emissions from petroleum refining, manufacturing of solid fuel, commercial & institutional sector, agriculture & fisheries and fugitive emissions from mining, transport and storage of coal, oil and natural gas.

LULUCF: includes GHG emissions and removals from changes in forest land, crop land, grass land, wet land, settlements and combustion of fuel wood in forest

Source: INCCA, India: Green House Gas Emission, 2010

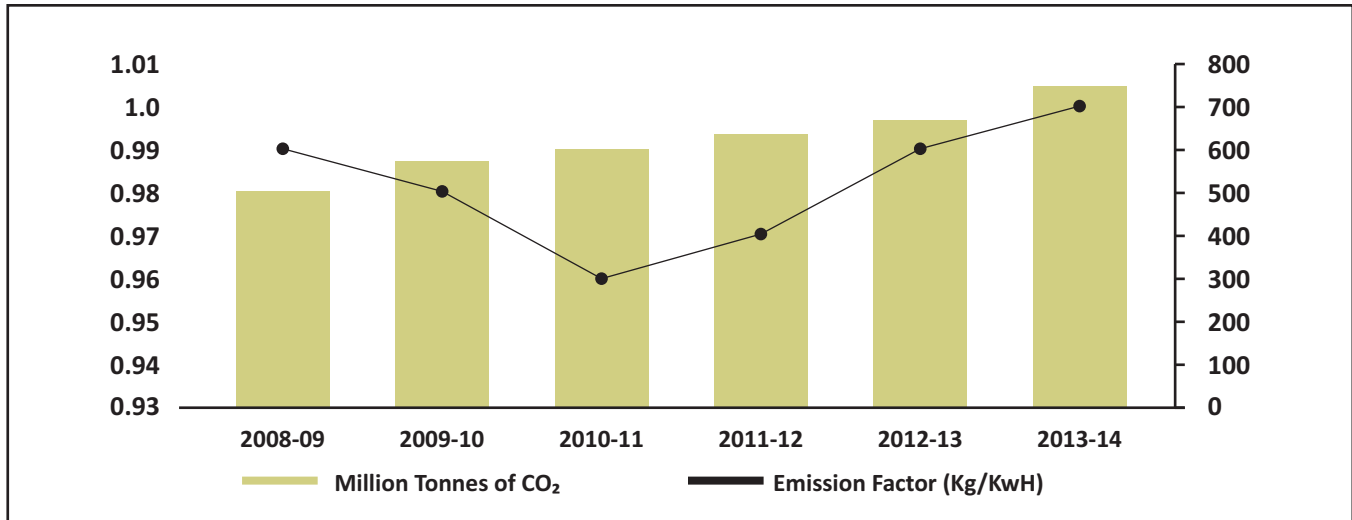
A total CO₂ emission from the power sector for the FY 2008-09 to 2013-14 has increased from 549 to 727 million tonnes of CO₂⁷. Even though emission factor is almost constant over this period, the total CO₂ emissions are increasing due the major increase in power capacity addition over the years (See Figure 2). Hence, it is crucial for policymakers to begin to assess the implications of continued use of coal for power generation in the context of the GHG mitigation challenge.

Given the above context, the scrutiny of budget entails largely the nature and character of public provisioning to mitigate the effects of climate change and also measures the magnitude of budgetary outlays needed to embark on a low-carbon economy path. The present assessment of public expenditure can also be the starting point for the prioritization between alternative applications of the scarce financial resources. This study makes an assessment of the allocation of public finance resources with stated policy objectives. This can serve as an input to the planning and budget process, contributing to the selection, prioritization and allocation of resources to programmes for low

⁶ Indian Network for Climate Change Assessment (INCCA) Report "Climate Change and India: A 4X4 Assessment - A sectoral and regional analysis for 2030s". Ministry of Environment and Forests, Govt of India. November 2010

⁷ Central Electricity Authority (CEA), CO₂ Baseline Database for the Indian Power Sector, Version 10, December 2014

Figure 2: Total CO2 emissions by the Power Sector, FY 2008-09 to 2013-14



Source: Central Electricity Authority (CEA), CO2 Baseline Database for the Indian Power Sector, Version 10, December 2014

carbon development of power sector. Further, it can also highlight policy objectives that require additional financing by opening up dialogue with development partners for developmental assistance priorities. The major attempt is to provide accessible information to facilitate country's planning on Low Carbon Development (LCD) of power sector, which could be later helpful in generating feedback on budget allocation from policy makers and stakeholder accountability. The current study looks into relevant policies and programmes of a number of Union Ministries managing demand and supply side of power sector such as, Ministry of Power, Ministry of Coal, Ministry of Atomic Energy, Ministry of Petroleum & Natural Gas, and Ministry of New and Renewable Energy for Low Carbon Development (LCD)⁸ of power sector.

The following section sets the methodological framework to assess the budgets for the low-carbon development of power sector in the country.

⁸ A low-carbon economy (LCE), low-fossil-fuel economy (LFFE) or decarbonized economy is an economy based on low carbon power sources. Such economies have a minimal output of greenhouse gas (GHG) emissions into the environment biosphere, but specifically refers to the greenhouse gas carbon dioxide.

2. Methodological Framework for Tracking Public Expenditure for Low Carbon Development of Power Sector

2.1 Existing Methodologies for Tracking Expenditure

This study attempts to track current public expenditure towards expansion of power sector through a low carbon pathway. It aims to achieve this through an empirical assessment of current quantum of public expenditure for LCD of power sector. Some of the major challenges in discerning how much LCD expenditure is incurred by Government are:

- How to define a spectrum of LCD strategies which is covered by diverse programs and schemes for GHG mitigation from power sector
- How to dissect sub components from the main schemes and programs following a reasonable level for data granularity (or divisibility) especially in cases where disaggregated budget data is not available

There are some existing methodologies addressing above challenges which have been designed by multilateral banks, for tracking the international aid for spending on climate change mitigation and adaptation in developing countries. Three of such approaches were studied – African Development Bank's Climate Finance Tracking Guidance Manual for Energy Sector⁹, Climate Change and African Political Stability (CCAP)'s Climate Code book for Tracking Climate Aid¹⁰ and the World Bank's Common Principles for Climate Mitigation Finance Tracking¹¹. These approaches define the framework for identification of activities for climate change, categorization of the qualifying programs based on their principal objectives and, tracking and reporting finances on climate change related activities disaggregated from non- climate change activities. For tracking finances on climate change activities in these studies, two approaches have been followed; first one is binary tracking (climate change activity or not) and second is percentile (or proportional) tracking system. According to one of the discussion papers, binary classification system is adequate where the principle objective of a scheme and program is climate change relevant. The second approach on percentile tracking (mentioned in CCAPS's climate code book), allows the quantification of climate related expenditure of both explicitly climate change mitigation relevant schemes as well as those that have mitigation component but are not primarily climate focused. However, this approach of tracking becomes inadequate when the program is very large in scope and has sub-components with multiple objectives.

Based on above approaches, the current method adopted in this paper follows a Binary classification system, employing it over the programs and schemes whose objective is matching with defined framework for LCD of power sector. As a first step a framework is defined for LCD strategies of power sector and second part involve developing matrix that categorises various program and schemes based on their principle objective matching with defined LCD framework. Matrix thus developed, has been populated with public finance data for the post National Action Plan on Climate Change period (2009-10 to 2015-16) for categorized programs and schemes falling within the LCD framework.

2.2 Sources of Information

The various aspects of programme and scheme including their guidelines were captured from various budget documents. The policy guidelines pertaining to schemes and programmes provide information on the key objectives of such interventions. Outcome Budgets and Annual Reports of relevant ministries also provide information on interventions of the programme and key deliverables of the intervention. Budgetary information at the aggregate level could be compiled from the study of Expenditure Budget (Vol-1 & 2). Further, the analyses of

⁹ Climate Finance Tracking Guidance Manual for Energy Sector, Department of Energy, Environment and Climate change, African Development Bank, September 2013.

¹⁰ Peratsakis, Christian, Justin Baker, and Catherine Weaver, "Tracking Climate Adaptation Aid: CCAPS Climate Code book" (Austin: Robert S. Strauss Center for International Security and Law, 2012).

¹¹ Common Principles for Tracking Climate Finance, World Bank, April 2015.

Detailed Demands for Grants of various ministries/ departments have been helpful to capture the broad expenditure classification at the level of Plan and Non-Plan under various budgetary heads. Moreover, it also provides Actual Expenditure figures till fiscal year 2013-14 and, revised and budget estimates for fiscal year 2014-15 and 2015-16 respectively.

2.3 Limitations of the Study

While assessing expenditure for low carbon development of power sector, their exist limitations. Limitation is observed in terms of the scope of analysis at the Union Government level as one is clearly overlooking the combined expenditures of States which is of considerable share of the total public expenditure in the country. Moreover, it excludes private investment in power sector, which is outside the purview of this analysis. The study has not delved into issues of utilization and implementation within this sector.

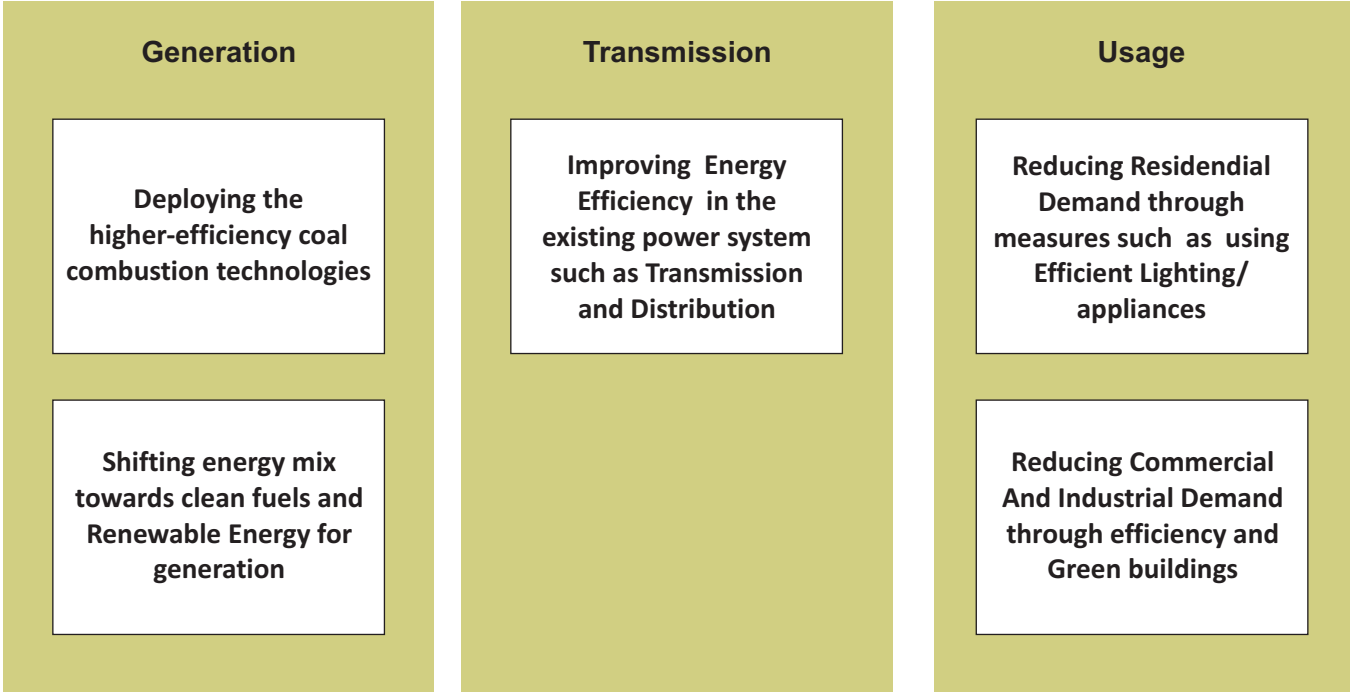
3. Framework defining Low Carbon Development Strategies for Power Sector

In order to track low carbon development (LCD) expenditures by the Union Government with regard to power sector, we assumed that the policies and programs at the Union Government level, are principally aiding three broad strategies for low carbon development of power sector.

- 3.1 Deploying the higher-efficiency coal combustion technologies
- 3.2 Shifting energy mix towards clean fuels and Renewable Energy for generation and,
- 3.3 Improving Energy Efficiency in the existing power system such as Transmission and Distribution, *and end-use of electricity*

The above spectrum of low carbon development strategies for power sector is explained in subsequent section of this study (See Figure 3).

Figure 3: Strategies for Low Carbon Development of Power Sector



This above categorization captures the main strategies of low carbon development of power sector, but is not exhaustive. For example, expenditure for installing end-of-pipe pollution control technologies to control SOx and NOx emissions from all coal based power plants or expenditure on improving institutional mechanisms for power sector is not covered. Such strategy which does not have direct bearing on reducing GHG emissions but have significant support in the induction of low carbon development of power sector has been categorized under ;

3.4 Adopting Environmentally Sound Process of Power Generation such as institutional and policy support, air pollutant emission reduction in power plants, nuclear fuel recycling, safe disposal of fly ash, capacity building of nodal agencies, raising awareness on energy efficiency, environment management systems during coal mining etc.

An estimation of Government expenditure incurred for each of above four categories is done separately, and then an overall assessment of baseline expenditure for LCD expenditures with regard to power sector has been made. Year 2009, post the announcement of the National Action Plan on Climate Change (NAPCC) is taken as baseline year for estimating and comparing expenditure for low carbon development over the years. NAPCC had proposed low carbon strategies for Power Sector in three out of its eight announced missions (**See Box 1**).

Box 1: Low Carbon Strategies for Power Sector under NAPCC (2008)

NAPCC has proposed in three out of its eight announced missions on LCD of power sector. These three missions were related to increasing share of renewable energy, enhancing energy efficiency and promoting energy conservation, which were as follows:

National Solar Mission: The NAPCC aims to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar competitive with fossil-based energy options. The plan included:

- Specific goals for increasing use of solar thermal technologies in urban areas, industry, and commercial establishments;
- A goal of increasing domestic production of photovoltaics to 1000 MW/year; and a goal of deploying at least 1000 MW of solar thermal power generation.
- Other objectives include the establishment of a solar research center, increased international collaboration on technology development, strengthening of domestic manufacturing capacity, and increased government funding and international support.

National Mission for Enhanced Energy Efficiency: Building on the Energy Conservation Act 2001, the plan recommended:

- Mandate decreased specific energy consumption in large energy-consuming industries, with a system for companies to trade energy-savings certificates;
- Energy incentives, including reduced taxes on energy-efficient appliances; and
- Financing for public-private partnerships to reduce energy consumption through demand-side management programs in the municipal, buildings and agricultural sectors.

National Mission on Sustainable Habitat: To promote energy efficiency as a core component of urban planning, the plan calls for:

- Extending the existing Energy Conservation Building Code; A greater emphasis on urban waste management and recycling, including power production from waste

A trend analysis of budgetary data from 2009-10 to 2015-16 may reflect the changes in priority over the years attached to the sector. A closer scrutiny of budgets of key ministries pertaining to power sector set the sectoral expenditure priorities based on the objectives and deliverables of the interventions that promote low carbon development of power sector. Interventions translated into spending in budgetary heads may not have similar nomenclatures in the budgets documents; hence attempts have been made to look critically at the budgets of the programmes. **Annexure I** provide compilations of Government Schemes and Programmes falling under above described categories with their objective and description of activities.

The following section provide detailed description of programs and policies falling under above mentioned four strategies for LCD of power sector , role of Central Government for implementation of these strategies and the scale of public expenditure on each of them.

3.1. Deploying the Higher-Efficiency Coal Combustion Technologies for Power Generation

Ministry of Power launched the Ultra Mega Power Projects (UMPPs) Programme in 2005-06 to facilitate development of high efficiency coal combustion technologies for power generation¹². An important element of this programme is the induction of 'supercritical technology', which is an important step towards energy efficiency¹³.

UMPPs which brings in private investment into power generation, was a major initiative of the Eleventh five year Plan. To improve energy efficiency further, GOI decided that for the Thirteenth five year Plan, all coal-fired capacity addition shall be through super critical units. So far, power purchase agreements have been signed for four UMPPs of 4,000 MW each on the basis of competitive tariff-based bidding. They are based in Sasan (Madhya Pradesh), Mundra (Gujarat), Krishnapatnam (Andhra Pradesh) and Talaiya (Jharkhand). Out of these, Mundra UMPP is fully commissioned and is generating electricity. Five units of Sasan UMPP (5 x 660 MW) have been commissioned and one unit has been synchronized so far, other 2 awarded UMPPs are expected to come in the Twelfth Plan (expect last unit of Talaiya UMPP, which is likely to come in the 13th Plan). 12 more super critical UMPPs are being planned covering Chhattisgarh, Gujarat, Tamil Nadu, Andhra Pradesh, Odisha, Maharashtra and Karnataka where site location is underway¹⁴.

The role of the Ministry of Power is basically to serve as a facilitator and to co-ordinate with concerned Ministry/ Agencies for ensuring; coal Block Allotment/ Coal Linkage, environment/ Forest clearances, required support from State Govt. Agencies, financial Institutions towards financial closure, to facilitate Power Purchase Agreement and proper payment security mechanism - with State Govt. / State utilities, monitoring the progress of Special Purpose Vehicles.

3.1.1 Government Finances for Promotion of UMPP

UMPP has been installed by the private project developers in Build, Own and Operate Framework. Project developers had been selected through competitive bidding process. Project specific Shell Companies (Special Purpose Vehicles) as 100% subsidiaries of Power Finance Corporation Limited have been created for carrying out developmental work consisting of tying of inputs/clearances and the bidding process for selection of developers for the UMPPs. Various inputs for the UMPPs are tied up by the SPV with assistance of Ministry of Power & Central Electricity Authority in consultation with the State Government. Union Government or Central plan devolution is not part of financing of UMPPs though these projects have been declared as mega projects. Power Finance Corporation Limited which isa Public Sector Undertaking under Ministry of Power manages the UMPP implementation through private investment as one of its functions. There is commitment of private investment of 1 lakh crore of Rupees for 5 new UMPPs as announced during Union budget 2015-16¹⁵. Ministry of Power provided loan to PFC Limited, of Rs. 640 crore, Rs. 445.79 crore and Rs. 384 crore over various budgets that are, FY 2013-14(Actuals), 2014-15 (RE) and 2015 -16 (BE) respectively to undertake the tasks assigned to it. However, it is uncertain to say about the share of spending on UMPP under this loan through Union Budget analysis. While, most of financing for installing plant is

¹² UMPP is coal-based thermal power project that has 4,000 MW generation capacities.

¹³ Higher steam parameters of 565/593 degree centigrade were adopted for supercritical units which lead to design efficiency of over 40 per cent and lower CO₂ emissions by about 5 per cent as compared to a typical 500 MW subcritical unit. 12th Five Year Plan Document, Volume 2, Chapter 14: Energy

¹⁴ Ministry of Power, Outcome Budget 2015-16.

¹⁵ New article available at: <http://www.thehindubusinessline.com/economy/budget/budget-2015-govt-to-set-up-5-new-umpps-with-1-lakh-cr-inv/article6944942.ece>

under the ambit of private developers with provision of loan from PFC Limited, the Ministry of Power makes expenditure to provide power evacuation infrastructure required for UMPPs. Table 2 provides data on proposed annual outlays by Ministry of Power for providing power evacuation infrastructure associated with various installed UMPP.

Table 2: Proposed Outlays by Ministry of Power for providing power evacuation infrastructure associated with various installed UMPP (In Rs. crore)

Project Name	Outlay 2010-11	Outlay 2011-12	Outlay 2012-13	Outlay 2013-14	Outlay 2014-15	Outlay 2015-16
Transmission System associated with						
a)Sasan UMPP	1031	1396	790.1	405.4	405.4	5.6
b)Mundra UMPP	810	944	641.9	437.2	437.2	157.5
c)Talliya UMPP	0.2	1	54.8	-	4.5	-
d)Orissa UMPP	-	-	-	-	-	1.3
e)Krishnapatnam UMPP Part A	-	176	517.6	59.8	59.8	-
f)Krishnapatnam UMPP Part B	-	123	197.3	643.3	643.3	121.1
g)Krishnapatnam UMPP Part C1	-	152	81.6	0.2	0.2	3.2
h)Krishnapatnam UMPP Part C2	-	-	4	-	137.1	-
System Strengthening in Northern region for Sasan and Mundra UMPP	-	-	-	-	-	9.5
System Strengthening of Mundra UMPP	-	-	-	-	-	9.7
Line Bays and reactor provision at POWERGRID associated with Krishnapatnam UMPP Synchronous Inter connection B/w SR & WR	-	-	-	1	1	-

Source: Outcome Budget, Various Years, Ministry of Power

Besides Ministry of Power, Union Ministry of Heavy Industry made expenditure of Rs. 13 crore and Rs. 50 crore in Financial year 2014-15 (RE) and FY 2015-16 (BE) for Research and Development of UMPP technology. **Annexure II** provides the information on GOI spending for research and development of UMPP technology.

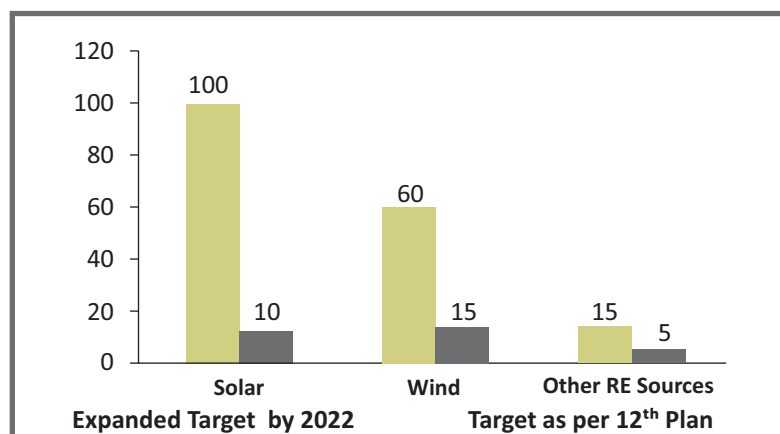
3.2. Shifting Energy Mix towards Renewable Energy and other clean fuels for Power Generation

Renewable capacity comprises approximately 13 percent of the total installed power capacity of India which stands at 39 GW of Renewable Energy (RE)¹⁶. Every additional 1GW of renewable energy capacity reduces CO₂ emissions by 3.3 million tonnes a year¹⁷. Indian Government recently made a commitment to increase the share of RE in the power sector to 175 GW by 2022 (**See Figure 4**).

¹⁶ CEA Executive Summary, January 2016

¹⁷ World Bank Report, ESMAP, Unleashing Potential of Renewable Energy in India, 2010

Figure 4: Recent Expansion in Target of Renewable Energy Installation Capacity (In GW)



Source: Investors Guide, RE-INVEST 2015, January 2015 and 12th Five Year Plan Document.
 Note: Other RE sources includes Small Hydro Project and Bio-Energy

Contrary to requirement of investments to realize the expansion in targets for this sector, the allocation for nodal ministry for RE that is, Ministry of New & Renewable Energy (MNRE) in recent Union Budget 2015-16 as a proportion of total Union Budget Expenditure is lower than 1/10th of a percent, which is a continued trend since year 2007-08 that is, post NAPCC period (See Table 3).

Table 3: Budget Allocation for MNRE (In Rs. Crore)

Year	Gross Budgetary Support (GBS)	Internal and Extra Budgetary Support (IEBR)	Total Budgetary Expenditure of the Union Government (Actuals)	Allocation for GBS for MNRE as % of total Budget Expenditure
2007-08	421	637	712671.0	0.06
2008-09	441	647	883956.0	0.05
2009-10	539	1221	1024487.0	0.05
2010-11	974	1401	1197328.0	0.08
2011-12	1184	2367	1304365.0	0.09
2012-13	1089	1894	1410367.0	0.08
2013-14	383	1464	1559446.8	0.02
2014-15(RE)	541	3346	1681158.0	0.03
2015-16(BE)*	288	3373	1777477.0	0.02

Source: Expenditure Budget Vol. II of various years.

Note: * There is additional supplementary Grants-in-aid of Rs. 503 crore for MNRE released in August 2015

Considering the magnitude of India's energy requirements, the contribution of the power sector to India's GHG emissions and the potential for renewable energy to displace GHG-intensive energy sources, it is clear that renewable energy has to be promoted in an accelerated manner to meet India's objectives for sustainable low-carbon development and inclusive growth.

3.2.1 Government Spending for Promotion of Renewable Energy and Other Clean Fuels

Currently, private sector has ownership of 86 per cent of the total RE installed capacity and 100 percent FDIs are permitted in RE sector¹⁸. Even so, there is a need for stronger interventions and financial allocations from the Government side in order to ensure that there is greater access to equity in the country, so that the potential for RE is tapped adequately in most states (including those where the private players might not be interested, such as in the remote areas where the business potential for RE is less) and grid connectivity for RE generated is enhanced. For having the stronger public sector interventions on these issues, there is need for greater magnitudes of budgetary investments for RE to be made by the Union Government. Some the major schemes related to promotion of Renewable Energy at the Union Government level are as follows:

- Grid Interactive and Distributed Renewable Power
- Rural Application of Renewable Energy
- RE for Urban, Industrial and Commercial Applications
- Research, Design & Development in RE
- Supporting Program
- Smart Grid Scheme
- Green Energy Corridor

Other Clean Fuels: Generation of nuclear power is another clean energy source as it does not involve emission of GHGs, and provides a stable source of base load power. The life cycle analysis study carried out by the one of the research studies concludes that total 6.8g of carbon dioxide emissions per kWh of nuclear energy produced which is much lower than the 9.5 to 38 g carbon dioxide per kWh from the fossil fueled power plants^{19 20 21}. Hence nuclear energy as a low carbon source of power is attracting attention. India expects to have 14,600 MW e nuclear capacity by 2020 through its nuclear power program²². It aims to supply 25 percent of electricity from nuclear power by 2050. Current installed capacity of nuclear power is 5780 MW which is 2 percent of the total installed power capacity.

Nuclear Power Corporation of India Ltd. (NPCIL) is the nodal agency for harnessing nuclear energy for power generation in the country. The main objective of programs of NPCIL is to increase nuclear power generation capacity in the country as a safe, environmentally benign and economical source of electrical energy to meet the power requirement. However, its uncontrolled nature, radioactive emissions and handling the nuclear waste, are some reasons which put a question mark on the acceptance of nuclear energy as the best alternative option. Addressing these concerns will require more transparency on part of government policy in addressing issues pertaining to safety. This could be eventually be a determining factor in the expansion of nuclear power program.

Annexure – II presents budgetary allocation for various schemes and programmes of RE and nuclear power, post NAPCC period till 2015-16.

3.2.2 Policy Options and Consideration for setting Expenditure Priorities for Promotion of Renewable Energy: The Union Government can consider the following policy options while deciding on its spending priorities for promotion

¹⁸ Central Electricity Authority, Annual Report 2012-13

¹⁹ Sovacool BK. A critical evaluation of nuclear power and renewable electricity in Asia. *Journal of Contemporary Asia*. 2010; 40(3):369-400.

²⁰ Life Cycle Greenhouse Gas Emissions of Nuclear Electricity Generation. wiley.com/doi/10.1111/j.1530-9290.2012.00472.x/pdf

²¹ Miller VB, Landis AE, Schaefer LA. A benchmark for life cycle air emissions and life cycle impact assessment of hydro kinetic energy extraction using life cycle assessment. *Renewable Energy*. 2011; 36(3):1040-6.

²² MOEF & CC sponsored ENVIS Centre on NGO and Parliament, Information on Nuclear Power in India

of Renewable Energy:

- Increase Government spending for promotion of Rural Applications of Renewable Energy Technologies with installation of Micro-Grids
- Increase public spending on RE at the state level and need of cohesive efforts by various Departments of State Government for development of this sector.
- Prioritize available financial resources for renewable energy viz. national clean energy fund and in state specific Incentive announced by the constitutional bodies such as Finance Commission

3.3 Improving Energy Efficiency in the existing power system such as Transmission and Distribution and End-use of Electricity

3.3.1 improving Efficiency in Transmission and Distribution (T&D)

India has made major strides in the expansion and enhancement of its Transmission and Distribution (T &D) network. The bulk transmission network (i.e., 132 kV or greater) has increased from 52034 circuit km (ckm) in 6th five year plan to over 320099 ckm in July 2015. Yet the performance of India's T & D is plaguing with high losses at around 23%, whereas the world average T & D losses stand at 9.32 percent for the year 2010 (See Table 4). According to the report of the Working Group on Power Sector for 12th Five Year Plan, reducing India's losses to a more manageable 10 percent could release power equivalent to about 10,000-12,000 MW of power capacity and hence, leading to indirect control of otherwise GHG emission due to power generation²⁴.

Table 4: T & D and Aggregate Technical & Commercial (AT & C) Losses (in percentage)

Losses in Percentage	2010-11	2011-12	2012-13
T & D losses	23.97	23.65	23.04
AT & C Losses	26.35	26.63	25.38

Source: Central Electricity Authority, Executive Summary, Power Sector, January 2015

The Government of India has begun to pay more attention to distribution reforms in 2003. It launched the Accelerated Power Development and Reforms Programme (APDRP) to reduce AT&C losses and increase reliability and quality of power supply. APDRP scheme is an Additional Central Assistance (ACA) scheme to finance the modernisation of sub-transmission and distribution networks with the objective to reduce AT&C losses to 15 per cent. This programme was not effective in reducing losses. A Re-structured APDRP was approved as a central scheme in 2008 with a total outlay of Rs.51,577 crore over the Eleventh Plan period. The focus of the programme is on actual, demonstrable performance in terms of AT&C loss reduction.

The coverage of the programme is for the urban areas—towns and cities with a population of more than 30,000 (10,000 for special category States). Private distribution utilities are not covered under the programme which has been a point of criticism by some States. Projects under the R-APDRP scheme were to be taken up in two parts. Part A focused on establishing reliable and automated system for sustained collection of accurate baseline data, and the adoption of information technology in the areas of energy accounting and auditing and consumer-based services. Part B includes projects to strengthen the distribution system, including activities like automation and validation of baseline system, project evaluation, capacity-building and development of franchisees in the distribution sector and

²⁴ Report of working Group on Power Sector for 12th Five Year Plan. Available at : http://planningcommission.gov.in/aboutus/committee/wrkgrp12/wg_power1904.pdf

consumer attitude surveys. The States/Utilities are required to constitute the State Electricity Regulatory Commission and need to achieve reduction in T & D losses by 3 percent per year (for Utilities having AT&C losses above 30 percent) or reduction by 1.5 percent per year (for Utilities having AT&C loss below 30 percent).

3.3.1.1 Government spending for Ensuring Efficiency in Transmission and Distribution

Central Government provides 100 percent loan for part A of the R-APDRP schemes and 25 percent (90 percent for special category States) loan for Part B of the R-APDRP schemes. The entire loan from GoI is routed through Power Finance Corporation PFC/Rural Electrification Corporation (REC). Annexure II provides information on GoI spending for R-APDRP program where majority spending is in the form of loan. Union Government had given a loan of Rs. 640 crore and Rs. 445 crore to Power Finance Corporation for R-APDRP in year 2014-15 and 2015-16 respectively. The R-APDRP has now been subsumed in Integrated Power Development Scheme. The commitment arising out of the projects already sanctioned under R-APDRP will be met from the funds available in the combined new scheme.

3.3.1.2 Policy Options and Expenditure Priorities for Managing of T & D Losses

The Union Government can consider the following policy options while deciding on its spending priorities for ensuring efficiency in Transmission and Distribution:

- Increase government investments in T&D for modernizing the existing infrastructure and introduce new technologies, expand high-voltage lines, improve integration among regional grids, and improve monitoring and metering of distribution networks.
- Increase investment in electricity metering and collection efficiency, especially in urban and peri-urban areas.
- Reduce commercial theft by, for example, continuously auditing electricity use, promoting incentives for greater transparency, and strengthening the penalties for illegal connections.

3.3.2 Energy Efficiency at End use level

Energy Efficiency (EE) can play a key role as India struggles to meet its development goals under severe environment and resource constraints. As per the interim report of Planning Commission on low carbon strategy for inclusive growth, emissions can be reduced by lowering demand for energy through demand side management (DSM) to improve energy efficiency, and altering the mix of electricity generation in favor of plants that emit lower emissions. The interim report had assessed that energy efficiency measures can reduce CO₂ emissions by 96 Mt by the year 2020, while the supply side measures can reduce emissions by another 85 Mt over the same period.

The Indian government recognised the importance of energy efficiency in passing the Energy Conservation Act of 2001. The implementation of energy efficiency programs, however, has accelerated in the last few years through the efforts of the Bureau of Energy Efficiency (BEE), a department under Ministry of Power (MOP). The schemes of BEE include Standards and Labelling (S&L), Energy Conservation Building Code (ECBC), Energy Efficiency in Existing Buildings, *Bachat Lamp Yojana* (BLY), State Designating Agency (SDA) Strengthening, Energy Efficiency in Small and Medium Enterprises (SMEs), Agriculture and Municipal Demand Side Management (DSM) and Contribution to State Energy Conservation Fund (SECF). These schemes are estimated to have achieved savings equivalent to 11,000 MW of avoided power capacity during the 11th five year plan²⁵. Schemes implemented by the Ministry of Power include Energy Conservation Awards and National Mission for Enhanced Energy Efficiency (NMEEE). The Prime Minister's Council on Climate Change approved the NMEEE "in principle", and claimed the mission will help save about 5% of annual energy consumption and nearly 100 million tons of CO₂ every year by 2015²⁶.

²⁵ <http://powermin.nic.in/Energy-Efficiency>

²⁶ <http://pmindia.nic.in/prelease/pcontent.asp?id=998>

Details of savings projected to be realized through various measures are given below, along with objectives and description of various schemes and programs.

Standardisation and Labelling (S&L) Program (Energy Efficiency in Equipment and Appliances): Large energy inefficiencies exist in consumer and industrial appliances. It is anticipated that by the end of the Twelfth Plan, total savings in avoided capacity addition would be 7,315 MW through S&L program.

Energy Efficiency in Industries: The total commercial energy consumed by industry including SMEs stands at about 40–50 percent of the total commercial energy consumption in the country. Hence energy efficiency measures would yield substantial benefits in this sector. The projected energy saving potential in the Twelfth Plan is 13.18 2 million tonnes of oil equivalent (mtoe) which consists of a saving of 6.2 mtoe from the seven energy-intensive industries, 1.75 mtoe from SME sector and 5.23 mtoe from thermal power stations sector.

National Mission for Enhanced Energy Efficiency (NMEEE): NMEEE is one of the eight Missions created by India's National Action Plan for Climate Change and is based on the Energy Conservation Act, 2001. The Mission will enable transactions in energy efficiency. Specific initiatives envisaged by the NMEEE include:

- Perform Achieve and Trade scheme—a market based mechanism to enhance energy efficiency. The scheme is expecting an energy saving of 3.5 million tons of oil equivalent (mtoe) in seven selective industrial sectors and 3.1 million tons of oil equivalent in thermal power stations by 2014–15;
- Market Transformation for Energy Efficiency (MTEE)—Clean Development Mechanism (CDM) roadmap, Standards and Labelling, Energy Service Company promotion, Capacity-building;
- Financing Energy Efficiency—tax exemptions, revolving fund, Partial Risk Guarantee Fund; and
- Promotion of performance contracting business model—enabling up gradation of existing buildings, streetlights, municipal pumping and so on through Energy Service Companies which invest in the upgradation and are paid through sharing of the resultant savings in the energy bill.

3.3.2.1 Government Spending for Energy Efficiency at Consumer End: Annexure II provides information on spending on energy efficiency measures at the consumer level. Two major programs /schemes where public spending being done, these are; Energy Conservation, implementation of various schemes by Bureau of Energy Efficiency.

3.3.2.2 Policy Options and Expenditure priorities for Energy Efficiency at Consumer Level:

The Union Government can consider the following policy options while deciding on its spending priorities for ensuring demand side management for energy efficiency at end user level:

- Provide incentives for energy-efficient technologies through fiscal measures
- Promote greater efficiency in the industrial and commercial sectors through programs such as efficiency standards and incentive schemes and by encouraging energy service companies to implement these programs.
- Actively support academics and other organizations (perhaps through BEE) to build capacity for energy efficiency assessment, R&D, and improvement

Box 2 : The Ministry of Environment, Forests and Climate Change, Government of India has published a final notification for emission standards for coal based thermal power plant under the Environment (Protection) Act, 1986 (29 of 1986). The proposed new standard for emissions is as follows:

Pollutants	Older Units		Older New		Future
	before December 31, 2003		After 2003 to 2006		
	<500 MW	> 500 MW	<500 MW	> 500 MW	
PM	100 mg/ Nm3		50 mg/ Nm3		30 mg/ Nm3
SO ₂	600 mg/ Nm3	200 mg/ Nm3	-	200 mg/ Nm3	100 mg/ Nm3
NO _x	600 mg/ Nm3		300 mg/ Nm3		100 mg/ Nm3
Hg	-	0.03 mg/ Nm3	0.03 mg/ Nm3		0.03 mg/ Nm3

Water Consumption :

1. All plants with once through cooling (OTC) shall install cooling tower (CT) and achieve specific water consumption max. 4m ³ /MWh within 2 years period from the date of notification	2. All existing CT-based plants shall reduce specific water consumption upto maximum of 3.5 m ³ /MWh within 2 years period from date of notification.	3. New plants to be installed after January 01, 2017 shall meet specific water consumption maximum of 2.5 m ³ /MWh and achieve zero liquid discharge.
---	--	--

Source: Draft Notification of MOEF & CC, April 2015

3.4 Adopting Environmentally Sound Development of Power Sector

There is need for adopting environmentally sound and sustainable process for power generation in order to reduce risk of health and climate change that coal fired power plant presents. Particulate matters, SO₂, NO_x and CO are emitted from the combustion of fuels in a thermal power plant. Recently to enforce the emission norms, Union Ministry of Environment, Forest and Climate Change has published emission standards for coal based thermal power plant (**See Box 2**). If unregulated, these can affect humans, vegetation, buildings and monuments, aquatic & forest ecosystem. Effluents from a Thermal Power Plant, like cooling water blow down, waste water from de-mineralized backwash and resin regenerator wastewater, ash transport water, and runoff from coal piles, ash piles and site, trace metals, acids and other chemicals in various combinations in the effluents, oil spills etc. have a negative impact on water quality.

Hence, interventions associated with power sector such as air pollutant emission reduction in power plants, nuclear fuel recycling, safe disposal of fly ash, capacity building of nodal agencies involved with direct implementation of pollution monitoring and environment management, raising awareness on energy efficiency, and environment management systems during coal mining etc. are of great significance in order to adopt environmentally sound and sustainable process during power generation. Such interventions does not have direct bearing on reducing GHG

emission but have significant support in the induction of low carbon and clean energy strategy in power sector .Annexure II provides GOI spending for environmental sound and sustainable development of power sector:

3.4.1 Policy Options and Expenditure priorities for Adopting Environmentally Sound and Sustainable Development of Power Sector:

The Union Government can consider the following policy options while deciding on its spending priorities for adopting environmentally sound and sustainable development of power sector:

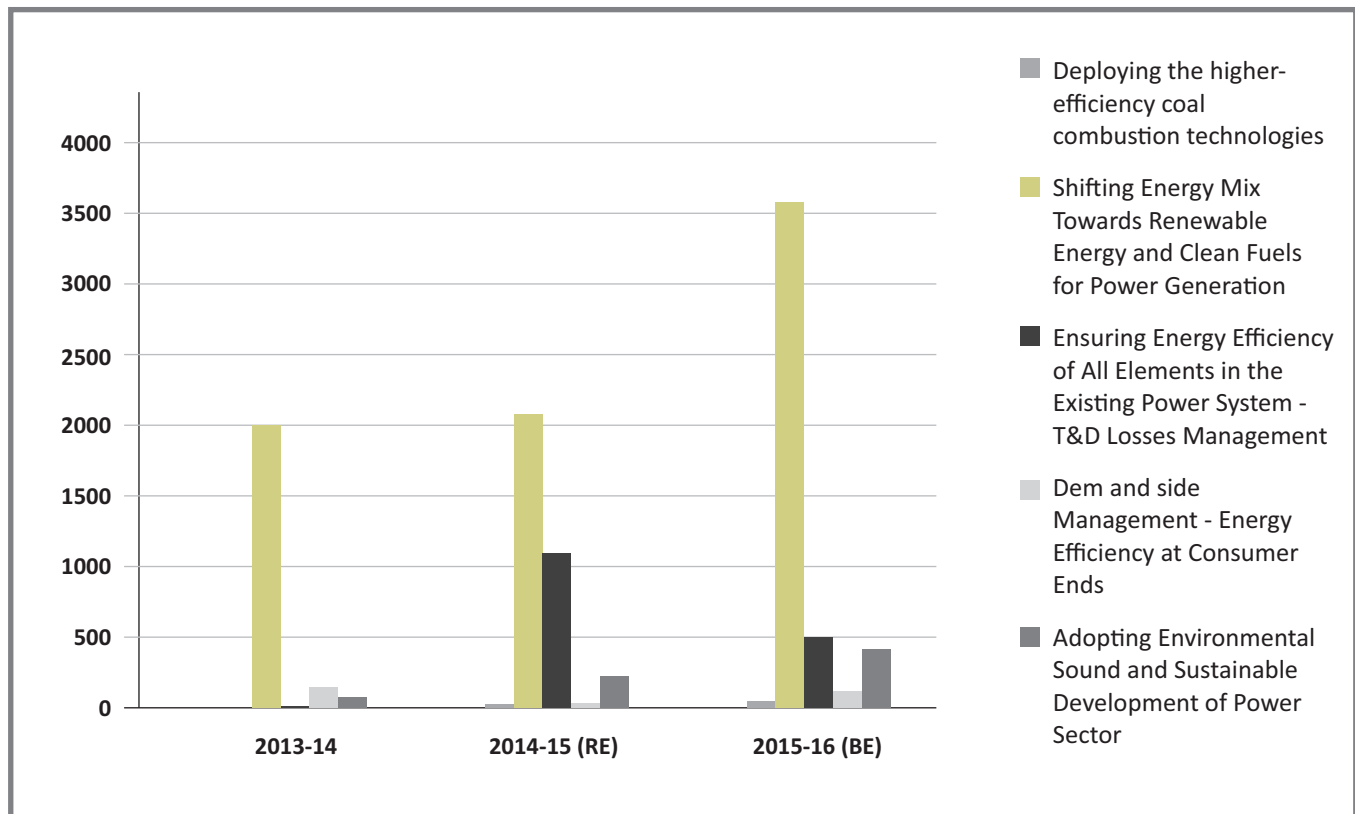
- India needs tighter norms to reduce the huge environmental load imposed by coal plants. Most importantly, the norms need to be enforced: Pollution Control Board need to build human power and skills to improve monitoring and regulators should be given more powers to ensure compliance.
- Ash utilisation should be supported by a policy framework that encourages its use in road construction and brick

4. Budgetary Analysis

Budgetary allocation data for various program and schemes has been presented in **Annexure II** for last 7 years 2009-10 to 2015-16. Following sections provide few results from budget analysis for low carbon development of power sector and the arising observation and suggestions.

Among all the strategies there is highest expenditure on the Renewable Energy promotion followed by expenditure on energy efficiency measures reducing transmission & distribution losses and at the consumer end.

Figure 5: Expenditure under various Strategies for Low carbon Development of Power Sector



5. Conclusion

GHG control and reduction of emissions from the coal-power sector necessarily will be a critical element

in India's carbon-mitigation strategy. India has taken a number of programs and schemes that will reduce GHG-emissions from the power sector while advancing the country's development agenda and also laying the groundwork for future deeper emissions reductions. In parallel, it is equally critical to focus on the public finances for strengthening the power sector for economic development of the country, and ultimately assist in the development of effective GHG-mitigation policies and actions.

Currently, there are various programs and schemes implemented by the Union Government which aids four broad strategies for low carbon and sustainable development of power sector. The Union Government can consider the following policy options while deciding on its spending priorities for promotion of low carbon development of power sector:

- Increase Government spending for promotion of rural applications of Renewable Energy Technologies with installation of Micro-Grids
- Increase government investments in T&D for modernizing the existing infrastructure and introducing new technologies, expand high-voltage lines, improve integration among regional grids, and improve monitoring and metering of distribution networks.
- Provide incentives for energy-efficient technologies through fiscal measures
- Pollution Control Board need to build human power and skills to improve monitoring and regulators should be given more powers to ensure compliance.

Annexure I: Schemes and Programme with description under Framework of Low Carbon Economy Development for Power Sector

S.No.	Category	Name of Scheme/ Program	Nodal Ministry	Description of Scheme / Program
1.	Deploying the higher-efficiency coal combustion technologies	R & D Projects - Development of Advanced Ultra Super - Critical (Adv -USC) Technology for Thermal Power Plants	Ministry of Heavy Industries	This scheme was introduced for the execution of R&D Projects 'Development of Advanced Ultra Super-Critical (Adv-USC) Technology for Thermal Power Plants'. The objective of this scheme is to undertake R&D and all aspects of Adv-USC Technology for Thermal Power Plants in order to improve power plant efficiency, reduce Carbon-dioxide emissions and reduce coal consumption as well as also establishing demonstration power plant based on the developed technology
2.	Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power generation	Nuclear Power Schemes	Department of Atomic Energy , Ministry of Atomic Energy	Nuclear Power Corporation of India Ltd. (NPCIL) under DoAE is the nodal agency for harnessing nuclear energy for power generation in the country. The main objectives of the company is to increase nuclear power generation capacity in the country as a safe, environmentally benign and economical source of electrical energy to meet the power requirement The company is currently building the 500 MWe FBR
3.	Shifting Energy Mix towards Renewable Energy for Generation and Clean Fuels	Various schemes under New and Renewable Energy	New and Renewable Energy	Grid-Interactive and Distributed Renewable Power: Provision of CFA for about 3770 MW Grid-interactive, Power capacity addition from Wind, Small Hydro, Biomass Power/ Cogeneration, Urban & Industrial Waste to Energy and Solar Power; and deployment of about 150 MW equivalents Off Grid/Distributed Renewable Power Systems. It is also proposed to launch new schemes on solar pumps (~400 crore), solar energy parks (~500 crore) and solar parks near irrigation canals (~100 crore). It also includes provision of Central Financial Assistance for Scheduled Castes beneficiaries. It covers central financial assistance for JNNISM, VGF for grid interactive solar power plants and rooftop subsidies. Renewable Energy for Rural Applications: The provision will be used

				<p>for construction of 1.10 lakh family types Biogas plant and start of a new programme on Cook stoves. It also includes provision for Scheduled Castes beneficiaries.</p> <p>Renewable Energy for Urban, Industrial and Commercial Applications: Deployment of Solar Thermal Systems and Promotion of Energy-efficient buildings and master plans for Solar Cities.</p>
4.	Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power generation	Green Energy Corridor	Ministry of Power	The scheme is proposed for maximization of renewable energy generation and integration with the main grid without compromising on the security and stability of power system.
5.	Ensuring Energy Efficiency at End User Level	Energy Conservation	Ministry of Power	Energy Conservation: The funds would be utilized for carrying out the awareness creation on Energy Conservation through print, electronic and other media for general public. Continuation of EC awards and paintings competition on Energy Conservation. The fund would also be utilized to implement the National Mission for Enhanced Energy Efficiency (NMEEE) and to upscale the efforts to create and sustain market for energy efficiency to unlock investments.
6.	Ensuring Energy Efficiency at End User Level	Bureau of Energy Efficiency (BEE):	Ministry of Power	Bureau of Energy Efficiency (BEE): Fund would be provided to BEE for implementation of its various energy efficiency initiatives in the areas of house hold lighting, commercial buildings, Standard & Labeling (S&L) appliances, Demand Side Management in Agriculture/ Municipalities, SMEs and large industries including the initiation of the process for development of Energy Consumption norms for industrial sub sectors, capacity building of SDAs etc. These initiatives by Government will enhance efficiency of energy consumption and reduce the rate of growth of energy consumption.

7.	Ensuring Energy Efficiency in Transmission and Distribution	Re-structured Accelerated Power development Reforms Programme (RAPDRP)	Ministry of Power	Re-structured Accelerated Power development Reforms Programme (RAPDRP): The objective of the programme is to facilitate State Power Utilities to reduce the level of AT&C loss to 15%. The programme has two major components. Part-A includes projects for establishment of information technology based energy accounting and audit system leading to finalization of verifiable base-line AT&C loss levels in the project areas. Part-B envisages distribution network strengthening investments leading to reduction in loss level.
8.	Ensuring Energy Efficiency in Transmission and Distribution	Smart Grid	Ministry of Power	The scheme of Smart Grid is one of the schemes included in the 12th Plan with an outlay of Rs. 1000 crore. The scheme envisages setting up of an institutional mechanism by launching “National Smart Grid Mission” which would serve the need of an electrical grid with automation, communication and IT systems that can monitor Power flow from the point of generation to point of consumption and ensure control of power flow or curtailment of loads matching generation on real time basis.
9.	Ensuring Energy Efficiency at End User Level	Govt. Residential Buildings	Ministry of urban development	The provision is for construction and maintenance of Energy Efficient Green Government residential buildings including Rashtrapati Bhavan, which also covers maintenance and repairs, Major and Minor Works, Furnishings, Rents, Lease charges, etc.
10.	Ensuring Energy Efficiency at End User Level	National Mission on Sustainable Habitat	Ministry of urban development	The provision is for construction and maintenance of Energy Efficient Green Government residential buildings
11.	Adopting environmental sound process of power generation	Nuclear Recycle Board	Ministry of Atomic Energy	Nuclear Recycle Board was a part of Bhabha Atomic Research Centre and has been created to carry out activities relating to Nuclear Fuel reprocessing and waste management.

12.	Adopting environmental sound process of power generation	Prevention of Air and Water Pollution	Ministry of Environment, Forests and Climate Change	The provision covers Grants-in-aid to State Governments/Central Pollution Control Board and funding of relevant schemes. The Central Pollution Control Board is also responsible for the prevention and control of air pollution.
13.	Adopting environmental sound process of power generation	Environmental Measures and Subsidence Control	Ministry of coal	Provision is for carrying out environmental protection measures including land reclamation and subsidence control in the coalfield areas as per the approved Master Plan for Jharia and Raniganj.

Source: Outcome budget, Expenditure budget and Annual report of various ministries and Departments

Annexure II: Spending at Union Government Level on Low Carbon Economy Development of Power Sector

Category	Union Government Ministry	Name of Scheme/ Program	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15 (RE)		2015-16 (BE)	
			Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan
Deploying the higher-efficiency coal combustion technologies	Ministry of Heavy Industries	R & D Projects - Development of Advanced Ultra Super - Critical (Adv -USC) Technology for Thermal Power Plants	-	-	-	-	-	-	-	-	-	-	13.2	-	50.0	-
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Ministry of New and Renewable Energy*	Grid Interactive and Distributed Renewable Power	200.9	-	532.6	-	901.8	-	874.5	-	1132.7	-	1800.0	-	2410.0	-
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Ministry of New and Renewable Energy Ministry of New and Renewable Energy	RE for Rural Applications	137.2	-	199.2	-	218.1	-	116.5	-	109.2	-	132.5	-	131.0	-
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Ministry of New and Renewable Energy Ministry of New and Renewable Energy	RE for Urban, Industrial and Commercial Applications	64.7	-	36.9	-	6.9	-	15.2	-	10.0	-	14.0	-	4.6	-

Category	Union Government Ministry	Name of Scheme/Program	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15 (RE)		2015-16 (BE)	
			Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Ministry of New and Renewable Energy	Research, Design & Development in RE	58.9	-	123.0	-	110.4	-	105.2	-	118.9	-	59.0	-	90.0	-
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Ministry of New and Renewable Energy	Supporting Programme	38.9	-	11.4	-	47.6	-	25.2	-	31.6	-	61.5	-	17.6	-
Shifting Energy Mix towards Renewable Energy and Clean Fuels for Power Generation	Department of Nuclear Energy	Nuclear Power Schemes	2004.5	721.2	708.2	412.1	1378.0	355.1	571.9	582.1	581.6	477.0	562.6	650.0	900.0	812.0
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Re-structured Accelerated Power Development Reforms Programme (RAPDRP) 2801	25.0	-	1.3	-	100.0	-	67.9	-	17.0	-	8.7	-	16.8	-

Category	Union Government Ministry	Name of Scheme/ Program	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15 (RE)		2015-16 (BE)	
			Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Consultancy charges for APDRP (2801)	-	-	10.5	-	-	-	-	-	-	-	-	-	-	-
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Loan to PFC under APDRP (6801) or 6552	-	-	-	-	-	-	-	-	-	640.0	-	445.8	-	-
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Smart Grid	-	-	-	-	-	-	-	-	-	-	1.0	40.0	-	-

Category	Union Government Ministry	Name of Scheme/ Program	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15 (RE)		2015-16 (BE)	
			Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Deen Dayal Upadhyaya Feeder Separation Scheme	-	-	-	-	-	-	-	-	-	-	500.0	-	-	-
Ensuring Energy Efficiency of All Elements in the Existing Power System- T & D losses management	Ministry of Power	Green Energy Corridor	-	-	-	-	-	-	-	-	-	-	1.0	-	1.0	-
Demand side Management - Energy Efficiency at Consumer end	Ministry of Power	Comprehensive Award Scheme for Power Sector	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Demand side Management - Energy Efficiency at Consumer end	Ministry of Power	Energy Conservation	-	-	-	-	-	-	-	0.7	-	-	1	-	1	-



Category	Union Government Ministry	Name of Scheme/ Program	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15 (RE)		2015-16 (BE)	
			Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan
Demand side Management - Energy Efficiency at Consumer end	Ministry of Power	Bureau of Energy Efficiency (BEE)	-	-	-	-	-	-	-	-	66.74	-	10.0	-	50.0	-
Demand side Management - Energy Efficiency at Consumer end	Ministry of Power	BEE- EAP Component	-	-	-	-	-	-	-	-	64.12	-	9.0	-	48.0	-
Demand side Management - Energy Efficiency at Consumer end	Ministry of Power	BEE- Non EAP Component	-	-	-	-	-	-	-	-	2.62	-	1.0	-	2.0	-
Adopting Environmental Sound and Sustainable Development of Power Sector	Ministry of coal	Environmental Measures and Subsidence Control	-	-	30.0	0.2	6.1	-	-	-	0.1	-	0.4	-	0.4	-
Adopting Environmental Sound and Sustainable Development of Power Sector	Ministry of Environment, Forests and Climate change	Prevention of Air and Water Pollution**	472.8	230.3	808.8	473.3	4.9	450.8	46.3**	73.02	107.9**	76.6	20.1	218.2	22.1	-

Source: Expenditure Budget Document of various Years for Various ministries

Note: * Budget Allocation for various schemes of MNRE includes amount met from National Clean Energy Fund. It does not include spending on North Eastern States ** Non plan budget of scheme- Prevention of water and air pollution is met through Water Cess. Above budget figures includes budget allocation for pollution prevention in industries other than power sector.

This research paper has been prepared by Jyotsna Goel.
For further information, please contact **Jyotsna Goel** at jyotsna@cbgindia.org



Centre for Budget and Governance Accountability
B-7 Extension/110A (Ground Floor), Harsukh Marg
Safdarjung Enclave, New Delhi - 110029
Tel: (11) 4920 0400, 4050 4846 (telefax)
Email: info@cbgindia.org
Website: www.cbgindia.org

An initiative supported by



The views expressed in this document do not necessarily reflect those of Shakti Sustainable Energy Foundation. The Foundation does not guarantee the accuracy of any data included in this publication and does not accept responsibility for the consequences of its use.