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## Policy and Spending Priorities for Renewable Energy in India

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### ABSTRACT

Ever since the Twelfth Plan has projected the growth rate of 8-9% for the economy by 2016-17, the focus is significantly on the meeting the challenge of the energy deficits for the economy. Tapping renewable energy sources hence is being mooted as an alternative proposal for meeting the deficiency in energy access and also reducing import dependency for the economy. The current budgetary outlays for the sector is extremely limited and pegged within 0.1% of the Union Budgets. There is huge scope for improving public expenditure for the sector. The paper looks critically the inter-linkage between public spending and policy priorities for the renewable energy sector in the country.

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The energy sector constitutes as one of the major driving forces of Indian economy, and towards reorienting the traditional carbon intensive economy to go on low carbon pathway, the policy focus will be on the development and mainstreaming of new sources of energy, specifically the Renewable Energy (RE) to a large extent. The country has set for itself a voluntary commitment for reducing the emission intensity of GDP by 20-25% from the 2005 levels by 2020<sup>1</sup>, and to meet self-imposed commitment, there needed energy centric interventions at least over next three Plan periods ranging from Twelfth Plan till Fourteenth Plan (Interim Report 2011: 12). Policy actions in changing energy architecture will be highly effective if it brings in major share of renewable in the commercial and non-commercial economic activities.

What needed to complement such policy actions is the augmentation of public provisioning toward RE, till it attains near grid parity. Ever since the sector is open to private investment including Foreign Direct Investment (FDI), the role of Government has always been a case of regulator and facilitator in promoting private investments in the sector. The cap of FDI through automatic route is currently prescribed as 100%. The FDI inflows to the sector are in tune of Rs 8,569 crore as reported during the last three years (data reported on 31.12.2012)<sup>2</sup>. Delhi and

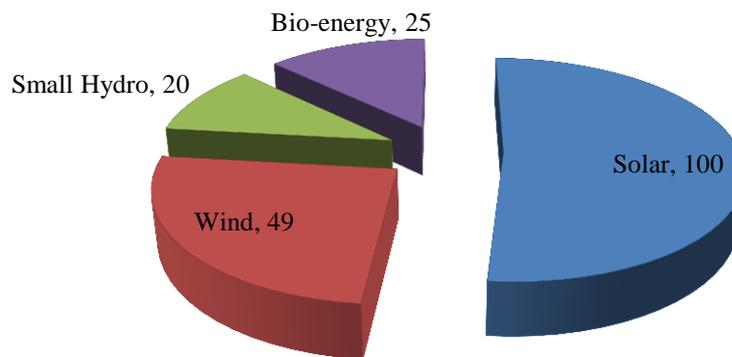


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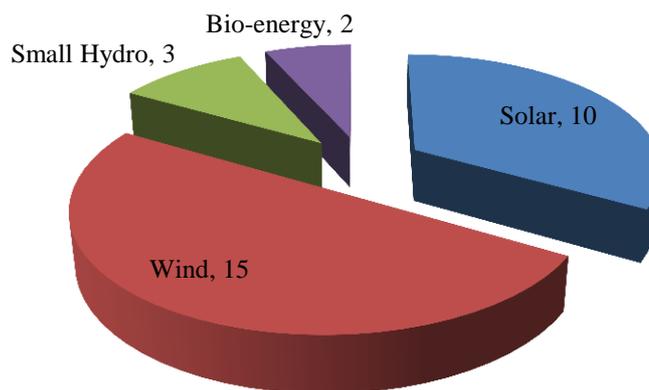
Haryana, Maharashtra, and Tamil Nadu and Gujarat are major benefactors of FDI flows. As per Bloomberg's (2012) *New Energy Finance Report*, the quantum of investments for the RE sector in India has increased to \$12 billion in 2011, a significant 62% growth over the previous year. Majority of the investments made in the sector are in the nature of Asset Financing, which means all money invested in RE generation projects is from internal company balance sheets, or from loans, or equity capital (Bloomberg:10). The public investment for the sector so far is very limited. The case for public spending is significant and compelling in India not only in the context of providing subsidies / Viability Gap Funding (VGF) for incentivizing R&D technology and bringing down the high capital cost associated with RE projects, but also required to make the off-grid connectivity with localized effects more viable options for non-commercialized usability.

The National Action Plan on Climate Change (NAPCC 2008) has underscored a minimum share of renewable energy at the national grid to be set at 5% in 2009-10, subsequently annual increase by 1% during the next 10 years to reach 15% by 2020.<sup>3</sup> This irrespective of the fact that, the country has estimated potential of 1, 89, 900 MW<sup>4</sup> of new and renewable energy, of which the solar energy constitute more than 50 per cent followed by wind, biomass, small hydro etc.<sup>5</sup> Currently, the installed capacity of electricity generation in the country is 1, 90, 516 MW, and out of this, the energy from renewable sources contributes only 25,000 MW by the end of the Eleventh Plan period<sup>6</sup>, including both solar<sup>7</sup> and non-solar sources of energy (wind, small hydro, bio-gas, etc.). The target for Twelfth Plan by 2016-17 is 30,000 MW (30 GW) for grid interactive for the Twelfth Plan period (see Sectoral composition of potentiality of RE and proposed capacity addition in Figure 1-2) which along with the installed capacity of the Eleventh Plan would harness only less than 29% of the estimated potentials by the end of the 2016-17. Exploitation of potentials is far from satisfactory and the sector is still deemed as a secondary option to meet the energy requirements in the country. If the policy planners envisage achieving the projected growth rate of 8-9% for the economy for the incumbent Plan<sup>8</sup>, then the concerns of energy deficit to be met urgently. There is an urgent need to build up its energy infrastructure fast enough to keep pace with the economic and social changes and to ensure sustainable GDP growth and access to electricity for all.<sup>9</sup>

**Fig 1. Estimated Potential of Power Generation from RE sources (in GW)**



**Fig 2. Proposed Capacity Addition of Grid-interactive Renewable Power under Twelfth Plan (in GW)**



Given the above backdrop, the paper through the study of budgets attempts to look critically at the inter-linkage between the public spending and priorities in public policies for the RE sector in the country. Where is the Government budget placed towards invigorating the sector by necessitating policy changes and public spending? Government budget is an important indicator of the government's priorities, and reflects on the quantum of public investment flowing to the sector necessary to meet its true potential. A limited view of government budget may indicate a perspective restricted to estimating receipts and expenditures, but a more holistic approach towards understanding budget recognizes the larger policy domain enforcing the priorities underlying the budgetary allocations.



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Even though the subject “Electricity” falls under 'Concurrent List' of the Constitution of India, the budgetary spending on energy generation, technological innovation, regional transmission, distribution and evacuation, and formulating enabling policy frameworks lies with the Centre. With respect to RE, the Ministry of New and Renewable Energy (MNRE) is the nodal Ministry entrusted with the responsibilities of looking into the formulation and implementation of a broad spectrum of policies and programmes covering the entire range of new and renewable energy sources. Hence, the analysis of public spending in RE here is limited to the budgetary spending and outlays made at the Union Level.

In the process, budgetary information from various budget documents such as Union Budget, Detailed Demands for Grants (DDGs), Outcome Budgets (various years) of the concerned ministries, and the Parliamentary Standing Committee Reports on Energy and Power have been assessed and scrutinized to review the level of public spending and the broad policy direction for the development of renewable energy. The study however acknowledge certain inherent limitation of budget analysis as it only partially attempt to recognise technical, functional and institutional constraints plaguing the development of the sector. Still certain insightful findings or inferences can be drawn pertaining to broad policy directions along with budgetary priorities for the sector, and finally flagging certain issues along with possible policy solutions.

### **Analysis of Union Budgets:**

While the renewable energy sector has huge potential, the budgetary priorities attached to the sector still remain quite low. The public spending for the conventional sources energy is significantly high as compared to renewable energy. The Twelfth Plan outlays approved for the Ministry of Power (MoP) and the Ministry of Petroleum and Natural Gas (MPNG) are as high as Rs. 9.8 lakh crore against the Gross Budgetary Support (GBS) of Rs. 19,113 crore for the MNRE (See Table 1). Considering the importance of RE in the overall energy basket, the Twelfth Plan outlays for the sector seems very negligible and reflects a myopic policy vision while allocating resources. This also further raises eyebrows when we see budgetary allocation in the last two Annual Plans of the Twelfth Plan. Going by the trends in allocations for the MNRE so far, it can assume that MNRE might miss to achieve the targeted allocation in the remaining of the Plan period, unless the sectoral budget is increased substantially. This concludes that the RE is being envisaged as a subsidiary to the total power supply in the country. Considering the potential of

the RE in India and the limitations of the conventional sources of energy, there is urgent need for the sector to be mainstreamed both in policy and budgetary perspectives.

**Table 1: Indicative Twelfth Plan Outlays for the various Ministries/Departments in the Energy Sector (Rs in Cr.)**

Name of the Ministry/Department	Twelfth Plan (2012-17) Projections			Allocation in 2012-13* [2]	Allocation in 2013-14* [3]	Difference to be met in the remaining years of the Twelfth Plan [1-2-3] [4]	Required Annual Outlays for achieve the Twelfth Plan projections in column [1] (column [4]/3)
	GBS	IEBR	Total Outlays [1]				
Ministry of Power	54279	386517	440796	59507.12	59760.48	321528.4	107176.13
Ministry of Coal	4617	108244	112861	9681.13	11801.91	91377.96	30459.32
Ministry of Petroleum and Natural Gas	5147	436541	441688	123444.73	144197.58	174045.69	58015.23
<b>Ministry of New and Renewable Energy</b>	<b>19113</b>	<b>13890</b>	<b>33003</b>	<b>3367.79</b>	<b>3927.55</b>	<b>25707.66</b>	<b>8569.22</b>
Department of Atomic Energy#	41615	65572	107187	15305.41	17832.38	74049.21	24683.07

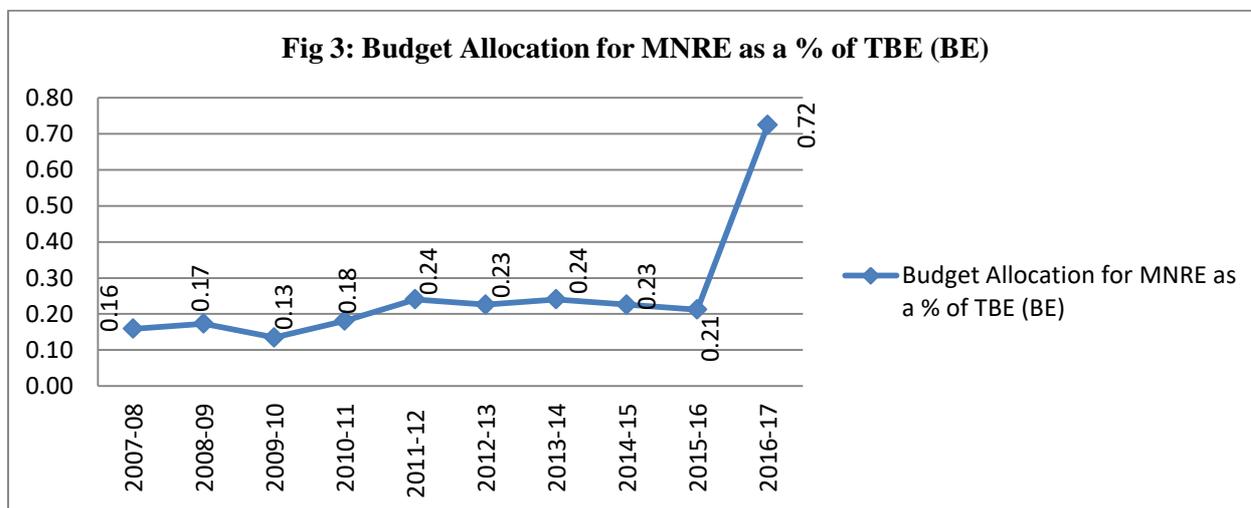
\*Includes both GBS and IEBR

# Includes outlays for Nuclear Power Schemes

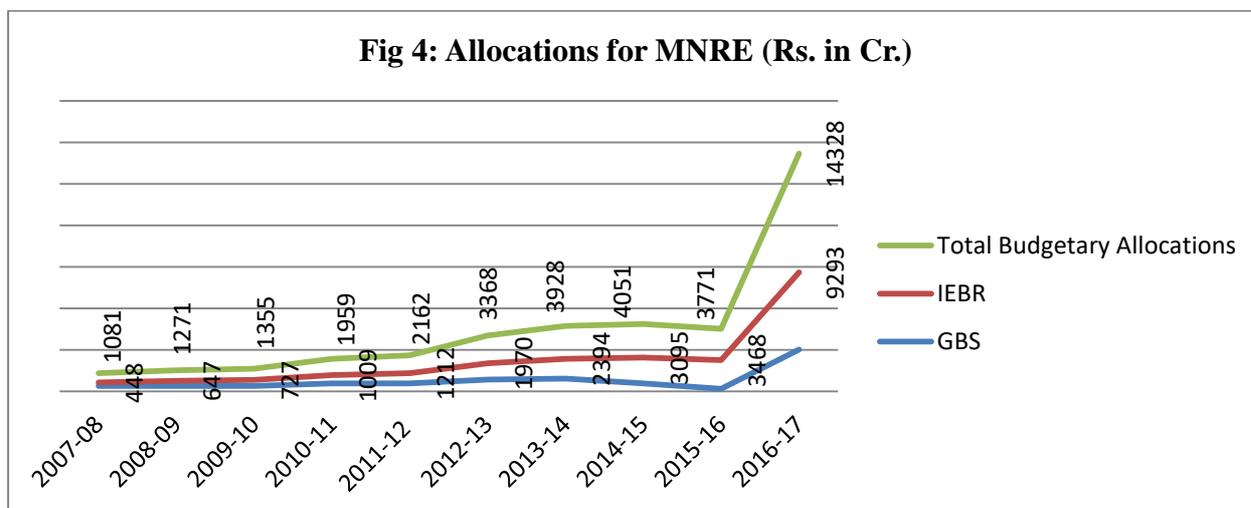
Source: Twelfth Plan Document, Expenditure Budget Documents of Union Budget (various years)

The public funds inflows to RE since Eleventh Plan (2007-08 till 2016-17) reflects a gradual approach to budgeting, even though the current policy setting focuses exceedingly on the need to expand access to clean energy sources both at commercial and non-commercial level. The average allocation for whole Eleventh plan period was merely 0.18%, which has seen marginally increase to 0.24% in 2012-13 and 0.72% in 2016-17 (Budget Estimates) respectively towards the end of the Twelfth Plan period (see Figure 3). The outlays have not been phenomenal as compared to conventional energy centric ministries. As a percentage of the Total Budgetary Expenditure (excluding IEBR), the share of the MNRE has consistently remained below 1% (Figure 3). The Estimate Committee (2011) argues in favor of allocating at least 1% of Union Budget<sup>10</sup> for the development of the sector in view of the importance and the huge investments

required in the sector; however the benchmark is yet to be reached for the sector. A significant variation in spending pattern can be observed in the post-NAPCC phase with the launch of Jawaharlal Nehru National Solar Mission (JNNSM, 2010), nearly Rs.424 crore hikes in FY 2010-11 over the FY 2009-10. The trend continued with Rs.210 crore in 2011-12 over the 2010-11, and the budget 2013-14 registered the spike of nearly Rs.370 crore over last financial year (Figure 4). It is important to observe that contrary to GBS, the Internal-Extra Budgetary Resources (IEBR) for the public sector entity, particularly Indian Renewable Energy Development Agency (IREDA), has received significant budgetary allocation in the post-NAPCC phase. The current budget 2016-17 has registered an increase of nearly Rs. 5,800 crore (GBS) over the preceding financial year (Figure 4).

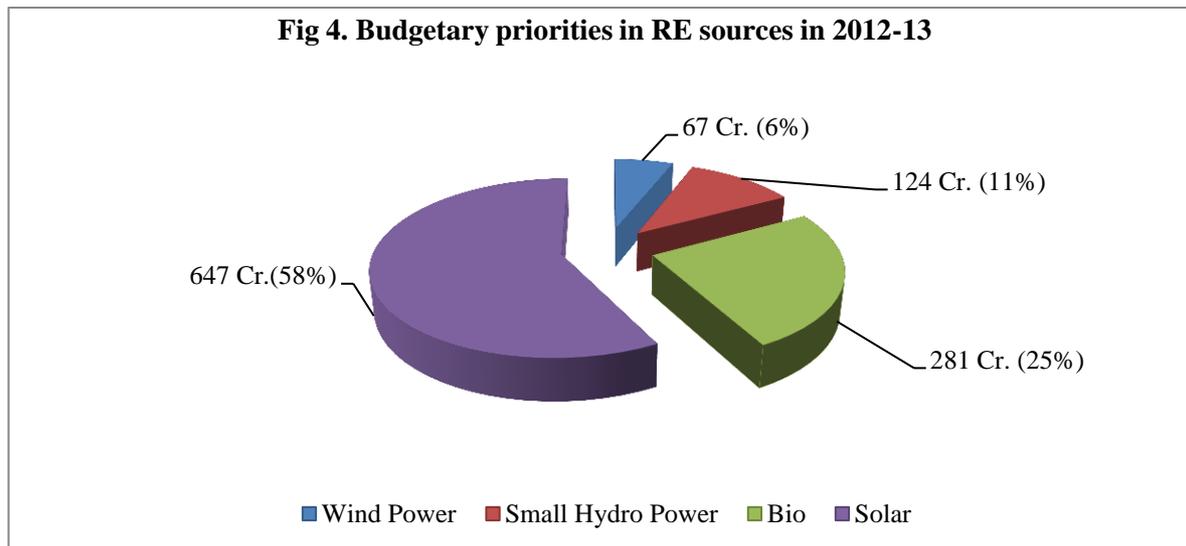


Source: Expenditure Budgets Documents of Union Budgets (various years)



Source: Expenditure Budgets Documents of Union Budgets (various years)

A closer look into two important interventions implemented by MNRE pertaining to Grid Connectivity and RE for Rural Applications, it can be observed of significant variations in budgetary allocations and the utilisation of funds available. The expenditure trend over the Eleventh Plan (Table 2) indicates that the Grid Interactive and Distributed Renewable Power have shown the highest expenditure over the Plan period, most importantly in the post-NAPCC period. Pertaining to outlays towards diverse sources of energy, Solar Energy has received nearly 50% of the budget, much higher than the priorities for developing other renewable energy sources like wind; small-hydro and bio-energy (see Figure 4). This has been part of the spending that have occurred as Phase 1 of the JNNSM and as the phase 2 of the JNNSM is being envisaged till 2016-17, the Solar Energy sector can be expected to get more budgetary resources under MNRE in the Twelfth Plan.



Source: Compiled from Detailed Demand for Grants of MNRE (2012-13)

**Table 2: Allocations for key Interventions in MNRE (Rs in Cr.)**

Key Programme	Eleventh Plan Outlays	Expenditure under Eleventh Plan	Expenditure as % Eleventh Plan Outlays	Outlays for Twelfth Plan Proposed by MNRE
<b>Grid-connected</b>				
Grid Interactive and Distributed Renewable Power	1779	1840	103	27732
RE for Urban, Industrial and Commercial Applications	216	147	68	1724



<b>Rural Application</b>				
RE for Rural Applications	910	911	100	3195
<b>Others*</b>	1163	900	77	8225

\*Includes Research, Design and Development in RE and other supporting programmes

Source: Twelfth Plan Document; The proposed figures compiled from the Departmentally Related Standing Committee Report of MNRE on DDG 2012-13; Expenditure Budget Document of Union Budget (various years).

Renewable energy has tremendous potentiality in electrifying rural villages. The Remote Village Electrification Programme (RVEP), implemented by MNRE, provides financial support for lighting/basic electrification in those remote un-electrified census villages and un-electrified hamlets of electrified census villages where grid extension is not found feasible by the State Governments and hence is not covered under the Rajiv Gandhi Gramin Vidyutikaran Yojana (RGGVY). Such villages are provided basic facilities for lighting/ electricity through various renewable energy sources (Lok Sabha Secretariat 2012). The budgetary outlays and expenditure for RVEP during the Eleventh Plan (year-wise) has been quite good till FY 2010-11, however the expenditure against the Budget Estimates for FY 2011-12 has been quite low (see Table 3). In addition to this, Decentralized Distributed Generation (DDG) under RGGVY, implemented by the Ministry of Power (MOP) also focuses to a large extent on rural electrification on mission mode with certain application of off-grid renewable energy, which primarily comprises of renewable off-grid applications. Under this scheme, nearly 90% capital subsidy is being provided towards overall cost of the projects and rest 10% of the project cost would be contributed by states through their own resources/loan from financial institutions / Renewable Energy Certificates. All un-electrified revenue villages and hamlets (above 100 populations) are eligible under DDG scheme of RGGVY. Implemented since 2009, the DDG has not achieved the desire outcome, with the reason being lack of clarity about the ownership of the project, low operational revenue, and lack of awareness among stakeholders as well as lack of adequate returns for the investing entrepreneur. Moreover, DDG is still being seen as a sub-optimal choice by the villagers who still prefer grid-connected power supply (Report of the Working Group on Power for Twelfth Plan 2012: 22-24).



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### **Inadequacy of Budgets:**

In the context of increasing the share of renewable energy in the total domestic energy production and in order to move away from the fossil fuels dependence, the current levels of public investment for RE does not seem adequate. The sector requires large initial capital investments not only for creating infrastructure, but also in developing technological breakthrough and markets to make the sector competitive like many conventional sources of energy in the country.

Evidence submitted by the MNRE shows that the proposed Twelfth Plan outlays would be grossly inadequate for up-scaling of activities envisaged by the nodal Ministry. According to the MNRE, Solar Photovoltaic (SPV) Off-Grid programme have suffered a setback due to lack of required funds leading to non-achievement of target during the first phase of the JNNSM. MNRE was unable to meet a committed Central Financial Assistance (CFA) liability of Rs. 1141.88 crore towards the sanctioned 118.12 MWp SPV Off-Grid projects during 2010-11 and 2011-12. MNRE needed to sanction an additional capacity of about 82 MWp during 2012-13 to meet the target of 200 MW in the first phase of the mission. Adequate funding is an important consideration for harnessing the potential of available renewable resources.<sup>11</sup>

The level of public investment indicated for the Twelfth Plan period is also unlikely to address the requirements of high capital investments for the renewable energy sector. Against a proposed outlay of Rs. 5000 crore by the MNRE, it was allocated Rs. 33,003 crore for the Twelfth Plan period. Moreover, the Working Group on Power (for the Twelfth Plan) reported a resource requirement to the tune of Rs. 1, 35,000 crore for the MNRE to meet its set targets.<sup>12</sup> Certain areas of concern in the renewable energy sector like the lack of evacuation, transmission and distribution infrastructure, the need for developing new renewable energy transmission networks, development of the storage technologies, incentivizing the sector to achieve grid parity with the conventional sources of energy etc. warrant huge public investments. As per the Power Grid Corporation of India's estimates, in order to realize the capacity addition plans for the Twelfth Plan period, an investment of around Rs. 30,000 crore would be required for creating and strengthening renewable energy power transmission infrastructure alone.<sup>13</sup> Taking into account the inadequacy of the resources for this sector, it is crucial that the budgetary allocations for Renewable Energy are stepped up substantially in order to meet the NAPCC and the Twelfth Plan targets for the sector. Given the high initial capital costs for the RE sector, it is



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crucial to ensure adequate funding to achieve the required development of this sector for meeting the growing needs and demands being placed on RE as a viable source of energy.

### **Resource absorption capacity of Institutions:**

Even though a number of institutions<sup>14</sup> are in place for promotion and growth of the renewable energy, the contribution of RE to energy mix is limited. Lack of convergence of these dedicated institutions in planning, management, financing and implementation of renewable policies and programmes have resulted in low fund absorbing capacity of the ministry. There are cases of under-utilisation of funds in overall budgets for renewable energy. On utilisation of funds during the Eleventh Plan, Standing Committee on Renewable Energy (2012-13) while looking into detailed Budgets of MNRE<sup>15</sup> notes that

“During the Eleventh Plan, the actual budget provision made available to the MNRE was Rs. 4068 crore (BE)/ Rs. 3897.80 crore (RE) and an amount of Rs. 3798.37 crore was actually utilized. While the Government has done fairly well in utilization of the allocated amount particularly for Grid-interactive & off Grid renewable power generation and Renewable Energy for Rural Applications programmes, the fund utilization was on lower side, especially during the first half of the Eleventh Plan period, under Renewable Energy for Urban, Industrial and Commercial Applications and Research, Design and Development in Renewable Energy Programmes. The trend of the utilization of the allocated funds indicate that the amount made available under various programmes were not being utilized properly during the first three years of the Plan period in general and the utilization of funds increased considerably during the last two years, thus giving a better picture to the total tally of utilization of funds on completion of the Eleventh Plan.”

The same trend continues in the first two Annual Plans of the Twelfth Plan. Such a pattern casts some doubt on the capacity of the ministry to utilize funds, which might be one of the reasons why the proposed allocations by the ministry have not been met by the Planning Commission and the Finance Ministry. Hence it can be observed that there is a need to build up the capacity of the ministry and the various agencies responsible for the implementation of its various programmes to utilize the funds more optimally. There is a need for setting up of a dedicated institution which will assist in achieving the goals under the various missions and also undertake



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activities to demonstrate commercial models to harness the large renewable energy potential. The dedicated institution need to act as a central level institution for program administration as well as undertaking project implementation, with coverage of grid as well as off-grid projects/applications.

### **Diversify Spending opportunities:**

The budgets for renewable energy should not go completely through the interventions administered by MNRE. There are several possibilities which can be further intertwined both at the Union and States level in providing socio-economic and general services. As per Climate Parliament assessment<sup>16</sup>, the health care system in the 95,000 villages are still to be electrified and majority of other villages which were assured of electricity, have poor quality of supply. The Government is providing assistance to supply power from back-up diesel generators (DG) to meet the guidelines of the Reproductive and Child Health (RCH II) programme. Rather, supplying electricity to the 2 lakh health sub-centres, primary health centres and community health centres from renewable energy could be a better choice. Likewise, the rural drinking water supply as administered by the Ministry of Drinking Water and Sanitation (MDWS) has huge potential to accommodate the budgets for renewable energy to distribute piped water supply. In Union Budget 2012-13, there has been allocation of Rs. 110 crore for installing solar energy based dual pump piped water supply scheme, even though it was routed from funds parked under National Clean Energy Fund (NCEF). Similarly the programmes like Mid-Day Meal (MDM) and the schools under Sarva Siksha Abhiyan (SSA), solar powered street lights under Pradhan Mantri Gram Sadak Yojana (PMGSY) have huge prospects for realising the potential of renewables. Allocating specific budget under energy components of many flagship schemes/programmes would generate demand for off-grid non-commercial renewable energy. Further, there is need for better convergence of administrative ministries to mainstream RE in social sector services.

### **Creating enabling policy environment:**

The sector needs significant investment inflows. The interest rate extended by the bank on the loans is high due to the high risk factor and large gestation period. According to the WISE (2011) report “The current interest rates are prohibitive and they are the single most important factor in making RE projects unviable.” To counter this problem, it is necessary that steps are taken to lower the rate of interests being charged in order to make renewable energy more



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affordable. The same can be done by (a) providing an interest subsidy (b) according Priority Sector Lending status to RE in view of the social and environmental benefits of renewables (c) allowing IREDA to raise low-interest finance from abroad and lending the same to RE development in India at 8-9% would go a long way in achieving national RE targets (WISE, 2011). Further, significant resources are yet to be utilized and parked under National Clean Energy Fund (NCEF), which can be used to lend low interest bearing funds to RE projects is a step in the right direction (Panda & Jena 2012). It may help make the cost of using renewable energy competitive with conventional energy. This could help in reducing high initial capital costs involved in producing renewable energy.

What is impeding the development of RE in the country is the absence of advanced, long term planning and a guiding, cohesive policy vision. We have multiple programmes running under various ministries, some of which are technology specific and others are state-specific. Government of India and regulatory commissions spell out their intent over a period of five years or even lesser, preventing investor confidence and thereby the flow of private sector investments in the sector. Multiple RE deployment targets, set at various governmental levels and under various initiatives, leave stakeholders confused. Limited co-ordination between central government institutions as well as between central government and the states in implementing central visions is also another contributing factor. Such lack of coordination results in delayed grid expansion, sub optimal markets structures, and limited state level interest in high RE targets. Therefore, a top-down approach to policy may be useful. Adopting an overarching long term enabling policy framework for development of RE could be the first step. This framework should be drawn keeping in mind the long term energy scenario of the country. This will facilitate states to draw their plans in alignment with the nationally accepted trajectory and channelize developmental and infrastructure investments accordingly.

World Bank (2010:40) also has highlighted about many overlapping incentives programme provided to the RE sector. “India offers every possible type of incentive, including feed-in tariffs; generation-based incentives; RPOs; central, state, and regional capital subsidies; accelerated depreciation; and tax incentives. The incentives are offered by different central and state agencies. Some have formulas that base the subsidy on nonlinear functions. The effect is unintended overlaps, reduced transparency and fiscal discipline, unnecessary complexity in claiming subsidies, and ineffective leverage for the amount spent on renewable energy



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development. An integrated and coordinated approach for financial incentives is urgently needed”.

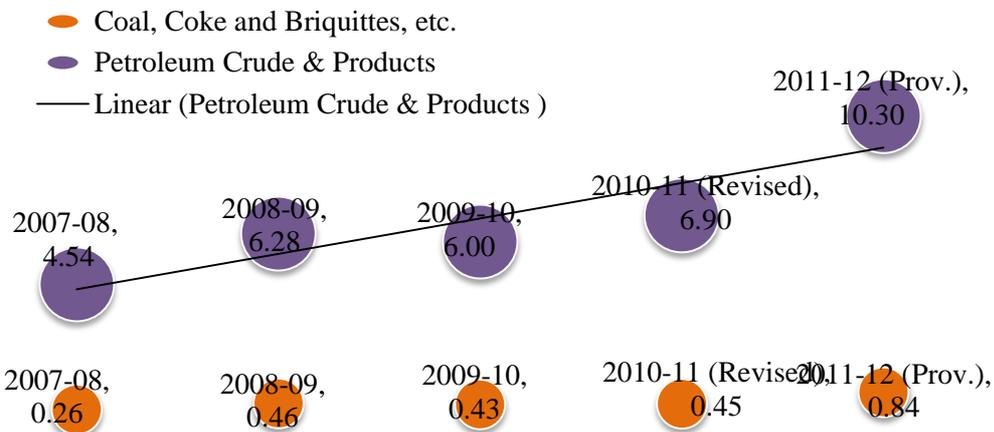
In addition to, strengthening our legislative framework to promote RE can streamline the planning processes and implementation mechanisms. The Electricity Act 2003 is the backbone of electricity sector in India. Though it is comprehensive enough for conventional sources of electricity, it needs to spell out provisions for the RE as well as the energy mix of the country. At present, many states are not usually adhering the allocated Renewable Purchase Obligations (RPO) while withdrawing their respective shares from the power grid. A legal framework is needed for strict enforcement of RPO obligations on the states. Finally, the implementing integrated energy policies for the country could not only promote greater adoption of clean energy solutions but also help utilize our conventional resources in a more sustainable manner.

### **Conclusion:**

To conclude, it is now policy imperative to mainstream RE in the overall energy architecture of the country. The mainstreaming processes need to be substantiated with augmented resources pulling and changing policy environment. Tapping RE potential is now inevitable towards meeting the enormous demand for electricity and deficiency in energy access in the country. The provisional figures of Census (2011) indicate that only 67% of the households in the country and 55% of rural households have access to electricity<sup>17</sup> and 85 % of the rural households are hugely dependent upon biomass fuels for their energy requirements. The per capita consumption of electricity in the country even though has increased from 15.6 kWh in 1950 to about 814 kWh units during the year 2011; it is still stand at the 24% of the world’s average and 35% & 28% respectively that of China and Brazil.<sup>18</sup> This situation is irrespective of the fact that there have been massive additions in generation, transmission and distribution capacity over the last sixty years of independence. The bottom-line hence is that the growth in power demand has always exceeded the power generation and capacity augmentation. How can one ignore the huge spike in the Current Account Deficit (CAD) of the economy due to high import bill (see Figure 5) of conventional energy feedstock. As per Integrated Energy Policy (IEP 2006: 69),<sup>19</sup> imports could increase to as high as 45% of the total coal requirement by 2031-32. If the IEP projection point to certain inevitable, then it is utmost policy imperative now to develop and use all possible domestic energy sources. Finally, from the perspective of mitigation policy discourse, there are enormous challenges put forth by the conventional sources of energy on national economy in

addition to their contribution to the growth of GHGs. As India moves forward on the path to low carbon economy, the high dependence on these sources for energy need to be reconsidered.

**Fig 5. Import of Principal Commodities under Energy Sector  
(Rs.in Lakh Cr.)**



Source: Compiled from Director General of Commercial Intelligence and Statistics as cited by RBI

Renewable energy is currently placed at margins to conventional power generation. Argument being advanced that due to variability factor associated with the RE, it cannot be relied on as the primary source of energy. The huge investment costs involve in generation, storage and transmission of power from the renewable surplus areas to other areas acts as a huge barrier in the development of RE as a primary source of energy in mainstream grid-connected areas. But this argument fails to take into account the widely acknowledged fact that the conventional sources of energy are highly subsidized. Coal, Oil and Natural Gas have large amounts of inherent subsidies which are not taken into account when computing their unit cost. If such subsidies are taken into account, then the cost of these products would increase substantially. As the unit costs of RE, especially solar energy, are coming down and the marginal cost of conventional energy is increasing day-by-day due to several supply based constraints, then it is possible that over next 10 to 12 years the unit cost of renewable energy such as wind and solar may come close to the unsubsidized cost of conventional energy. However, for the interim period, some special policy efforts to mainstream RE with other sources would ensure a reliable supply to the grid and would make the sector competitive in the long run.

As large hydro, thermal and nuclear power projects are marred with environment, political and ecological concerns and considerations pertaining to associated costs involved in terms of

displacement of people, deforestation etc., shifting to renewable energy sources becomes a more viable option to explore. In contrast to the conventional energy sources, the renewable sources are clean, localized, economical, sustainable, and favorable to the economic growth in the long-run. Notwithstanding several above mentioned reasons, the sector is highly labour intensive and can contribute significantly towards employment generation (WISE 2011). Renewable can go a long way in ensuring economic development of renewable-abundant states and can help ensuring energy security in remote and inaccessible rural areas through its' off-grid applications.

## Endnotes

<sup>1</sup>In December 2009, India announced that it would aim to reduce the emissions intensity of its GDP by 20-25% from 2005 levels by 2020. This is an articulation of India's voluntary domestic commitment, even though it does not see itself a part of any internationally legally binding agreement on emission intensity targets and emission reduction outcomes. Source: Interim Report (2011:12).

<sup>2</sup>Details of FDI made in RE sector during the last 3 years and current years (as on 31.12.2012) can be seen in Annexure-I referred to in reply to part (c) of the Lok Sabha *Unstarred Question No. 1968* for 8th March, 2013 regarding Investment in RE Sector. Data collected from Parliament Questions, Lok Sabha. See [www.loksabha.nic.in](http://www.loksabha.nic.in)

<sup>3</sup>The Information is cited from World Bank (2010:22) and Arora *et al* (2010:1): India Renewable Energy Status Report, Background Report on DIREC 2010, NREL/TP-6A20-48948, October 2010.

<sup>4</sup>As per the *Twenty-Ninth Report* (2011-12) of the Standing Committee on Energy on "Availability of Identified Non-Conventional Resources of Energy – their Potentials vis-à-vis Utilisation", Lok Sabha Secretariat, New Delhi, "the potential of RE sources identified in the country is 1,89,900 MW, in which the share of solar (1,00,000 MW), wind power(49,000MW), small hydro power (up-to 25 MW), biomass (15,000MW), bagasse (17,000MW), waste to energy 3,900 (MW) respectively. Further the revised potential of wind energy by Centre for Wind Energy Technology (C-wet) has been estimated to be around 1,00,000 MW at 80 m. height (which is yet to be validated). After validation of revised wind potential the total potential of RE in the country would be about 2,50,000 MW."

<sup>5</sup>See source cited in note 2; and also see *Twenty First Report* of Standing Committee on Energy (2011-12), *Action Taken Report* Submitted by Ministry of New and Renewable Energy on the recommendations contained in the *Fifteenth Report* (Fifteenth Lok Sabha) on the subject 'Funding of New and Renewable Energy Projects', Lok Sabha Secretariat, New Delhi.

<sup>6</sup> See note 2.

<sup>7</sup>India receives about 5000 trillion kWh/year equivalent energy through solar radiation. The average solar insolation incident over India is about 5.5 kWh/m<sup>2</sup> per day. Just 1% of India's land area can meet the country's entire electricity requirements till 2030. See NAPCC (2008: 30).

<sup>8</sup>Figure quoted from "Full Text of Prime Minister's Statement at the Full Planning Commission Meeting on Twelfth Five Year Plan (2012-17) on 15.09.2012"; Viewed on 11 April 2013 ([http://planningcommission.nic.in/news/pm\\_speech1509.pdf](http://planningcommission.nic.in/news/pm_speech1509.pdf) ).

<sup>9</sup>India has an energy supply shortage of 10.2%. See *Twenty-Ninth Report* (2011-12) as in note 2.

<sup>10</sup>Climate Parliament has estimated following ways the Government might spend its 1% of budget expenditure on renewable energy (a) 30% of the 1% should be spent on a Feed-in-Tariff (FIT); (b) 40% of the 1% should be spent on capital subsidy at a rate of 30% of the cost of renewable energy plants; (c) 10% of the total available funds should be spent on Risk Guarantee Fund (RGF); (d)10% should be made on village mini-grids; and (e) remaining 10% should be spent on R&D and HRD.

<sup>11</sup>Departmentally Related Standing Committee Report (DRSCR) on MNRE Budget 2012-13.



<sup>12</sup> As per the Working Group Report on Power for the Twelfth Plan (pg. 52), the fund requirement for the RE projects for Biomass is Rs. 10,500 crore, Small Hydro Power is Rs. 8000 crore, Solar is Rs. 49400 crore, Wind is Rs. 67,200 crore

<sup>13</sup> See Energy Chapter in Twelfth Plan (2012-16) Document, Planning Commission, GOI.

<sup>14</sup> Institutions like Solar Energy Centre, IREDA, Centre for Wind Energy Technology, Alternate Hydro Energy Centre, National Institute of Renewable Energy have been playing critical role in facilitating the installation of renewable energy in the country. At the state level, State level nodal agencies are carrying out MNRE's mandate and implementation of projects and programmes.

<sup>15</sup> See note 9.

<sup>16</sup> Read details in Climate Parliament's Renewable Energy Briefing Series Paper # 2 on "Promoting Renewable Energy : Co-benefits for India" available at

[http://www.climateparl.net/viewpage.do?category\\_id=16&tagName=India](http://www.climateparl.net/viewpage.do?category_id=16&tagName=India)

<sup>17</sup> See 'Sources of Lighting' in 'Housing Census 2011' for state-wise figures in URL [http://www.censusindia.gov.in/2011census/hlo/Data\\_sheet/India/Source\\_Lighting.pdf](http://www.censusindia.gov.in/2011census/hlo/Data_sheet/India/Source_Lighting.pdf) (Viewed on 18 July 2013)

<sup>18</sup> See National Electricity Plan 2012, Volume 1 (Generation) in URL

[http://www.cea.nic.in/reports/powersystems/nep2012/generation\\_12.pdf](http://www.cea.nic.in/reports/powersystems/nep2012/generation_12.pdf) (Viewed on 18 July 2013).

<sup>19</sup> The Integrated Energy Policy (2006:xiii) estimates that the India's primary energy supply will need to increase by 4 to 5 times and its electricity generation capacity by 6 to 7 times of its 2003-04 levels to deliver a sustained growth rate of 9% through 2031-32 with primary energy supply growth of around 5.8 % *per annum*. Commercial energy supply would need to grow faster at about 6.8% *per annum* as it will incrementally replace non-commercial energy over this period. See Interim Report (2011:11).

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