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## Linking International Development and Market Formation: Case Study of Energy Efficiency Investments in India

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# Linking International Development Institutions and Market Formation: Case Study of Energy Efficiency Investments in India

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**Abstract:** *India is facing a conflicting twin challenge of maintaining long term energy security and mitigating Climate Change induced risks. Energy efficient economic pathway is considered to be the least cost based approach to mitigate energy security and climate risks. However energy efficiency markets in India are still nascent mainly due to "split incentive" barriers, capital market imperfections, bounded rationality, irreversible nature of energy efficient technologies, asymmetric information, and associated transaction costs. These issues have increased energy efficiency investment risks by widening the gap between small and medium enterprises (SMEs) adopting energy efficient technologies/measures and financial institutions financing the energy efficiency investments. This research argues that successful promotion of energy efficiency market in India would require not only an array of policies and innovative national institutional and regulatory frameworks but also international development institutions. This paper begins by providing a brief account of various policy incentives to develop energy efficiency market in India and then proceeds to investigate how the work of The World Bank in India helps create energy efficiency market by addressing policy and regulatory issues, institutional weakness, information asymmetry that distorts financial institutions' risk-return signals in SME energy efficiency financing, and risk mitigation instruments such as guarantees. The research proposes an integrated "multiple actors-multiple risk" based framework that maps techno-economic issues, capacity building, environmental risks, investment appraisal and valuation, financial risk mitigation instruments, and project management on synergy development between energy efficiency financing requirement of SMEs and financial institutions. The research concludes that such initiatives by The World Bank help reduce substantial entry barriers and information asymmetry in energy efficiency markets and hence align financiers' risk-return expectations with true risk-reward of energy efficiency projects.*

## Introduction

India's energy system performance over the past two decades has been shaped by significant and systematic institutional and market design transitions,

and these transitions are closely related with transformation of energy sector equilibrium from a centrally planned society to a market one. The performance in terms of both "equity" and "quantity" has been far from satisfactory. Though more than 80% of Indian villages are electrified; electricity access to rural household is below 60% against over 90% in urban areas. The issue of equity in Indian energy sector is highlighted by the fact that performance of the modern energy system in rural areas, in terms of cooking and lighting energy consumption, is significantly lower than in urban areas. Per capita energy consumption in India is far less than the global average commercial energy consumption (Balachandra et al; 2010). Despite lower per capita income in India (USD 1045 in 2009), energy consumption consumes a large proportion of household budgets mainly due to distorted and irrational energy prices. The share of modern energy carriers is about 75% of total consumption and is likely to expand as the Indian economy treads on higher economic growth pathway. In light of the expected increase in energy demand driven by future economic growth, the distorted, high energy prices coupled with a lack of adequate domestic energy supply and infrastructure is expected to increase the dependence of Indian energy portfolio on foreign supplies, resulting in an increased vulnerability of the Indian energy system. Indian imports of coal, gas, and oil is expected to increase to 50%, 73%, and 90% in 2050 from 12%, 25%, and 70% in 2005 (Yadav, 2010). The Indian oil import bill for 2006 was US $ 39 billion. This raises a key question for Indian policymakers; what future energy-economic pathways are to be chosen that not only increase energy access but also maintain reliable energy security and optimal economic burden.

The energy transition aligned with macroeconomic reforms in the early 90s shifted the Indian energy system disequilibrium to market equilibrium by delineating a wide range of reform initiatives and facilitating agent based investment decision making. The transition included unbundling of vertically integrated regulated utilities, privatisation of the transmission segment, and introduction of competition in the electricity sector.. The reforms were supported by the ideology that competition will improve the efficiency of energy markets, thereby reducing electricity and energy prices and the resultant drain on consumer's welfare. These reforms were designed and implemented as part of broader economic reforms, including privatisation, divestment, and deregulation of many segments of the Indian economy. The role of the state in developing and producing goods and services in many industries including infrastructure services, energy and utilities, and heavy manufacturing diminished and the share of private participation noticeably increased. However the reforms based on text-book based idealised models of unbundling and privatisation yielded only interim results without achieving operational efficiencies in the power sector.

While addressing development and domestic energy problems has been a priority for India, the international externality issue of climate change has also drawn the attention of Indian and global policymakers. Climate change which is considered to be a derivative problem of development takes a central role in Indian energy policy-making due to the expected future increase in Green House Gas (GHGs) emissions, including carbon dioxide (CO2). India accounts for over 4% of global CO2 emission and is the fifth largest CO2 emitter world-wide. A high degree of dependence on coal, oil, and gas makes the issue of GHG emission more perilous on account of higher CO2 content of fossil fuel and may push the economy towards various long-term irreversible development lock-ins such as unsustainable urban planning, SME development, and infrastructure investment (Shukla, 2008).

In 2006, the National Planning Commission (Government of India) introduced an Integrated Energy Policy (IEP) to provide a long-term roadmap to promote competition in energy markets, maintain a reliable and affordable energy supply and arrest climate adverse actions.. The IEP envisages various long term energy and emission scenarios by using economic growth, demographic transitions, technology innovation, and institutional reforms as future drivers of the energy system. One of the key policy prescriptions for India to meet key future energy challenges of energy security, energy access, and climate change is to reduce energy intensity, defined as energy consumption per unit of national income (GDP), through promotion and adoption of higher energy efficient investment in the economy. Such energy efficient investments not only seek to use available scarce energy resources in an effective and efficient manner but also cut down CO2 emissions significantly. This will also account for a very sizable share of energy resources which remain unused due to efficiency improvements, and can be mobilised towards addressing the issues of energy security and energy access.

Addressing the 10th Delhi Sustainable Development Summit in Delhi on February 5, 2010, the Indian Prime Minister Dr. Manmohan Singh, who also pioneered the Indian economic reforms in 90s, made a very strong case for developing markets to enhance energy efficiency investment in the country.

*"We will soon launch an ambitious National Mission on Enhanced Energy Efficiency that will put in place an innovative policy and regulatory regime to unlock the market for energy efficiency, estimated at over US$ 15 billion. It is expected that the initiative will lead to avoidance of capacity addition of nearly 20,000 MW and reduced carbon dioxide emissions of almost 99 million tonnes."*

Against the above backdrop, this paper rigorously examines the key problems in implementing energy efficiency projects in India and critically evaluates the role of the World Bank in providing strategic and financial aid to market

expansion. The paper first reviews and evaluate energy policy developments in India followed by evolution of energy efficiency policies and strategies. It then identifies the key risks associated with energy efficiency projects perceived by market agents.

**Pre-Reform energy markets in India**

Until early 90s, Indian energy system was planned by an overarching social planner in line with the social economic planning environment. The argument for social energy planning was borrowed from the "merit goods" characteristics of the energy and electricity sectors. It was argued that the energy and electricity business should remain with the state, given the critical role these sectors play in long term development, delayed revenue generation capacity of business, procedural complexities and irreversible nature of energy investment, possibility of hold-up problem and opportunistic behavior of agents, and low paying capacity of Indian households. State-owned electricity utilities known as State Electricity Boards (SEBs) were formed under a vertically integrated monopoly structure to operate in power generation, transmission, and distribution segments of the business. SEBs had dual nature as commercial entities and as devices for development policy. However, SEBs operating under an inefficient and complex web of bureaucratic and technocratic networks and the influence of political forces realised huge financial losses due to operational inefficiencies, technology constraints, populist political coercion, weak institutional regime, and a lack of management expertise. SEBs operated at loss level of as high as 50%, emanating from technical and financial losses. Given the prominence of electricity on the Indian political agenda, electricity price formation and electricity supply decisions have been dictated by the socio-political acceptability at the expense of economic efficiency. There was practically no overlap between economic and political equilibria in the pre-reform period. The sector's soft budget constraint operations and its inability to reach an economically optimal tariff deprived it of the required funds for investment and eventually made it dependent on government subsidies as a source of funding (Shukla et.al., 2004). Moreover, the subordination of SEBs to government direction often gave rise to other distortions in investment choices (Roques et al. 2006) that eventually led to underinvestment in capacity additions. The inability of state and central governments to publicly finance new power capacity, ill financial health of SEBs, and balance of payments problem in the early 1990s acted as a bottleneck in the power sector and created a need to attract private and foreign investment in the Indian power sector.

**International institutions, reform push, and shifting governance in India**

The Indian Electricity Reform process, started off in 1991, has attempted to rectify the investment deficiencies in the generation sector through policy decisions designed to attract private investors. The amendments in the Electricity Act 1910 and Electricity Supply Act 1948, driven by the Balance of Payment (BoP) problem and other macro-economic corrections, offered private and foreign investors , known as independent power producers (IPPs), attractive terms to set up power plants in India.

The Power Purchasing Agreements (PPAs) – agreements outlining terms and conditions for power purchase between the SEBs and the IPPs -- guaranteed a 16% return on equity. But the poor health of SEBs in combination with long term PPAs skewed the entire policy incentives and created a long term burden for the SEBs and a potential stranded cost for further reforms (Dubash & Rajan, 2001). This inefficient diagnosis of ill health of the power sector encouraged private investment in the generation segment to address power shortages, with IPPs selling power through PPAs to the SEBs. Buying IPP power at prices above retail tariffs when the SEBs could not even cover the cost of under-priced power from state-owned generators aggravated the financial distress (Newbery, 2006; Shukla et al. 2004). On the other side, private generators were wary of their generating units turning into stranded assets owing to irregularities of payments from SEBs .The fear was aggravated by several incidences of renegotiation of PPAs, expectations of various stakeholders with varied interests, multitude of risks, and an uncertain environment (Kumar, J, et al. 2008). Dabhol Power Company, a large natural gas based power plant, failed miserably in wake of the urgency of reforms with unrealistic tariff formulation, misallocation and mismanagement of multitude of risks, and flawed capital cost structure.

The second phase of the reforms swept through the sector in mid 1990s. Individual states took initiative to restructure their respective electricity sectors with the help of bilateral and multilateral agencies. This phase of reform, popularly known as electricity restructuring, was the brainchild of the World Bank. The World Bank has been vehemently pushing the market based reform agenda in emerging economies world-wide. According to Krugman (1992), "*It makes considerable sense for the World Bank and other multilateral agencies to push very hard for liberal policies in developing countries, given the demonstrated tendencies of these clients to engage in economically irrational interventions*". The state of Orissa took aid from World Bank to unbundle its electricity sector into separate generation, transmission, and distribution segments and is cited as the pioneer of this era. This phase of reform used single buyer model (SBM), where the transmission and bulk supply licensee act as the buyer of all the electricity produced by the generators and sell it to the distribution and retail supply licenses for further supply and distribution. A regulatory commission was set up in each state to ensure and regulate proper

supply of electricity. But the reform could not meet its goal as the entire supply chain was critically affected by the presence of unexpected monopolies and cumulated losses of the distribution business. The most successful aspect of the Orissa reform has been the creation of independent regulators, which was replicated in other states, though with mixed results. In July 2002, after the lukewarm result of Orissa reform, the distribution operation of the Delhi Vidyut Board, the state owned utility that served the 14 million people living in metropolitan Delhi, was privatised.. The investor friendly restructuring in Delhi gave investors a bit of certainty by adopting a bidding system which worked on the basis of a trajectory of transmission and distribution (T&D) losses reduction in the first five years of private operations.

The most important legislative initiative in the Indian electricity sector is the Electricity Act 2003 which is designed to bring long-term competitiveness and efficiency in the sector by proposing several institutional and operational mechanisms. The Act provides an enabling framework for unbundling and privatisation on the one hand, and introduction of wholesale competition, trading and bilateral contracts with regulatory oversight, on the other. It provides windows of opportunity for IPPs, electricity traders, large users who want to exit from being the captive clients of integrated monopolies and even a ray of hope for rural consumers, who hitherto were condemned to be the victims of poor quality supply merely because they were also partly the recipients of subsidy for agricultural pumping.

The Electricity Act 2003, with its unique ability of bringing in fundamental and radical provisions for changes in transmission and distribution segment, moves towards creating a market based regime in Indian electricity sector and is considered to be a cornerstone for further reform. By pushing the Indian electricity market toward a relatively competitive structure, the Act distinguishes itself from other previous Acts in India by creating a multi buyer- multi seller system and hence improvising options of retail competition by allowing a choice of supply to certain consumers (Bhattacharyya, 2005). The Act also provides a broader mandate for the bulk electricity market with de-licensing of thermal power generation, open access, provision for private investment in generation and transmission, and multiple tariffs.

The market-based reform process has historically encountered considerable failures and challenges and not yet been able to ensure the timely and optimal capacity mix development-the main objective of the reform process (Shukla et al. 2004., Singh, 2007). The effectiveness of power reforms in attracting private investment, ensuring efficiency, and infusing transparency of regulatory setups has been questioned on several counts (Phadke & Rajan, 2003). Several researchers suggest that in the context of weak regulatory setup in developing countries,

competition can bring efficiency improvement and lower the prices for consumers (Phadke, 2007., Bushnell & Ishii, 2007). Another set of researchers believe that wholesale market induced competition in developing countries is not feasible and desirable from societal perspective (Dubash & Singh, 2005., Reddy, 2001). The latest body of literature recommends hybrid electricity market designs for developing countries like India, on account of socio-political and economic structures which are typically different from those in developed markets (Tongia, 2007).

**Environment and climate change**

Climate change arising due to increase in GHG emissions is an extreme case of externality and requires long-term forward looking policy options.. Dynamics of energy, electricity generation and associated negative externalities in Indian context have been analysed in various studies (Hourcade et al. 2008., Mathy & Guivarch, 2009., Shukla, 2006., Shukla et al. 2008). However, these studies are predominantly deterministic and focus on sectoral mitigation and adaptation pathways for India.

Though the climate policy horizon has to be long term, the specific policy initiatives have to be immediate for several reasons, such as, to initiate mitigation efforts now so as to reduce the impacts of climate change later, to avoid lock-ins in various long term infrastructure development projects etc. The mitigation strategy of climate change and de-carbonization of economy should be part of the broader energy policy goals. Decisions on mitigation action taken in the form of government policy to internalise externalities associated with the power sector will have to contend with the fundamental and political uncertainties associated with climate change and energy markets. The result is that the extent and form of government policy is itself uncertain. Power generation companies are amongst the biggest emitters of GHGs, and are therefore amongst the most exposed companies to climate change policy and regulatory risks. Power sector reform has helped in maintaining better environmental regime by reducing the emissions. But the impacts of the reform are not as effective as the impacts of environmental regulation and policies (Shukla et al. 2004). One primary reason is that power sector reforms in India have been mainly motivated by factors which do not necessarily have serious bearings upon the environment.

**Low carbon society: reconciling energy and climate change**

A central development policy question for Indian policymakers is to design economic pathways that will be met with limited resources available, with minimal externality, and in the presence of large uncertainties with respect to climate. These pathways must be reliable, sustainable, technically feasible, low carbon emitting, and should have a positive impact on the economy. Decoupling of carbon emission and economic growth will form the backbone of such pathways. A low carbon

society (LCS) is one of the most discussed economic pathway world-wide that has the potential to meet all the above criteria. Several modeling studies have been done to evaluate costs and benefits of adoption of LCS in India (Shukla et al., 2008; Hourcade & Crassous, 2008). Such LCS pathways will require actions from both the demand and supply side in the economy. Deployment of low carbon technologies will improve the supply side, whereas from demand side, behavioral modification and demand side incentives will be required.

**Energy efficiency: A new asset class**

Similar to other developing countries such as China and Brazil, India has also declared its commitment to climate change by announcing voluntary carbon emission reduction target as part of negotiating process of Post-Kyoto climate policy regime (UNFCC, 2010). Historically, carbon intensity (carbon emission per unit GDP) of Indian economy on purchasing power basis has been well below global carbon intensity level. And moreover, India has also managed to reduce its carbon intensity level over the period 1994-2008. The Government of India issued a National Action Plan on Climate Change in June 2008, which presents a set of eight missions, including one dedicated to energy efficiency, and announced its intention to voluntarily reduce India's carbon intensity by 20 to 25 % by 2020 compared to 2005 levels. Several researchers find percentage carbon intensity target misleading as it doesn't refrain absolute carbon level from continued increase (Fisher & Springborn, 2009., Jotjo & Prezzey, 2009). However such targets increase economic efficiency by focusing on structural and technological transitions of the economy rather than GDP growth itself (Stern & Jotjo, 2010) and tread the economy on the LCS pathway.

Indian energy efficiency is fifth lowest in the world; however there is an economic potential for substantial energy savings (Kala, 2010). Voluminous academic and practitioner literatures suggest that improving energy efficiency is the largest and least-cost optimal opportunity to meet growing future energy demand by reducing energy consumption, and thus carbon emission significantly (IEA, 2008., IPCC, 2007). However, the speed of diffusion of energy efficiency investments in India has been very poor mainly due to various government and market failures on the economic, institutional, governance, and information fronts (P. Balachandra, 2010., Bhattacharya & Cropper, 2010). Some of the key failures are distorted energy pricing, high start-up costs, capital markets imperfections, higher transaction and structuring costs, market and policy uncertainties, unfavorable interest rates, and lack of awareness and information (Ghosh et al. 2002; Reddy & Assenza, 2007; Chandrasekhar & Kandpal, 2007; Yang, 2006; Mckinsey & Company, 2009). Moreover, a high degree of information asymmetry leading to higher monitoring

and compliance costs under "impaired institutional-regulatory nexus" that can produce regulatory capture in various forms further deters investors and companies from energy efficiency investment in India.

**Key Policy and Institutional Initiatives**

The institutional and policy environment in India recognised the merits of energy conservation and energy efficiency improvements as early as in 1965 and set up the Energy Survey Committee of India to understand the role of energy in economic development policy. This provided a strong impetus for integrating energy policy into national development policy in early 1970s. Ever since, the energy sector and associated issues formed a critical part of overriding themes of Indian Five-Year development plans. A number of initiatives have been taken up to evolve institutional capacity and effectively establish procedural norms and practices to channelize investment in EE. Key institutional developments are listed below in table 1. The most significant institutional development has been the setting up of the Bureau of Energy Efficiency (BEE), a statutory body to facilitate, coordinate, and administer EE activities. The BEE was created to remove the institutional void in the EE sector with multiple goals of systemically reducing energy intensity of the Indian economy, strengthening the delivery mechanism in the country, and providing leadership to the key agents involved in EE activities.

**Table 1: Key Energy conservation and efficiency policy initiatives**

| Year | Initiative | Objectives | Agencies involved | Recommendation / Action |
|---|---|---|---|---|
| 1965 | Energy Survey Committee of India (ESCI) | First attempt to estimate and forecast future energy needs and sources | National Council of Applied Economic Research | Submitted a comprehensive report with first-cut estimates of income elasticity of energy use in India |
| 1974 | Fuel Policy Committee (FPC) | To analyze energy demand-supply | National Planning Commission, GoI | 1.Proposed recommendation to substitute oil by coal in the wake of global oil crisis<br>2.Shifting focus to hydro to |

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|---|---|---|---|---|
| | | scenario with a particular focus on EE | | achieve higher efficiency in power generation and transmission |
| 1976 | Petroleum Conservation Action Group | To create awareness on conserving petroleum products and promote R&D in fuel efficient technology | Ministry of Oil and Petroleum, GoI | Proposed various recommendations for enhancing energy conservation |
| 1979 | Working Group on Energy Policy (WGEP) | To complete comprehensive review of energy system and propose policy initiatives | National Planning Commission, GoI | demand side management, establishing norms and standards of fuel efficiency, and developing coordination among energy intensive sectors |
| 1981 | The Inter-ministerial Working Group | To recommend policies and programs to achieve energy saving targets | GoI | 1.Recommended creation of an "apex" body to streamline energy conservation activities<br>2.Identified industry, transportation, and agriculture as key sectors for energy conservation |
| 1983-88 | Advisory Board on Energy (ABE) | To empower the GoI to take energy conservation measures | Prime Minister's Office | 1.Commissioned the Indian Law Institute to prepare a draft of the Energy Conservation Bill for Parliament<br>2.Established Nodal Energy Conservation Organization to assist central and state governments |

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|---|---|---|---|---|
| 1990-97 | 1.Eco Mark<br>2.Voluntary program on energy efficiency | Various programs to enhance energy efficiency and conservation | The Ministry of Environment and Forest (MOEF), Central Pollution Board, Bureau of Indian Standard | 1.Eco-labeling program of environment benign products<br>2.Energy efficiency standards developed for refrigerators and air-conditioners |
| 2001 | Energy Conservation Act (ECA) | To facilitate and enforce the efficient use of energy | Parliament of India, Ministry of Power, State Governments | Set up norms and promoted Energy intensive sectors known as "designated consumers" to adhere these norms |
| 2002 | Creation of Bureau of Energy Efficiency | To implement provisions of Energy Conservation Act and facilitate and coordinate EE activities | Ministry of Power | 1.Prepared energy conservation action plan and released in 2002<br>2.Established system, norms, standards, and procedures to monitor sectoral energy efficiency performance<br>3.To engage multi-lateral, bilateral, and private sector in energy efficiency activities<br>4.Partially eliminated market failures arising out of information asymmetry<br>5.Comprehensive energy labeling program in 2006 |
| 2008 | National Action Plan on Climate Change | To Identify measures that promote development while yielding co-benefits of addressing to climate change | Prime Minister's office, Ministry of Power, MOEF, BEE, Ministry of New and Renewable Energy, Ministry of urban development, | Proposed eight core "national" missions running through 2017 |

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|---|---|---|---|---|
| | | | Ministry of water resources | |

Source: Various GoI policy documents

National Mission on Enhanced Energy Efficiency (NMEEE) is one of the eight core "national" missions under NAPCC. It recently proposed an Energy Efficiency Action Plan with five key sets of activities briefly mentioned in table 2.

**Table 2: Energy Efficiency Action Plan under National Mission on Enhanced Energy Efficiency (NMEEE)**

| Plans/ Schemes | Proposed actions |
|---|---|
| Perform Achieve and Trade scheme (PAT) | Market-based mechanism to enhance energy efficiency |
| Market Transformation for Energy Efficiency (MTEE) | Clean Development Mechanism (CDM) roadmap, Standards and Labeling, ESCO promotion, capacity-building |
| Financing Energy Efficiency | Tax exemptions, Revolving fund, Partial Risk Guarantee Fund |
| Power Sector Technology Strategy – fuel-shifting, focus on new as well as old plants | IGCC demonstration plants, Development of know-how for advanced super-critical boilers |
| Other initiatives | Setting up energy efficiency services limited, strengthening of BEE, capacity building and awareness program |

Source: NAPCC, Government of India, 2010

**Firm level energy efficiency investment analysis: Indian MSMEs and EE investment possibility**

Energy efficiency improvements projects that can be profitable at firm levels are often not implemented in the developing world. India which boasts of a significant industrial sector is not an outlier. The industrial sector in India, which increased its percentage share in GDP from 20% in 1960 to 28.25% in 2009 (CMIE, 2010), consumes about half of the total commercial energy consumption. About three-quarters of the industrial sector operate in heavy energy intensive sectors such as metals industry, brick-making, and glass and ceramic industries (CMIE, 2010). There are over 13 million Micro, Small, and Medium-sized enterprises

(MSME) in India, forming over 80% of the total number of industrial enterprises in the country. MSMEs contribute about 45% of industrial sector output, produce about 40% of export, and employ over 40 million people, after agriculture (is it the biggest employer after agriculture?). While the total number of Indian MSMEs witnessed a growth rate of about 10% over the period 2000-2010, the total production and export from MSMEs grew by about 50% and 40% per year (Partha Sarthy, 2007., CMIE 2011). Though energy intensity of the industrial sector has declined over the year, MSMEs have not been able to reduce their energy intensity at the same pace. A recent study by National Productivity Council for BEE estimates that total potential electricity savings in the industrial sector is about 18.57 billion unit, large enough to approximately meet over 3.5% of total energy demand in India. Energy cost accounts for 20-30% of total cost of goods sold for MSMEs, depending on the energy consumption nature of the MSMEs. Many MSMEs are employing inefficient and obsolete technologies leading to higher energy costs. Moreover, increased competition for product and new markets has started putting additional cost and price pressure. On the other hand, a recent survey of more than top 278 global business leaders on energy efficiency investment potential, conducted by The Economist, finds that about 70% of respondents have initiated energy efficiency programs within their organizations mainly on account of saving electricity and energy costs (Economist Intelligence Unit Survey, 2011). This is in stark contrast with the outlook of MSEMs towards energy efficiency improvement and clearly shows the pervasive information asymmetry about perceived importance of EE for profits, lack of information, and poor internal management approach, that MSMEs are inflicted with.

Indian MSME sector presents a valuable opportunity to deploy energy efficient technologies and improve existing energy efficiency practices. Such initiatives and practices will enable MSMEs to cut down energy costs and reduce the adverse impacts of price-based competition. Despite numerous governmental financing plans and schemes to advance energy efficient investment in the MSME sector, penetration of energy efficient investment has been very low. The impediments to EE diffusion in MSME sector is slightly different than ones cited earlier. The difference mainly arises due to peculiar characteristics of MSMEs, the environment in which they operate- demand and supply side barriers, policy and institutional barriers, and unorganised management approach lacking expertise in optimising the internal resources and strategies. Perhaps the biggest problem with EE projects in the MSME sector is the fact that these projects are often not considered as being directly aligned with the most important part of business-business expansion that is responsible for increase in future revenue, but rather associated only with the reduction in energy cost. Existing surveys and studies on Indian MSMEs show that trade credit is a key source of financing and working

capital management (about over 15% of total requirement) for MSMEs in India (Allen et al, 2009., Love & Peria, 2004). This trade credit based financing structure is largely driven by business and social relational contracts. However such relational contract based transactions are weak legally as they are not backed by legal or written contracts.

MSMEs operating under such severe budget and credit constraints find opportunity costs of exhausting their credit limits on cutting energy costs than on increasing revenues extremely high. The energy efficiency proposition for MSMEs becomes even less attractive given limited access to adequate and timely capital and credit on competitive terms, particularly longer tenure loans. Indian banks find it extremely difficult to lend to MSMEs on account of high transaction cost, monitoring cost, recovery cost, and increased risk perception associated with lending to smaller clients. Problems of collection and monitoring of bank loans get amplified if we consider geographic spread of MSMEs in India. On the other hand, electricity suppliers deriving revenues from sales of electricity often have very little incentives to deploy resources and promote energy efficiency programs that will reduce the energy demand and thus revenues for the suppliers (IEA, 2007b; Kushler et. Al, 2006).

Given the importance of the MSME sector to the Indian economy, the Government of India has asked Indian banks to prioritise lending to SMEs. Indian banks have followed "cluster" based lending to SMEs due to their "hard to reach" customer categorisation. Cluster lending can be thought of an innovative lending scheme targeted at certain clusters of industries that are co-located for economic or policy regions (The World Bank, 2010). Given the typology of industrial clusters, each cluster will have different challenges and opportunity for an energy efficiency lending strategy. Two types of cluster lending programs have been tried in India- one focused at upgrading technology and improving performance with energy efficiency improvements as an internal component, and the second aimed particularly at projects where energy efficiency improvement was the core lending objective.

State Bank of India (SBI), India's largest public bank, has taken a holistic and innovative approach and created a "partnership-governance regime" using a variety of contractual agreements with research institutions, training and development centers, and local bodies. Similar practices have been adopted by the Small Industries Development Bank of India (SIDBI) and a dedicated R&D center has been established. Lending practices of five key banking and financial institutions, including two private banks, to SMEs for energy efficiency improvement have been compared in table 3.

**Table 3: Comparison of key 5 banking/financial institutions active in SME energy efficiency lending**

| Bank/ Financing Institution | SBI | ICICI (Private bank) | Yes Bank (Private bank) | IREDA[1] | SIDBI[2] |
|---|---|---|---|---|---|
| **Sectors Financed** | SME/ general lending | SME/ general lending | SME/ general lending | SME/ general lending | SME |
| **Technology** | Industrial cogeneration and efficiency | Energy efficiency (EE) equipments | EE equipments | Demand side investment, EE equipments, process improvements | Energy saving equipment/ process |
| **Beneficiary priority** | Priority to existing customers-Strong relational contract | loan grant to new and existing customers | loan grant to new and existing customers | loan grant to new and existing customers | loan grant to both new and existing customers |
| **Loan Term Structure** | 5 years | 3-5 years | 3 years | 7-10 years | 7-9 years |
| **Working Capital Loan Availability** | Yes | Rare | Rare | Yes | Yes |
| **Loan Covenant** | Rigid covenant with penalty | Rigid covenant with penalty | Rigid covenant with penalty | Rigid covenant with penalty | Flexible covenant |
| **Interest** | Commerc | 7-10% | Commercial | 10-12% | Fixed |

[1] Indian Renewable Energy Development Agency
[2] Small Industries Development Bank of India

| | | | | | |
|---|---|---|---|---|---|
| **Rate** | ial rate (PLR[3] based) | | rate | Rebate:1-2% | rate:9.5-10% Floating: PLR – (0.5-1.25%) |
| **Collateral Requirement** | Yes | Yes | Yes (Asset/Guarantee) | Yes | Not strictly required |
| **Future EE targeted lending program** | Yes | No | No | Yes | Yes |
| **Non-Fund based Credit help to SMEs** | Partial | No | No | Line of credit available from World Bank | Yes-line of credits and guarantees |

Source: Author's preparation from various loan documentation reports and annual reports

SIDBI and SBI as a part of their cluster lending programs have attempted to drastically reduce agency costs and information asymmetry problems and hence improve the efficiency of loan-repayment by facilitating the coordination between SMEs, entrepreneurs, and technical experts who have provided technical assistance in improving the current technology/practices and identifying additional technology options. Prompted and encouraged by the lowering of transaction and monitoring costs, four other public sector Indian banks[4] have now developed financing schemes for energy efficiency projects in the MSME sector. Though such a top-down approach partially managed to reduce the higher transaction cost of loans, it could not generate enough demand for energy efficiency loans from SMEs. The partial success of EE lending activities is attributable to demand and supply side problems. On the demand side, despite the partnership, banks have not been able to devise attractive ways to either create new demands or transform existing demands for technology upgradation and process improvements. On the supply side, the lukewarm interest has been the result of misalignment of Indian Banks' short-term priorities versus long term goals of promoting SMEs to become advanced, competitive, and financially sound. At present, SMEs seeking finances for EE investment from private banks have to adhere to general lending programs as

[3] Prime lending rate: the interest rate that commercial banks charge their most credit-worthy clients
[4] Bank of Baroda, Bank of India, Canara Bank, and Union Bank of India

lending schemes targeted specifically at financing EE projects have been discontinued by banks.

The energy action plan under NMEEE acknowledges the financing constraint faced by MSMEs for EE projects and demands that special mechanisms be put in place to help SMEs acquire improved technologies. In effect, the NMEEE provides a framework as well as direction for policy interventions – both existing and proposed – by the Government of India to achieve the twin goals of improved energy performance and reduced greenhouse gas emissions through the promotion of EE.

*"To promote technology upgradation in the SME (small and medium enterprise) sector, it would be essential to evolve sector-specific integrated programmes for technology development. This would require external support for significantly longer durations to address various technological barriers and promote energy efficiencies at the unit level. The information or knowledge gap is more pronounced in case of small industries and 'hand-holding' to help industries install energy efficient technologies as well as to ensure their optimum performance through best operating practices will be required."*

**MDBs and energy policy in the developing world**

International institutions have historically supported the developing world improve their electricity infrastructure and services by supplying public financial resources and influencing regulatory and institutional mechanisms. These institutions support developing countries' efforts to provide clean and reliable electricity services to households and businesses through financing instruments, policy advice, partnerships, and knowledge transfer.

Multilateral Development Banks (MDB) are increasingly seen as institutions that can effectively mold energy technology choice and policy making, improve service delivery, accentuate capacity building exercises, and provide capital for energy investment with risk-return expectations that are very different from the ones arising out of imperfect Indian capital markets. However traditional aid and loan disbursement conditionality of MDBs has been questioned due to their inability to enforce conditions and bureaucratic inconsistency (enforce inconsistency??) within lending agencies such as pressure to meet lending targets, defensive lending to promote repayment of previous loans, or short term altruism (Mosley et al., 1995; Collier, 1997; Dreher, 2004, Svensson, 2004). It has been argued that enforcing conditions in structural loan disbursement is heavily influenced by the borrowing country's international and trade relations with the U.S. (C. Kilby, 2009).

MDBs have started using energy efficiency as a critical criterion for supplying technical assistance and loans for energy projects in developing economies. Sixteen out of 29 Asian Development Bank (ADB) energy projects worth US$6255.3 million,

13 out of 19 Inter-American Development Bank projects worth US$470.716 million, and 18 out of 31 World Bank energy projects worth US$5098.76 million, focus strongly on energy efficiency improvements along with other policy issues (Nakhooda & Ballesteros, 2010). India alone has received energy policy targeted loan disbursement from the ADB and the World Bank to the tune of US$1861.2 million and US$285 million respectively (Table 4). ADB together with other MDBs have been supporting northern state of Himachal Pradesh in endowing the state with supply of hydropower and clean energy.

**Financing energy efficiency at MSMEs Project: case study of energy efficiency in Indian MSMEs and the World Bank's role**

**Background**

In line with its stated objective of poverty reduction and economic growth by supporting the provision of efficient, affordable and clean energy supply, and present pervasive barriers and perceived risks in adoption of energy efficiency investment in Indian MSME sector, the World Bank partnered with Global Environment Facility (GEF), Government of India, and key responsible ministries, to develop a Programmatic Framework for Energy Efficiency in India in 2008. The programmatic framework led by Global Environment Facility (GEF) aims at accelerating the penetration of EE technologies and processes in MSME sector. GEF has two such programs in its offing- one to be implemented with UNIDO focuses on promoting EE and renewable energy in selected MSMEs and the other one with the World Bank focuses only on EE in selected MSMEs.

The World Bank has valuable past experience in multiple-agency projects in the areas of financing, energy efficiency, and lending to SMEs in India by working with various local bodies such as SIDBI and IDBI. Such partnerships with local financial institutions are of paramount importance for projects that require constant engagement of local bodies after completion. The constant engagement is required to ensure that the interest of the local financing sector is maintained in order to expand the benefit of the project and hence form and expand the market, which is one of the key overriding objectives of such projects.

Various initiatives to improve industrial energy efficiency, including Indian SMEs, have been undertaken by international agencies such as ADB, USAID, World Bank, and GEF in the past. These initiatives have met with mixed success, similar to those implemented by SBI and SIDBI. One such key initiative by the World Bank named SME Financing and Development (SMEFD) which does not directly support financing of energy efficiency projects in MSME sector needs, but has significantly

added to overall development of Indian SMEs by removing the financing constraints, needs to be mentioned here. SMEFD project has covered about 930 SME units spread over 10 Indian states, with funds disbursement over US$ 115 million and has assisted SIDBI and SIDBI's project funded branches (bank branches?) to increase lending by 53% and 72% respectively. This has also helped SIDBI in diversifying its term loan portfolio by including working capital loans and working capital term loans, which are in high demand due to economic uncertainties.

**The project**

The selected case study is a GEF-World Bank grant program titled "Financing Energy Efficiency at MSMEs Project". The project aims to address all three major barriers to diffusion of EE- information asymmetry, financing constraints, and lack of internal management approach. In particular, the failure of SBI and SIDBI's EE lending arrangements in the past has helped the World Bank understand the importance of creating an additional demand for EE investment. The main objective of the project is to support development of a large portfolio of EE projects in the selected MSME cluster and help improve market acceptance by both MSMEs and local financing institutions. The project carries a significant scope for replication and scalability and attempts to bridge the gap between techno-economic and financial-institutional aspects of EE investment. The project follows "cluster" approach and would be implemented as part of larger SME EE program of the BEE.

Five clusters have been selected on the basis of a variety of factors such as,: number of units, energy usage and intensity, EE potential and availability of proven EE technologies, SME financial health and ability to access finance, strength of potential apex organizations, and replication potential. Main fuels used across the five clusters are coke, furnace oil, charcoal, gas, oil, and electricity- all are carbon intensive.

The project will have four main components as shown in figure 1.

The first component will have a strong focus on capacity building and information dissemination across five clusters, including 3810 MSME units, with the objective of increasing the knowledge base of EE in MSME sector.

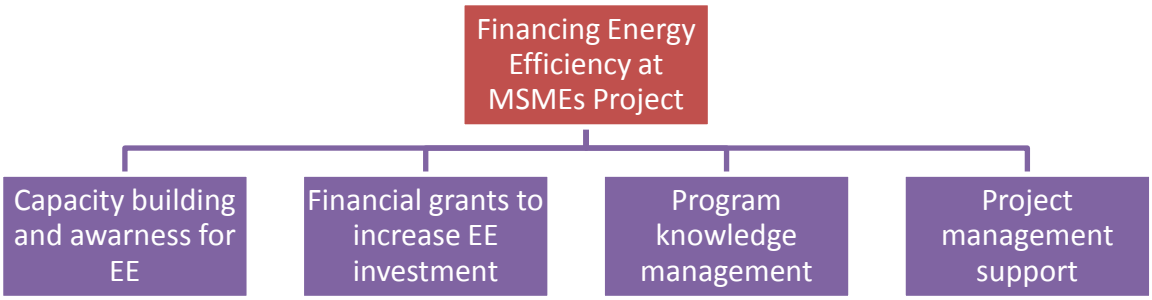


**Figure 1: Components of the project**
Source: Derived from project document

The second component primarily centers on providing grant support to cover initial costs including project assessment and funding for a limited number of incentives for demonstration projects of EE technologies.

The third component aims at advancing knowledge management practice of BEE and includes resource and manpower provision to BEE for monitoring and evaluation, cross-country exchanges, and exchange of nee best practices. This is crucial to long term energy efficiency policy development as BEE is one of the main statutory bodies advising GoI on energy policy.

The fourth component will set up a project management unit at BEE to supervise, manage, and evaluate the proposed project.

**Project governance structure and involved parties**

Following Ronald Coase's argument of risk allocation, the project is structured in a way that allocates tasks to the party who can complete them at the lowest possible cost and risks. Fund disbursement will be channelised through a grant agreement between GoI and the World Bank, and between the World Bank and SIDBI (fig 2). The World Bank has to channelise funds to the Ministry of Power, GoI, who will transfer the funds to BEE on a timely basis as per the request of the BEE. Such a time consuming and lengthy fund channeling is the result of BEE's statutory body status. Funds to SIDBI will be transferred directly to a bank account defined by SIDBI and can be used by SIDBI with a withdrawal application.

BEE and SIDBI will be the main implementers of the project. BEE will be responsible towards overall implementation of the project, and will directly complete activities that support its mandate, whereas SIDBI will mobilize activities

in World Bank-nominated clusters for demand creation and provide capacity building support to participating financial institutions.

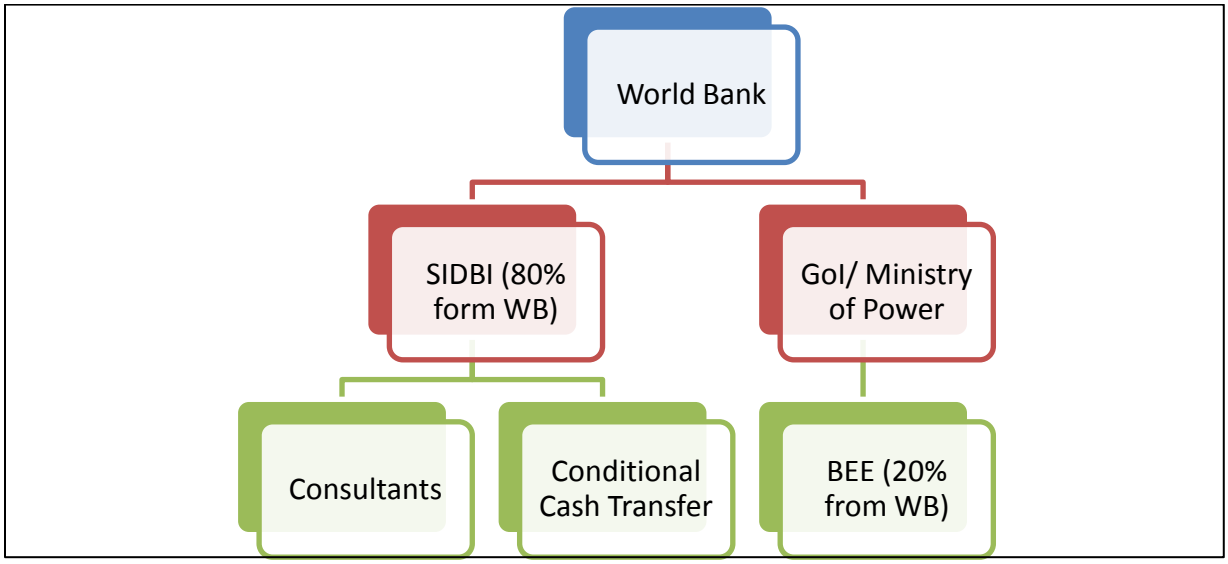


**Figure 2: Project governance and fund transfer structure**
Source: Derived from project document

**Proposed cost and risk structure**

The project will draw upon the fund disbursement from the World Bank. The total cost for the project is estimated to be US$ 57,563,300. The World Bank will provide about 20% of the total project cost. The remaining 80% is expected to be arranged by MSMEs through local financing institutions, line-credit from banks, government support, and assistance from International Bank of Reconstruction and Development, and equity contributions from MSMEs. About 35% of total funding from the World Bank will be utilised for capacity building and awareness, including-marketing and outreach efforts to clusters, capacity building exercise for energy auditors, support to financial intermediaries, unit level support to MSMEs to access finance, and vendor-outreach support. About 52% of the FEF fund will be used for energy efficiency project development support and grants for demonstration of efficient technologies. Remaining part of fund will be used for strengthening the strategic framework by BEE to delineate a well functioning and independent regulatory and market transformation regime, addressing a variety of market failures.

**Table 4: Proposed cost and financing structure of the project**

| Project Component | US $ | Co-financing (US$) | % of total GEF Fund |
|---|---|---|---|
| Capacity building & awareness for EE | 3,909,410 | 239832 | 34.60% |
| Financial grants to increase EE investment | 5,867,896 | | 51.93% |
| Program knowledge management | 1,000,000 | | 8.85% |
| Project management support | 522,694 | 23468 | 4.63% |
| **Total for GEF-Bank** | **11,300,000** | US$ 2, 250,000 for BEE<br>US$ 9,050,000 for SIDBI | |
| ***Private sector finance mobilised by MSMEs*** | ***46,000,000*** | | |
| ***Total including private sector*** | ***57,563,300*** | | |

Source: Author's calculation

Given the potential impetus the project may have on expansion of EE investment in MSME sector, its outreach, and involved parties, risk analysis needs to be conducted. Such analysis becomes more critical given the historical lukewarm response of MSMEs in adopting EE technologies and processes. Risk profiling of key elements of the projects is carried out in figure 3. A qualitative risks analysis of the project shows that the project does not suffer from very high degree of risks. The key risks of creating demand, i.e. market risk is mitigated through cluster based target approach and BEE's and SIDBI's grass-root level networks with NGOs, campaigning agencies, and local district level government system. Moreover, the project design contains a large number of components designed solely for creating a large sustained demand for EE goods and services. Moderate risk of technology for enhancing efficiency and meeting growing energy demand of MSMEs is balanced against a substantial potential to achieve efficiency breakthroughs. Adoption of technologies will cast a great attention to the development process and initial implementation of case studies. This approach has been well demonstrated in the U.S., Europe, and china. Besides, operations and maintenance warranties by vendors of equipment also mitigates the technology risks. Fund disbursement process is

moderately risky as fund to BEE is not routed directly to BEE, which may result into possible delays. Such delays in Indian energy contexts in past have been cited as major bottlenecks in project deliveries (Yadav, 2010). Implementing agency risk is also moderate mainly due to potential mismatching problem arising out of overlapping areas of operations between SIDBI and BEE. Accounting and consultancy risk stands moderate due to constant monitoring of procurement plan on website, which also significantly ward off the possibility of potential collusion between accounting bodies and consultants working on the project.

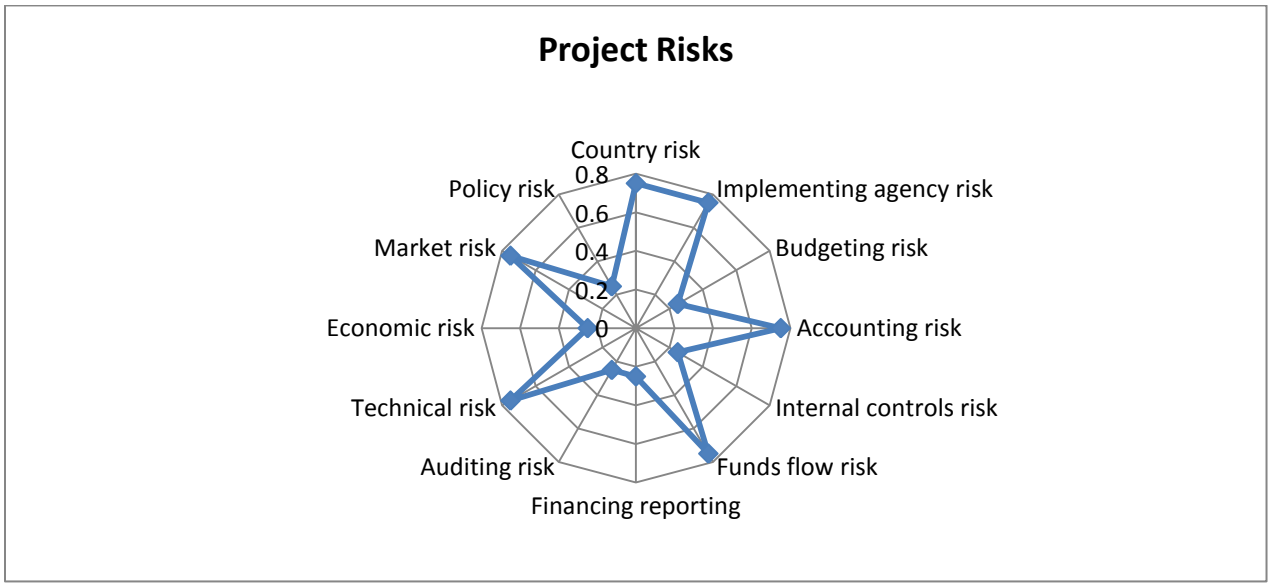


**Figure 3: Risk profiling of the project**
Source: Author's risk ranking

**Financial analysis and economic gains**

A compendium of case analysis on energy efficiency investment in India prepared by UNEP RISO find that typical SMEs investing in energy efficiency technologies and processes manage to attain internal rate of return (IRR) over 30% and above. In some cases, IRR is as high as 80%. Simple payback period for such investment ranges from 2 months for low cost measure to 2 years for more capital-intensive arrangements. Comparing the scenario where the World Bank and SME mobilised EE investment with a base case scenario that does not have any such dedicated MDB support, the total annual savings in energy bills over the base case amount to over US$ 50 million. The project also brings about over 6.5 million ton of CO2 emission reduction which exceeds base case CO2 emission reduction by more

than 4 million over 15 years. If we include the additional revenue that the project can leverage from CDM mechanism, the profitability of the project increases significantly. The mitigation cost of carbon emission to GEF is about US$ 2.84/ incremental ton of CO2 avoided, which is well below US$20/ton-CO2- the going price for carbon emission reduction certificate.

**Conclusion**

The Indian energy system which has historically operated at complex political-economic equilibria is facing conflicting challenges of energy security, climate change, and energy access. Indian policymakers in tandem with global policymakers have realized the urgency of driving future Indian economic pathway to a sustainable frontier that embeds cost efficient solutions to the above three challenges. While attempting to optimise the economic pathway cost, policymakers also need to evaluate the trade-off between risks and associated costs. Various policy initiatives in the form of reforming energy markets, setting-up of independent and transparent regulatory and institutional mechanisms, delineating policy responses aiming to minimise excessive rent-seeking behavior of market agents, and changing market designs to bring about stability in energy markets, have been undertaken with mixed results. Energy efficiency initiatives which drew the attention of Indian policymakers' a while ago have not yet fully met their economic potential. Numerous market and policy barriers have been cited as reasons for this. Lately, such initiatives have received a strong impetus from emerging issues of Low Carbon Society development in domestic and global policy settings. Series of market and government failures in the past did not allow the proper implementation of energy efficiency policy and initiatives and have resulted in a slower adoption of energy efficiency technologies and processes. A recent proposed energy efficiency plan for MSMEs by international institutions such as the World Bank and Global Environment Facility is expected to remove the barriers to adoption of EE investment and hence reduce the perceived risks in EE projects. The design of the project casts a strong signal that the perceived risks will be mitigated for both the MSMEs and local financing institutions. Such risk reduction will help policymakers improve the economics of energy efficiency markets in India.

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