Climate Investment Funds

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Washington, D.C.
November 4, 2011

Agenda Item 4

CTF Investment Plan for India

3RD OCTOBER,2011

CLEAN TECHNOLOGY FUND
INVESTMENT PLAN FOR INDIA

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CURRENCY EQUIVALENTS

(Exchange Rate Estimated as of August 31, 2011)

Currency Unit = INR

1USD = 46 INR

FISCAL YEAR

April 1 – March 31

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BEE	Bureau of Energy Efficiency
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Carbon Emission Reduction
CERC	Central Electricity Regulatory Commission
CFL	Compact Fluorescent Lamp
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DC	Designated Consumer
DFC	Dedicated Freight Corridor
DFR	Detailed Feasibility Report
DPL	Development Policy Loan
EA 2003	Electricity Act 2003
EE	Energy Efficiency
EEFP	Energy Efficiency Financing Platform
ERC	Electricity Regulatory Commission
ESCO	Energy Service Company
EScerts	Energy Saving Certificates
FEEED	Framework for Energy Efficient Economic Devices
FI	Financial Institution
FIT	Feed In Tariff
GBI	Generation Based Incentive
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
GOI	Government of India
GOR	Government of Rajasthan
HP	Himachal Pradesh
IEA	International Energy Agency
IEGC	Indian Electricity Grid Code
IEP	Integrated Energy Policy
IMF	International Monetary Fund
IREDA	Indian Renewable Energy Development Agency
JNNSM	Jawaharlal Nehru National Solar Mission
LADA	Local Area Development Authority
MDB	Multilateral Development Bank
MNRE	Ministry of New and Renewable Energy
MOU	Memorandum of Understanding
MV&E	Monitoring Validation & Evaluation
MW	Megawatt
NAPCC	National Action Plan on Climate Change
NER	North East Region
NMEEE	National Mission on Enhanced Energy Efficiency
NSM	National Solar Mission
PAT	Perform, Achieve & Trade
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PRG	Partial Risk Guarantee
PV	Photo Voltaic

R-APDRP	Restructured – Accelerated Power Development & Reform Program
RE	Renewable Energy
REC	Renewable Energy Certificate
RET	Renewable Energy Technology
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RLDC	Regional Load Dispatch Centre
RPO	Renewable Energy Purchase Obligation
SEEP	Super Efficient Equipment Program
SEC	Specific Energy Consumption
SERC	State Electricity Regulatory Commission
SHP	Small Hydroelectric Power
SLDC	State Load Dispatch Centre
UN	United Nations

I EXECUTIVE SUMMARY

1. INTRODUCTION

Government of India (GOI) has been actively pursuing a range of initiatives to support its policy objective of promoting environmentally sustainable growth. Several of these are currently at a stage where they need to be supported by investments on the ground. The overall investment quantum is large. Several alternate funding avenues are being considered in this regard.

The initial investments made to support these programs will be critical in catalyzing the respective programs and have significant impact on the segment that the respective programs seek to achieve. A strategy for financing climate change will also need to be anchored in the National Action Plan on Climate Change and the domestic development strategy. The investments will have to be made, therefore, through a long term and comprehensive Plan for both mitigation as well as adaptation purposes across several sectors. In this Investment Plan, the Government of India proposes to obtain an initial financing from the Clean Technology Fund (CTF) to support a set of projects and initiatives that have been identified for their critical impact on social and economic development with significant co-benefits for climate change. A subsequent phase of the Investment Plan will include substantial investments in lower emission sustainable development initiatives covering various sectors and applications.

2. COUNTRY AND SECTOR CONTEXT

India is at a unique juncture in its development. The Indian economy has been growing at an accelerated rate over the past several years to achieve increasingly high GDP targets. The International Monetary Fund (IMF) projections indicate that the strong economic growth of the past decade is likely to continue to hold true and reach 8 percent per annum until 2015. This rapid economic growth generates substantial potential for public and private investments in development. As outlined in India's 11th Five Year Plan (2007–2012), the government of India is also aiming to double per capita GDP over 10 years. Such dramatic and rapid income growth for a country as populous as India would require a significant transformation across all sectors of the economy.

India's current energy consumption level on a per capita basis is low, but is expected to grow substantially in the coming decades. Economic growth, increasing prosperity and urbanization, rise in per capita consumption, and spread of energy access are the factors likely to substantially increase the total demand for energy and for electricity in particular. Improving energy access coupled with increased demand for industrial and commercial applications is leading to significant increase in energy demand. Supply expansion has not kept pace with the increasing demand. Thus there is sustained energy supply-demand imbalance. In the electricity sector, energy deficits are of the order of 9% and peak deficits are of the order of 10%[1], which could increase over the long term due to supply side constraints. The problems are aggravated by high transmission and distribution losses on account of inadequacies in network infrastructure and high levels of electricity theft.

Coal is the mainstay of India's generation in the past and continues to be the primary fuel source at present, as India lacks sufficient alternate sources of domestic energy. Hydro projects have also contributed to the generation mix substantially. However both these resources are increasingly facing challenges. In spite of adoption of more efficient coal technologies there is a risk within the next few decades of stranding of capacity on account of acute coal shortages. Hydro power development has also fallen significantly short of targets, with only about 30 percent of the targets of India's 11th Five Year Plan (2007-12) likely to be achieved within this period. In view of electricity supply shortages, huge quantities of diesel and furnace oil are being used by all sectors – industrial, commercial, institutional or residential. Lack of rural lighting is leading to large-scale use of kerosene. This usage needs to be reduced, as it is leading to enormous costs in the form of subsidies and increasing the country's import dependence, apart from environmental damage and health hazards. Biomass remains the fuel of choice for a large portion of the rural population.

According to the UN, India's urban population will increase from 288 million in 2000 to 590 million by 2030, a 2.4% annual increase. This massive urban transformation - the largest national urban transformation of the 21st century – defines India's fundamental opportunities and challenges: to respond to the demands on the urban sector imposed by a growing and sophisticated economy and by the additional 10 million people who will become urban dwellers each year. This will require

[1] Source: CEA. Data for FY 2011 (April 2010 – March 2011).

providing them with adequate public services and infrastructure, and ensuring that urbanization is environmentally sustainable.

This rapid urbanization is expected to place substantial stress on existing—often insufficient—transport infrastructure, both for long-distance freight and the movement of people within cities. The transport sector is the second largest contributor to energy related GHG emissions in India, and its share in national GHG emissions has increased from 6.4 percent to 7.5 percent between 1994 and 2007 [INCCA 2010]. Moreover, India imports about 80 percent of its petroleum requirements, a significant part of which is used for transport. The quantity of oil imported, the unit cost of oil and the share of transport fuels (gasoline, diesel, kerosene and aviation turbine fuel or ATF) in the petroleum basket are all steadily increasing. Given the likely oil-constrained future, there is need to lower transport's dependence on petroleum to enhance India's energy security and lower its carbon footprint. In order to meet this challenge it is clear that India will have to develop extensive and better mass transit systems in cities, invest in efficient modes of freight transport, and improve vehicle efficiency. Despite these efforts, emissions from the transport sector are expected to experience among the fastest growth of any sector.

Accordingly CO_2 emissions are set to grow rapidly if the government's growth and development objectives are to be met. However, during the run-up to Copenhagen conference on climate change, India made a significant announcement that it will endeavour to reduce 20 to 25 percent of the GHG emissions intensity of its GDP by 2020 in comparison with 2005 level . With its relatively low carbon footprint and a steadily declining energy intensity over the last decade, India is likely to advance its commitment to address climate change through this voluntary goal. This will, however, require large and scaled up investments in the identified sectors according to national priority. All major sectors of the energy system can contribute to a lower emission and lower-carbon development if the required support in a comprehensive manner is made available to enhance sector investment, and performance, ; particularly in the power sector.

Without new and additional sources of financing to catalyze large scale clean technology application areas that currently face significant deficit of resources and technologies, India will need to rely on coal and hydrocarbon resources to meet its growing needs and on scarce domestic resources to address climate vulnerability and build climate resilience. In order to introduce lower emission and lower carbon growth measures and to adapt to climate change in accordance with the GOI's objectives of poverty reduction and development, Government initiatives and projects in this regard will need to be supplemented with significant and new additional funding.

3. PRIORITY SECTORS FOR GHG MITIGATION ACTIONS

India's Integrated Energy Policy Report (IEP) 2006 estimates that India needs to increase primary energy supply by 3 to 4 times and electricity generation by 5 to 6 times to meet the lifeline per capita consumption by 2031, and sustain economic growth at 8 % (with an equivalent installed capacity of 320 to 332 GW). To address these needs, India needs an order-of-magnitude increase in renewable energy growth in the next decade, and substantive success in its demand side management and energy efficiency programs.

A number of analyses have been done to assess potential measures for India to achieve low carbon growth which have established that India is following a path of low-emissions growth. India's 12^{th} Five Year Plan is expected to include a lower GHG emission inclusive growth strategy in order to achieve the voluntary mitigation goal of reducing GHG emissions intensity of GDP by 20 to 25 percent by 2020 against a 2005 level. An Expert Group on Lower Carbon Strategies for Inclusive Growth is currently working to provide inputs on identification of sectors and mitigation actions along with their financial and technological implications.

The scale of the growth of energy demand in India raises questions about the time path of the country's GHG emissions.. Various modeling projections indicate that the largest share of greenhouse gas emissions in India will continue to be from the power sector (captive generation and grid supply) by 2032. For instance, the Expert Group indicated that should India wish to sustain 9 percent economic growth until 2020, it will need to increase its installed capacity to 377 GW (from current levels of 172 GW). According to these projections, emission from the power sector could be in the range of 1452 to 1620 million tonnes of CO2 equivalents by 2020 (from the current 719 million tones of CO2 equivalent). Hence, any effort in this sector, whether on the introduction of renewable sources of energy, or on the reduction on the demand, has the potential to significantly reduce the total quantity of emissions against a business as usual scenario.

Government of India has already identified a range of initiatives that form a core part of the climate strategy of India. It is important to ensure that the strategies are translated on the ground through comprehensive programs that are aligned to the strategies. These programs need to be provided with adequate funding as well as other essential implementation support to ensure that the strategies are converted to action on the ground that yield the desired outcomes.

The power sector programmes require foremost attention. This sector has traditionally fallen behind the emerging demand requirements resulting in chronic imbalances between demand and supply. Lack of adequate utility supply has resulted in use of expensive and inefficient back-up power resources. Even as coal based generation would continue to be a mainstay for some time, alternative approaches for catering to the growing demand need to be promoted on a very large scale. This would primarily be in the area of renewable energy. Simultaneously, energy efficiency measures must be promoted and lent the scale that permits significant reductions in energy intensity of India's GDP growth.

Government of India has identified a range of interventions that could support its climate and sustainable growth strategies. An inventory of these potential strategies is annexed at the end of the report. For Clean Technology Fund (CTF) financing, a priority set of initiatives to which such interventions will be addressed in the initial phase has been identified. For subsequent Phase of financing, the immediate priorities identified by Government of India in accordance with its National Action Plan on Climate Change and the lower carbon inclusive growth strategy would need to be covered.. In the subsequent phases larger number of interventions covering a wider set of sectors and interventions could be taken up with the funds dedicated to addressing climate change in accordance with agreed principles of international actions in this field.

4. RATIONALE FOR SELECTED SECTORS FOR CTF FINANCING

As has been articulated above, sustainable expansion of electricity remains the primary challenge for Government of India. Inclusive growth cannot happen without rapid expansion of electricity supply for the entire population of the country. While the initial target of 2012 for this is likely to be missed, the need for attaining this in a reasonable time scale cannot be overstated. Government of India thus places tremendous emphasis on sustainable supply growth initiatives that have transformative potential for CTF financing in Phase 1.

Four specific supply side initiatives are being proposed under Phase 1 financing:

(a) Himachal Pradesh: Development Policy Loan on Environmental Sustainability and Climate Change

(b) Support for the National Mission for Enhanced Energy Efficiency (NMEEE)

(c) Partial Risk Guarantee for Energy Efficiency Technologies

(d) Support to the Jawaharlal Nehru National Solar Mission (JNNSM)

Two of these [(a) and (d)] have potential transformative impact on the supply side, while the other two address the critical gaps in the demand side and usher a framework for promoting energy efficiency on an accelerated scale so as to significantly reduce the energy intensity of India's economic growth.

Himachal Pradesh: Development Policy Loan on Environmental Sustainability and Climate

Himachal Pradesh is one of the leading hydropower states in India and hydropower (large and small) by far dominates its renewable energy resource potential. Himachal Pradesh is among the few states which has streamlined and crystallized the various procedures to minimize the bottlenecks and has come up with an investor friendly hydropower policy to attract private sector investment. However, further improvements are required, particularly to align the state's regulatory and market access framework with the fast changing developments at the central (federal) level. The intent would be to implement a framework that would spur hydropower development, from its current level of 31 percent to 70 percent, within 10 years, which would be a remarkable achievement that could serve as a model for other hydropower states in the country, and in the South Asia Region. The project presents a strong CO2 emissions reduction potential.

Support for the National Mission for Enhanced Energy Efficiency (NMEEE)

The goals of National Enhanced Energy Efficiency Mission (NMEEE) are to implement market-based approaches to unlock energy efficiency opportunities, estimated to be worth about Rs. 7,400 million. The CTF would provide concessional financing to support specific program under NMEEE, namely:

(i) support to the Super-Efficient Equipment Program (SEEP) Initiative: CTF resources would be utilized to kick start this program in India, focusing on electric fans, as there is a significant volume sold on an annual basis (10 million or 25% of the market), and the manufacturers are mostly domestic. The CTF intervention is required to monetize the future energy savings, which would enable consumers to buy the higher efficiency fans. Once the demand for super efficient fans kick in and industry players establish economies of scale, customers would see the benefit of lower energy bills. The market is then expected to stabilize without any subsequent financial support structure.

The financing will have a very significant transformative impact. The programs also lend themselves to replication and hence the overall impact will be very large.

(ii) support to the Perform, Achieve and Trade scheme, which is a market -based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded.

Partial Risk Guarantee for Energy Efficiency Technologies

The proposed Partial Risk Guarantee (PRG) mechanism covers specified technology and associated commercial risks for new technologies in EE and RE that are not usually priced by commercial banks. To help extend the reach of private financing by mitigating perceived risk and encourage private sector involvement in these sectors, this facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors get lower cost debt. The fund would be available in case of default only, i.e., it will be paid out to participating banks in the event of a loss or default, as specified in the structure of the PRG mechanism. The mechanism is intended to address the key barriers of (i) availability of long term finance at reasonable rates of interest to solar and energy efficiency applications; (ii) build capacity within financial institutions to assess commercial risks in these businesses. Lower cost financing would help make more projects financially viable, bringing advanced renewable energy investments closer to grid-parity faster and reducing payback periods of energy efficiency investments.

The CTF financing would supplement a project that has recently been requested of the World Bank, which is to be co-financed by the Global Environmental Facility ($35m) and the GOI ($20m). Given the uncertain nature of investments, India's deep and sophisticated capital markets variation in types of risk that the market might offer for this facility, this leverage can vary substantially, though the upside likelihood is expected to be higher than the downside.

Support to the Jawaharlal Nehru National Solar Mission (JNNSM)

India is endowed with abundant sunlight and solar radiation. Solar radiation is most concentrated in the western and southern regions, particularly in the states of Gujarat, Rajasthan, and Maharashtra[2]. The current solar potential in the country is estimated at 5000 trillion kWh, but installation on the ground is limited. Achieving the ambitious target for 2022 of 20,000 MW will be dependent on lessons identified during implementation of the first two phases, which if successful could lead to conditions of grid-competitive solar power.

The transition to mainstreaming solar energy could be appropriately scaled up through capacity development of all stakeholders related to issues of technology, finance, project management, and policy development. JNNSM envisages setting up utility-scale solar power generation plants through the promotion and establishment of solar parks with dedicated infrastructure by state governments as well as newer hybrid technologies that could potentially hold significant commercial promise in future years. Despite early success in the competitive bidding that has resulted in tariffs of around $0.25/ kWh, at a discount of 25%-35% to benchmark tariffs stipulated by the regulator, tariffs for solar power are still nearly two to three times that of conventional power. JNNSM envisages that the initial years would see a push to scale up research, development, and deployment to drive down costs; by the third phase of JNNSM, solar energy would achieve tariff parity with conventional power.

Monitoring, Verification and Evaluation (MV&E)

The Monitoring, verification and evaluation (MV&E) of the projects financed from CTF funds will be carried out as per the well-established monitoring and evaluation protocols applied by MDBs for concessional finance. A clear distinction between the M& E procedures followed by the MDBs and the

[2] Other states with good solar power potential are Madhya Pradesh, Tamil Nadu, and Kerala.

MRV (measurable, reportable & verifiable) protocols that are under consideration under the multilateral discussions on climate change finance will be kept; the MRV guidelines will not be applicable to projects financed by the CTF.

CTF Financing in Subsequent Phase(s)

As mentioned, the Investment Plan would have several phases. Initial would include projects in the sectors that are ready for multilateral development bank (MDB) and CTF-supported implementation within the next 12 to 18 months. The notional CTF allocation for Phase 1 is US$750 million.

Other eligible projects that may not be ready for MDB support at this time would be slated for subsequent phase of the Investment Plan, subject to the availability of additional CTF funds. Subsequent phase could include substantial investments in NMEEE program to support to the Performa Achieve and Trade scheme, which is a market-based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities through certification of energy savings that could be traded; low-carbon transport, the treatment of raw sewage prior to discharge to river systems (particularly the Ganga basin), Urban Transformation projects, electricity transmission from the North-Eastern region of India, further support to other energy efficiency and renewable energy projects. Several of these initiatives are at a concept development stage and would be ready for subsequent phase of CTF financing if funding were to materialize. It is noteworthy that the projects indicated for CTF financing in subsequent phase are already under active consideration by GoI since all of these represent emergent requirements of the country. CTF financing will however play an important role in advancing their implementation in a significant manner, thus having a positive impact on the environment and on GHG emissions. The project designs would also reflect elements that would enhance the scale of CO2 emissions reductions achieved. Thus, CTF funds will have a catalytic impact in the design and implementation of the projects in a manner that lends scale and scalability, and would significantly enhance the emissions related benefits from such projects, which may otherwise be only partially realized.

II INTRODUCTION

The Government of India (GoI) proposes to secure additional sources of financing to (i) support its National Action Plan on Climate Change (NAPCC), and in particular the two missions to mitigate greenhouse gas emissions pursuant to that Plan, namely the Jawaharlal Nehru National Solar Mission (JNNSM) and the National Mission on Enhanced Energy Efficiency (NMEEE) and (ii) to support a number of programs in key sectors, including clean energy generation, enhanced energy access and efficient transmission and distribution, low carbon technologies in the urban sector, promotion of a modal shift for freight transport from road to rail, and financial intermediation. The Investment Plan for CTF identifies both immediate opportunities that can be implemented within the next twelve to eighteen months, and other operations which longer lead times.

As a first step, GoI intends to seek $750 m from the Clean Technology Fund (CTF) to support some of the operations identified in this discussion paper. GoI will seek additional sources of funding as and when the financing mechanisms at the global level are set up as per agreed international principles of addressing climate change

III COUNTRY AND SECTOR CONTEXT

1. ENERGY DEMAND AND ECONOMIC GROWTH

India's carbon emissions are heavily influenced by the structure of its large and expanding economy, the limitations on its energy resources, as also its current status in terms of energy access. Although India is the world's fourth largest economy, it has significant challenges to meet the Millennium Development Goals. With 1.2 billion inhabitants, the overarching priority for India is to maintain its economic growth and lift millions out of poverty while providing them with access to energy, to potable water and sound sanitation as well as other social services. Recent World Bank analysis (World Bank, 2008) shows that the number of people who lived below $1.25 a day in 2005 PPP (purchasing power parity) dollars – a threshold that is close to the official poverty line – was about 456 million. By almost any metric, the Indian economy currently has a relatively low carbon footprint. Though India is ranked among the top ten emitters due to the size of its economy and population, its CO_2 intensity, particularly when measured using PPP GDP, is among the lowest for comparator countries including developing countries and countries with a significant share of coal (the most carbon-intensive fossil fuel) in the energy mix. India has (i) an intensity of emissions per unit of GDP that is at par with the world average (ii) per capita emissions that are among the lowest in the world and (iii) a forest cover that has stabilized.

Table 1: 2008 Emissions Data for Selected Countries

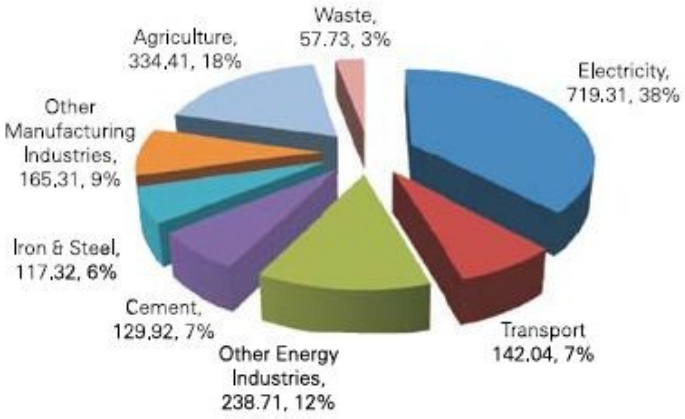
Region / Country	Population (million)	GDP (billion 2000 US$)	GDP ppp (billion 2000 US$)	Energy Cons. (MTOE)	CO_2 Emissions MT CO_2	Per-capita Energy Cons. (kgOE)	Energy Intensity KgOE/ $GDPppp	Kg CO_2/ $GDP ppp	Per-capita Electricity Cons. (kwh)	Per-Capita CO_2 Emission (tonnes)
World	6609	39493	61428	12029	28962	1.82	0.20	0.47	2752	4.38
China	1327	2623	10156	1970	6071	1.48	0.19	0.60	2346	4.58
Brazil	192	808.95	1561	235.56	347	1.23	0.15	0.22	2154	1.80
India	1123	771	4025	421	1146	0.53	0.10	0.28	543	1.18
Japan	128	5205	3620	513.5	1236	4.02	0.14	0.34	8475	9.68
S. Africa	48	178	517	134.3	346	2.82	0.26	0.67	5013	7.27
Thailand	64	173	548	104	226	1.63	0.19	0.41	2157	3.54
Turkey	74	372	821	100	265	1.35	0.12	0.32	2210	3.59
UK	61	1766	1833	211	523	3.48	0.12	0.29	6142	8.60
USA	302	11468	11468	2340	5769	7.75	0.20	0.50	13616	19.10
France	64	1506	1738	264	369	4.15	0.15	0.21	7573	5.81
Germany	82	2065	2315	331	798	4.03	0.14	0.34	7185	9.71
Russia	141.79	429.55	1651.17	786	1593.83	5.54	0.48	0.97	6443	11.24

Source: International Energy Agency 2009

In 2007, India's greenhouse gas (GHG) emissions by sources and removal by sinks were 1727.71 million tons of CO2 equivalents (or 1904.73 million tons of CO2 equivalents without land use, land

use change and forestry), with the largest shares from electricity generation (38%), agriculture (18%) and other energy industries (12%)[3].

Figure 1: Greenhouse Gas Emissions Distribution across Sectors, 2007



Source: Interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth, May 2011

The grid based power supply fleet in India is currently dominated by coal based capacity. As on May 2011 the total installed capacity in the utility sector was 174,911 MW, out of which thermal constituted about 65%, large hydro (>25MW) 22%, nuclear 3% and renewables 11% (other than large hydro). In thermal, generation from coal with 83% share comprises the majority, followed by Gas at 16% and Diesel with just 1%. However, on account of the inadequacies in the utility sector there is a large captive power generation fleet. In view of electricity supply shortages, huge quantities of diesel and furnace oil are being used by all sectors – industrial, commercial, institutional or residential. More than 60% industries rely on captive power plants (Rud, 2009) and the captive generating capacity connected to the Grid was 19.5 GW at the end of March 2007 (CEA, 2008a), which represents about 13.3 percent of the overall installed capacity in India. Alternate estimates indicate a considerably higher number, particularly if off-grid large captive plants are considered.

The share of renewable energy technologies in electricity production is small, but the installed base has been steadily growing. In fact, with an average installed capacity of close to 2000 MW per annum in the last few years, renewable energy technology (RET) installations have exceeded conventional generation installations in some of the years. A snapshot of the overall installed capacity is provided in the table below.

Table 2: Installed Capacity (MW) of Grid Connected Installations, May 2011

Region	Thermal (MW)				Nuclear (MW)	Hydro (MW)	Renewable (MW)	Total (MW)
	COAL	GAS	DSL	TOTAL				
Northern	24233	4135	13	28380	1620	14073	3166	47239
Western	31431	7904	17	39352	1840	7448	5358	53997
Southern	20483	4691	939	26113	1320	11299	9342	48073
Eastern	18748	190	17	18955	0	3882	360	23197
N. Eastern	60	787	143	990	0	1116	224	2329
Islands	0	0	70	70	0	0	6	76
All India	**94953**	**17706**	**1200**	**113859**	**4780**	**37817**	**18455**	**174911**

Source: CEA 2011

Over the past several years, the Indian economy has been growing at an accelerated rate to achieve increasingly high GDP targets. The International Monetary Fund (IMF) projections indicate that the strong economic growth of the past decade is likely to continue to hold true and reach 8 percent per annum until 2015. Growth in terms of GDP between 2000 and 2015 is indicated in the chart below[4][5].

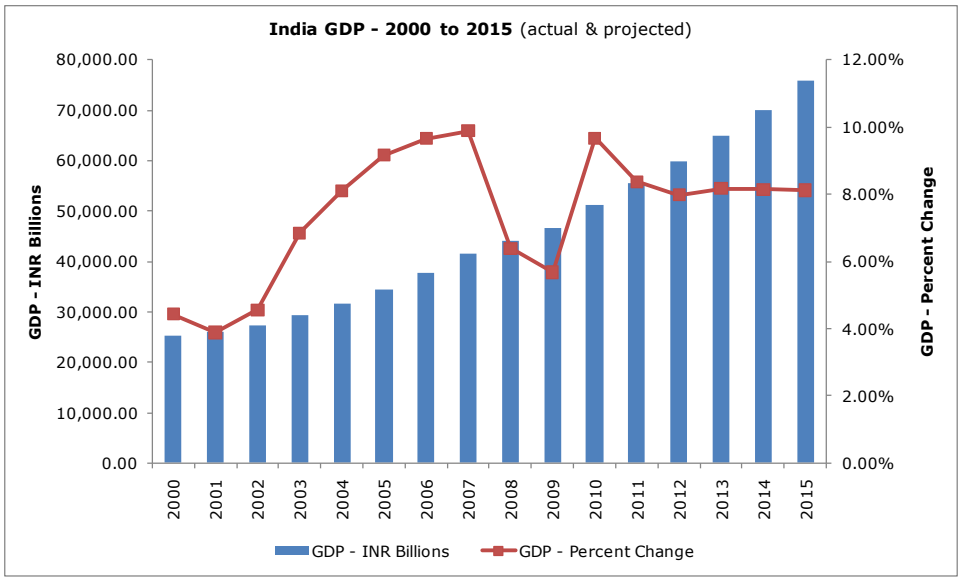
[3] Interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth, May 2011

[4] International Monetary Fund, World Economic Outlook Database, October 2010

[5] The original data is in calendar years from 1997. Prior to 1997, IMF staff converted fiscal-year data to calendar years by taking 3/4 data of year t and 1/4 data of year t+1 as data for calendar year t. Latest actual data: 2009. Official data for the latest year are advanced estimates. Data available on quarter-by-quarter basis. National

In the 12th Five-Year Plan (2012-2017), the Government of India (GoI) intends to target 9 percent annual growth, although detailed plans are still under discussion.

Figure 2: India GDP Growth – Current and Projected



Source: IMF 2010

Growth of this order in a developing economy creates an upsurge in demand for energy. In India, this is in spite of several substantial initiatives to reduce energy intensity of growth through measures such as standards and labels, building codes, introducing market mechanisms for energy intensive industries. The Planning Commission indicates that energy elasticity of GDP growth between 1991 and 2004 was 0.82[6]. Actual values in a regime free of energy constraints (that India has been traditionally facing) could be higher as more and more consumers come into the fold of commercial energy consumption[7].

India's substantial and sustained economic growth is placing enormous demand on its energy resources. A decade back, production of coal growing at an average of 3.5% per annum was more than adequate to meet the requirements of the country's coal based generation fleet. In recent years in-spite of a significant ramp up in coal production and supply to an average of more than 6% per annum, there are looming coal shortages over the medium to long term. More importantly, after five years of accelerated growth, the coal production in 2010-11 has stagnated on account of the environmental permitting related issues that the coal sector (including the state owned coal companies) is encountering. There is a significant risk of capacity on the ground being stranded on account of lack of coal in the coming decades since close to 54% of total installed power capacity in the country is from coal based power plants. Various estimates indicate that as much as 22,000 MW equivalent of coal based generation could be stranded by 2012 on account of pervasive coal shortages[8].

According to the Integrated Energy Policy, expansion needs for power generation until 2032 are vast, with estimated increases from fourfold to as much as six fold. During the same period, demand for fuel used in road transport may increase more than fivefold. These increases are a natural consequence of income growth and greater availability and delivery of basic services. They occur even with investments that improve supply-side energy efficiency—such as greater thermal efficiency in new power plants and reduced technical losses in transmission and distribution—and demand-side efficiency improvement through continued industrial modernization and other means.

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accounts manual used: SNA 1993 GDP valuation: Market prices Start/end months of reporting year: April/March Base year: 2004/05 Chain-weighted: No Primary domestic currency: Indian rupees Data last updated: 09/2010

[6] Source: Planning Commission of India, http://planningcommission.nic.in/sectors/index.php?sectors=energy

[7] As per the Integrated Energy Policy, 2006, about 43 percent of India's energy requirements are met through non-commercial energy – wood, biomass, agricultural residues, etc. As consumers switch to various forms of commercial energy with economic and social advancement, the demand on commercial energy will increase further. Large scale use of grid and off-grid captive power (primarily on furnace oil and diesel) also indicates that the energy elasticity data could be understated to some extent.

[8] Based on interim reports of the Fuels Committee of the Confederation of Indian Industry, 2011

The demand and supply imbalance in energy is also pervasive in other segments leading to efforts by Government of India to augment energy supplies. India imports about 80% of its oil, the principal transportation fuel. In-spite of significant accretion to gas reserves and production in the recent years there is a concerted effort to bring in more gas from domestic and international sources. Wider gas usage is proposed for the fertiliser, transport and industrial sectors, but above all for the power sector. However, indigenous gas production has stagnated recently, raising concerns of a plan based on high gas based growth.

Economic growth, increasing prosperity and urbanization, rise in per capita consumption, and spread of energy access are the factors likely to substantially increase the total demand for electricity. Thus there is an emerging energy supply-demand imbalance. In the electricity sector, energy deficits are of the order of 9% and peak deficits are already of the order of 10% in fiscal year 2010-11, which could increase over the long term due to supply side constraints. The problems are aggravated by high transmission and distribution losses on account of inadequacies in network infrastructure and high levels of electricity theft. Quality of electricity supply is also poor. Even as serious efforts are being made by GoI to address these issues through programs like the Restructured Accelerated Power Development and Reform Program (R-APDRP) and the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), the challenges remain formidable. Lack of rural lighting is leading to large-scale use of kerosene. This usage needs to be reduced, as it is leading to enormous costs in the form of subsidies and increasing the country's import dependence.

The scale of the growth of energy demand in India raises questions about the time path of the country's GHG emissions. India's CO2 emissions from fuel use in 2007 were less than 5 percent of the world total, according to the International Energy Agency (IEA 2009), but its share of the global emissions is likely to increase with economic development. As mentioned previously, India currently relies heavily on coal for its commercial energy demand (54 percent of installed capacity), but it lacks sufficient domestic energy resources, and is increasingly dependent on imports of fossil fuels to meet demand. Use of smaller (and often inefficient) diesel generators to provide back-up electricity is pervasive. While specific estimates are not available, the overall CO2 emissions of these back-up generators are arguably very large[9].

With an expectation of a substantial increase in energy use, reduction in the growth in total CO2 emissions will depend on the extent to which total growth in energy use is offset by a combination of (a) further reduction in energy intensity of GDP, allowing growth and development goals to be met with less growth in energy use and associated CO2 emissions than anticipated; and (b) further reduction in the CO2 intensity of energy use, through greater increases where possible in the share of energy demand met by lower-carbon or even carbon-neutral energy resources.

During the run-up to Copenhagen conference on Climate Change, India made a significant announcement that it will endeavour to reduce 20 to 25 percent of its GHG emissions intensity of GDP by 2020 against a 2005 level. With its relatively low carbon footprint and a steadily declining energy intensity over the last decade, India will further advance its contribution to addressing climate change through this voluntary mitigation goal.

This domestic goal has been announced within the context of a very large proportion of the citizens that continue to live with no access to electricity and other forms of commercial energy. *"In 2005, a total of 412 million people in India had no access to electricity, with 380 million of them (92% of those who do not have access to lifeline electricity) living in rural areas and 32 million in urban areas (IEA, 2007). According to recent IEA estimates, India is today 64.5% electrified, with an urban electrification rate reaching 93.1% and a rural rate of only 52.5%"*[10]. Others with access often have to cope with poor and erratic availability of electricity and other fuels. With constraints faced in resource availability and in delivery mechanisms, traditional means of energy supply are falling short. This is likely to be the case in the foreseeable future so that energy access will continue to remain a problem. Catering to ever increasing energy demands and finding viable low carbon alternatives to fossil fuel use is one of India's top most priorities. In particular, the electricity sector which constitutes more than 65% of India's commercial energy requirements has to take a lead in this regard to put the country on a low carbon growth path.

According to a recent World Bank's Low Carbon Development Study, India can achieve its voluntary domestic mitigation goal with the numerous commitments made in the Integrated Energy Policy and Five-Year Plans. India would be in a better position to improve its past performance, provided the key technologies at the right costs are available and especially finances are made available.

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[9] It is variously estimated that in a single urban agglomeration of Gurgaon, located in the National Capital Region, the back-up capacity using liquid fuels would be of the order of 800-1000 MW. Due to shortages in grid electricity supply, the extent of utilization of these generators is significant.

[10] International Energy Agency, "Comparative Study on Rural Electrification Policies in Emerging Economies"

Government of India recognizes these imperatives, which are reflected in the NAPCC. Some of the principal measures of the NAPCC missions are aimed at augmenting the clean energy supply base, while simultaneously promoting energy efficiency. Within the clean energy space, the overwhelming focus of the Jawaharlal Nehru National Solar Mission is on expanding the reach of solar energy for energy generation (both grid based and decentralized) as well as other applications related to lighting, space heating and cooling, and cooking applications. In the energy efficiency arena, through the National Mission for Enhanced Energy Efficiency, GoI proposes to introduce commercial incentives and market based arrangements to encourage consumers to reduce the extent of energy use without compromising on the economic and social priorities of the country. In addition, the National Water Mission and the National Mission for Sustaining the Himalayan Ecosystem have a bearing of energy generation and consumption in a sustainable manner.

Apart from the NAPCC, a series of sector specific initiatives and policies to sustain low carbon growth have been undertaken for promoting low carbon growth. At present GoI is conducting the process of formulating the 12th Five Year Plan covering the period 2012-17. A dominant theme for this Plan is promotion of sustainable growth and the terms of reference of various working groups formed for the functional ministries explicitly recognizes the same. India is thus firmly on the path of sustainable low carbon growth. The overwhelming focus at present is to ensure that the implementation wherewithal is created and catalytic measures are adopted to achieve scale, sustainability and replicability in the various low carbon growth initiatives.

IV PRIORITY SECTOR IDENTIFICATION

The scale of the growth of energy demand in India is indicative of the large unmet energy needs in India as also of the need to promote high efficiency and lower emissions energy generation.. Government of India has already identified a range of initiatives that form a core part of the climate strategy of India. Given the importance of coal fired power plants in its strategy of meeting energy needs, an investment plan for addressing climate change must find ways of supporting the mainstay of India's climate friendly investments in future. It is important to ensure that the strategies are translated on the ground through comprehensive programs that are aligned to the strategies. These programs need to be provided with adequate funding as well as other essential implementation support to ensure that the strategies are converted to action on the ground that yield the desired outcomes.

The Integrated Energy Policy Report (IEP) 2006 estimates that India needs to increase primary energy supply by 3 to 4 times and electricity generation by 5 to 6 times to meet the lifeline per capita consumption by 2031, and sustain economic growth at 8 % (with an equivalent installed capacity of 320 to 332 GW). IEP Scenarios point to coal reserves of less than 45 years (by 2040) at a growth rate of 5% in domestic production, and an increasing reliance on coal imports. Clean coal projects are the most economical investments that may reduce both energy intensity as well as carbon intensity of the output in India. Going forward, India has set ambitious targets of 40 to 55 GW of additional renewable energy capacity at the end of the 13th plan in 2022. The goals of the National Action Plan on Climate Change (NAPCC), may represent additional renewable energy capacity of 40 to 80 GW by 2017. To achieve these goals, India needs an order-of-magnitude increase in renewable energy growth in the next decade, and substantive success in its demand side management, energy efficiency programs and distribution sector investments.

A number of analyses have been done to assess potential measures for India to achieve lower emissions and lower carbon growth, and in particular how it can achieve the voluntary goal of reducing GHG emissions intensity of GDP by 20 to 25 percent by 2020 against a 2005 level. An Expert Group on Low Carbon Strategies for Inclusive Growth is currently working to provide inputs on identification of sectors and mitigation actions along with their financial and technological implications.

Various modeling projections indicate that the largest share of greenhouse gas emissions in India will continue to be from the power sector (captive generation and grid supply) by 2032. For instance, the Expert Group indicated that should India wish to sustain 9 percent economic growth until 2020, it will need to increase its installed capacity to 377 GW (from current levels of 172 MW). According to these projections, emission from the power sector could be in the range of 1452 to 1620 million tonnes of CO2 equivalents by 2020 (from the current 719 million tones of CO2[11] equivalent). Hence, any effort in this sector, whether on the introduction of renewable sources of energy, or on the reduction on the demand, has the potential to significantly reduce the total quantity of emissions against a business as usual scenario.

Within the various energy related sectors, the power sector requires foremost attention. This sector has traditionally fallen behind the emerging demand requirements resulting in chronic imbalances between demand and supply. Lack of adequate utility supply has resulted in use of expensive and inefficient back-up power resources. The sector has also traditionally been driven by coal based capacity with about 53% of the installed capacity fleet being based on coal. Technology for coal based thermal power production is steadily improving. In the 12th Plan period, 75% of the new coal based generating sets will use efficient super-critical technologies. The aim is to reach 100% by the 13th Plan period. Given the importance of coal fired power plants in its strategy of meeting energy needs, an investment plan for addressing climate change should support India's climate friendly investments in clean coal sector

At the same time, even as coal based generation will continue to be a mainstay for quite some time, alternative approaches for catering to the growing demand need to be promoted on a very large scale.

The alternatives to coal based generation face pervasive financial and technological challenges, resulting in slowing down of their deployment. Further, India is a populous country and there are significant alternate demands on land and other resources. These often conflicting demands result in slowing down of deployment of alternate technologies. In hydropower for example, the 11th plan is likely to witness slippages that will result in less than 30% of the targets materialising. The situation

[11] As shown in figure 2.1 (p.16) of interim report of LCS

in the 12th Plan may be considerably worse, unless addressed through specific interventions. Most of the capacity indicated in the projections is slated to materialize in the year 2016-17. Review reveals that most of these projects are delayed on account of various factors related to land acquisition, rehabilitation and resettlement, site access, evacuation, financing and other development related issues. Even more importantly, hydro being a state subject in a federal structure, there are distinct emerging disconnects between the policy and regulatory framework at the central (federal) level and the corresponding policies and regulations at the state level. Alignment of the policies and regulations and creation of a framework that allows for seamless market access for hydropower is an important consideration for scale-up of hydro resources in the country.

Simultaneous with the supply side interventions, energy efficiency, demand side management and related demand side interventions are assuming equal (if not greater importance). A mega-watt saved is much more valuable than a mega-watt produced, but in practice is hard to achieve. Economics of supply require the demand side to be aligned to supply resource profiles and vice-versa. GoI recognizes the need for close alignment of the demand and supply side interventions. This has also been the focus of Expert Group of the Planning Commission, which notes in its Interim Report that *"Energy Efficiency (EE) can play a key role as India struggles to meet its development goals under severe environment and resource constraints. Several EE options are less expensive than coal or gas-based generation, and therefore, should be the "first resource" considered for fulfilling demand. However, despite the apparent attractiveness of several EE options, their diffusion and adoption is sluggish. Clearly, there are barriers to adoption that need to be overcome by appropriate policies and institutional arrangements"*[12].

The transportation sector, has displayed the largest percentage growth of greenhouse gas emissions in India over the past decade. Emissions in the sector can be limited to between 413 to 435 Mt Co2 equivalents (CO2e) for an 8 % growth rate (477 Mt to 504 Mt CO2e for 9 percent growth rate), but this would require the early completion of the dedicated freight corridor, investments in urban public transport, and improvements in fuel use efficiency of vehicles over the next decade.

Afforestation and related activities which require huge investment and on which India is spending almost US $ 1 billion every year need to be supported through an investment plan for addressing climate change. Govt. of India has prepared a Green India Mission and a detailed plan for implementation is under preparation. Once the Mission becomes operational, India may need additional US$ 1 bn every year. Improving the fuel efficiency of cooking stoves used in rural India will be a useful project in this sector.

Government of India has identified a range of interventions that could support its climate and sustainable growth strategies. An inventory of these potential strategies is annexed at the end of the report. For CTF financing, a priority set of initiatives to which such interventions will be addressed in the initial phase has been identified. For Phase 1 of CTF financing, the immediate priorities identified by Government of India in high impact areas would need to be covered, and the essential barriers that constrain implementation of these interventions would need to be addressed. Subsequently, a larger number of interventions could be taken up with future F funds that are set up in accordance with the agreed international principles of addressing climate change.

[12] Para 3.1.1 of Interim Report of Expert Group on Low Carbon Strategies for Inclusive Growth, Planning Commission, May 2011

V RATIONALE FOR SELECTED SECTORS

As has been articulated above, sustainable expansion of electricity remains the primary challenge for Government of India. Inclusive growth cannot happen without rapid expansion of electricity supply for the entire population of the country. The policy objective of Government of India is an unequivocal "Power to All". While the initial target of 2012 for this is likely to be missed, the need for attaining this in a reasonable time scale cannot be overstated. Government of India thus places tremendous emphasis on sustainable supply growth initiatives that have potential for CTF financing in Initial Phase.

While the importance of coal fired power plants in its strategy of meeting energy needs and the importance of making them key components of an investment plan for addressing climate change is fully understood, it is proposed that four specific demand side and supply side initiatives may be supported under the initial Phase of the CTF financing:

(a) Himachal Pradesh: Development Policy Loan on Environmental Sustainability and Climate Change

(b) Support for the National Mission for Enhanced Energy Efficiency (NMEEE)

(c) Partial Risk Guarantee for Energy Efficiency Technologies

(d) Support to the Jawaharlal Nehru National Solar Mission (JNNSM)

Two of these [(a) and (d)] have potential transformative impact on the supply side, while the other two address the critical gaps in the demand side and usher a framework for promoting energy efficiency on an accelerated scale so as to significantly reduce the energy intensity of India's economic growth.

As mentioned, the Investment Plan would have two phases. Initial Phase would include projects in the energy sector that are ready for multilateral development bank (MDB) and CTF-supported implementation within the next 12 to 18 months. The notional CTF allocation for Phase 1 is US$750 million.

Other eligible projects that may not be ready for MDB support at this time would be slated for subsequent phase of the Investment Plan, subject to the availability of additional CTF funds. Subsequent phase is expected to include substantial investments in low-carbon transport, environmental clean-up of the highly polluted river systems (particularly the Ganga basin), Urban Transformation projects, electricity transmission from the North-Eastern region of India, further support to other energy efficiency and renewable energy projects. Several of these initiatives are at a concept development stage and would be ready in time for Subsequent phase of CTF financing subsequently.

The key Investment Plans proposed in CTF Phase 1 are elaborated upon below.

1. HIMACHAL PRADESH: DEVELOPMENT POLICY LOAN ON ENVIRONMENTAL SUSTAINABILTY AND CLIMATE CHANGE

Over the recent years, India has established an overarching policy and institutional framework for supporting clean energy development. However, multiple regulatory and institutional overlaps have led to ineffective coordination that has resulted in continuing implementation gaps. The barriers that hold back renewable energy development relate to three broad areas: the financial viability of renewable energy projects, the lack of soft and hard support infrastructure, and regulatory and process delays, which increase transaction costs.

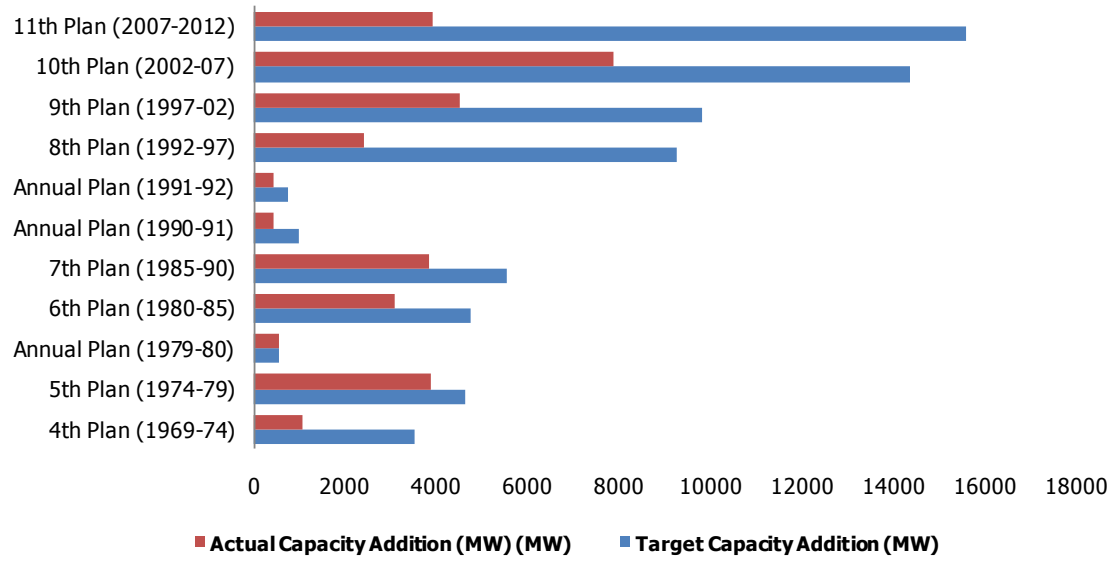
While many progressive policies have been recently enacted at the central level, the state actors remain the main implementation agents, with significant interfaces with the end-users. The states have the responsibility for managing the distribution sector, and play a lead role guiding renewable energy projects through the regulatory requirements. Development of renewable energy has been relatively slow because of long delays in getting clearances and acquiring access to evacuation infrastructure, lack of clear policy for private sector participation in some states, and issues associated with land acquisition.

With significant all-India potential, hydropower remains as one of the critical options to achieve the objective of diversification of energy sources and address energy/peak shortages in the country. Ability of hydropower plants to respond quickly to demand fluctuations makes them the ideal electricity source to cope with demand peaks and help stabilize system frequency. Hydro generation

also counterbalances the carbon intensity of the power sector and mitigates the risk of global climate change.

Despite its critical role, India has not been able to harness its hydropower potential in an optimum manner and the growth of hydropower in the country has not only been very slow but also has been decelerating. Figure 3 and 4 indicate the hydro power development in India over various plan periods and the decreasing share of Hydropower in the total installed capacity respectively.

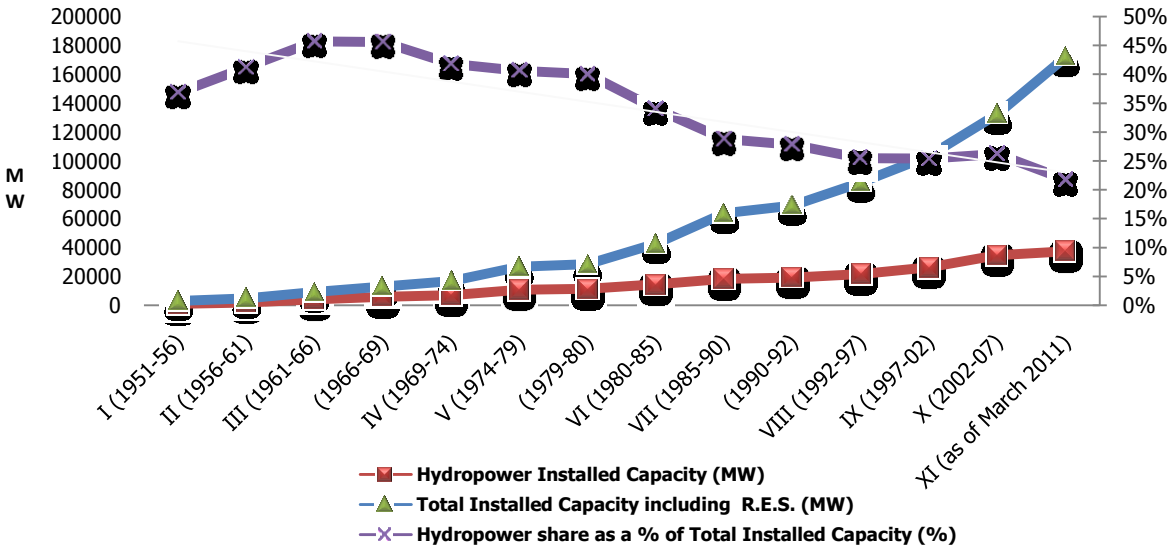
Figure 3: Hydro Power development in India (Target Vs Achievement)



Source: CEA (as of December 2010)

Note: Achievement of XI plan includes only the projects commissioned as of December 2010.

Figure 4: Decreasing Share of Hydro Power in the total installed Capacity



Source: CEA 2011[13]

[13] Installed capacity depicts the total installed capacity of the country including capacity based on Renewable Energy Sources (R.E.S), which includes sources like solar, wind, bio-energy, small hydro, etc

As observed above, the share of hydropower in India's installed capacity has been steadily declining over the past decades due to several reasons. From 44 percent in 1970, this share has decreased to about 22 percent today (2011), which is suboptimal to meet peak load requirements as well as system and frequency stability. Hydropower's share of energy generated, as opposed to installed capacity, is even smaller, at ~ 22 percent (as of march 2011), reflecting a lower availability, due to hydrological reasons, of the existing installed hydropower capacity relative to the thermal plants that predominate in India's generating system.

A further analysis of hydro power projects in the XI Plan period indicates that out of 15,627 MW only 3431 MW has been commissioned (as of March 2011) with remaining capacity under various stages of development, clearly indicating a slow progress. The overall achievement during the XI Plan period will be less than a third of the original target.

As per the studies carried out by CEA, the country would need a capacity addition of 100,000 MW in the XII Plan (2012-17), out of which ~20,000 MW is proposed to be added through hydro projects. This is based on short listing 87 projects aggregating to a total capacity of 20,334 MW out of 109 candidate projects (with cumulative capacity of 30,920 MW) identified earlier. Of this, 38% is likely to be added by the private sector. However, given the past history of failure to achieve targets and the most recent trends in hydro project development, meeting the XII Plan targets will indeed be a challenge.

A region-wise break-up of the undeveloped potential in the country along with the all India status as on 30th April 2011 is provided in Table 3.

Table 3: Region-wise and All India hydro capacity development (excluding small hydro and pumped storage)

Region	Total (MW)	Above 25 MW (MW)	Capacity developed		Capacity Under construction		Capacity Yet to be developed	
			(MW)	%	(MW)	%	(MW)	%
Northern	53395	52263	13878	27%	7616	15%	30769	59%
Western	8928	8131	5552	68%	400	5%	2179	27%
Southern	16458	15890	9328	59%	609	4%	5953	37%
Eastern	10949	10680	2908	27%	2454	23%	5318	50%
North Eastern	58971	58356	1116	2%	4686	8%	52554	90%
All India	**148701**	**145320**	**32782**	**23%**	**15765**	**11%**	**96773**	**67%**

Source: CEA 2011 (as on 30th April 2011)

The focus states of the 12th plan period are Himachal Pradesh, Arunachal Pradesh, Uttarakhand and Jammu & Kashmir. There is an ambitious target capacity addition from private sector investment in all these states. Though this is a positive move towards bringing about additional capacity in the sector, for such a scale to materialize in a five-year period and beyond, it would be imperative to address the key barriers affecting hydropower development particularly in the Himalayan, hydro rich states and prioritize minimizing delays mainly on account of local displacement and opposition, clearances, DPR preparation and financial closure. Furthermore, the nature of hydro resource also presents hydrological and geological risks that are quite different from fossil-fuel based power and other renewable energy resources.

The GOI is now at a critical juncture where an opportunity exists for a transformational shift towards large scale development of hydropower to meet a significant part of its growing power demand needs. If successfully implemented, the proposed hydropower expansion program will help alter the baseline trajectory for emissions from the power sector. If this expansion were to fall short, then India would be compelled to seek alternative energy sources to supply its base-load generation needs by most likely reverting to an equivalent expansion of coal-based capacity in-line with the baseline scenario. Any delay in the implementation of the hydropower development program would likely lead to coal substitution in order to cover the resulting shortage in power supply, which will end up increasing emissions from the sector. Moreover, once additional coal-fired plants are constructed, their environmental impact will be long-term because they are not likely to be decommissioned quickly and will operate for some time to come. Therefore, there is a compelling need and considerable urgency to particularly undertaking the priority development of resources that are already under the control of existing developers. This would result in considerable progress towards achieving the GOI hydropower development targets, and for India to meet its energy sector needs while at the same time reduce its future carbon footprint from the power sector.

Given the development urgency, the GOI intends to rapidly scale-up the considerable hydropower resources so that they can meet the immediate power demand needs without compromising its climate change objectives. The CTF resources will help fast-track these developments by addressing some of the barriers that still remain and would take longer to resolve. By the time the proposed investments are complete, the country would have successfully addressed a majority of the barriers that presently curtail development, so that the sector can continue to expand on a sustained basis.

In many ways, the state of Himachal Pradesh is an excellent candidate to develop and implement a policy and institutional framework (Development Policy Loan) to further develop its hydropower sector. Himachal Pradesh is one of the leading hydropower states in India and hydropower (large and small) by far dominates it renewable energy resource potential. The State has an accessed potential of 19,044.55 MW (excluding SHP) in its five river basins: Sutlej (9,420.25MW), Beas (4,582 MW), Ravi (2,294 MW), Yamuna (591.52 MW) and Chenab (2,748.3 MW). However, only about 31% of this potential has been developed so far. The state government has taken several initiatives to encourage private sector participation in hydropower development.

Himachal Pradesh is among the few states which has streamlined and crystallized the various procedures to minimize the bottlenecks and has come up with an investor friendly hydropower policy in place to attract private sector investment. However, further improvements are required, particularly to align the state's regulatory and market access framework with the fast changing developments at the central (federal) level.

The intent would be to implement a framework that would spur hydropower development, from its current level of 31 percent to 70 percent, within 10 years, which would be a remarkable achievement that could serve as a model for other hydropower states in the country, and in the South Asia Region. In order to achieve this objective, it would have to address the policy barriers that have been identified in the sector:

- Private sector sees hydropower investment as risky (hydrological, geological), and appropriate policy framework is yet to be in place to address these risks.
- Land acquisition and rehabilitation pose increasing challenges for scaling-up.
- Community benefit sharing is not adequately implemented, and may lead to risks during operation.
- The policy and regulatory disconnects between the inter-state level and in-state level on market access, transmission access and pricing, etc. are addressed.

Replication Potential - India is endowed with rich hydropower potential; it ranks fifth in the world in terms of exploitable potential. The reassessment studies (1978-87)[14] undertaken by the Central Electricity Authority (CEA) revealed that the large (>25 MW) hydro electric power potential of the country was about 84000MW at 60% load factor (translating into 148,700MW in terms of installed capacity) from a total of 845 schemes. Out of this potential, up to 25% has been developed so far**.**

Hydropower can provide reliable base load power and peak generation (for storage projects) while avoiding much of the local and global environmental impacts that result from coal, which would be the alternate choice in most instances. As a clean and renewable resource, hydro can reduce as much as 90 percent of the GHG emissions when compared with coal based generation and also virtually eliminates local pollutants such as sulphur dioxide (SO2), nitrogen oxides (NOx), and particulates. Being an indigenous and non-tradable resource, hydro also enhances the energy security of the country. Given among the world's leading potential, hydropower in India can have a transformational impact since it can be expanded at a significant scale to serve the burgeoning energy needs of the country. Hydropower development provides the best opportunity for India to reduce its reliance on coal for its increasing base-load power needs and alter the baseline trajectory of emissions that would arise from the continued expansion of coal based generation capacity. GoI's policy interventions are consistent with these objectives and are reflected accordingly in the Hydropower Policy 2008. The policy aims at bringing competition and transparency in bidding for hydropower projects, provide a sustainable market, reduce development costs, and provide a framework for addressing local issues. However, hydropower being largely in the domain of the states, appropriate implementation wherewithal needs to be created at the state level.

Accelerated development of hydro projects would result in significant benefits to the states, developers and the country as a whole. Conversely, delayed development has a very high cost for all concerned. To mitigate adverse environment and social impact, a framework for benefit sharing

[14] The first assessment of hydro electric potential in the country was conducted during the period, 1953-59 by the Power Wing of the Central Water and Power Commission

needs to be created, local and state level organisations for administering and implementing such a framework need to be strengthened; cascade-wise development authorities for major cascades could take forward the assessment of environment damage during project construction in a basin through credible and accredited third party auditors and there is need for monitoring of adherence to environment and social action plans.

Transformative Impact and Global Environment Benefits - The proposed CTF intervention is to support GOI's fast-track efforts to develop hydropower in Himachal Pradesh and elsewhere in India by helping incremental capacity addition to the tune of at least 50% of actual capacity addition in the state.

Himachal Pradesh has been at the forefront of hydropower development, particularly through the private sector. However development is significantly delayed on account of a host of factors. As compared to 2113 MW of large hydro capacity targeted for commissioning in the 11th Plan period only 192 MW has been commissioned in the first four years. Even after accounting for projects to be commissioned in the last year of the 11th Plan, there will be significant deficits as compared to plans.

The 12th plan hydropower capacity addition target in the state is 2457 MW. If a significant portion of this target capacity along with the backlog from the 11th plan period is to be commissioned during the 12th Plan, the key barriers must be addressed.

Local issues pose significant challenges to hydropower development. With a DPL to the state through the CTF intervention, the transformative impact can be very significant. If 500 MW of capacity is assumed to be facilitated by the development policy loan (DPL) intervention, the investment impact can be significant. Considering a capital cost of USD 1.5mn/MW, the total investments facilitated will be to the tune of USD 750 million.

A successful implementation of the DPL will also set out the framework for use by other projects not directly supported by the DPL. This would be in Himachal Pradesh, in other Indian states and eventually in other countries in the region like Nepal and Bhutan. Thus the DPL has the potential of having transformative impact on the development of hydro projects in India and in South Asia.

The global environment benefits have been computed taking into account the incremental capacity addition facilitated by the CTF financing. The proposed new capacity (500MW) will result in a saving of approximately 1.0 MtCO2/year[15]. GHG emissions estimated at about 1.0MtCO2/yr would result in cumulative emissions savings of 20 million tons of CO2 over a 20-year plant life.

2. NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY—NMEEE

While its economy is growing at 9% and power sector growing in double digits, India is currently facing significant power shortages which are expected to continue in the foreseeable future. Currently, India has an installed generation capacity of around 175 GW. In spite of rapid expansion, supply is unable to keep pace with demand, and reliability of supply remains low. Energy efficiency (EE) can help meet the country's significant power deficit and simultaneously address sustainability concerns.

In recent years, India's energy consumption has been increasing at one of the fastest rates in the world due to population growth and economic development. Commercial primary energy consumption in India has grown by about 700% in the last four decades. Driven by the quest for improved quality of life, energy usage in India is expected to grow at an exponential rate. Since close to 70% of the energy needs are met by coal, the energy sector alone accounts for half of India's carbon-dioxide (CO2) emissions. In such a scenario, enhancing energy efficiency is the fastest and cheapest means to save energy, for national energy security as well as for reducing GHG emissions. At present India is fifth lowest in the energy efficiency in the world but studies suggest that there is a huge potential for substantial improvement.

The goals of National Enhanced Energy Efficiency Mission (NMEEE) are to implement market-based approaches to unlock energy efficiency opportunities, estimated to be worth about Rs. 7,400 million.

By 2014-15, NMEEE is expected to have made the following gains:

- Annual fuel savings in excess of 23 million ton of oil equivalent (toe)
- Cumulative avoided electricity capacity addition of 19 GW
- CO2 emission mitigation of 98 million tons per year

[15] Assuming 1MW renewable energy capacity avoids 2000tCO2

Some of the biggest barriers to wider adoption of EE measures relate to understanding of energy efficiency technologies by financial institutions, availability of commercially proven technologies on energy efficiency, lack of developed market for energy service companies (ESCOs) and higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future. In the NMEEE, four new initiatives are envisaged:

- A market based mechanism to enhance cost effectiveness of improvements in EE in energy-intensive large industries and facilities, through certification of energy savings that could be traded (Perform, Achieve and Trade Scheme also known as PAT scheme).
- Accelerating the shift to EE appliances in designated sectors through innovative measures to make the products more affordable.
- Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.
- Developing fiscal instruments to promote energy efficiency.

The CTF would provide concessional financing to support two specific programs under NMEEE, namely:

(i) support to the Super-Efficient Equipment Program (SEEP) Initiative: As per the experience in several middle income countries, the NMEEE intends to reduce household electricity demand. CTF resources would be utilized to kick start this program in India, focusing on electric fans, as there is a significant volume sold on an annual basis (10 million or 25% of the market), and the manufacturers are mostly domestic. The CTF intervention is required to monetize the future energy savings, which would enable consumers to buy the higher efficiency fans. Once the demand for super efficient fans kick in and industry players establish economies of scale, customers would see the benefit of lower energy bills. The market is then expected to stabilize without any subsequent financial support structure. The time period of the support is envisaged as five years. Subsequent phases of the SEEP program will expand such rebates and financial support to other appliances, based on the experience of Phase I.

In a tropical country like India with an 8 month long summer in the northern areas and longer in the other areas, ceiling and vertical fans provide for a significant portion of the cooling needs. Due to traditional paucity and high costs of electricity, air-conditioning is not very widely used, leading to a high dependence of fans in the country. It is estimated that the annual residential sales in the country are around 23 million units. While extremely high-efficiency fans are available, the market supports a wide variety of old and new technologies, leading to a lower adoption of high-efficiency units. Given the high usage and long life of fans installed in domestic and commercial settings, increased adoption of higher efficiency fans can provide benefits by reducing peak demand as well energy consumption in the country. This financial incentive will make such fans more desirable by the consumers, eliminating any disincentives of higher prices. Such an intervention is required to move the market towards higher efficiency appliances. Subsequent phases of the SEEP will expand such rebates and subsidies to other appliances, based on the experience of Phase 1.

(ii) support to the Perform, Achieve and Trade scheme (*in two phases- Phase I of US$50 million & Phase II for US$150 million*), which is a market -based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded. The Perform, Achieve and Trade scheme is a 'market-based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded'. This program is mandatory for all large industrial units and facilities (DCs), of the following energy-intensive industries in India: thermal power, aluminium, cement, fertilizers, chlor-alkali, steel, paper and pulp and textiles, numbering around 571.

This program, designed with inputs from industries and academia, seeks to provide targets to DCs under the Energy Conservation Act to save energy, based on their individually calculated Specific Energy Consumption (SEC). Targets are a percentage reduction over the unit's SEC, based on factors like sectoral targets to achieve the national goals, current SEC as a ratio of the best in the sector and unit-specific diversities. Achieving efficiency levels beyond the targets would generate Energy Saving Certificates (ESCerts) that can be traded with entities that are unable to meet their own targets and thereby need to comply with the rules by buying ESCerts from the market. For this market to emerge, a fundamental shift in attitudes of looking towards energy efficiency improvements as financially beneficial investments rather than for broader social goals needs to be achieved. The incentive mechanism of ESCerts and the proposed financial support will provide incentives to achieve this transformation.

For this market to emerge, a fundamental shift in attitudes of looking towards energy efficiency improvements as financially beneficial investments rather than for broader social goals needs to be achieved. The CTF intervention would provide an interest financial support incentive to achieve this

transformation. The operation seeks to jumpstart the transition to market based scheme and galvanize proposed investments of US$4 billion required for implementation of the scheme.

Replication Potential – The replication potential is inherently high for such investments, once successfully implemented. The SEEP scheme could be extended to other appliances once the initial implementation is successful. The PAT scheme can be broad-based and expanded to other Designated Consumers (DCs).

Transformative Impact and Global Environmental Benefits – As mentioned earlier, by 2014-15, the NMEEE is expected to result in CO2 emission mitigation of 98 million tons per year and a cumulative avoided electricity capacity addition of 19GW.

The proposed CTF intervention has the potential of buy-down costs through investments by early stage adopters, assisted through financial incentives. Transformational change is envisaged by changing the energy usage in industries through market-based incentive mechanisms, rather than regulation. Such systems change the nature of policy actions, like regulation, in the industrial sector.

3. PARTIAL RISK GUARANTEE FOR ENERGY EFFICIENCY TECHNOLOGIES

Slow adoption of commercially-available and proven-at-scale alternative energy options can be due to several factors, not the least of which is higher costs of debt. Financial institutions and commercial banks are averse to investing in projects whose technologies or processes have not been deployed widely due to their perceived higher-risks in construction and operation, leading to higher costs of debt and smaller allocation in their lending portfolios. The proposed Partial Risk Guarantee (PRG) mechanism covers specified technology and associated commercial risks for new technologies in EE and RE that are not usually priced by commercial banks. To help extend the reach of private financing by mitigating perceived risk and encourage private sector involvement in these sectors, this facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors get lower cost debt. The fund would be available in case of default only, i.e., it will be paid out to participating banks in the event of a loss or default, as specified in the structure of the PRG mechanism. The mechanism is intended to address the key barriers of (i) availability of long term finance at reasonable rates of interest to solar and energy efficiency applications; (ii) build capacity within financial institutions to assess commercial risks in these businesses. Lower cost financing would help make more projects financially viable, bringing advanced renewable energy investments closer to grid-parity faster and reducing payback periods of energy efficiency investments.

Similar risk sharing projects prepared by the World Bank Group in other countries like Chile, Hungary, China, etc. have shown leveraging of four to nine times the guarantee fund. Given India's deep capital markets, a risk-sharing facility that reduces cost of financing would encourage far more capacity installation than direct investments.

Replication Potential – The replication potential of the program is high. This is on account of the fact that a small PRG program can have a bearing on a large investment and bank financing outlay. Once the program is successfully implemented, it can be extended to a larger number of candidate energy efficiency projects. The candidate sectors (including renewable energy projects) can be expanded to include others clean development initiatives where technology and business models are not currently supported by commercial finance due to bankability challenges.

Transformative Impact and Global Environmental Benefits - Accelerated deployment of low-carbon energy technologies in the rapidly growing Indian economy would help to bring down the trajectory of growth in global carbon dioxide emissions. The Integrated Energy Policy Report, 2006, estimates that India will need to increase primary energy supply by three to four times and electricity generation by five to six times from 2006 to meet the lifeline per capita consumption needs of its citizens and to sustain an eight percent growth rate. The government plans to provide universal access and to increase per capita consumption to 1,000 kWh by 2012. This translates to an installed generation capacity requirement of approximately 800 GW in 2031-32 compared to the installed capacity of 160 GW in 2010 (at 8% GDP growth rate). In the backdrop of this unprecedented growth in energy demand, the Government of India's National Mission on Enhanced Energy Efficiency under the NAPCC have provided policy goals to achieve a higher penetration of low carbon options. The NMEEE aims to increase the energy efficiency of the country by 20% by 2020. **Under the NMEEE, the Bureau of Energy Efficiency (BEE) is currently setting up a small PRG facility, which has been seeded with an initial capital of USD 20 million from the Government's own budget.** It

is expected that the GoI-funded Phase I of the PRG will leverage EE investments of 30 times[16] the initial corpus value. Phase II of this PRG would be supported with GEF funds.

Large RE capacity investments and enhanced EE equipment in an economy the size of India will bring down unit costs of new technologies for other emerging countries of the world as well, providing for global benefits.

The CTF financing would supplement a project that has recently been requested of the World Bank, which is to be co-financed by the Global Environmental Facility ($35m) and the GOI ($20m). Given the uncertain nature of investments, India's deep and sophisticated capital markets variation in types of risk that the market might offer for this facility, this leverage can vary substantially, though the upside likelihood is expected to be higher than the downside.

The PRG provides a market transformation through credit enhancement products in India, not done through government or multilateral instruments in the past. This new product serves the purpose of market-making on new technologies and ESCOs in India. In an economy where most of the lending is done based on relationships with existing large customers and not on project -basis, this guarantee product increases the opportunities for new and emerging private sector players to get loans that are not independently priced by the market.

The global environmental benefits of a PRG of USD 25 million would be very substantial since it could support energy efficiency projects equivalent of 1000 MW or more. The avoided emissions on account of 1000 MW equivalent would 2MtCO2/year. GHG emissions estimated at about 2MtCO2/yr would result in cumulative emissions savings of approximately 40 million tons over a 20-year plant life.

4. SUPPORT TO THE JAWAHARLAL NEHRU NATIONAL SOLAR MISSION (JNNSM)

India is endowed with abundant sunlight and solar radiation. Solar radiation is most concentrated in the western and southern regions, particularly in the states of Gujarat, Rajasthan, and Maharashtra[17]. The current solar potential in the country is estimated at 5000 trillion kWh (source: MNRE). The total installed capacity of grid connected solar power plants is 17.82MW and of off grid solar photovoltaic (SPV) systems >1kW is 4.42 MW as on December 31, 2010.

The Jawaharlal Nehru National Solar Mission (JNNSM) was launched in January 2010 pursuant to the NAPCC to facilitate extensive solar power development. The major focus of JNNSM is to:

- To create an enabling policy framework for the deployment of 20,000 MW of solar power by 2022.
- To ramp up capacity of grid-connected solar power generation to 1000 MW by 2013; an additional 3000 MW by 2017 through the mandatory use of the renewable purchase obligation by utilities backed with a preferential tariff. This capacity can be more than doubled – reaching 10,000MW installed power by 2017 or more, based on the enhanced and enabled international finance and technology transfer. The ambitious target for 2022 of 20,000 MW or more, will be dependent on the 'learning' of the first two phases, which if successful, could lead to conditions of grid-competitive solar power. The transition could be appropriately up scaled, based on availability of international finance and technology.
- To create favourable conditions for solar manufacturing capability, particularly solar thermal for indigenous production and market leadership.
- To promote programmes for off grid applications, reaching 1000 MW by 2017 and 2000 MW by 2022.
- To achieve 15 million sq. meters solar thermal collector area by 2017 and 20 million by 2022.
- To deploy 20 million solar lighting systems for rural areas by 2022.

Achieving the ambitious target for 2022 of 20,000 MW will be dependent on lessons identified during implementation of the first two phases, which if successful could lead to conditions of grid-competitive solar power.

[16] Assuming the payment to be 10% of the PRGF corpus, a debt to equity ratio of 2:1, the PRGF would leverage energy efficiency investments which are 30 times the corpus value.

[17] Other states with good solar power potential are Madhya Pradesh, Tamil Nadu, and Kerala.

Scalability and Replication Potential - The transition to mainstreaming solar energy could be appropriately scaled up through capacity development of all stakeholders related to issues of technology, finance, project management, and policy development. JNNSM envisages setting up utility-scale solar power generation plants through the promotion and establishment of solar parks with dedicated infrastructure by state governments as well as newer hybrid technologies that could potentially hold significant commercial promise in future years. Despite early success in the competitive bidding that has resulted in tariffs of around $0.25/ kWh, at a discount of 25%-35% to benchmark tariffs stipulated by the regulator, tariffs for solar power are still nearly two to three times that of conventional power. JNNSM envisages that the initial years would see a push to scale up research, development, and deployment to drive down costs; by the third phase of JNNSM, solar energy would achieve tariff parity with conventional power.

Transformative Impact and Global Environment Benefits - There are three areas in which CTF could be transformative in support of the JNNSM:

(i) lowering the cost of financing and facilitating technology transfer in the establishment of solar parks

(ii) financing new and innovative technologies which have not been financed under Phase I

(iii) contributing to a concessional financing pool for projects under 300 MW of phases I and II of the Mission, to help overcome high up-front capital and lack of access to long term credit at attractive rates

ADB is assisting GOI in developing several solar parks comprising multiple utility scale solar generating plants, transmission systems, and associated infrastructures being developed taking public-private partnership approach (PPP). The near-term development program includes solar parks in Gujarat (1,000 MW), Rajasthan (1,700 MW), Maharashtra (1,000 MW), and pilot projects utilizing hybrid solar and other generation technologies (additional notes on the first batch of solar parks is included below). These are first-of-a-kind "pioneer" projects with (i) additional costs associated with state-of-the-art solar thermal generation technologies, particularly for solar-hybrid integration; (ii) first-mover risk associated with deployment of these renewable energy systems in India; (iii) evacuation challenges for intermittent renewable energy power requiring special transmission design and equipment; (iv) low utilization factor for transmission of such energy resulting in additional load on taxpayers and consumers; and (v) challenges associated with large scale development of renewable energy projects in an identified area through a solar park approach. Clearly, lower cost financing combined with technology transfer and knowledge support would be needed to improve project viability and bring solar tariffs to an acceptable range for large scale deployment.

VI POLICY AND REGULATORY ANALYSIS FOR PRIORITY SECTORS

1. ENERGY SECTOR

India follows a planned economy model featuring Five Year Plans. While India is transiting to a market economy, the Five-Year planning process serves as important guidance to priorities and investments in key sectors. The development objectives of the country in the energy sector have been summarized below:

i. Expansion of energy access is critical for social development objectives. "Although India is the world's fourth largest economy it faces significant challenges in meeting the Millennium Development Goals, as it is home to a third of the world's poor and a quarter of the world's poor without access to electricity (about 400 millions in 2008). In addition, electricity supply is both inadequate and unreliable and more than two-thirds of all Indian households relied on traditional use of biomass as the main source of cooking fuel and one-thirds of households on kerosene for lighting in 2004–05"[18]

ii. Quality of service standards

iii. Education and health services – severely and adversely impacted by non-availability and non-reliability of electricity services

iv. Electricity access has a very important impact on addressing gender issues

v. Sustainable growth taking into account climate change impacts

The 11th Five Year Plan had its underpinnings in the Integrated Energy Policy (IEP) of 2006. This policy heavily emphasised more energy efficient and low carbon growth, and called for specific measures, namely:

- the reduction of technical transmission and distribution losses from 29 to 15 percent from 2005 to 2025
- the retiring of significant quantities of sub-critical coal, rehabilitation of some existing coal and gas-fired plants with higher heat rates, and introduction of super-critical coal technologies
- a five-fold increase in hydropower by 2032, approaching the technical limit of that resource; and
- sourcing 15 % of grid-connected power from renewable energy by 2032, and quadrupling the nuclear capacity within that time frame.

Thus there is considerable degree of policy preparedness, and a host of transformative plans in the energy sector. However, the key will remain to improve the implementation performance and catalyzing the shift to clean energy technologies.

In addition to measures prescribed in the11th Plan and Integrated Energy Policy, the GoI adopted in June 2008, a National Action Plan on Climate Change (NAPCC), which has two missions that mitigate greenhouse gas emissions. These are the National Mission for Enhanced Energy Efficiency (NMEEE), and the National Solar Mission (NSM), respectively.

The enabling policy framework for renewable energy and energy efficiency is summarized and discussed in the table below.

Table 4: GOI Energy Policy Framework

Sector	Key Policies	Key Features
National	Integrated Energy Policy 2006	- phasing out of capital subsidies by the end of the 10th Plan linked to creation of renewable grid power capacity; - requiring power regulators to seek alternative incentive structures that encourage utilities to

[18] The World Bank, "Draft Report - Energy Intensive Sectors of the Indian Economy: Path to Low Carbon Development", pg 1. Data in terms of purchasing power parity.

<table>
<tr><th>Sector</th><th>Key Policies</th><th>Key Features</th></tr>
<tr><td></td><td></td><td>integrate wind, small hydro, cogeneration and so on into their systems, and the linking of all such incentives to energy generated as opposed to capacity created;

- requiring power regulators to mandate feed-in laws for renewable energy, where appropriate, as provided under the Electricity Act 2003.

The policy also made a range of more specific recommendations in relation to particular renewable energy sources, including mini hydro, wind and wood gasification power.</td></tr>
<tr><td>National</td><td>Plan Periods and Targets</td><td>Five Year Plan Periods as per the Planning Commission, Government of India

India is currently in its 11th Five Year Plan

Renewable Energy Targets for Plan Periods

<table>
<tr><th>Resource</th><th>Up to 9th Plan</th><th>10th Plan</th><th>11th Plan</th><th>12th and 13th Plans</th><th>Total</th></tr>
<tr><td>Wind power</td><td>1667</td><td>5333</td><td>10500</td><td>22500</td><td>40000</td></tr>
<tr><td>Small hydropower</td><td>1438</td><td>522</td><td>1400</td><td>3140</td><td>6500</td></tr>
<tr><td>Bio power</td><td>368</td><td>669</td><td>2100</td><td>4363</td><td>7500</td></tr>
<tr><td>Solar power</td><td>2</td><td>1</td><td>-</td><td>-</td><td>3</td></tr>
<tr><td>Total</td><td>3475</td><td>6525</td><td>14000</td><td>30003</td><td>54003</td></tr>
</table>
</td></tr>
<tr><td>National</td><td>National Electricity Policy 2005</td><td>“Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy.

For this purpose, efforts need to be made to reduce the capital cost of projects based on non-conventional and renewable sources of energy.

Cost of energy can also be reduced by promoting competition within such projects. At the same time, adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources”</td></tr>
<tr><td>National</td><td>National Tariff Policy 2006</td><td>“Appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs

Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources

The Central Commission should lay down guidelines within three months for pricing non-firm power, especially from non–conventional sources, to be followed in cases where such procurement is not through competitive bidding”</td></tr>
<tr><td>National</td><td>National Action Plan on Climate Change 2008</td><td>Outlines existing and future policies and programs addressing climate mitigation and adaptation.

The plan identifies eight core “national missions” running through 2017 and directs ministries to submit</td></tr>
</table>

<table>
<tr><th>Sector</th><th>Key Policies</th><th>Key Features</th></tr>
<tr><td></td><td></td><td>detailed implementation plans to the Prime Minister's Council on Climate Change.

NAPCC's emphasis is mainly on development activities yielding co-benefits for addressing climate change.

It says these national measures would be more successful with assistance from developed countries, and pledges that India's per capita greenhouse gas emissions "will at no point exceed that of developed countries even as we pursue our development objectives.</td></tr>
<tr><th colspan="3">Sector Specific</th></tr>
<tr><td>Hydropower</td><td>Hydropower Policy 2008</td><td>The New Hydro Power Policy 2008 recognises the need for a separate policy framework for hydro development in the new market environment.

It also seeks to address a number of issues that have emerged with the new developments that have taken place in the sector since the last policy directions. These issues include:

Need for coordination models for sharing of costs of geological and hydrological data collection and of infrastructure development, proper sequencing of implementation so that infrastructure is not over-strained, and coordinated release of water for optimized generation;

Bringing the state level policies in close coordination with central policy

Facilitating new project development through price regulated contracts in contrast to the prevailing framework where distribution licensees have to procure only through competitive bidding. This provision is expected to improve financing of projects.</td></tr>
<tr><td>Solar</td><td>Jawaharlal Nehru National Solar Mission</td><td>The objective of the National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible.

National Solar Mission has outlined targets for solar generated power for grid connected as well as the distributed and decentralized off-grid commercial energy services.

<table>
<tr><th>Date</th><th>Grid based Solar Capacity installed/proposed</th><th>Solar thermal collectors</th><th>Off grid solar applications</th></tr>
<tr><td>December, 2010</td><td>17.82 MW (installed)</td><td>3.97 million sq meters</td><td>4.42MW</td></tr>
<tr><td>March 2013</td><td>1100 MW (including 100 MW of off-grid and rooftop/tail end capacity)</td><td>7 million sq meters</td><td>200MW</td></tr>
<tr><td>2017</td><td>4000 MW (can be up to 1000 MW, subject to availability of international finance)</td><td>15 million sq meters</td><td>1000MW</td></tr>
<tr><td>2022</td><td>20000 MW</td><td>20 million sq meters</td><td>2000MW</td></tr>
</table>
</td></tr>
<tr><td>Wind</td><td>Generation Based Incentives (GBI) for</td><td>GBI to be implemented in parallel with existing fiscal incentive including that of accelerated depreciation in</td></tr>
</table>

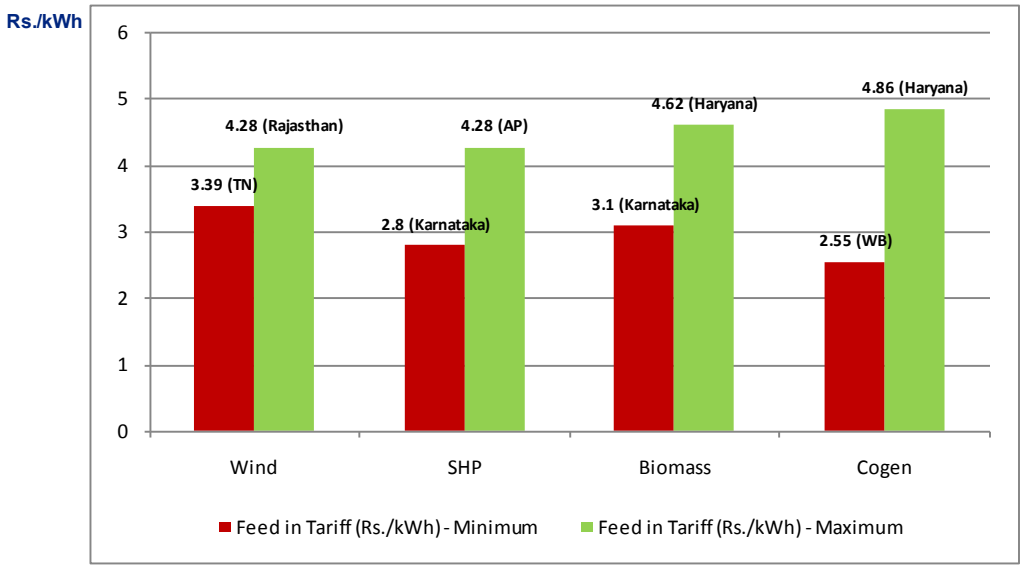
Sector	Key Policies	Key Features
	Wind Power	a mutually exclusive manner; Companies can either avail accelerated depreciation or GBI, but not both GBI scheme applicable for maximum capacity limit to 4000MW during the remaining period of the 11th plan Eligibility – (a) producers who do not avail accelerated depreciation benefit, (b) grid connected wind power projects set up for sale of electricity to grid at SERC tariff, (c) captive wind power projects; *Exclusion – projects selling power to third party* Incentive @Re.0.50 per unit with a cap of Rs.6.2 million per MW Incentive is over and above tariff approved by SERC
Energy Efficiency	National Mission on Enhanced Energy Efficiency (NMEEE)	NMEEE sets out a comprehensive strategy aiming at promoting energy service companies (ESCOs), preparing structured programs to leverage international financing instruments including Clean Development Mechanism (CDM), promotion of energy efficiency financing platform, setting up of partial risk guarantee funds and adoption of robust and credible monitoring and verification protocols. Four programs supported by NMEEE: (i) Perform, Achieve and Trade (PAT) (ii) Market Transformation for Energy Efficiency (iii) Energy Efficiency Financing Platform (EEFP) (iv) Framework for Energy Efficient Economic Development (FEEED)

Renewable Energy and Energy Efficiency Regulatory Framework

Consequent to the Electricity Act, 2003 (EA 2003), renewable energy based power pricing issues are in the domain of the electricity regulatory commissions (ERCs) in the states. As per Section 62 (1) (a) of the EA 2003, tariff for supply of electricity by a generating company to a distribution licensee is to be determined by the Appropriate Commission. Since renewable energy based power sales are predominantly at the state level, the SERCs have the primary responsibility of determining their tariffs. SERCs also determine the terms and conditions of state level open access, wheeling charges and other associated issues that affect wind energy generators. A summary of key provisions of the EA 2003, National Electricity Policy and Tariff Policy has been provided in Annex 1.

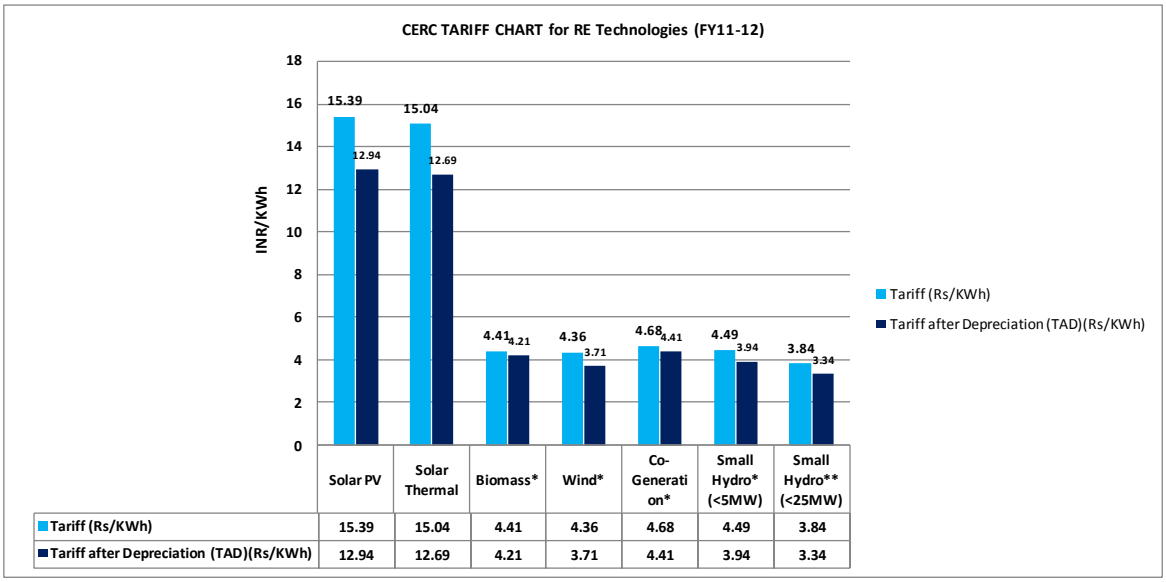
States have generally followed the feed-in tariff (FIT) mechanism that has been in place since 2004. However the rates have been altered substantially over a period of time. The figure below highlights the maximum and minimum technology specific FITs across different states in India.

Figure 4: State-wise tariffs for renewable energy power (Rs./kWh)



The Central Electricity Regulatory Commission (CERC) has announced capital cost benchmarks for renewable energy technologies. The figure below summarizes the CERC tariffs for different renewable energy technologies.

Figure 5: Renewable energy tariffs based on CERC benchmarks



	Solar PV	Solar Thermal	Biomass*	Wind*	Co-Generation*	Small Hydro* (<5MW)	Small Hydro** (<25MW)
Tariff (Rs/KWh)	15.39	15.04	4.41	4.36	4.68	4.49	3.84
Tariff after Depreciation (TAD)(Rs/KWh)	12.94	12.69	4.21	3.71	4.41	3.94	3.34

Even as the regulations of CERC is directly applicable only to projects of (a) *generating companies owned or controlled by the Central Government* and (b) generating companies that *enter into or otherwise have a composite scheme for generation and sale of electricity in more than one State*; in terms of 61 (a) of the EA 2003 the State Commissions are required to be guided by the principles and methodologies determined by the CERC.

As per section 86(1)(e) of the Electricity Act 2003, every distribution utility is required to procure a certain percentage of its power from renewable energy sources. The CERC has also formulated regulations on renewable energy certificates (RECs) and is actively promoting their trading. The revised Indian Electricity Grid Code (IEGC) that has been recently announced by CERC contains conducive provisions for allowing market interface to wind generators. Some of these include:

- **Schedule by wind power generating stations may be revised by giving advance notice to SLDC (State Load Dispatch Centre)/RLDC (Regional Load Dispatch Centre). There may be maximum of 8 revisions for each 3 hour time slot.**
- **The wind generators shall be responsible for forecasting their generation up to accuracy of 70%.**

Some of the other provisions have been summarized in the Box below.

Box 1 – Key features of the IEGC in the context of grid connected renewable power

- All wind power stations to be treated as must-run station(s)
- Mandatory Scheduling of wind power generation from 1st January 2011 for plants with capacity 10MW and above connected at 33 KV and above where power purchase agreement (PPA) has not yet been signed.
- For capacity and voltage level below this, as well as for old wind farms
    - To be mutually decided between the generator and transmission or distribution utility
- Schedule by wind power generating stations may be revised by giving advance notice to SLDC/RLDC. There may be maximum of 8 revisions for each 3 hour time slot
- The wind generators shall be responsible for forecasting their generation upto an accuracy of 70%.
- A maximum generation of 150% of the schedule only, would be allowed in a time block, for injection by wind, from the grid security point of view.

As per EA 2003, the *states shall adopt* the provisions of the IEGC, implying that State Grid Codes have to be aligned with the IEGC and this alignment has to be ensured. This will compel states to follow these provisions. If a project signs PPA subsequently, it would still remain under the purview of the IEGC.

2. ENERGY EFFICIENCY

Energy efficiency technologies can be categorized into two types. One category is of technologies that are mass produced such as lamps, refrigerators, motors, air conditioners, drives, etc. The second category is of technologies that form part of larger processes such as in the production of steel or cement, which are more likely to be one of-a-kind. The industrial sector consumes about half of the total commercial energy available in India, 70 % of which is in energy-intensive sectors - fertilizers, aluminium, textiles, cement, iron and steel, and paper - 15-25% of this avoidable. 5 - 10% energy saving is possible simply by better housekeeping measures, another 10-15% is possible with small investment like low cost retrofits, use of energy efficient devices and controls etc.

The relevance of legislation to improve end-use energy efficiency in all sectors of the economy was realized as an outcome of a national debate on the need for strengthening the energy conservation movement. The extent of importance accorded by the central government to energy conservation is reflected in formulation of a separate Act 'Energy Conservation Act 2001', which was specifically enacted to promote energy conservation.

Under the provisions of the Act, Bureau of Energy Efficiency (BEE) has been established with effect from 1st March, 2002 under the Ministry of Power. The Bureau is responsible for spearheading the improvement of energy efficiency of the economy through various regulatory and promotional instruments.

BEE has a mission to institutionalize energy efficiency, set up a delivery mechanism for energy efficiency services and to provide leadership to implement a nation-wide energy efficiency program, with a thrust on self-regulation and market principles and with the primary objective of reducing energy intensity of the Indian economy**.** The Act provides for regulatory functions for market development and information management, and other enabling functions to achieve its objectives.

The BEE has powers to direct the designated consumers to abide by energy consumption norms and to get their energy consumption audited. The power supply utilities are also included in the list of 15 categories of Designated Consumers. The major regulatory functions of BEE include: performance standards and labelling; introduction of energy conservation building codes; and activities focused on designated consumers. Some of the flagship programs and initiatives of the BEE have been summarized below:

- Standards and Labelling Programs
- Increasing awareness and building capacity of implementing agency i.e. state nodal agencies
- Mandating efficiency standards like Perform Achieve and Trade (PAT) for some critical energy intensive industries
- Energy Efficiency in Buildings – Standards and Codes (Energy Conservation Building Code)

- Introducing a country wide Household Lighting Efficiency programs through CFLs (compact fluorescent lamps)– Bachat Lamp Yojana (this scheme is a CDM registered project and utilizes CER proceeds)
- Enhancing Energy Efficiency in Municipal Services such as Street Lighting, Pumping system etc
- Facilitating a market for Energy Service Companies (ESCOs) to implement energy efficiency programs

Thus, considerable groundwork has already been undertaken. The success of the program objectives will depend on suitable implementation enablers being available. In particular, the implementation is entirely through the private sector, and hence appropriate instruments have to be designed to address the needs and concerns of private capital. This has to be backed by suitable Monitoring, Verification and Evaluation Mechanisms (MV&E) to ensure appropriate use of the incentive frameworks and the attainment of program goals.

With the overall policy and regulatory environment of each of the priority sectors provided in this section, the following section of this paper discusses the impact potential and barrier analysis of the different types of clean energy technology.

VII IMPACT POTENTIAL AND BARRIER ANALYSIS

1. IMPACT POTENTIAL

The government of India has one of the largest programs in renewable energy in addition to the large hydro program in the world, covering a wide spectrum of resources such as wind, solar, biomass, and small hydro. Of these, wind has been the most successful program, as India has the fifth largest installed capacity in the world at 13,066 MW. However, the intermittent or variable nature of wind power, coupled with the moderate wind regime (with low load factors of 20 to 25 percent) in India, limits the capacity of wind power to provide base load energy, especially in the absence of large energy storage capacities. Hydropower is a promising resource and India already plans to develop full technical capacity by 2031. The potential of the existing renewable energy technologies and hydropower along with the capacity installed and expected to be commissioned is summarized in the table below.

Table 5: Technology Potential, Development and Guiding Policies

Technology	Potential (MW)	Current Capacity Installed (cumulative)[1] (MW)	Capacity under Development[2] proposed to be commissioned during 2012-13 to 2016-17 (MW)	Guiding Policy/ Regulation
Hydro (large)	150,000	37,328	42,000	2003: Prime Minister's 50,000MW initiative 2008: Hydropower Policy State Policies (Himachal Pradesh, Uttarakhand, Sikkim, J&K, Arunachal Pradesh)
Hydro (small, <=25MW)	15,000	2,939	1,610	Feed-in-tariffs State Policies
Wind	48,500	13,066	11,000	Feed-in-tariffs, RPO, Accelerated Depreciation benefits, GBI
Biomass	23,700	2,632	1,970	Feed-in-tariffs, Accelerated Depreciation
Solar	20-30 MW/sq.km	18	3,700	National Solar Mission State Policies and Tariffs

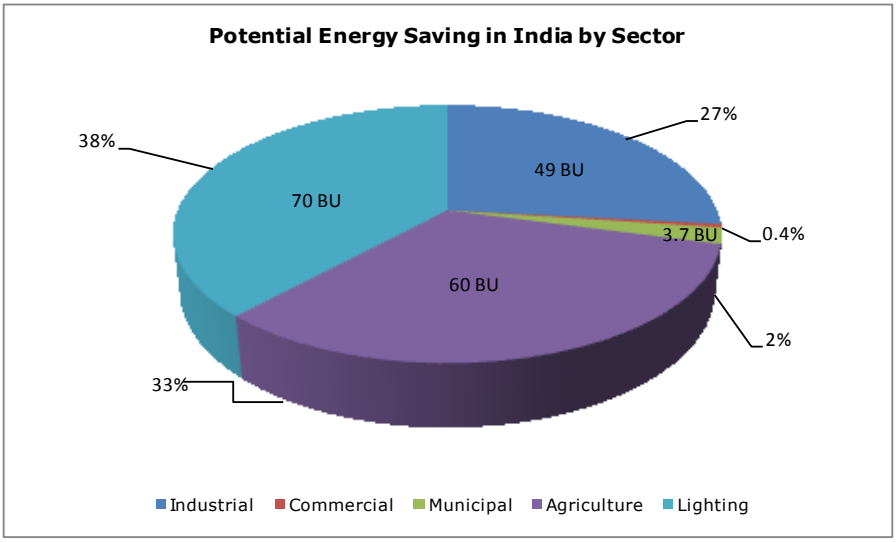
1: up to December 31, 2010
2: For Large Hydropower – figures indicate development pipeline during 12th Plan period; for RE – figures indicate Targets set for the 12th Plan period

Attainment of these targets is heavily dependent on the right implementation enablers. In several of the above, it is near certain that the targets will not be achieved. For example, the hydro project targets are unlikely to materialise due to a variety of reasons. This will have serious implications for India's energy and climate related priorities as well as for global climate objectives. It thus becomes necessary to address the key constraints directly to minimise the shortfall.

Energy Efficiency – In addition to supply side solutions, India is focussing heavily on energy efficiency. It has been estimated that the overall potential is of the order of 20,000MW and the target

of GOI for the 11th Plan was 10,000MW of the terminal year of the 11th plan (2011-12)[19]. The sector specific energy saving potential in India has been illustrated in figure 6 below.

Figure 6: Sector specific energy saving potential in India



Source: Bhaskar Natarajan, Energy efficiency finance in India - some progress and what next; Report prepared at Asia clean Energy forum, 2008, ADB

Note: BU – billion units

2. BARRIER ANALYSIS

Unlike conventional sources, where power projects are concentrated in a few sites, renewable resources including large hydro power resource is dispersed and largely decentralized, including in applications. Given the nature of these resources, there are certain sector specific barriers that need to be taken into account to formulate enablers which will facilitate development of such technologies. These barriers have been summarized in the table below.

Table 6: Priority Sector Specific Barriers

Sector	Barriers/Constraints
Large Hydro Power	• Geological risks • Local displacement and opposition due to absence of benefit sharing policies, guidelines and enforcement • High cost of finance due to long gestation period • Infrastructure bottlenecks (roads, transmission network) • Delayed consents and clearances • Uncoordinated basin wise development • Inadequate and inappropriate pricing framework • Lack of quality and reliable detailed feasibility reports (DFRs) • Sharing of responsibility between state and developer • Workforce capabilities • Hydrology risks • Acceptability by host communities

[19] Source: Powering up the Investment Potential of Energy Service Companies in India, Report by World Resources Institute, 2009

Sector	Barriers/Constraints
	• Poor access to commercial finance / lack of project finance • Limitations on cumulative impact assessments of environmental concerns
Solar	• Resource access – lack of publicly available data on solar insulation level • High costs • Technology maturity • Cost of Finance • Access to Finance • Lack of indigenous manufacturing base • Lack of technically, skilled manpower
Energy Efficiency	• Lack of awareness • Cost of finance • Lack of organized energy service companies • Lack of institutional framework • Lack of adequate capability of implementing agencies such as state nodal agencies • Inadequate monitoring and evaluating frameworks

Based on an assessment of the sector specific barriers that has been carried out above, the following are the common barriers to future growth of clean energy in the country which will require appropriate interventions:

1. Access to Finance
2. Cost of Finance
3. Resource Access
4. Network Access and other Infrastructure Bottlenecks
5. Cost of Equipment
6. Manufacturer and Development Ecosystem
7. Standardization of Contracts and Institutional Arrangements
8. Lack of technically, skilled manpower
9. Social acceptability/ ability to get clearances on time

Going forward, India has set ambitious targets of 40 to 55 GW of additional renewable energy capacity at the end of the 13th plan in 2022 in addition to large hydro capacity addition. The NAPCC has additional renewable energy and energy efficiency targets. To achieve these national objectives, India needs an order-of-magnitude increase in renewable energy growth in the next decade.

The CTF can address only certain select barriers based on its modest size compared to investment needs and significant barriers in the country. Considering this, select interventions have been outlined in the following chapter along with the necessary rationale.

VIII IMPLEMENTATION POTENTIAL AND RISK ASSESSMENT

1. HIMACHAL PRADESH: DEVELOPMENT POLICY LOAN ON ENVIRONMENTAL SUSTAINABILTY AND CLIMATE CHANGE

The overall implementation risk for this priority activity is considered to be moderate. The hydropower project pipeline is mature with considerable groundwork has already completed with extensive survey work undertaken related to the resources. Himachal Pradesh is one of the leading hydropower states in the country and has succeeded in attracting significant private sector interest in the sector. However, although hydropower technology is commercially proven, the risks in such projects are mainly in the form of hydrological and geological risks. Local social and environmental factors pose significant risks and need to be addressed directly. There are also market risks that projects face. These market risks emanate from a fast changing power markets framework in the country, as well as the policy and regulatory gaps at the state level that limits market access and makes it expensive. These barriers must be addressed. Without this a large number of projects are significantly delayed and in certain cases stand a risk of being scrapped even after the commissioning of construction. Some of the key policy impacts of the Himachal Pradesh hydro policy have been summarized in the table below.

Table 10: State Policy impacts

Policy impact	Key aspects
On project development	• Himachal Pradesh has been successful in bringing in significant capacity addition • Bidding for projects below 2MW capacity in HP is based on the MoU route. Rest are competitively bid out • Active state involvement • Strong institutional capacity • Strong civil society
On pricing of power	• Regulated tariffs based on ERC norms for sales in the state. However this policy needs to be aligned to recent changes in national policies mandating competitive procurement • For sale beyond the state boundaries the framework is driven by market dynamics of competitive short term and long term markets • Peak pricing yet to be introduced for hydro projects
On transparent allocation	• Allocation process for hydro projects in HP is based on higher upfront premium during bidding • Lack of transparent criteria for selection of bidders based on technical strength
On investor confidence/ response	• Investor confidence in hydro projects is typically conservative on account of the long gestation period and high initial capital costs for such projects • Investor confidence in HP has been strong till date; the investor interest has however been shifting towards NE states as the potential there is progressively realised

Given the existing enabling Policy and Regulatory framework at the National level, a summary of the Implementation Potential and Risks of the identified priority area vis-a-vis key risk categories have been included in the table below.

Table 11: Implementation Potential and Risk Summary – Renewable Energy Development in Himachal Pradesh

RISK	MITIGATION	RESIDUAL RISK
Project Readiness	The Himachal Pradesh Hydropower Policy provides for a Local Area Development Authority (LADA) for project(s) being implemented in each river valley. The activities of the LADA include overseeing rehabilitation and relief of local inhabitants including protecting their rights for irrigation and drinking water, among others. The CFT co-financed DPL for HP will be supporting an already existing social framework for hydropower in the state.	**LOW**
Policy & Regulatory Framework **Clarity of policies related to hydropower**	The Policies with regard to Hydropower (both at the central and state level is already in place.	**LOW**
Implementation Capacity	DPL for Himachal Pradesh will be administered by the State Government. Although there exists implementation capacity with the state for such type of funds, the objective of this loan will be to ensure certain specific social development activities including local benefit sharing and sound water-shed management, which will be first-of-its kind for state.	**MODERATE**
Finance **Commercial banks are reluctant to lend for RE/EE**	Commercial banks in India are already lending to renewable energy projects including large hydro. Innovative financial products will be utilized to address financial sector's reluctance to lend to large hydro projects.	**MODERATE**
Private Participation **Private sector remains reluctant to invest in new hydropower**	Approximately 50% of the large hydropower development pipeline comprises of private sector projects. Power market downturns (in terms of prices) as well as local issues could pose challenges. The regulations in the states are not aligned to central (CERC regulations) on open access and transmission pricing. This results in progressive delays in projects and adverse cost economics.	**MODERATE**
Scale-up and Replication	Perceived financial risk will be reduced as successful project implementation will demonstrate that financing of hydropower projects are good business opportunities for the domestic financing sector. Increase in large hydropower development capacity and benchmarks from the proposed investments to enhance the policy environment will enhance the abundant scale-up and replication potential of additional hydro power generation capacity.	**MODERATE**
Safeguards **Some hydropower projects are located in environmentally sensitive areas**	Project design will follow GOI and multilateral bank safeguards. Appropriate environmental management and social development measures will be incorporated into project design.	**LOW**

2. IMPLEMENTATION SUPPORT FOR NATIONAL MISSION ON ENHANCED ENERGY EFFICIENCY (NMEEE)

Under the NMEEE, BEE has initiated an 'Energy Efficiency Financing Platform' for promoting financing of EE projects. This program seeks to encourage banks and FIs willing to take up ESCO based projects by enabling the following risk mitigation measures:

- Capacity building and awareness of the personnel in banks and FIs on performance contracting issues
- Aggregation of energy efficiency projects as a result of BEE schemes in different sectors
- Experience sharing and dissemination of national and international best practices in the field of energy efficiency financing

The framework for energy efficient economic development envisages design of fiscal instruments to address the following key issues:

- Provision of comfort to lenders by provision of a risk guarantee for performance contract, and
- Provision of a venture capital fund from the Government to provide equity for energy efficiency projects
- Interest awards to reduce the cost of funds (e.g., for industries covered under the PAT scheme) and catalyse the identified projects to implementation

The Bureau of Energy Efficiency under the Ministry of Power have been active in designing the programs under NMEEE with consultations with a wide range of stakeholders and impacted entities. The World Bank has an existing active dialog and program with BEE and prior experience in market making instruments in countries like China, Chile and Brazil. It also has experience in dealing with financial institutions and to leverage knowledge and money to positively influence behaviour of suppliers and consumers.

Given the existing enabling Policy and Regulatory framework at the National level, a summary of the Implementation Potential and Risks of the identified priority area vis-a-vis key risk categories have been included in the table below.

Table 7: Implementation Potential and Risk Summary – Support to NMEEE

RISK	MITIGATION	RESIDUAL RISK
Project Readiness	The Bureau of Energy Efficiency under the Ministry of Power have been active in designing the programs under NMEEE with consultations with a wide range of stakeholders and impacted entities.	**LOW**
Policy & Regulatory Framework **Clarity of policies related to NMEEE**	The NMEEE has a strong policy framework for supporting market mechanisms for greater off-take of energy efficiency measures.	**LOW**
Implementation Capacity	For supporting implementation of NMEEE, BEE as the implementing agency is a technically sound and experienced entity. Supporting mechanisms like a strong ESCO base to be created. BEE has already empanelled ESCOs.	**MODERATE**
Finance **Commercial banks are reluctant to lend for RE/EE**	Commercial banks in India are already lending to renewable energy projects. Innovative financial products will be utilized to address financial sector's reluctance to lend to RE/EE proponents. Technical assistance will be provided as necessary to upgrade commercial bank capacity to assess and mitigate project risk.	**MODERATE**

RISK	MITIGATION	RESIDUAL RISK
Private Participation **Private sector remains reluctant to invest in new energy efficiency projects**	Advisory services and technical assistance will be provided as necessary to upgrade ESCO capability for implementing and managing energy efficiency projects.	**MODERATE**
Scale-up and Replication	The World Bank has an existing active dialog and program with BEE and prior experience in market making instruments in countries like China, Chile and Brazil. It also has experience in dealing with financial institutions and to leverage knowledge and money to positively influence behaviour of suppliers and consumers.	**MODERATE**
Safeguards	Project design will follow GOI and multilateral bank safeguards. Appropriate environmental management and social development measures will be incorporated into project design.	**LOW**

3. PARTIAL RISK GUARANTEE SCHEME FOR NEW TECHNOLOGIES IN ENERGY EFFICIENCY AND RENEWABLE ENERGY

The overall implementation risk for this priority activity is envisaged to be moderate. This partial risk-guarantee (PRG) facility will address financial barriers to effective deployment of new technologies in Energy Efficiency and Renewable Energy. The proposed PRG mechanism covers specified technology and associated commercial risks for new technologies in EE and RE that are not usually priced by commercial banks. To help extend the reach of private financing by mitigating perceived risk and encourage private sector involvement in these sectors, this facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors get lower cost debt.

Given the existing enabling Policy and Regulatory framework at the National level, a summary of the Implementation Potential and Risks of the identified priority area vis-a-vis key risk categories have been included in the table below.

Table 8: Implementation Potential and Risk Summary – Partial Risk Guarantee Scheme

RISK	MITIGATION	RESIDUAL RISK
Project Readiness	For providing transitional funding support to RE/EE projects, WB is already in discussions with the GOI regarding financing opportunities and have already been approached by interested development financial institutions for administering the PRF.	**LOW**
Policy & Regulatory Framework **Clarity of policies related to PRF**	The Policy framework with regard to supporting financing of new RE/EE technologies including addressing inherent risks (at the central level through the NMEEE) is already in place.	**LOW**
Implementation Capacity	For supporting implementation of mechanisms in the NMEEE such as the PRF, BEE as the implementing agency is a technically sound and	**LOW**

RISK	MITIGATION	RESIDUAL RISK
	experienced entity.	
Finance **Commercial banks are reluctant to lend for RE/EE**	Innovative financial products will be utilized to address financial sector's reluctance to lend to RE/EE proponents. Technical assistance will be provided as necessary to upgrade commercial bank capacity to assess and mitigate project risk.	**MODERATE**
Private Participation **Private sector remains reluctant to invest in new RE and EE projects**	Renewable energy projects in India are 100% owned by private sector players. However, advisory services and technical assistance will be provided as necessary to upgrade ESCO capability for implementing and managing energy efficiency projects.	**MODERATE**
Scale-up and Replication	Perceived financial risk will be reduced as successful project implementation will demonstrate that financing of hydropower, RE/EE projects are good business opportunities for the domestic financing sector. Increase in RE/EE development capacity from the proposed investments to enhance the policy environment will enhance abundant scale-up and replication potential of additional RE capacity.	**MODERATE**
Safeguards	Project design will follow GOI and multilateral bank safeguards. Appropriate environmental management and social development measures will be incorporated into project design.	**LOW**

4. SUPPORT TO THE JAWAHARLAL NATIONAL SOLAR MISSION (NSM)

As discussed earlier, GoI has identified development of Solar Power as a critical initiative for achieving long term energy security. India's solar potential is large, and among the various renewable energy resources, solar energy potential is the highest in the country. Towards this end, the GoI launched the JNNSM in January, 2010, which aims at bringing on line 20 GW of solar power by 2022. The first phase of the NSM (by 2013) envisions the installation of 1,000 MW of grid-connected solar power plants (along with 100 MW of roof top and small-scale solar power, and 200 MW of non-grid connected power), out of which 50% of the electricity generation is envisioned to come from CSP technologies. The implementation of the Mission will proceed on the basis of the technology advancements and cost reduction, which will be necessary for rapid scale-up and to achieve the target of 20,000 megawatts.

Concessional finance will be critical to bring down the initial costs in adoption of CSP technologies while the ecosystem to the support solar power is being developed. Also the private sector developers under the first phase are mostly opting for the most developed and proven technology of parabolic trough. The Ministry wants to examine avenues for supporting pilot projects using CSP technologies other than trough technologies, which are not fully commercial yet have high replicable potential for India. They are also unlikely to receive private sector financing in the normal course, since these are high technology risk projects, and would need concessional financing.

Multilateral development assistance is being extended to the GOI in developing several solar parks comprising multiple utility scale solar generating plants, transmission systems, and associated infrastructures being developed taking a PPP approach.

There are three areas in which CTF could be transformative in support of the JNNSM:

(i) lowering the cost of financing and facilitating technology transfer in the establishment of solar parks

(ii) financing new and innovative technologies which have not been financed under Phase I

(iii) contributing to a concessional financing pool for projects under 300 MW of phases I and II of the Mission, to help overcome high up-front capital and lack of access to long term credit at attractive rates

Given the existing enabling Policy and Regulatory framework at the National level for large scale promotion of solar power in the country, a summary of the Implementation Potential and Risks of the identified priority area vis-a-vis key risk categories have been included in the table below.

Table 9: Implementation Potential and Risk Summary - JNNSM

RISK	MITIGATION	RESIDUAL RISK
Project Readiness	Given the strategic focus of the GoI on solar power and the ambitious NSM targets; the MNRE's priority is on developing pilot projects for innovative CSP technologies using concessional financing. The Ministry has sent a request for the same to Department of Economic Affairs (on 21st July, 2011). There is an active engagement of MDB's with the key agencies in developing the solar parks and the integral transmission systems in Gujarat, Rajasthan, Maharashtra, and is engaged with MNRE and IREDA for the integrated solar-hybrid project at the central level. The projects are at various stages of feasibility analysis and initial due diligence stage. These projects can be prepared and brought for approval by year-end 2012.	**LOW**
Policy & Regulatory Framework **Clarity of policies related to JNNSM**	The Policies and strategic thinking (at the central level) with regard to promotion of new & innovative solar technologies including promotion of solar parks is already in place. However, the phase II framework is still under development.	**MODERATE**
Implementation Capacity	The funds would be routed through GOI owned financial institution and mode of selection of the developer of demonstration project would be selected through a competitive bidding process involving a pre technical qualification. The process for assessing final technology configuration, DPR and Technical Specifications has been initiated. Domestic manufacturing is substantially in place both for CSP & PV, and technology can be absorbed with low difficulty.	**LOW**
Finance **Commercial banks are reluctant to lend to solar projects**	Commercial banks in India are already lending to renewable energy projects. Innovative financial products will be utilized to address financial sector's reluctance to lend to less well known private developers with suitably viable projects. Technical assistance on due diligence will be provided as necessary to upgrade commercial bank capacity to assess and mitigate project risk. Presence of MDA's reduces the risk perception and encourages them to invest. Specialized power sector FIs are available and will be able to come forward if they gain the insights into solar financing.	**LOW**
Private Participation	Renewable energy projects in India are 100% owned by private sector players. The solar projects that are being developed under Phase I of the JNNSM are all	**LOW**

RISK	MITIGATION	RESIDUAL RISK
Private sector remains reluctant to invest in projects with high techology risks and low returns	by private sector players who participated in a competitive bidding process.	
Scale-up and Replication	Perceived financial risk will be reduced as successful project implementation will demonstrate that financing of solar projects are good business opportunities for the domestic financing sector. The sector is currently dependent on subsidies. Hence, scale up will depend on continued availability of subsidies and also reduction of cost curves.	**MODERATE**
Safeguards	Project design will follow GOI and multilateral bank safeguards. Appropriate environmental management and social development measures will be incorporated into project design.	**LOW**

Monitoring, Verification and Evaluation (MV&E)

The Monitoring, verification and evaluation (MV&E) of the projects financed from CTF funds will be carried out as per the well-established monitoring and evaluation protocols applied by MDBs for concessional finance. A clear distinction between the M& E procedures followed by the MDBs and the MRV (measurable, reportable & verifiable) protocols that are under consideration under the multilateral discussions on climate change finance will be kept; the MRV guidelines will not be applicable to projects financed by the CTF.

IX CTF FINANCING IN SUBSEQUENT PHASE

It needs to be noted that the projects proposed for financing under the CTF investment plans represent programs that will be critical in catalyzing clean energy development and have transformative impact on the segment that the respective programs seek to achieve. In Phase 1, the GOI proposes to utilize the initial CTF financing to support the Government's goals of removing barriers and scaling up investments for an initial set of projects that have been identified for their criticality and their transformative impact. Other eligible projects that may not be ready for support at this time would be slated for Subsequent phase of the Investment Plan, subject to the availability of additional CTF funds. Several of these initiatives are at a concept development stage and would be ready for Subsequent phase of CTF financing if funding were to materialize. It is noteworthy that the projects indicated for CTF financing in Subsequent phase are already under active consideration by GoI since all of these represent emergent requirements of the country. CTF financing will however play a role in advancing their implementation in a significant manner, or in improving their project thus having a positive impact on the environment and on emissions. Thus, CTF funds would have a catalytic impact in the design and implementation of the projects in a manner that lends scale and scalability, and would significantly enhance the emissions related benefits from such projects, which may otherwise be only partially realized.

Key projects to be included in the Investment Plans for Subsequent phase of CTF financing are outlined in the sub-sections below:

North Eastern Power System Improvement Project

The North Eastern Region (NER) faces significant bottlenecks in electricity access (24.3% rural access compared to the All India figure of 44%, as per Census 2001) and availability levels (11.1% energy shortage and 17.1% peak shortage on restricted demand). The per capita power consumption in NER (at 238 kWh) is one-third of the national average (734 kWh). The investments in transmission and distribution grids have been inadequate. Transmission and distribution losses are much higher than the national averages, which are themselves much more than acceptable international standards.

To address the above constraints and develop the full potential of the region, GoI has prepared a comprehensive scheme for the development of the power system in the NER that includes investments for strengthening/augmenting intra-state transmission and distribution network in the six states of the North Eastern Region (NER) to facilitate increased access and availability of power to the people in the region and reduce the transmission and distribution losses. CTF financing will help promote public and private investments and will have greatly beneficial impact on CO2 emissions on account of lower transmission and distribution losses.

Rajasthan Urban Transformation

GHG emissions in urban areas arise from transport, municipal solid waste disposal, sewage treatment, and buildings. Transportation in India's cities is dominated by the petroleum-fueled vehicles; rudimentary waste management creates methane (CH4) emissions; "green" building designs have yet to be widely deployed. The Government of Rajasthan (GOR) is promoting urban redevelopment efforts which address the infrastructure challenges, which are expected to result in GHG reductions of approximately 15 % over a period of 5-10 years. The GOR is being supported by ADB in identification and preparation of a comprehensive urban development project which will comprise water supply, wastewater treatment plants, and solid waste management systems.

CTF financing would support GOR cities in local implementation of national programs for GHG mitigation. The candidate investments which would be supported by CTF include: (i) energy efficiency in water supply systems; (ii) methane recovery from sewage treatment plants; and (iii) energy recovery from solid waste management systems. All of these will have a very high beneficial impact on CO2 abatement. The project would introduce innovative financing approaches to ensure that climate-friendly infrastructure is fully funded. Grants will be utilized for capacity building and design support. CTF financing would be utilized to buy down the overall cost of financing. Concessional financing will be complemented by introduction of infrastructure service fees which will achieve full cost recovery.

Net Positive Waste-water technologies for clean up of the Ganga river

The Ganga basin is the most populous in the world, with more than 400 million people in India alone. It accounts for 25% of India's water resources, and the five states on its mainstream (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal) are home to more than 50% of the poor people in the country. These basin states have a disproportionately high incidence of income poverty and, with the exception of West Bengal, have generally lagged in growth and poverty reduction. Recent studies have estimated the burden of water-borne diseases in terms of health costs of almost $4 billion per year on a basin-wide level. Support from CTF could help overcome a significant barrier in municipal finance in India, whereby very few resources are allocated to operational and maintenance for

wastewater treatment plants, which tend to operate at sub-optimal conditions. The support would finance two aspects: (i) the incremental costs of implementing pilot net-positive wastewater treatment plants versus conventional plants and (ii) the support for operational and maintenance costs for a minimum of five years, to ensure satisfactory operating conditions. Use of renewable energy technologies for generating electricity used for wastewater management would be an integral part of the framework. The rendering of wastewater treatment plants from an energy consumer to a renewable energy producer would be a significant development in a populous country such as India that is embarking on significant investments to treat sewage discharged to rivers.

Eastern Dedicated Freight Corridor

The transport sector presents some of the greatest emerging challenges. At present, India has the second largest urban system with over 292 million people living in 5,161 cities and towns. By 2032 the urban population is expected to increase to 117 million households representing 436 million people. Increasing household income is fuelling vehicle ownership; car and motorcycle ownership is expected to increase to almost 7 times the current fleet over this period with a strong shift from motorcycles to cars. Car ownership rates in India (vehicles per thousand people against per-capita GDP) are currently growing faster than the historical tendencies of countries such as Korea and Japan. Emissions from the transportation sector are less than a quarter of the total GHG emissions of India, but it has the fastest growing GHG emissions of any sector.

Rail transport has been the principal mode of goods flow, but suffers from severe inadequacies and has been giving way to road transport for both passenger and goods transportation. Indian Railways has not been able to create additional capacity over the past two decades to keep pace with the increasing demand. During 1991-2002, the rail freight growth was about 4 percent against demand growth of about 7 percent. During 2003-2010, the rail freight traffic growth was about 7 percent against a demand growth of 10 percent. Continuing inadequate rail freight capacity is forcing freight to move by uneconomic alternative modes of transport which imposes high avoidable costs on the economy, and increased greenhouse gas emissions.

In 2011, Indian Railways has begun investing in the development of dedicated freight corridors (DFC) to address the growing demands of freight transport in India, decongest the already saturated rail network and promote the shifting of freight transport from road to rail. The initiative will require significant financing interventions. Once formulated, these are likely candidates for Subsequent phase financing.

Private Sector Energy Efficiency (EE) and Renewable energy (RE) Guarantee Facilities

RE and EE opportunities noted above have additional costs and face various risks, inter alia (i) additional costs associated with state-of-the-art RE/EE technologies and systems; (ii) first-mover risk associated with deployment of these systems in India; and (iii) perceived risk of utilizing innovative financing. Developing these resources requires a significant shift in investment trajectories to support a variety of EE and grid-connected utility-scale RE projects, which is not expected to happen without additional private sector participation and quantum increases in commercial financing.

CTF financing will be utilized for creative financial structuring of utility scale RE projects, building on recent country experience with reverse auctions, first loss guarantees for energy efficiency (in the PRC), and use of grants for partial funding of project contingencies (in Thailand). CTF will be used to cover part of the additional capital costs and to mitigate first-mover risks in certain sub-sectors so that commercial financing can be effectively mobilized for large-scale RE projects. Large-scale EE projects will also be considered for financial support.

Private Sector Intermediation

Despite overall satisfactory performance, the banking sector is constrained by the scarcity of long-term funding which is critical for infrastructure finance, including RE projects. RE project development is further constrained by actual and perceived risks related to high upfront capital costs, the intermittent nature of most RE resources (e.g., wind, solar and hydro) and related low plant capacity and utilization factors. Unfamiliarity with the technologies and smaller transaction sizes contribute to high development costs. Banks are reluctant to lend for energy efficiency (EE) initiatives as such investments normally create savings rather than tangible assets, collateral, and cash flows.

CTF cofinancing will be utilized to cover part of the additional costs and risks of RE/EE projects by creation and deployment of innovative financing mechanisms, including guarantees, risk-sharing, and contingent financing (which ADB has successfully deployed in India, the PRC, and Thailand). CTF will provide additional liquidity and lower-cost funding that will expand and leverage ADB support to RE/EE investments through an established financial intermediary (FI). CTF will help crowd-in private sector financing which will promote mainstreaming of RE/EE project finance. CTF cofinancing will strengthen FI capacity and diversify funding sources, thereby enhancing ability to provide longer-term funding than is otherwise available in the market. It will contribute to strengthen the financial sector, and enable financial institutions to promote financial intermediation to RE/EE initiatives in India.

X FINANCING PLAN AND INSTRUMENTS

The Summary snapshot of the Climate Investment Plan below is presented in two phases, based on project readiness; Phase One projects will be appraised in less than a year from now, while Phase Two consists of projects that are under preparation and likely to be appraised within two years from now.

Phase One	Name of Project	MDB Partner/Project Size	Financing Sought from CTF ($ mn)
1	Himachal Pradesh Environmentally Sustainable Development Policy Loan	World Bank	100
2	National Mission on Enhanced Energy Efficiency—Super Efficient Equipment Programme (SEEP)	World Bank	50
3	Partial Risk Guarantee Scheme for New Technologies in Energy Efficiency (PRG)	World Bank	25
4	Rajasthan Solar Park	ADB	200
5	Gujarat Solar Park	ADB	150
6	Maharashtra Solar Park	ADB	150
7	Integrated Solar-hybrid Pilot Project	ADB	50
8	National Mission on Enhanced Energy Efficiency—Perform, Achieve, Trade (PAT)- Phase I	World Bank	50
Ph-2			
1	National Mission on Enhanced Energy Efficiency—Perform, Achieve, Trade (PAT)- Phase II	World Bank	150
2	Support to National Solar Mission	World Bank	150
3	Northeast Transmission	World Bank	100
4	Rajasthan Urban	ADB	100
5	Net-Energy Positive Wastewater technologies for the clean-up of the Ganga river	World Bank	100
6	Eastern Dedicated Freight Corridor	World Bank	500
7	Private Sector Financial Intermediation	ADB-PSOD	75
8	Energy Efficiency & Renewable Energy Guarantee Facility	ADB-PSOD	200
9	Scaling up Renewable Energy & Energy Efficiency in private sector	IFC	100

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ANNEXES

1. ANNEX I – CTF FINANCING FOR INITIAL PHASE PROJECTS

1.1. HIMACHAL PRADESH ENVIRONMENTALLY SUSTAINABLE DEVELOPMENTAL POLICY LOAN (WB)

Problem Statement

Himachal Pradesh is endowed with rich hydropower resources, and is identified as one of the four focus states of hydropower development in the 12th 5-year plan.

The state government has taken several initiatives to encourage private sector participation in hydropower development. Himachal Pradesh is among the few states which has streamlined and crystallized the various procedures to minimize the bottlenecks and has come up with an investor friendly hydropower policy in place to attract private sector investment. Among socially proactive provisions of the Himachal hydropower policy, the government has constituted local area development authorities (LADAs) for project(s) being implemented in each river valley. Activities of the LADAs include overseeing restoration of facilities adversely affected due to implementation of the project, the implementation of rehabilitation and relief plan and local development activities related to development of agriculture, horticulture, animal husbandry, health and forest development and other social activities.

However, only about 31% of the potential has been developed so far, and performance is far below the targets set out in the 11th Plan. The key barriers to consistently meeting those targets include the following:

- Private sector sees hydropower investment as risky (hydrological, geological), and appropriate policy framework is yet to be in place to address these risks.
- Land acquisition and rehabilitation pose increasing challenges for scaling-up.
- Community benefit sharing is not adequately implemented, and may lead to risks during operation.

In Himachal Pradesh, there are also possibilities in many sectors for significant improvements in energy efficiency, with low or potentially negligible costs. These opportunities exist in demand-side efficiency improvements in industry, public and commercial buildings, among others. However, these opportunities depend on accomplishing various policy and institutional changes, which constitutes a challenge. One significant challenge is for the state to build the existing institutions and know-how to implement policies devised by the central government. Other barriers include competition for limited funds from projects with higher risk-adjusted rates of return and constraints on financing availability for covering up-front costs. A well-known example of the former in industry is the tendency for a growing firm to choose production capacity expansion over energy efficiency improvement to increase its market share, even if both energy efficiency improvement and capacity expansion give positive rates of return.

Proposed Transformation

The objective of this priority activity is to provide a Development Policy Loan (DPL) to the State of Himachal Pradesh, which will have component focused on policies to establish a framework for environmental sustainability, where one component will promote the participation of the state public and private sectors in the NMEEE and the development of renewable energy including hydropower development. Other measures that will be considered include improved monitoring and evaluation, which will be required to document ongoing progress.

The GoHP intends to put in place a comprehensive policy and institutional framework that would enable the further development of 14,500 MW of hydropower over the next ten years, of which about 10 % would be small hydro of less than 5 MW. With this framework, the GoHP would increase its hydropower deployment from the current 31 % to 70 % of technical capacity within a short time, which would be an example for other mid-Himalayan states, and neighbouring countries such as Bhutan and Nepal, which also have a significant hydropower potential.

The GOI is now at a critical juncture where an opportunity exists for a transformational shift towards large scale development of hydropower to meet a significant part of its growing power demand needs. If successfully implemented, the proposed hydropower expansion program will help alter the baseline trajectory for emissions from the power sector, as hydropower remains one of the only alternatives to bring a significant quantity of clean energy to grid. If this expansion were to fall short, then India

would be compelled to seek alternative energy sources to supply its base-load generation needs by most likely reverting to an equivalent expansion of coal-based capacity in-line with the baseline scenario. Any delay in the implementation of the hydropower development program would likely lead to coal substitution in order to cover the resulting shortage in power supply, which will end up increasing emissions from the sector. Moreover, once additional coal-fired plants are constructed, their environmental impact will be long-term because they are not likely to be decommissioned quickly and will operate for some time to come. Therefore, there is a compelling need and considerable urgency to particularly undertaking the priority development of resources that are already under the control of existing developers. This would result in considerable progress towards achieving the GOI hydropower development targets, and for India to meet its energy sector needs while at the same time reduce its future carbon footprint from the power sector.

Rationale for CTF Investment

The proposed operation in Himachal Pradesh will be a DPL, which is a type of operation that provides rapid financial assistance to allow countries to deal with actual or anticipated development financing requirements of domestic or external origins. DPLs typically support the achievement of a set of development results through a medium-term program of policy and institutional actions consistent with a country's economic and sectoral policies. The operation will support a number of policy and institutionally transformative initiatives that HP is undertaking in the areas of benefit sharing, river basin management and land acquisition and rehabilitation. GoHP is also one of the first India states to announce its intention of becoming a carbon neutral state and towards that end undertaking a number of initiatives in the area of energy efficiency and clean energy development.

Given the development urgency, the GOI intends to rapidly scale-up the considerable hydropower resources so that it can meet the immediate power demand needs without compromising its climate change objectives. CTF will help fast-track these developments by addressing some of the barriers that still remain in one of the key hydropower states.

HP has been a proactive state in enhancing environmental sustainability and a successful implementation of the DPL in HP can be transformative and will also set out the framework for use by other states not directly supported by the DPL. This could be replicated in other Indian states and eventually in other countries in the region like Nepal and Bhutan. Thus the DPL has the potential of having transformative impact on the development of hydro projects in India and in South Asia.

The global environment benefits have been computed taking into account the incremental capacity addition facilitated by the CTF financing.

Readiness

The Government of India is already undertaking considerable reforms with the assistance of its development partners to address some of the barriers and scale-up the development of renewable energy such as geothermal resources. Himachal Pradesh has already taken several initiatives to encourage private sector participation in hydropower development. The DEA has requested IBRD assistance for a Development Policy Loan in August 2010, and indicated in November 2010 its intention to seek CTF financing for this operation.

Financing Plan

Source	Amount (us$ million)
GoI/ State Governments	5500
GOI/ Central Government	5900
Private Sector	14400
IBRD	100
CTF	100

Project Preparation Timetable

Milestone	Expected Schedule
Bank PCN and Identification	May 2011
Appraisal and Negotiation	November 2011
Board Approval	November 2011
Project Completion	November 2013

1.2. IMPLEMENTATION SUPPORT TO NATIONAL MISSION ON ENHANCED ENERGY EFFICIENCY (WB)

Problem Statement

While its economy is growing at 9% and power sector growing in double digits, India is currently facing significant power shortages which are expected to continue in the foreseeable future. The current energy shortage in the country is at 11%, with peak energy shortage at 16.5 percent (2007/08). During the 11th Five Year Plan, capacity additions were in the order of 60 GW, which is significantly higher than the 20 MW than the historical addition of 20GW. It is likely that the 12th Five Year Plan currently under preparation will call for a capacity addition of 100 GW in 2012-16, which will be required for India to keep up with its increasing energy demand. Currently, India has an installed generation capacity of around 171 GW. The Government of India is looking for additional resources such as renewable energy and energy efficiency (EE), to help meet the country's significant power deficit and diversify the energy generation portfolio mix.

In recent years, India's energy consumption has been increasing at one of the fastest rates in the world due to population growth and economic development. Commercial primary energy consumption in India has grown by about 700% in the last four decades. Driven by the quest for improved quality of life, energy usage in India is expected to grow at an exponential rate. Since close to 70% of the energy needs are met by coal, the energy sector alone accounts for half of India's carbon-dioxide (CO2) emissions. In such a scenario, enhancing energy efficiency is the fastest and cheapest means to save energy, for national energy security as well as for reducing GHG emissions. At present India is fifth lowest in the energy efficiency in the world but studies suggest that there is a huge potential for substantial improvement.

With National Mission for Enhanced Energy Efficiency (NMEEE), India has embarked on an ambitious plan to cut its energy consumption with the following policy aims:

- Reduction of 98 million tons of carbon dioxide emissions annually by 2014-15;
- Avoidance of electricity generation capacity addition of 19,000 MW
- Save fuel in excess of 23 million metric tons of oil equivalent (mMtoe)

Some of the biggest barriers to wider adoption of EE measures relate to understanding of energy efficiency technologies by financial institutions, availability of commercially proven technologies on energy efficiency, lack of developed market for ESCOs and higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future. In the National Mission for Enhanced EE, following four new initiatives are envisaged:

- A market based mechanism to enhance cost effectiveness of improvements in EE in energy intensive large industries and facilities, through certification of energy savings that could be traded,
- Accelerating the shift to EE appliances in designated sectors through innovative measures to make the products more affordable.
- Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.
- Developing fiscal instruments to promote EE.

The programs under the NMEEE have results indicators. Efficiency targets and individual program targets of the proposed project would be aligned with indicators of GoI's NMEEE schemes, along with intended outcomes of:

- Financial investments in energy efficiency leading Achievement of Introduction and implementation of an efficient market in ESCerts
- Entry of energy-efficient equipment suppliers in the market and creation of demand for these investments.

Proposed Transformation

The proposed CTF intervention has the potential of buy-down costs through investments by early stage adopters, assisted through financial incentives. Transformational change is achieved by changing the energy usage in industries through market-based incentive mechanisms, rather than regulation. Such systems change the nature of policy actions, like regulation, in the industrial sector.

The CTF would provide concessional financing to support two specific programs under NMEE, as follows

A $50 million fund to accelerate the deployment of Super-Efficient Fans (under SEEP).

Given the high usage and long life of fans installed in domestic and commercial settings, increased adoption of higher efficiency fans can provide benefits by reducing peak demand as well energy consumption in the country. Monetizing the future energy savings of high efficiency fans by bringing down current cost of these fans through a public policy push is proposed to kick start the market of high efficiency fans. With the cost of super efficient fans being higher than low efficiency fan by about $5 a piece, a support of $50 million is proposed to bring down the cost of super efficient fans to that of low technology fans. With this policy push, over 10 million fans (25% of market) annually could be converted to high efficiency fans over next five years. This financial incentive will make such fans more desirable by the consumers, eliminating any disincentives of higher prices. Once the demand for super efficient fans kick in and industry players establish economies of scale, customers would see the benefit of lower energy bills. The market is then expected to stabilize without any subsequent financial support structure. The time period of the support is envisaged as five years. Subsequent phases of the SEEP will expand such rebates and financial support to other appliances, based on the experience of Phase I.

Rationale for CTF Investment

Some of the biggest barriers to wider adoption of energy efficiency measures tend to revolve around higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future. In order to overcome these functional and behavioural barriers, the proposed support will assist in initial years of market making while the market-oriented approach of the NMEEE is stabilized. Using this approach, concessional funds would be available to suppliers and/ or consumers contingent on achieving pre defined milestones or outcomes, thereby lowering the risk of not achieving stated reductions in cost due to energy efficient applications.

Financing Plan:

The duration of the first period of the Super-Efficient Appliances Development project is envisaged for five years, from 2012 to 2016.

Support to NMEEE SEEP (2012-16)	
Sources	
CTF	50
IBRD	
Private Sources	1,930
Total	*2,000*

Project Preparation Timetable:

In order to meet the targets set under the NMEEE, this intervention would have to be fast-tracked as thus:

Milestone	Expected Schedule
Bank PCN and Identification	October 2011
Appraisal and Negotiation	June 2012
Loan Effectiveness	September 2012
Implementation and Monitoring (SEEP)	April 2012 to 2016
Implementation and Monitoring (PAT)	To March 2014

1.3. PARTIAL RISK GUARANTEE SCHEME FOR NEW TECHNOLOGIES IN ENERGY EFFICIENCY

Problem Statement

Accelerated deployment of low-carbon energy technologies in the rapidly growing Indian economy would help to bring down the trajectory of growth in global carbon dioxide emissions. The Integrated Energy Policy Report, 2006, estimates that India will need to increase primary energy supply by three to four times and electricity generation by five to six times from 2006 to meet the lifeline per capita consumption needs of its citizens and to sustain an eight percent growth rate. The government plans to provide universal access and to increase per capita consumption to 1,000 kWh by 2012. This translates to an installed generation capacity requirement of approximately 800 GW in 2031-32 compared to the installed capacity of 160 GW in 2010 (at 8% GDP growth rate). In the backdrop of this unprecedented growth in energy demand, the Government of India's Nehru Solar Mission (NSM) and National Mission on Enhanced Energy Efficiency (NMEEE) under the National Action Plan on Climate Change have provided policy goals to achieve a higher penetration of low carbon options. The NMEEE aims to increase the energy efficiency of the country by 20% while the NSM aims to achieve solar energy installations of 20GW by 2020.

Some of the biggest barriers to wider adoption of EE measures relate to understanding of energy efficiency technologies by financial institutions, availability of commercially proven technologies on energy efficiency, lack of developed market for ESCOs and higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future.

Slow adoption of commercially-available and proven-at-scale alternative energy options can have several factors, not the least of which is higher costs of debt. Financial institutions and commercial banks are averse to investing in projects whose technologies or processes have not been deployed widely due to their perceived higher-risks in construction and operation, leading to higher costs of debt and smaller allocation in their lending portfolios

The nature of a Partial Risk Guarantee (PRG) magnifies private investment in new technologies, generating leverage. Under the NMEEE, the Bureau of Energy Efficiency (BEE) is currently setting up a small PRG facility, which has been seeded with an initial capital of USD 20 million from the Government's own budget. It is expected that the GoI-funded Phase I of the PRG will leverage EE investments of 30 times20 the initial corpus value. Large RE capacity investments and enhanced EE equipment in an economy the size of India will bring down unit costs of new technologies for other emerging countries of the world as well, providing for global benefits.

Proposed Transformation

The objective of this priority activity is to help extend the reach of private financing by mitigating perceived risk and encourage private sector involvement in these sectors; this facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors get lower cost debt. The fund would be available in case of default only, i.e., it will be paid out to participating banks in the event of a loss or default, as specified in the structure of the partial risk guarantee (PRG) mechanism. The mechanism is intended to address the key barriers of (i) availability of long term finance at reasonable rates of interest to solar and energy efficiency applications; (ii) build capacity within financial institutions to assess commercial risks in these businesses. Lower cost financing would help make more projects financially viable and reducing payback periods of energy efficiency investments.

In order to achieve this objective, the CTF would contribute to a partial risk guarantee of $65 m financed as follows: a first phase consisting of GOI funding of $20 million and climate finance of $25 million, followed by a second phase supported by the Global Environmental Facility for $20 million.

The PRG provides a market transformation through credit enhancement products in India, not done through government or multilateral instruments in the past. This new product serves the purpose of market-making on new technologies and ESCOs in India. In an economy where most of the lending is done based on relationships with existing large customers and not on project -basis, this guarantee product increases the opportunities for new and emerging private sector players to get loans that are not independently priced by the market.

[20] As per the design documents of the Government of India, assuming the payment to be 10% of the PRGF corpus, a debt to equity ratio of 2:1, the PRGF would leverage energy efficiency investments which are 30 times the corpus value.

IFC's proposal, will complement IBRD's PRG work, by supporting private sector infrastructure finance companies (IFCos) and other financial institutions to build their technical capacity and portfolios in renewable energy and energy efficiency financing using risk-sharing facilities and other products. IFC and IBRD are able to collaborate at the macro level, with both institutions doing similar work in different parts of the market to ensure enough market penetration to catalyze transformation and sustainability. Each institution will draw on its existing and new client relationships and coordinate their approach to target the appropriate financial intermediaries.

Implementation Readiness

The Bureau of Energy Efficiency has designed the project and received a budget line item from the Government of India to initiate the program with an amount equivalent to US$20 million. The program was designed with extensive consultations with the banking industry. A request for assistance for the program through Global Environmental Facility has been received and is currently being processed.

Rationale for CTF Investment

The CTF would support a proposed PRG mechanism that covers specified technology and associated commercial risks for new technologies in EE and RE that are not usually priced by commercial banks. To help extend the reach of private financing by mitigating perceived risk and encourage private sector involvement in these sectors, this facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors get lower cost debt. The fund would be available in case of default only, i.e., it will be paid out to participating banks in the event of a loss or default, as specified in the structure of the PRG mechanism. The mechanism is intended to address the key barriers of:

- availability of long term finance at reasonable rates of interest to solar and energy efficiency applications;
- Build capacity within financial institutions to assess commercial risks in these businesses.

Similar risk sharing projects prepared by the World Bank Group in other countries like Chile, Hungary, China, etc. have shown leveraging of four to nine times the guarantee fund. Given India's deep capital markets, a risk-sharing facility that reduces cost of financing would encourage far more capacity installation than direct investments.

Financing Plan:

Based on prior experience with risk-sharing facilities from the World Bank's and IFC's operations, it is expected that about 10% of the corpus available for risk-mitigation will be called on. Assuming a 2:1 debt to equity ratio, the concessionary resources will be leveraged about 30 times21. Divided in two phases, the financing plan would be as follows:

Partial Risk Sharing Facility	
Sources	**US$ m**
Govt of India	**20**
CTF (IBRD)	**25**
GEF	**20**
IFC	**50**
Private Sources	**1,885**

[21] As per design documents of the Government of India

Project Preparation Timetable:

The government of India has allocated $20 million for the risk-sharing facility in its budget. The implementation will be underway shortly, to which CTF and GEF resources will add their own resources. The assistance will be provided on this schedule:

Milestone	Expected Schedule
Bank PCN and Identification	October 2011
Appraisal and Negotiation	June 2012
Loan Effectiveness	September 2012
Implementation and Monitoring	September 2012 to tenure of loans

1.4 SUPPORT TO NATIONAL SOLAR MISSION (ADB + WB)

Problem Statement

India is endowed with abundant sunlight and solar radiation. Solar radiation is most concentrated in the western and southern regions, particularly in the states of Gujarat, Rajasthan, and Maharashtra[22]. The current solar potential in the country is estimated at 5000 trillion kWh (source: MNRE). The total installed capacity of grid connected solar power plants is 17.82MW and of off grid solar photovoltaic (SPV) systems >1kW is 4.42 MW as on December 31, 2010. In order to mitigate climate change, the Government of India (GOI) has committed itself to expanding its solar energy capacity even though the cost of solar power is significantly higher than conventional sources. The Jawaharlal Nehru National Solar Mission (JNNSM) under the National Action Plan on Climate Change (NAPCC) is a key policy intervention to rapidly enhance solar capacity and support low carbon development. The NAPCC announced the intent to add 20 GW of capacity from solar by 2022.

The JNNSM first phase to promote 1,000 MW of solar power through a mix of photovoltaic (PV) and concentrated solar power (CSP) technologies has used a competitive bid framework for price discovery. Despite successful competitive bids that have resulted into tariffs of around $0.25/ kWh, at a discount of 25%-35% to benchmark tariffs stipulated by the regulator – tariffs for solar power are nearly two to three times that of conventional power. JNNSM envisages that the initial years would see a push to scale up research, development, and deployment to drive down costs; by the third phase of JNNSM, solar energy would achieve tariff parity with conventional power.

ADB is assisting GOI in developing several solar parks comprising multiple utility scale solar generating plants, transmission systems, and associated infrastructures being developed taking public-private partnership approach (PPP). The near-term development program includes solar parks in Gujarat (1,000 MW), Rajasthan (1,700 MW), Maharashtra (1,000 MW), and pilot projects utilizing hybrid solar and other generation technologies (additional notes on the first batch of solar parks is included below). These are first-of-a-kind "pioneer" projects with (i) additional costs associated with state-of-the-art solar thermal generation technologies, particularly for solar-hybrid integration; (ii) first-mover risk associated with deployment of these renewable energy systems in India; (iii) evacuation challenges for intermittent renewable energy power requiring special transmission design and equipment; (iv) low utilization factor for transmission of such energy resulting in additional load on taxpayers and consumers; and (v) challenges associated with large scale development of renewable energy projects in an identified area through a solar park approach. Clearly, lower cost financing combined with technology transfer and knowledge support would be needed to improve project viability and bring solar tariffs to an acceptable range for large scale deployment.

JNNSM envisages setting up utility scale solar power generation plants through the promotion and establishment of solar parks with dedicated infrastructure by state governments, among others, the governments of Gujarat (GOG), Rajasthan (GOR) and Maharashtra (GOM) as well as demonstration CSP projects.

Project 1. Rajasthan Solar Park

GOR has identified the Bhadla solar park situated on more than 10,000 hectare of land near Jaisalmer, Rajasthan. The solar park will accommodate both solar photovoltaic (PV) power plants (Phase I) and concentrated solar power (CSP) plants (in subsequent phases). A high level master plan is being developed with support of ADB to ascertain the feasibility of the chosen location at Bhadla, and to prepare a detailed project report including laying out of plots, planning for common infrastructure, and developing cost estimates and financing plans. This master plan is expected to be ready by December 2011.

The Rajasthan Rajya Vidyut Prasaran Nigam (RVPN), setup in 2000, has been declared as the state transmission utility (STU) of Rajasthan. RVPN is responsible for the planning, development, operation and maintenance of the transmission facilities at 132 kV and above in Rajasthan. RVPN has developed a detailed project report to evacuate nearly 4,000 MW of solar and wind energy from a high renewable energy potential zone identified in Western Rajasthan. RVPN expects nearly 1,700 MW of solar power and 2,300 MW of wind power to be connected to its bulk power transmission system in the western part of Rajasthan. While some of the power is to be consumed in the state by the distribution companies, a large part of this power would be wheeled to other states to support them to meet their renewable power procurement obligations.

[22] Other states with good solar power potential are Madhya Pradesh, Tamil Nadu, and Kerala.

Considering the low utilization ration of transmission ratio for evacuating renewable energy and additional investment needs for stabilizing electricity, RVPN considers requesting GOI to provide a grant.

Project 2. Gujarat Solar Park

GOG launched its Solar Power Policy in 2009 and proposes to establish a number of large scale solar parks, the first of which would host 500 MW of generating capacity. The development of solar parks will streamline the project development timeline by letting government agencies undertake land acquisition and necessary permits, and provide dedicated common infrastructure for setting up solar power generation plants largely in the private sector. This approach will facilitate the accelerated installation of solar power generation capacity at scale, which will facilitate reduction in installed system costs. Common infrastructure for the solar park includes site preparation and leveling, power evacuation, water supply, access roads, security and services. In parallel with JNNSM, the Gujarat Electricity Regulatory Commission (GERC) announced feed-in-tariff23 to mainstream solar power generation which will be applied for solar power generation plants in the solar park; GOG launched its Solar Power Policy 2009 to meet the objective. Gujarat Power Corporation Limited (GPCL) is the responsible agency for developing the solar park of 500 megawatts and will lease the lands to the project developers to generate solar power. Gujarat Energy Transmission Corporation Limited (GETCO), with the mandate to develop transmission infrastructure in Gujarat will develop the transmission evacuation from the identified interconnection points.

The development of this infrastructure to evacuate and transmit such a large quantum of renewable energy power has its challenges including (i) the development of a large solar park of nearly 1000 MW that is unprecedented among ADB's developing member countries with associated technical and other challenges, (ii) cost recovery from consumers in Rajasthan or other Indian states given significantly low load factors for infrastructure transmitting renewable energy compared to conventional fossil fuels and (iii) technical challenges related to evacuation of such a large quantum of intermittent power in a stable and reliable manner that requires the use of innovative stabilizing equipment.

Project 3. Maharashtra Solar Park

Metropolitan Region Development Authority (MMRDA), GOM is aiming setting up a Solar Park on a 117 hectare plot at Taloja, Maharashtra. As per area planning, the requirement of land for processing unit will be around 17 hectares whereas for land filling activity at any time will be around 25-30 Hectares, sufficient to take care of longer period.

In this region Sun yield is excellent for 5 hours a day and for more than 200 days per year, which is an ideal requirement for such projects. One MW power can be tapped from 2.5 to 3 Ha. of land. There is also a new trend of Hybrid, a combination of solar park and wind energy which is a popular and modern trend which also can be considered to generate more energy. With lessons and experiences to prepare master plan of Gujarat and Rajasthan solar park, ADB will provide financial and technical assistance to Maharashtra.

Project 4 Integrated Solar-Hybrid Pilot Project

Pilot demonstration projects for grid connected solar power, closely aligned with the R & D priorities, were envisaged under JNNSM with a view to address issues related to optimization, variability of solar resource and storage constraints and targetting space-intensity through the use of better technologies.

Concentrating Solar Power (CSP) technologies use solar energy to produce high temperature by focusing solar radiation from a larger area on to a smaller area and then generating electricity by employing a prime mover, most commonly actuated by high pressure steam, but also using a external combustion engine (like Stirling engine) directly. CSP has capacity to store heat energy for short periods of time, and it can be increased by providing additional thermal storage, for continuing generation of electricity during periods of low sunshine as well as after sunset. The flexibility of CSP plants in combining with the conventional fuels enhances energy security.

CSP can provide a reliable source of electricity production in the regions with strong direct normal irradiance (DNI), i.e. strong sunshine and clear skies. IEA has envisaged that by 2050, with appropriate support, CSP could provide 11.3% of global electricity, with 9.6% from solar power and 1.7% from backup fuels (fossil fuels or biomass). In sunniest countries, CSP is tipped to become a competitive source of bulk power in peak and intermediate loads by 2020, and of base-load power by 2025 to 2030.

CSP plants at commercial scale were set up during late eighties at Mojave desert, USA with aggregate capacity of 354.5 MW capacity for the nine plants. These plants are still operational. The present cumulative installed capacity of CSP plants has grown to 1265 MW, and is further rising as capacity of over 1,800 MW is reported under construction. Capacities over 15,000 MW have been announced in different parts of the world.

[23] Rs 13.00 for first 12 years and Rs 3.00 from thirteenth to twenty fifth year to be applied for solar photovoltaic operation.

Presently, USA and Spain represent for more than 90% of the market in terms of installed capacity and capacities under construction. As per announcements made, USA is far ahead while other countries, such as, China, Morocco, Sudan and India also have ambitious plans to set up CSP plants.

At present four variants of technologies form part of CSP family. These are Parabolic Trough; Tower; Linear Fresnel and Parabolic Dish technology. Parabolic troughs are the most favoured technology and represent over 90% of the capacity of the operational plants. Solar towers, however, seem to have getting much attention as is clear from the technology configurations for plants under construction. Reportedly, solar dish and Fresnel reflector technologies are also emerging as potential technologies for mass deployment; however, not much information is available in public domain on the proposed plants.

Setting up demonstration projects using technologies that are not covered under commercial projects is one of the windows envisaged to achieve basic aim of the Mission to make solar power cost effective and achieve parity with grid power by 2022. For this, it is envisaged to have advanced technology configurations which could lead to cost reduction through higher efficiency and capacity utilization factor (CUF), and scale effect. The setting up of these demonstration grid connected solar power projects is visualized to enable solar project developers to plan projects in next phase of the JNNSM based on the learnings from these projects in terms of their performance.

The issue related to proposed technology configuration for the demonstration projects under JNNSM was discussed extensively during two formal meetings of the Core Group constituted for this purpose, and informally with various stakeholders including technology providers and experts.

The following technology configurations are proposed:

- Up to 50 MW capacity with air/ hybrid cooling; the minimum capacity would be 20 MW
- 50 MW capacity with up to 30% gas hybridization
- 50 MW capacity having operating temperature over 500 C
- Solar Augmentation of the existing coal thermal power plant
- Solar - biomass hybrid plant of 1- 3 MW capacity
- Base load capacity solar stand alone plant of up to 10 MW capacity; the minimum capacity would be 3 MW

All projects, except the one related to solar augmentation of existing coal thermal power plants are proposed to be procured based on global tariff Case 1 bidding. The decision on the mode of procurement will be decided later based on the identification of coal plant where such augmentation could be carried out.

Proposed Transformation

CTF financing will be utilized for addressing some of the expected technology challenges encountered in developing solar parks in India (and to other countries). CTF will be used to cover part of the capital costs involved in the development of such projects particularly to address technological problems [noted above] that will be faced by such unprecedented large scale renewable energy projects. If such problems can be addressed through concessional financing and knowledge transfers, they could result in significant milestone for development of solar power projects in India.

CTF will facilitate mainstreaming of private sector investments by crowding-in private sector financing [mainly for electricity generating plants]. The solar parks and integrated solar-hybrid portfolio will demonstrate the commercial viability of several large-scale solar projects, with generation assets developed by the private sector and transmission assets developed by transmission utilities. Successful demonstration of utility-scale solar projects will facilitate development of the local solar thermal industries which are required to enable long-term low-carbon development. These projects will provide business models that can be replicated in India, elsewhere in the region, and globally.

The role of the proposed intervention in the next phase is two-fold:

1. **Finance new and innovative technology which has not been financed under Phase I of the JNNSM: US$ 250 million funding to support the Demonstration projects under the National Solar Mission**[24]: Under this intervention, the World Bank will support untested hybrid configuration with solar augmentation to an existing coal/gas thermal boiler; and CSP technologies that may not be tried under the projects tried under the Phase I of the NSM and have high replicability potential for India. This is critical for ensuring technology diversity and testing replicable models (hybrid) in India. Thus, the following technological options are the suggested options as support for these demonstration projects:

[24] On the current scenario of expected cost of USD 4 million per MW of CSP project.

a. **Hybrid with linear Fresnel direct steam generation as hybrid with gas thermal plant:** This is suggested due to both considerable learning effects that could be reaped from such an undertaking, which has not yet been done at scale; and from the natural fit of such an option for the Indian market, given the structure of the country's electricity supply.

b. **Hybrid options with parabolic trough, which can be several configurations:** Co-generation; steam augmentation; integrated solar combined cycle.

c. **Central receiver (Power tower) with super heated temperatures**: Depending on Heat Transfer Fluid, cost effective thermal energy storage is possible with capacity factor depending on HTF can range between 25% - 75%. This could be air cooled, is suitable for base load generation when equipped with storage, levelized cost is lower than for parabolic trough.

The funds would be routed through Government of India owned financial institution and mode of selection of the developer of demonstration project would be selected through a competitive bidding process involving a pre technical qualification. The process for assessing final technology configuration, Detailed Project Report and Technical Specifications has been initiated.

2. **Contributing to Concessional financing pool US$50 million fund for projects under 300 MW of Phase I/Phase II of the NSM:** Under this intervention, the World Bank will contribute to a pool of funds which will finance CSP projects of Phase II of NSM with concessional long tenure finance available to selected players, through a competitive route. This instrument aims to set -up a financing mechanism that will help overcome some of the barriers to untested and innovative investment in India in solar thermal power, which, among others, include: 1) high front-end capital cost, 2) lack of access to long-term credit at attractive rates.
3. IFC's program will dovetail with this effort to promote private sector investments in solar CSP with storage, which remains a relatively new and unproven technology in India. IFC will focus its efforts on using the private sector allocation for CTF towards early-stage commercial solar thermal technologies to enable both private sponsors/project developers and banks to finance these projects at the "market" solar tariff.

Implementation Readiness

Given the strategic focus of the GoI on solar power and the ambitious NSM targets; the MNRE's priority is on developing pilot projects for innovative CSP technologies using concessional financing. The Ministry has sent a request for the same to Department of Economic Affairs (on 21st July, 2011).

ADB is actively engaged with the key agencies developing the solar parks and the integral transmission systems in Gujarat, Rajasthan, Maharashtra, and is engaged with MNRE and IREDA for the integrated solar-hybrid project at the central level. The projects are at various stages of feasibility analysis and initial due diligence stage. These projects can be prepared and brought for approval by year-end 2012 (assuming no fatal flaws emerge during due diligence). An indicative financing plan is presented below.

Rationale for CTF Investment

Given the strategic focus of the GoI on solar power, one immediate opportunity is for India to access the CTF which provides concessional financing for the demonstration, deployment and transfer of low carbon technologies like the concentrating solar power, with significant potential for greenhouse gas emissions savings. The World Bank CTF financing would reduce the perceived investors' risks through the provision of financing with the longer tenure of up to 25-30 years, compared to the maximum tenure of 12 years in India's domestic financial market. Such large projects of 50 – 100 MW scale for innovative technologies which are adaptable to Indian conditions, would help replication in the coming phase of the JNNSM, and would be required to help accelerate the market and building confidence amongst stakeholders. This would be done by acquiring plant operational performance information, gaining experience in project design, development and execution, thus, reducing risks and associated expenses related to these innovative designs.

Given the complex technology and project, successful demonstration of CSP projects in India using concessional financing and World Bank's global knowledge of CSP across other countries would facilitate replication and streamlining of procedures across other locations within India. The World Bank and the ADB have been in discussions to jointly finance such a demonstration project.

Commercial development of wind and solar energy in resource rich areas such as Gujarat and Rajasthan will support enhancement of India's energy security, save foreign exchange, and protect against global fuel price fluctuations by using non-tradable domestic energy sources. Utility-scale RE development is constrained by several factors:

- Utility-scale solar projects are at the initial stages in Asia and face additional costs and risks not covered by conventional project financing. Creative financing approaches, including the use of concessional funds, are needed to engender confidence in the financial markets and mainstream large-scale project financing.
- Carbon finance can provide some financial support, but is not sufficient to overcome the cost and risk barriers noted above.[25]
- CTF can provide a catalytic role in supporting the development of integrated solar-hybrid pilot projects that theoretically generate stable power around the clock and could eventually support integration of such projects to meet base load in India. If technically proven, this would have immense significance for transforming the economics of solar power generation.
- CTF can support reduction or elimination of the technical risk associated with the operation of unprecedented scale of capacity addition of renewable power generation (nearly 4,000 MW of solar and wind is expected to be evacuated from the renewable energy hotspot in Rajasthan) that is expected to be intermittent in nature and would need deployment of special equipment to ensure stable and reliable power output to the grid.

The replication potential for such solar parks and integrated solar-gas projects is significant and could form a significant component of the future phases of the National Solar Mission. Replication potential is more than 10 to 1.

Financing Plan:

The indicative financing plan for the ADB solar portfolio of projects is shown in the table below.

Source	**Gujarat Park (1000 MW)**	**Rajasthan Park (1700 MW)**	**Maharashtra Park (1000 MW)**	**Integrated Solar-Hybrid Pilot Project (100 MW)**	**Total (US $ million)**
Government Agencies	150	350	150	50	700
Project Sponsors / other lenders[b]	2,550	4,090	2,550	280c	9470
Carbon Finance[a]	150	260	150	20	580
ADB	50	50	50	50	200
CTF	150	200	150	50	550
Total	3050	4950	3050	450	11500

[a] No provision has been made for the carbon finance risks associated with possible lack of agreement on a post-2012 successor to the Kyoto Protocol. The carbon finance estimate assumes 25% plant load factor, 0.7 tons CO_2e/MW-h, [1000 MW ~ 1.53 million t/y CO_2e] $10 per ton CO_2e, and 10 year crediting period; estimates are rounded off for convenience. Estimates are subject to further revision.

[b] Total cost assumes $3 million per MW installed plus additional investment in transmission systems.

[c] Indicative and dependent on technology choice.

[25] The European Union Emissions Trading System will not buy post-2012 carbon credits from India, which severely reduces the prospects for meaningful carbon finance.

Source	Amount (Million US$)	
	Financing of new and innovative technology	Contribution to concessional financing pool
IBRD	125.00	25.00
CTF	125.00	25.00
Government Agencies / Private sector / Project sponsors/other lenders	300	1000.00

Government of India owned financial institution (like IREDA) would be financial intermediary with executing department being the Ministry of New and Renewable Energy (MNRE), GoI.

Project Preparation Timetable:

Milestone	**Implementation schedule**
Project Concept Note	December 2011
Appraisal	July 2012
Board approval	October 2012
Implementation of the project	November 2012 – November 2017

The indicative processing schedule for the solar projects is shown in the table below.

Milestone	**Gujarat Park**	**Rajasthan Park**	**Rajasthan Park**	**Integrated CSP Hybrid (100 MW)**
ADB Project Identification	July 2011	July 2011	October 2011	July 2011
TA Support completed		December 2011	March 2012	March 2012
Appraisal / Negotiations	July 2012	May 2012	August 2012	June 2012
ADB Board Consideration	August 2012	June 2012	September 2012	July 2012
Project Completion	January 2015	December 2015	March 2016	December 2014

2. ANNEX II – CTF FINANCING FOR PROJECTS IN SUBSEQUENT PHASE

2.1. IMPLEMENTATION SUPPORT TO NATIONAL MISSION ON ENHANCED ENERGY EFFICIENCY (WB)

Problem Statement

While its economy is growing at 9% and power sector growing in double digits, India is currently facing significant power shortages which are expected to continue in the foreseeable future. The current energy shortage in the country is at 11%, with peak energy shortage at 16.5 percent (2007/08). During the 11th Five Year Plan, capacity additions were in the order of 60 GW, which is significantly higher than the 20 MW than the historical addition of 20GW. It is likely that the 12th Five Year Plan currently under preparation will call for a capacity addition of 100 GW in 2012-16, which will be required for India to keep up with its increasing energy demand. Currently, India has an installed generation capacity of around 171 GW. The Government of India is looking for additional resources such as renewable energy and energy efficiency (EE), to help meet the country's significant power deficit and diversify the energy generation portfolio mix.

In recent years, India's energy consumption has been increasing at one of the fastest rates in the world due to population growth and economic development. Commercial primary energy consumption in India has grown by about 700% in the last four decades. Driven by the quest for improved quality of life, energy usage in India is expected to grow at an exponential rate. Since close to 70% of the energy needs are met by coal, the energy sector alone accounts for half of India's carbon-dioxide (CO2) emissions. In such a scenario, enhancing energy efficiency is the fastest and cheapest means to save energy, for national energy security as well as for reducing GHG emissions. At present India is fifth lowest in the energy efficiency in the world but studies suggest that there is a huge potential for substantial improvement.

With National Mission for Enhanced Energy Efficiency (NMEEE), India has embarked on an ambitious plan to cut its energy consumption with the following policy aims:

- Reduction of 98 million tons of carbon dioxide emissions annually by 2014-15;
- Avoidance of electricity generation capacity addition of 19,000 MW
- Save fuel in excess of 23 million metric tons of oil equivalent (mMtoe)

Some of the biggest barriers to wider adoption of EE measures relate to understanding of energy efficiency technologies by financial institutions, availability of commercially proven technologies on energy efficiency, lack of developed market for ESCOs and higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future. In the National Mission for Enhanced EE, four new initiatives are envisaged:

- A market based mechanism to enhance cost effectiveness of improvements in EE in energy-intensive large industries and facilities, through certification of energy savings that could be traded.
- Accelerating the shift to EE appliances in designated sectors through innovative measures to make the products more affordable.
- Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.
- Developing fiscal instruments to promote EE.

The programs under the NMEEE have results indicators. Efficiency targets and individual program targets of the proposed project would be aligned with indicators of GoI's NMEEE schemes, along with intended outcomes of:

- Financial investments in energy efficiency leading Achievement of Introduction and implementation of an efficient market in ESCerts
- Entry of energy-efficient equipment suppliers in the market and creation of demand for these investments.

Proposed Transformation

The proposed CTF intervention has the potential of buy-down costs through investments by early stage adopters, assisted through financial incentives. Transformational change is achieved by changing the energy usage in industries through market-based incentive mechanisms, rather than regulation. Such systems change the nature of policy actions, like regulation, in the industrial sector.

The CTF would provide concessional financing to support two specific programs under NMEE, as follows

Moreover, IFC will work directly with private actors in the financial sectors (IFCOs, ESCOs, Financial intermediaries) to draw them into energy efficiency (EE) and renewable energy (RE) financing by using risk-sharing instruments or credit lines, and providing technical assistance to increase their familiarity with EE and RE technologies and conduct better risk assessment of such projects (see Annex). IFC's program will complement IBRD's efforts to focus on working with financial intermediaries to promote energy efficiency and renewable energy in the SMEs and among heavy industries.

Rationale for CTF Investment

Some of the biggest barriers to wider adoption of energy efficiency measures tend to revolve around higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of the returns in future. In order to overcome these functional and behavioural barriers, the proposed support will assist in initial years of market making while the market-oriented approach of the NMEEE is stabilized. Using this approach, concessional funds would be available to suppliers and/ or consumers contingent on achieving pre defined milestones or outcomes, thereby lowering the risk of not achieving stated reductions in cost due to energy efficient applications.

The targets for reduction under PATS amounts to around 10 million metric tons of oil equivalent (mMtoe), out of more than 240mMtoes of energy consumed in these specific industries in the country. This figure of 240mMtoe represents more than 60% of the total commercial energy consumption in the country, making the targets stringent. It is estimated that the investments required in the non-power DCs to meet the PAT targets in the first Commitment Period from 2011 to 2014 would be around Rs. 9,000 Cr (~ US$ 2 billion). Investments required in the power sector efficiency enhancement would be an additional Rs. 11, 000 Cr, leading to a total of Rs. 20,000Cr (US$ 4 billion).

Leverage is achieved by incentivizing several industries to attempt to achieve higher-than-mandated energy reductions, in order to earn tradable EScerts. This sweetener of PAT financial support provides the impetus for designated consumers to achieve compliance through technological innovation and change, rather than paying the penalty. This incentive for technologies-based compliance tilts the balance towards investment in new technologies.

Implementation Readiness

The National Mission on Enhanced Energy Efficiency is one of the pillars of India's National Action Plan on Climate Change. The NMEEE's PAT scheme has already been implemented and the first mandate period for the chosen 571 units has started earlier this year, to run through 2014. The scheme's regulations had been decided after a detailed consultation process with the affected sectors and individual industries, and budget support was taken for the scheme's administration. The Bureau of Energy Efficiency has sent a request to the line ministry, which will be forwarded to the Bank shortly. The other components of the NMEEE are also under implementation.

Financing Plan:

The support to the NMEEE will be structured to attract private resources. It is estimated that financial support mechanism for PAT entities will attract leverage 20 times of the available grant resources. The financial will promote investments in EE interventions for these 571 entities. IFC is expected to participate in the program and its role will be decided in due course.

The duration of the first period of the Super-Efficient Appliances Development project is envisaged for five years, from 2012 to 2016.

	Support to NMEEE
	PAT (2011-14)
Sources	
CTF	200 (US$ 50 million in initial phase; US$ 150 million in subsequent phase)
IBRD	
IFC	*$50 m*
Private Sources	3,750
Total	*4,000*

Project Preparation Timetable:

The PAT scheme is currently operational and the entities are expected to meet their legally-mandated ESCerts targets during the implementation period of 2011 to 2014. Availability of financial support will provide a greater incentive for the entities to aim for compliance through reducing their specific energy consumption, rather than purchase of ESCerts on the model.

The project to monetize future energy savings of high efficiency fans is proposed to run for five years, before being expanded to other appliances.

In order to meet the targets set under the NMEEE, this intervention would have to be fast-tracked as thus:

Milestone	Expected Schedule
Bank PCN and Identification	October 2011
Appraisal and Negotiation	June 2012
Loan Effectiveness	September 2012
Implementation and Monitoring (SEEP)	April 2012 to 2016
Implementation and Monitoring (PAT)	To March 2014

2.2. NORTH EASTERN REGION (NER) POWER SYSTEM IMPROVEMENT PROJECT (WB)

Problem Statement

The North Eastern Region (NER) faces significant bottlenecks in electricity access (24.3% rural access compared to the All India figure of 44%, as per Census 2001) and availability levels (11.1% energy shortage and 17.1% peak shortage on restricted demand). The per capita power consumption in NER (at 238 kWh) is one-third of the national average (734 kWh). Also, the investments in transmission and distribution grids have been inadequate. Many areas are connected only through low capacity 132 kV lines which imposes a constraint on their ability to draw their allocated share of power. Remote areas are connected through long power lines which results in poor reliability and quality of power at the consumer end. *All these factors lead to significantly high* Transmission and Distribution (T&D) losses (varying between 30% and 50%), while the Aggregate Technical and Commercial (AT&C) losses are even higher, going up to 70% in some cases. The GoI's VISION 2020 document for the region states that

'Almost every North Eastern State is deficit in power, which is important given the nascent state of industrial and other economic activities based on power in the region… Power consumption has remained virtually stagnant in most of the states over a period of more than ten years, with the exception of Meghalaya and Sikkim... In Manipur, power consumption has actually declined and is stagnant in Assam… For the future, ambitious plans have been drawn up for making NER not only self-sufficient in power but also the 'power house' for the rest of the country… All the states need to develop their internal transmission grids to avoid incurring wasteful expenditure on wheeling power from the central grid.'

However, the region is endowed with rich energy resources, including:

- More than 60 GW of hydropower potential (40% of the 150 GW hydropower potential in the country);
- 169 billion cubic meters of natural gas reserves (15% of the total All India reserves of 1115 billion cubic meters);
- 1.38 billion tons of total coal reserves (against All India reserves of 277 billion tons); and
- 283 million tons of crude petroleum reserves (37% of the estimated All India reserves of 773 million tons).

To address the above constraints and develop the full potential of the region, GoI has prepared a comprehensive scheme for the development of the power system in the NER that includes investments for s*trengthening/augmenting intra-state transmission and distribution network in the six states of the North Eastern Region (NER) to facilitate increased access and availability of power to the people in the region and reduce the transmission and distribution losses.*

Proposed Transformation

The investments proposed under the proposed project would more than double the transmission and distribution capacity in the six states, consistent with the expansion of generation availability from 1570 MW in 2011 to more than 5600 MW projected in 2016-17. These investments that are required to be undertaken within the next five to seven years would be a massive scale up and shall be approximately equivalent to the cumulative investments undertaken over last couple of decades. Such expansion is expected to partially bridge the large gap between per-capita consumption of electricity in the region (currently at 238 units) and in the country as a whole (currently at 734 units) and also facilitate increased access levels in the region. The investments will also help in bringing down the significantly high level of T&D and AT&C losses in the States in the region.

The availability of power would also facilitate the development of the rich resources present in the region for the benefit of the region itself as well as for the country as a whole. Such natural resources include hydropower, limestone (cement) and natural gas among others. The development of resources –especially power – for wider economic benefit can only be justified once the local demand have been substantially met.

Implementation Readiness

A request for support of $1.5 billion for the project was received from the DEA in December 2010. The project's initial design and each state's DPRs for the proposed investments have been prepared by the Government of India through the Power Grid Corporation of India Limited.

Rationale For CTF Investment

India needs massive additions in capacity to meet the demand of its rapidly growing economy and address its current energy shortage. The country's overall power deficit—11 percent in 2009—has risen steadily, from 8.4 percent in 2006. The Integrated Energy Policy Report (IEP) 2006 estimates that India needs to increase primary energy supply by 3 to 4 times and electricity generation by 5 to 6 times to meet the lifeline per capita consumption by 2031 (for an installed capacity of 800 GW or more), and sustain economic growth at 8 %. IEP Scenarios point to coal reserves of less than 45 years (by 2040) at a growth rate of 5% in domestic production, and an increasing reliance on coal imports.

CTF investments will help in bringing down the demand for generation capacity for meeting the local demand due to reduction in transmission and distribution losses equivalent amount which otherwise would be required to be met from a mix of fossil fuels and renewable sources and thus lead to reduction in GHG emissions. Also, With a store house of natural resources, NER can play an important role to sustain the growth of the power sector and the Indian economy and also help diversify India's energy supply, reduce the dependence on imports, and mitigate fuel price volatility.

Financing Plan

For first operation

SOURCE	AMOUNT (US$ MILLION)
GOI/ STATE GOVERNMENTS	750
IBRD	325
CTF	100
TOTAL	1175

Project Preparation Timetable

Milestone	Expected Schedule
Bank PCN and Identification	October 2011
Appraisal and Negotiation	November 2012
Loan Effectiveness	
Implementation and Monitoring	

2.3. RAJASTHAN URBAN TRANSFORMATION (ADB)

Problem Statement

1. Urban development and redevelopment will be one of the most challenging issues for India and the Asia region in general as the bulk of population growth in the twenty-first century will be in urban areas. The built environment—mainly cities—consumes three fourths of the world's resources and emits 80% of global GHGs.[26] Cities are the proving grounds for sustainability and sustainable, climate-friendly infrastructure, with a full spectrum of cross-sectoral challenges: energy, transport, water, waste treatment, environmental management, and climate change adaptation.

2. GHG emissions in urban areas arise from transport, municipal solid waste disposal, sewage treatment, and buildings. Transportation in India's cities is dominated by the petroleum-fueled vehicles; rudimentary waste management creates methane (CH4) emissions; "green" building designs have yet to be widely deployed. This situation is exacerbated by limited power supplies which are required to run water supply, waste management operations, and buildings. Power shortages preclude the possibility of electrified urban transport systems. Limited access to finance further constrains municipalities' ability to finance modern, climate-friendly infrastructure.

3. The Government of Rajasthan (GOR) is promoting urban redevelopment efforts which address the infrastructure challenges, which are expected to result in GHG reductions of approximately 15 % over a period of 5-10 years. The GOR is being supported by ADB in identification and preparation of a comprehensive urban development project which will comprise water supply, wastewater treatment plants, and solid waste management systems.[27]

Proposed Transformation

4. GOR has expressed its interest in working with the ADB with the support of CTF financing to design the proposed urban development project to achieve a broader transformational impact. The proposed CTF program would support GOR cities in local implementation of national programs for GHG mitigation. The candidate investments which would be supported by CTF include: (i) energy efficiency in water supply systems; (ii) methane recovery from sewage treatment plants; and (iii) energy recovery from solid waste management systems.

5. The project would introduce innovative financing approaches to ensure that climate-friendly infrastructure is fully funded. Financing instruments could include loans, guarantees, and bonds. Public-private partnerships may be considered, but initially would be in the form of outsourced operations and maintenance contracting. Grants will be utilized for capacity building and design support. CTF financing would be utilized to buy down the overall cost of financing. Concessional financing will be complemented by introduction of infrastructure service fees which will achieve full cost recovery.

Implementation readiness

6. The proposed project is at the identification stage and preparation will begin in early 2012. The anticipated ADB Board consideration date is May 2013.

Rationale for CTF Financing

7. Concessional financing through appropriately designed instruments is necessary to help buy down high up-front capital costs in markets where technologies exhibit cost effectiveness over the lifetime of the investment. Specific approaches need to be structured to ensure lower income groups can benefit from such programs. Experience has demonstrated that information and awareness-raising are important, yet on its own, it may be insufficient, and specific incentives and financing products are necessary to stimulate market transformation. Decision making and quick start-up of investments would significantly be accelerated if concessional financing blended with ADB grant and loans were available, particularly in the current constraint financial markets. Therefore, without CTF financing, there would be no reduction in the existing emissions trajectory.

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[26] Sarah Slaughter, panel presentation on "Opportunities in infrastructure and built environment", MIT Sloan School of Management, Cambridge, Massachusetts, 19 September 2008. Accessed on 12 April 2010 from http://mitworld.mit.edu/video/610.

[27] Other components which might be considered are: initiatives for expanded mass transit systems and intelligent traffic management; promotion of renewable energy (RE, including solar parks developed under the National Solar Mission); and improved building energy efficiency.

8. Municipalities are the major financial, educational, political and economic centers of the country. They make investments or influence investments (through policies and incentives) in infrastructure which lock in the carbon intensity for decades into the future. More often than not, municipalities do not have the additional resources to undertake large infrastructure projects. The immediate concerns of the municipalities take up all the resources, and hence unfortunately they are not able to implement the strategies which would have co-benefits for the municipality as well as for the climate.

9. In order to explore the full potential of the impact that an urban area/ municipality can make in terms of impacting the carbon intensity and its use; us to allow for cost-sharing arrangements. The cost sharing arrangements are necessary to accelerate investment in municipalities and this investment does tackle some of the key areas that impact emissions from a municipal area.

10. As noted above, during the next 2 decades and beyond, the bulk of economic growth is expected to be in urban areas. Thus, the replication and scale-up potential is very high -- at least 10:1 -- in India and neighboring countries.

Financing Plan

11. The indicative financing plan is shown in the table below.

Source	**Amount (US$Million)**
Government Agencies	90
Project Sponsors / other lenders[a]	TBD
Carbon Finance[b]	0
ADB	300
CTF	100
Total	490

[a] Potential investments via public-private partnerships has not yet been confirmed, but may be considered during project design stage.

[b] Carbon finance is currently projected to make no meaningful contribution as upfront project cofinancing.

Project Preparation Timetable

12. The indicative processing schedule is shown in the table below.

Milestone	**Expected schedule**
ADB Project Identification	September 2011
TA Support completed	September 2012
Appraisal / Negotiations	March 2013
ADB Board Consideration	May 2013
Project Completion	May 2016

2.4. NET-ENERGY POSITIVE WASTEWATER TECHNOLOGIES FOR THE CLEAN-UP OF THE GANGA RIVER

Problem Statement

India's recent remarkable growth has been clouded by a degrading environment and growing scarcity of natural resources. The share of the most polluting sectors in India's exports has increased dramatically during the last decade, and a growing pollution footprint is negatively impacting human health and development outcomes. While the Government has taken major steps to address these challenges, there is significant space for innovation in policy, regulation and investments that would promote growth that respects the environment, for example through investments in clean water and sanitation or the more efficient use of shared water resources.

About 70% of India's surface water is polluted by domestic sewage, toxic industrial effluent, thermal power plant discharge, agricultural run-off containing nutrients and pesticides, as well as leachates from urban, industrial and mining waste dumps. In India, water pollution kills more than 1 million people each year, including close to half a million children and water-related diseases are 70% of the total disease burden, with an estimated economic loss to the national at about 4% of GDP (Rs.36,600 crore in 1995-96).

The Ganga basin is the most populous in the world, with more than 400 million people in India alone. It accounts for 25% of India's water resources, and the five states on its mainstream (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal) are home to more than 50% of the poor people in the country. These basin states have a disproportionately high incidence of income poverty and, with the exception of West Bengal, have generally lagged in growth and poverty reduction. Recent studies have estimated the burden of water-borne diseases in the Ganga basin at 1.4 million DALYs per 100 million people28, which amounts to health costs of almost $4 billion per year on a basin-wide level.

The National Ganga River Basin Authority (NGRBA) was established in 2009 with a mandate to establish a multi-sector program for river conservation and pollution abatement. Through its 'Mission Clean Ganga', the NGRBA has resolved that by year 2020 no untreated municipal sewage or industrial effluents will be discharged into the mainstream of the river.

The Ganga today is seriously polluted and under extreme environmental stress from inadequacy of municipal wastewater infrastructure and services; industrial pollution; solid waste and non-point sources; and inadequate in-stream flows. Global experience shows that river cleanup, despite its benefits, is always a lengthy and costly endeavour. It is clear that cleaning the Ganga is likely to take at least two decades and will have a price tag of tens of billions of dollars. The cost of infrastructure required to collect and treat municipal wastewater on the main-stem cities alone is estimated to be $4b. Inclusions of the associated sewerage networks, as well as the full costs of comprehensive solid waste management, industrial pollution control, and river front management would push this estimate much higher.

Proposed Transformation

Given the scale of the river and current water quality status, it is clear that cleaning the Ganga is likely to take at least a few decades and will have a price tag of tens of billions of dollars. The cost of infrastructure required to collect and treat municipal wastewater on the main stem cities alone is estimated to be $4 billion. Inclusion of the associated sewerage networks, as well as the full costs of comprehensive solid waste management, industrial pollution control, and river front management, would push this estimate much higher.

The objective of the proposed program is to finance pilots for new and transformative technologies, which if successful and replicated on scale, could be transformative. There are at least two types of technologies that tap the energy potential of wastewater resulting in net-energy positive wastewater treatment, either a centrifugal wastewater treatment technology, or an anaerobic digester. The pilots would also be implemented through innovative financing and implementation models, especially concessions, leases, and other forms of public-private participation (PPP).

Support is sought from CTF to overcome a significant barrier in municipal finance in India, whereby very few resources are allocated to operational and maintenance for wastewater treatment plants, which tend to operate at sub-optimal conditions. The support would finance two aspects: (i) the incremental costs of implementing pilot net-positive wastewater treatment plants versus conventional plants and (ii) the support for operational and maintenance costs for a minimum of five years, to ensure satisfactory operating conditions.

[28] Climate Change Impact and Adaptation in Kolkata Metropolitan Area, World Bank, 2010

Conventional aerobic systems that are utilized for wastewater treatment have significant operational and maintenance costs. The best performing WWTPs under the previous Ganga Action Plan I launched in 1985 are those with technologies that have a lesser dependence on electricity and lower maintenance costs, such as waste stabilization ponds and up-flow anaerobic sludge blanket (UASB), which were introduced on a pilot basis. A significant percentage of the conventional aerobic systems operate below capacity and are unable to meet effluent quality standards, in large part due to irregular power supply, inadequate household connections, and inadequate operational and maintenance.

The intent is to introduce on a pilot basis the recent technological advances which can tap the energy potential of wastewater, either through gas or electricity generation, to the extent that the wastewater treatment can meet its own energy needs and even generate a surplus. Under optimal conditions, these advanced technologies generate more electricity than that required to operate the wastewater treatment plant, and are thus able to also provide an additional source of renewable energy to the grid, rather than purchase energy from the grid. The introduction of such a technology on a large scale could be advantageous in a country such as India, which has a persistent energy deficit, and would also address the long-standing challenge of sustainable operation of wastewater treatment plants

Rationale for CTF Investment

India needs massive additions in capacity to meet the demand of its rapidly growing economy and address its current energy shortage. The country's overall power deficit—11 percent in 2009—has risen steadily, from 8.4 percent in 2006. The Integrated Energy Policy Report (IEP) 2006 estimates that India needs to increase primary energy supply by 3 to 4 times and electricity generation by 5 to 6 times to meet the lifeline per capita consumption by 2031 (for an installed capacity of 800 GW or more), and sustain economic growth at 8 %. IEP Scenarios point to coal reserves of less than 45 years (by 2040) at a growth rate of 5% in domestic production, and an increasing reliance on coal imports.

With about 150GW of known resource potential—of which only about 10 percent has been developed— small scale renewable energy is an important part of the solution to India's energy shortage. Of that, the Ministry of New and Renewable Energy conservatively estimates the potential of waste-to-energy projects at 7 GW (MNRE, 2009). Developing renewable energy can help India diversify its energy supply, reduce the dependence on imports, and mitigate fuel price volatility.

The rendering of wastewater treatment plants from an energy consumer to a renewable energy producer would be a significant development in a populous country such as India that is embarking on significant investments to treat sewage discharged to rivers.

Readiness

Requires a discussion with the National Ganga River Basin Authority and the five Ganga states.

Financing Plan:

Source	***Amount (us$ million)***
GoI/ State Governments	***TBD***
IBRD	***TBD***
CTF	***100***
Total	***TBD***

Project Preparation Timetable:

This would require additional financing to the existing NGRBA project, which should take place after progress on disbursement.

2.5. EASTERN DEDICATED FREIGHT CORRIDOR

Problem Statement

The Eastern Dedicated Freight Corridor (DFC) Project has been accorded a high priority among the Government's infrastructure programs owing to the large impact it will have on freight transport in the country. It seeks to expand freight capacity, and increase Indian Railway (IR) share of the national freight market with far reaching impacts on both transport costs and energy consumption in the transport sector. From an energy consumption perspective, the proposed project seeks to significantly shift the mode of freight transport from road to rail, and through systems optimization, it will enhance the carrying capacity of high-value export cargoes and critically needed energy supplies, as well as improve the competitiveness of passenger service with buses. Finally, the Eastern Dedicated Freight Corridor Project will invest in the construction of electric tracks, rather than using the conventional diesel locomotives.

Indian Railways (IR) is the fourth busiest railway in the world in terms of total traffic unit-kilometres carried. As a result of the rapid growth of IR's freight traffic, from 557 million tonnes in 2004 to 833 million tonnes in 2009, the line capacity utilization on IR's most heavily trafficked routes exceeds 100% by a significant margin[29]. The four routes that form a quadrilateral connecting Delhi, Mumbai, Chennai and Kolkata, are the most heavily trafficked. While these routes, better known as the Golden Quadrilateral (GQ) account for just 16% of the network's track length, they carry more than 60% of the total freight transported by IR. With freight traffic in the country projected to grow at more than 7% per annum, IR urgently needs to add capacity on these routes. Recognizing this, the Government approved an IR proposal to establish dedicated freight-only lines, paralleling the existing Quadrilateral routes.

Emissions from the transportation sector contributed to about 8 % of energy based emissions in 2004[30], but it has the fastest growing GHG emissions of any sector.

As India grows and gets further interconnected, the GHG emissions are likely to accelerate if the current trend continues. Projections indicate that the share of transport related GHG emissions will continue to rise and should other sectors achieve moderate levels of efficiency, GHG emissions from the transportation sector could reach 25% of India's total GHG emissions within a couple of decades. This is due in large part to the expected growth rate of vehicle population in the country, which has experienced increases of 5 to 15% per annum depending on the class of vehicles. India's transport sector has mixed ownership and management, with the public and private sector participating in both development and operation of transport services[31]. The institutional arrangements reflect the complex arrangements between the various government entities at the Central and State levels in the country.

Railway transport has always played an important role in the land transport market. So far, the existing railway transport system has not caught up with the increased demand derived from the country's recent rapid economic growth. The investments in both Eastern and Western Freight Corridors are an attempt to significantly improve rail transport in the country. It is expected that these projects will increase rail share of container transport, and lead to efficiencies in transport.

However, the planned modal shares may not materialize if: (i) the demand for bulk transport outweighs the capacity expansion, (ii) travel speed by road becomes faster due to the introduction of more modern trucks and highway network expansion, (iii) adequate intermodal systems are not established.

Proposed Transformation

In May 2011, the World Bank approved an Adaptable Program Loan (APL) of $900 million loan to the GOI in support of the first phase of the Eastern Dedicated Freight Corridor Project, which would eventually have three phases. The Program proposed for World Bank financing would construct 1130 km of the Eastern Corridor from Ludhiana in Punjab to Mughal Sarai in Uttar Pradesh, which includes the most heavily congested sections of this corridor, and connects ports and coal mining areas in the east to consumption centers in the north-west of the country (as shown in Table 1).

[29] Based on charted line capacities which are capacities derived by a planner for optimum operation of a railway line.

[30] GoI (2004): National Communication to the Conference of Parties to UNFCCC, MoEF, Delhi

[31] Details are provided in World Bank (2002): India's Transport Sector: The Challenges Ahead pp 18

Rationale for CTF Investment

The Eastern DFC project is first and foremost a 'growth' project. Its dedicated railway line for freight will help in the faster and more efficient movement of goods which include food grains, fertilizers, cement, iron & steel, as well as coal and other products. The new freight service will boost India's productivity by reducing the transportation costs of carrying raw materials to industrial hubs and manufactured goods to ports. It will also ease the movement of all rail traffic in the existing rail lines, thereby enabling the faster movement of people and goods, and providing a better standard of service for both passengers and freight.

The Eastern DFC will also contribute to lower GHG emissions over its project lifetime. A carbon footprint analysis conducted by the Indian Railways finds that the DFC will generate a total of about 10.48 million tons of GHG emissions over a 30 year period, as compared to 23.29 millions of GHG emissions in the absence of DFC. A savings of about 12.81 million tons of GHG emissions and 2.25 times less greenhouse gas emissions over a 30 year period compared to a business as usual scenario. This is due to three main factors:

a) The DFC will ease congestion on the railway tracks by streamlining the operations of the railways and reducing the consequent idling of railway engines and the ensuing GHG emissions.

b) The use of GHG-emitting diesel fuel will also be reduced as all locomotives will be electric rather than a current mix of diesel and electric.

c) By shifting freight transportation from road to rail, the DFC will lower energy consumption in the transport sector and reduce GHGs by 55%.

Further to the lower GHG emission potential, the project by virtue of being a green field project, offers number of opportunities for further reduction of GHG emissions. Some of such opportunities

being considered by the project include energy efficiency measures such as (i) regenerative breaking systems (ii) communication based train control and other long term design modifications such as reduction of wheel diameter, change wagon material (steel or aluminum), adoption of double stack containers, etc.

Support is sought from the CTF to finance part of the incremental costs of investing in a dedicated freight corridor.

Readiness

While the CTF recognizes the need to reduce GHG emissions in the transportation sector, it favors modal shifts to public transportation, improved fuel economy, and fuel switching, as well as investments in efficient freight transport. However, the CTF committee may not support operations that enhance the infrastructure to transport a significant quantity of coal, as coal represents 52 % of subsequent phase and 42 % of phase 3.

Financing for the Western corridor has already been secured from JICA, and bidding process for the construction of the line is in progress. Financing for the Eastern corridor will be supported by the World Bank through an Adaptable Program Loan (APL), which is an IBRD Specific Investment Loan, in three phases. The total cost of the three phases in the Eastern Corridor is US$4.065 billion, of which $1.453 billion is for the first phase from Khurja to Kanpur. The Government is contributing $483.44m for the first phase, and sourcing the remaining $975m from the first phase of the World Bank's APL.

Project Preparation Timetable

Implementation arrangements for this project are already in place. The triggers for APL2 and APL3 are mostly related to land acquisition and the award of the civil works contract. The expected timeline for APL 2 to be ready is FY 2013 and for APL3 is FY2013/14.

Financing Plan (US$m)			
Source	**Local**	**Foreign**	**Total**
Borrower:			
APL 1 Khurja - Kanpur	483.44	0.00	483.44
APL 2 Kanpur - Mughal Sarai	538.00	0.00	538.00
APL 3 Ludhiana – Khurja	365.00	0.00	365.00
International Bank for Reconstruction and Development:			
APL 1 Khurja - Kanpur	0.00	975.00	975.00
APL 2 Kanpur - Mughal Sarai	0.00	1,050.00	1,050.00
APL 3 Ludhiana – Khurja	0.00	700.00	700.00
Total:	**1,386.44**	**2,725.00**	**4,111.44**

2.6 PRIVATE SECTOR FINANCIAL INTERMEDIATION (ADB)

Problem Statement

1. India is the world's fourth largest greenhouse gas (GHG) emitting country. Per capita emissions are low but total emissions are expected to continue growing for the foreseeable future. With an indicative target of increasing energy efficiency by 20% by 2016, supplemented with the domestic mitigation goal of reducing emissions intensity of GDP by 20-25% of the 2005 level by 2020, India's growth ambitions would necessitate increase in its power requirements by 5-6 times (about 800 GW) by 2031-32[32], of which 280 GW is projected to be coal-based.[33] Prospective renewable energy (RE) resources include about 75 GW of biomass & small hydro and about 75 GW solar, wind, & waste-to-energy.

2. The Indian economy is forecast[34] to have real GDP growth of 8.6% in 2011with an annual average of 8.8% a year in the period from 2012 to 2015. Macroeconomic fundamentals[35] are sound – high savings and investment rates, fast labor force growth and rapid expansion of the middle class – but high inflation and a wide budget deficit persists (inflation averaged 12% year-on-year in 2010, up from 10.9% in 2009; the budget deficit was over 5% of GDP in the past 3 years). While Indian banking system is well capitalized, it has a low credit penetration and loan to GDP ratio, and its capital markets remain largely underdeveloped.

3. Despite overall satisfactory performance, the banking sector is constrained by the scarcity of long-term funding which is critical for infrastructure finance, including RE projects. RE project development is further constrained by actual and perceived risks related to high upfront capital costs, the intermittent nature of most RE resources (e.g., wind, solar and hydro) and related low plant capacity and utilization factors. Unfamiliarity with the technologies and smaller transaction sizes contribute to high development costs. Banks are reluctant to lend for energy efficiency (EE) initiatives as such investments normally create savings rather than tangible assets, collateral, and cash flows.

Proposed Transformation

4. CTF cofinancing will be utilized to cover part of the additional costs and risks of RE/EE projects by creation and deployment of innovative financing mechanisms, including guarantees, risk-sharing, and contingent financing (which ADB has successfully deployed in India, the PRC, and Thailand). CTF will provide additional liquidity and lower-cost funding that will expand and leverage ADB support to RE/EE investments through an established financial intermediary (FI). CTF will help crowd-in private sector financing which will promote mainstreaming of RE/EE project finance.

5. CTF cofinancing will strengthen FI capacity and diversify funding sources, thereby enhancing ability to provide longer-term funding than is otherwise available in the market. contribute to strengthen the financial sector, and enable financial institutions to promote financial intermediation to RE/EE initiatives in India. The CTF cofinancing will increase the aggregate amount of long-term finance for RE/EE projects and provide business models that can be replicated in India and elsewhere in the region.

6. The CTF-supported activities are intended to establish new FI business lines for "green" lending, providing critical knowledge development in FIs for valuation and monetization of energy and other resource savings. Implementing this investment strategy – monetizing the benefits of savings – represents a significant evolution in financial services

[32]Integrated Energy Policy, 2006. Government of India.

[33] World Bank. 2010. *Unleashing Renewable Energy Potential in India*.

[34]Economist Intelligence Unit (as of June 2011).

[35]India is currently rated Baa3 (foreign currency) by Moody's Investor Service, BBB- by both Standard & Poor's and Fitch, and AAA locally by CRISIL/ICRA.

that has yet to be developed at scale (even in developed countries). Developing new business lines in Indian FIs will be transformational, as the early adopter / first-mover success can be readily replicated. Demonstrating the validity of this business model will open up the larger potential of the EE and RE markets. Success of this Program will help to steer India's economic development into a low carbon path with more sustainable use and management of resources. The impact of the CTF supported activities will be that commercial FIs will adopt EE/RE financing as a mainstream business line, which is necessary to mobilize the investments required to meet the GOI objectives for energy efficiency and intensity noted in paragraph 1.

Implementation Readiness

7. There is large demand for financing of smaller and medium size RE/EE projects in India, in which ADB cannot directly participate and to which local banks are hesitant to lend. ADB has been working with a local financial intermediary that develops and supports lending activities to RE/EE projects. Several projects are already in the pipeline but require innovating financing structure to reach financial closure and proceed to implementation.

8. There is an excellent opportunity to engage a strong and reputable bank that has the reach, capability, and interest in pursuing RE/EE projects and facilitate follow-through by other similar banks in the country and in the region.

9. CTF funds would be utilized for a variety of investments in a programmatic fashion, with a typical preparation horizon of 3-6 months. Capacity building will be mobilized as necessary to ensure that the underlying transactions can be efficiently implemented. Gender action plans will be developed and implemented in accordance with ADB policy and procedures. Civil society organizations will be consulted in accordance with ADB's Public Communications Policy 2005. Results indicators will be incorporated into the logical framework of the investment program.

RATIONALE FOR CTF FINANCING

10. The rapid expansion of RE/EE investments in India is constrained by the following considerations which necessitate CTF cofinancing:

i. The global financial crisis has led to limited liquidity and ability by local commercial banks to provide long-term financing for renewable energy projects. The CTF cofinancing will bridge this market gap and demonstrate viability of long-term debt funding required for the RE sector and funding flexibility required for shorter-term EE projects. This will facilitate development and scale up of investments in the RE/EE sectors leading to low carbon growth and greenhouse gas emissions reduction.

ii. The CTF cofinancing will provide systemic support to the Indian banking sector to strengthen confidence in the country's banking system and enhance its ability to finance RE/EE investments. The increased confidence will help increase depositor and private sector investor interest and facilitate an increase in foreign lending and investments in RE/EE in the country and elsewhere in the region.

FINANCING PLAN

11. The proposed program will utilize US$ 50 million of CTF funds to leverage approximately US$ 450 million of total investment. The indicative financing plan for the RE/EE portfolio of projects is shown in the table below.

Source	Amount (US $ million)
Project Sponsors / other lenders	290
Carbon Finance[a]	10
ADB	100
CTF	75
Total[b]	475

[a]No provision has been made for the carbon finance risks associated with possible lack of agreement on a post-2012 successor to the Kyoto Protocol. The carbon finance estimate covers only the renewable energy portion (excludes carbon finance from EE investments) is preliminary and subject to further revision.

[b]Total cost assumes 144 MW Renewable Energy investments at $2.5 million per MW installed (80% of total cost) and 300 MW equivalent Energy Efficiency investments at $0.3 million per MW (20% of total cost).

PROJECT PREPARATION TIMETABLE

12. The indicative processing schedule for the project is shown in the table below.

Milestone	**Expected schedule**
Project Preparation	September 2011
Appraisal / Negotiations	October – November 2011
ADB Board Consideration (Approval)	December 2011
Project Completion	December 2014

2.7 PRIVATE SECTOR EE AND RE GUARANTEE FACILITY (ADB)

Problem Statement

1. India is one of the largest electricity consumers in Asia, and is the world's 4th largest greenhouse gas emitting country. The electric power sector is increasingly reliant on imported coal and natural gas. Energy security considerations point toward the need to increase use of domestic energy resources to offset dependence on imports. With an indicative target of increasing energy efficiency by 20% by 2016, supplemented with the domestic mitigation goal of reducing emissions intensity of GDP by 20-25% of the 2005 level by 2020, India's growth objectives necessitate increase in power resources by 5-6 times (about 800 GW) by 2031-3236, of which 280 GW is projected to be coal-based.37

2. Prospective renewable energy (RE) resources include about 75 GW of biomass & small hydro and about 75 GW solar, wind, & waste-to-energy. Biomass is the only widely available resource which can provide baseload power generation. Solar power systems can provide partial baseload and load-following power. India's National Solar Mission, announced in 2010, intends to commission 20,000 megawatts (MW) in grid-connected solar power generation by 2022 to help fill persistent energy shortages with diversified low-carbon power generation, secure its energy independence using indigenous resources, and become a manufacturing hub for the solar energy industry in Asia.

3. Due to the "as-is, where-is" nature of these resources, the typical size of RE generation projects is 25 – 50 MW per plant, which implies some dis-economies of scale compared to conventional fossil power generation. Intermittent resources such as hydropower, solar, and wind require energy storage and smart grid technology for optimum utilization. Energy efficiency (EE) investments, e.g. for green buildings (new and retrofit) and industrial cogeneration, have the potential to provide several GW of virtual power, but are not attractive to commercial financiers as the investments generate savings rather than discrete revenue streams.

4. The RE and EE opportunities noted above have additional costs and face various risks, inter alia (i) additional costs associated with state-of-the-art RE/EE technologies and systems; (ii) first-mover risk associated with deployment of these systems in India; and (iii) perceived risk of utilizing innovative financing. Developing these resources requires a significant shift in investment trajectories to support a variety of EE and grid-connected utility-scale RE projects, which is not expected to happen without additional private sector participation and quantum increases in commercial financing.

Proposed Transformation

5. CTF cofinancing will be utilized for creative financial structuring of utility scale RE projects, building on recent country experience with reverse auctions and ADB experience with partial credit guarantees for solar power development (in India), first loss guarantees for energy efficiency (in the PRC), and use of grants for partial funding of project contingencies (in Thailand). CTF will be used to cover part of the additional capital costs and to mitigate first-mover risks in certain sub-sectors so that commercial financing can be effectively mobilized for large-scale RE projects. Large-scale EE projects will also be considered for financial support.

6. CTF will facilitate mainstreaming of EE and RE investments by crowding-in private sector financing. The portfolio will demonstrate the commercial viability of utility-scale solar and other RE projects. These projects will provide business models that can be replicated in India and elsewhere in the region.

7. Successful demonstration of a variety of utility-scale RE projects will facilitate development of the domestic industrial supply base to support replication at scale, driving down the cost of production of RE systems. Growth of local green industries is a fundamental requirement to enable long-term low-carbon development.

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[36] Integrated Energy Policy, 2006. Government of India.

[37] World Bank. 2010. *Unleashing Renewable Energy Potential in India*.

Implementation Readiness

10. ADB approved a credit guarantee facility for solar power development in April 2011, which is an innovative prototype for financing RE in India. ADB is actively engaged with the developers of various RE and EE projects, and expects to maintain a project deal flow of up to $800 million per year total investment for the foreseeable future, with about $1.6 billion of total prospective investment over the next 2 years. CTF funds would be utilized for a variety of investments in a programmatic fashion, with a typical preparation horizon of 6-8 months. Capacity building will be mobilized as necessary in parallel to transfer knowledge to stakeholders the DMC and ensure that the underlying transactions can be efficiently implemented. Gender action plans and targeting of benefits to women will be developed and implemented in accordance with ADB's gender policy and Social Protection Strategy.. Civil society organizations will be consulted in accordance with ADB's Public Communications Policy. Results indicators will be incorporated into the logical framework of the guarantee facility. An indicative financing plan is presented below.

Rationale for CTF Financing

11. Commercial development of solar and other RE resources will increase India's energy security, reduce persistent energy deficits, promote distributed generation, and protect against global price fluctuations for imported coal by using non-tradable domestic energy sources. Utility-scale RE development is constrained by several factors:

- Utility-scale solar projects in particular are at the pioneer stage and face additional costs and risks which are not being covered by conventional project financing. Creative financing approaches, including the use of concessional funds for partial credit guarantees and contingent financing, are needed to engender confidence in the financial markets and mainstream RE project financing.
- Carbon finance can provide some financial support, but is not sufficient to overcome the cost and risk barriers noted above.
- CTF can provide a catalytic role in reducing or eliminating first mover and other risks for utility-scale RE projects, and foster accelerated replication and scale-up in the near term.
- The replication potential for solar and other RE and EE projects is more than 10 to 1.

Financing Plan

12. The indicative financing plan for the ADB RE portfolio of projects is shown in the table below.

Source	**Amount (US $ million)**
Project Sponsors / other lenders	880
Carbon Finance[a]	120
ADB	400
CTF	200
Total[b]	1,600

[a] No provision has been made for the carbon finance risks associated with possible lack of agreement on a post-2012 successor to the Kyoto Protocol. The carbon finance estimate assumes 25% plant load factor, 0.7 tons CO_2e/MW-h, [1000 MW ~ 1.23 million t/y CO_2e], $10 per ton CO_2e, and 10 year crediting period; estimates are rounded off for convenience. Estimates are subject to further revision. The carbon finance estimate is preliminary and subject to further revision.

[b] Total cost assumes capital cost of RE systems at $2.0 million per MW installed.

Project Preparation Timetable

13. The indicative processing schedule for the initial set of RE projects is shown in the table below, which assumes that CTF funds would be available by first quarter of 2012.

Milestone	Expected schedule [a]
ADB Project Identification	January 2012
Appraisal / Negotiations	April – May 2012
ADB Board Consideration (Approval)	July 2012
Project Completion	August 2015

2.8 SCALING-UP RENEWABLE ENERGY AND ENERGY EFFICIENCY INVESTMENTS IN THE PRIVATE SECTOR (IFC)

The India CTF investment plan identifies several areas where CTF funds can be used to scale up renewable energy (RE) and energy efficiency (EE) to support the country's low carbon growth strategy. This Annex outlines where IFC could leverage their skills, relationships, and financing with private sector stakeholders to support and fast-track market transformative initiatives to increase India's energy security and access and lower the carbon intensity of its GDP.

Problem Statement

1. By 2030 India will need to increase available power supply by a factor of at least four times if it is to meet its stated annual economic growth target of 8 percent. At present, India's total installed generation capacity is more than 160,000 MW. Of this, about 10 percent is renewable, excluding large hydro. While the potential for installed renewable capacity is 89 gigawatts (GW), India currently has only 15.5 GW installed. This gap in potential versus current capacity, together with the growing demand for power, represents an enormous potential for private sector investments in the renewable energy space in India.

2. The Government of India (GoI) issued a National Action Plan on Climate Change (NAPCC) in June 2008, which presents a set of eight missions and announced its intention to voluntarily reduce India's carbon intensity by 20 to 25 percent by 2020 compared to 2005 levels. GOI's 12th Five-Year Plan targets low carbon sustainable growth as one of its main pillars. According to a recent McKinsey Report, co-sponsored by IFC, the estimated financing required for clean energy in India between 2010 and 2030 is in the order of US$1.1 trillion. Of this, 80 percent will need to be mobilized from the private sector.

3. IFC's strategy in India will focus on a wholesaling approach (through financial institutions) and targeted direct investment in renewable energy and energy efficiency projects. This approach is critical for IFC and CTF to make a meaningful contribution to the sector and diversify their impact over a larger number of industry players. The overall context of the proposed CTF intervention in the financial sector comes from the significant gaps in infrastructure financing in India and the need to support smaller infrastructure finance players to develop and focus their attention on renewable sources of power and increased efficiencies in the use of energy in the private sector.

4. Internationally, infrastructure sector lending is typically dominated by insurance companies and pension funds that have long tenor funds which are ideal for financing this sector. However in India, insurance and pension investments are strictly regulated and government norms require that the majority of corpus should be invested in GoI securities and public sector entities. The Indian power sector receives a majority of its investments from commercial banks and other financial institutions (FI). However these entities are also facing increasing constraints in funding power projects including (a) statutory requirements to invest the bulk of their liabilities in priority sectors, (b) single industry exposure limits (industry norm for single industry exposure is 15 percent) due to an almost 100 percent growth in power sector credit from FY 2008 to FY 2010 and (c) asset liability mismatches as bulk of the bank deposits tend to be of a short term nature.

5. In light of the above constraints, GoI has been focusing on opening up new avenues of long term funding for the infrastructure sector. Under one such initiative, the GoI and the Reserve Bank of India (RBI, India's central bank) have notified select non-banking financial companies (NBFC) as infrastructure finance companies (IFCo). IFCos have been allowed specific benefits which include higher single or group borrower limits, a lower risk weight for bank finance to IFCos (20 percent as compared to 100 percent for most other NBFCs) and the permission to raise external commercial borrowings (ECBs) up to 50 percent of their net worth. This is subject to IFCos ensuring that over 75 percent of their assets are in the infrastructure sector and that their capital adequacy ratio (CAR) remains above 15 percent.

6. The Ministry of Power (MoP) and Bureau of Energy Efficiency (BEE) have been entrusted with the task of preparing the implementation plan for the National Mission for Enhanced Energy Efficiency (NMEEE) and to upscale the efforts to create and sustain a market for energy efficiency to unlock investment of around Rs.74,000 crores (US$ 16.5 billion). NMEEE, by 2014-15, plans to achieve about 23 million tons oil-equivalent of fuel savings- in coal, gas, and petroleum products, along with an expected avoided capacity addition of over 19,000 MW. The carbon dioxide emission reduction is estimated to be 98.55 million tons annually. One of the main components of the mission is the Perform, Achieve and Trade Scheme. Yet, local banks, and energy service companies (ESCOs) have not moved aggressively into energy efficiency financing, in part because they are not fully aware of

the potential market opportunity, and in part because they are not familiar with EE projects and, therefore, perceive it as a highly risky investment.

7. For larger direct investments, while certain technologies e.g. solar photovoltaic (solar PV), have received significant interest, there are, however, other areas of solar energy, particularly solar thermal with storage that have not. Concentrated Solar Power (CSP) has some significant advantages over solar PV. It can be implemented at scale (50-100 MW unit size). It also leverages conventional power generation equipment which drives down costs. The power produced is more "grid-friendly" as it does not drop sharply at sunset. However, the private sector has found it difficult to deploy the technology at commercial scale. Some key reasons for this are: The market still lacks technical experts and demonstrated experience on the ground relative to solar PV. For example, there are over 20 GW of installed base of solar PV, while the installed base of CSP remains about 1 GW, although there is a healthy pipeline. Moreover, the implementation timeline of these projects tends to be longer and more technically sophisticated. Another barrier to the development of CSP with storage is the high initial capital cost, which could be addressed by market aggregation. To date, there has been limited rollout of large scale projects, with the exception of a 17MW plant in Spain. For the above reasons, banks show little appetite for lending to these projects which means greater emphasis is placed on private equity which is both more costly and scarce.

8. The private sector will need to play a role in bringing promising technologies such as these to scale for India. It is therefore proposed that a portion of CTF be dedicated towards these early-stage commercial solar thermal technologies, allowing both private sponsors and banks to finance these at the "market" solar tariff. In time, market-driven efficiencies and improved technology would allow these technologies to become commercially viable alternatives.

9. A typical 100 MW CSP power plant with storage requires about US$700 million (vs. $340 million for a solar PV project) but is expected to generate significantly higher power output over longer hours every day. A typical project is likely to have a viability gap of about US$100-150 million, mainly due to the current high costs of new, specialized components, limited suppliers and the comparatively complex implementation required.

Proposed Transformation

While there are a number of opportunities for IFC that would be CTF-eligible, IFC will focus its efforts in deploying CTF funds to two main areas:

10. *Wholesale Finance for Renewable Energy and Energy Efficiency.* IFC proposes to use CTF financing to help financial institutions, especially IFCos in the short term, to increase their lending capacities toward renewable energy projects in India. The proposed wholesale finance program fits well with GOI's National Solar Mission and CTF's strategic objectives by mitigating climate change impact by accelerating generation from renewable sources and energy efficiency. Further, the proposed program would help alleviate the key bottleneck of financial support to develop reliable clean energy and assist a relatively new player in the infrastructure financing space to scale up its operations. With continued discussions with GoI and RBI towards a modified policy that will allow non-IFCos to raise working capital through external commercial borrowings (ECBs), IFC proposes to involve commercial banks and other traditional FIs as wholesale channels of renewable energy finance in India within the medium term. While renewable energy will be the main investment target of these loan facilities, the program will nonetheless include large energy efficiency measures such as industrial process improvements leading to higher efficiency, cogeneration, and waste heat recovery as eligible sub-projects.

11. The proposed initiative will also fully complement the IBRD and ADB interventions in Renewable Energy. The IBRD/ADB loans will help to increase large-scale renewable energy sources and enhance energy efficiency in large industries. IFC interventions will complement the public sector activities to ensure a market wide transformation of RE investments.

12. *Direct Investments in Renewable Energy and Energy Efficiency*. IFC would provide appropriate incentives for qualified developers, suppliers and ESCOs, to fast-track the implementation of renewable energy projects, particularly CSP and CSP with storage, where additional incentives or risk mitigation is required. IFC has already been approached by some of its client base of solar power developers that would invest in CSP if appropriately priced financing was made available through a blend of CTF, IFC and private sector financing. This would catalyze the industry through demonstrating success, driving down prices and reducing technology risk. The proposed intervention fits well with GOI's National Mission on Enhanced Energy Efficiency (NMEEE) and CTF's strategic objectives by mitigating climate change impact by accelerating generation from renewable sources.

13. The proposed initiative will also fully complement the IBRD and ADB interventions in Energy Efficiency. The IBRD targeted public sector banks in India will target larger scale investments in large industries. IFC interventions will complement the public sector activities to ensure a market wide transformation of RE and EE investments.

These initial projects, in addition to having an immediate GHG impact, would provide valuable information on the types and amounts of incentives required to catalyze renewable energy development in the country.

14. In fiscal year 2010, IFC invested US$1.6 billion in climate change mitigation projects in developing markets. Globally, IFC has mobilized over US$10 of financing from the private sector per dollar of concessional finance for climate. In India, IFC has set a target of reaching US$750 million in investments in the RE and EE sector over the next three years. IFC will leverage its international experience in RE and EE to support first-of-kind projects. In India in particular, IFC has already financed the first solar IPP and roof-top solar projects. IFC will apply innovative structuring to apply CTF funds with minimum concessionality to address the key barriers that are preventing progress of private sector investment in the RE and EE sectors.

Implementation Readiness

15. There are currently a number of private sector renewable energy projects that have been developed and could be implemented during 2012 with the appropriate financial / risk incentives. Several of these companies have already approached IFC for help in obtaining financing on terms that would make the project feasible. Several local financial institutions have also expressed strong interests in partnering with IFC under either a credit line, risk sharing facility or even mezzanine finance facility to provide financing to developers of small renewable energy sub-projects and companies implementing energy efficiency improvements. The implementation potential of these programs is enhanced by IFC's established relationships with market players and its technical expertise in the topic (IFC has a core team focused on sustainable energy and more than ten years of history in financing such projects directly and through financial intermediaries). Accordingly, the likelihood of IFC being able to structure appropriate incentives and implement an initial program rapidly after approval is very high.

Rationale for CTF Financing

16. *Wholesale Finance for Renewable Energy and Energy Efficiency.* The utilization of CTF funds alongside IFC investments in dedicated credit lines and risk sharing facilities will help increase availability of funding to smaller private sector renewable energy and energy efficiency players. The small renewable energy sub-projects are being crowded out by borrowings of the large thermal power projects, which continue to be a focal area for FIs, including IFCos. IFC's support of IFCos and other mainstream and non-banking FIs would also provide a demonstration effect to bring in overseas lenders who have largely stayed away from the renewable energy sector.

17. Local FIs typically need to strengthen renewable energy risk assessment capabilities and are unwilling to finance such projects as these are perceived to be of higher market and technical risks. CTF financing to FIs will help scale up FI's capacity to assess such clean energy projects through sharing of IFC's experience and knowledge of these sectors worldwide. This is especially critical as several FIs are relatively small players in the sector and require support from experienced partners to grow its presence.

Direct Investments in Renewable Energy and Energy Efficiency. CTF financing will be needed to provide appropriate financing (including to cover the viability gap evident in the sector) and risk incentives for private developers to enter India's renewable energy sector. While there is interest in entering the market, private developers are unwilling to do so without some concessional support. CTF funds are needed to incentivize local financial institutions to undertake financing in lower carbon emitting technologies. Many companies involved in the development of renewable energy, energy efficiency, cleaner production and waste treatment projects have recently found themselves unable to borrow, even at high interest rates, for any type of investment. CTF funding, and its flexible application, can provide incentive to these local financial institutions the necessary financing for these companies to implement projects. With effective financial structuring, CTF funds can address the specific barriers and catalyze the sector's transition to a lower carbon base.

Financing Plan

18. Financing plans will be developed at the proposal stage. The following is a conceptual financing plan for indicative purposes.

Source	Wholesale Finance	Direct Investment	Total (US$ million)
Sponsors / Other lenders	300	300	600
IFC	150	150	300
CTF	50	50	100
Total	**500**	**500**	**1,000**

19. The program is expected to be prepared along the following timeframe.

Milestone[38]	Expected schedule
Government concept approval/Bank concept review	December 2011
Program preparation	February 2012
Appraisal/Negotiations	April - May 2012
Approval	June 2012
Program Implementation Start	July 2012

[38] The Project preparation timetable is for illustrative purpose only. It is based on the assumption that the India country investment plan is approved by the CTF committee in November 2011.