REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:GEF Trust Fund

For more information about GEF, visit The GEF.org

PART I: PROJECT INFORMATION

Project Title: Facility for Low Carbon Technology Deployment			
Country(ies):	India	GEF Project ID:[1]	4927
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	150188
Other Executing Partner(s):	Bureau of Energy Efficiency(BEE)	Submission Date: Resubmission Date:	10-09-2015 18-12-2015
GEF Focal Area (s):	Climate Change	Project Duration (Months)	60
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☐ ➢ For SGP ☐ ➢ For PPP ☐		Project Agency Fee ($):	827,672

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Co financing ($)
CCM-1 (select)	Technologies successfully demonstrated, deployed, and transferred	Innovative low-carbon technologies demonstrated and deployed on the ground	GEF TF	8,712,328	59,770,000
		Total project costs		8,712,328	59,770,000

B. PROJECT FRAMEWORK

Project Objective: To facilitate deployment and scaling up of low carbon technologies in India that can address technology gaps to mitigate climate change and promote use of energy efficiency and renewable energy technologies and systems in selected sectors.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount ($)	Confirmed Co-financing ($)
1. Innovation Ecosystem for selecting technology innovators and instituting competitive awards and policy incentives	Inv	1.1. Innovation Ecosystem for selecting technology innovators and instituting competitive awards and policy incentives	1.1.1. Expert Panels instituted for three selected technology areas 1.1.2. Twenty Challenge competitions conducted 1.1.3. Financial Institutions revalidated 1.2.1. Targeted	GEF TF	6,708,746	55,000,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.

		1.2.Adoption of improved low-carbon technologies in the Indian economy, that would include reduced need for new energy generation capacity	innovation and technology development to meet identified low-carbon technology needs awarded 1.2.2. Approximately 120 low carbon innovations demonstrated			
2. Technical assistance for Technology Transfer Support Facility	TA	2.1.Establishment of deployment support eco-system for low carbon climate mitigation technologies	2.1.1. Appropriate networks and centres for research and deployment of low-carbon technologies verified. 2.1.2. Technology Transfer Support Facility established 2.1.3. Consultations/ workshops with international/ national experts, with documentation and dissemination of the Facility carried out.	GEF TF	1,103,582	2,070,000
3. Monitoring and Evaluation	TA	3.1. Monitoring and evaluation mechanisms and indicators established to facilitate successful project implementation and sound impact assessment.	3.1.1.Regular monitoring exercises conducted; 3.1.2. Midterm and final evaluation conducted.	GEF TF	100,000	300,000

Subtotal		7,912,328	57,370,000
Project management Cost (PMC)[3,4]	(select)	800,000	2,400,000
Total project costs		8,712,328	59,770,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
Private Sector	Private Entities[5]	Investment	50,000,000
National Government	Government of India (BEE)	Cash	9,300,000
GEF Agency	UNIDO	Cash	170,000
GEF Agency	UNIDO	In-kind	300,000
Total Co-financing			59,770,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b
UNIDO	GEF TF	Climate Change	India	8,712,328	827,672	9,540,000
Total Grant Resources				8,712,328	827,672	9,540,000

[1] In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

[2] Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Cofinancing ($)	Project Total ($)
International Consultants	500,000	500,000	1,000,000
National/Local Consultants	1,000,000	2,000,000	3,000,000

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No.

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

[3] PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

[4] Considering the size of the project, several national counterparts agencies, diverse stakeholders and complexity of the project management in addition to the range of geographical distribution of technology providers and innovators in the country, the project management cost has been increased 9%.

[5] According to the GEF Co-financing policy FI/PL/01, Co-financing that is expected to be secured or mobilized from private sector entities or project beneficiaries during the inception phase of the project implementation, but after CEO endorsement, may be counted as confirmed co-financing if the Agency's project document includes clear requirements that such co-financing be mobilized during implementation at a clearly expressed minimum level. Such contributions will often be mobilized during project implementation through match requirements in the project or similar project design features.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[6]

After the PIF approval, based on several consultations held between key stakeholders including the GEF OFP for India and World Bank during the PPG phase, it was decided that the project is transferred to the UNIDO as the implementing agency for the main phase in place of the World Bank (the initial implementing agency). Please find attached the GEF CEO's approval letter for change of implementing agency, dated 9th of July, 2015. In addition, it was agreed that the initial national executive partner agency - the Technology Development Board (TDB) may be replaced by the Bureau of Energy Efficiency (BEE), an autonomous institution under the Ministry of Power that is closely involved in promoting low carbon technologies in general and energy efficiency in particular in India..

During the PPG phase, there was a wide range of studies undertaken on 26-30 different energy intensive technology areas with huge potential for energy savings. Based on various studies and findings including technology status assessment, it was decided that the project should focus on three technology areas namely Low Grade Industrial Waste Heat Recovery (WHR), space conditioning (HVAC and cold storage etc.) and Pumping (agricultural).

Therefore, four key technology areas as stated in the approved PIF were narrowed down to three key technology areas in the FSP.

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

The Government of India has taken several important steps towards the sustainable energy and climate agenda, the first of which was enacting the Energy Conservation Act in 2001. The Act provides for the legal framework, institutional arrangement and a regulatory mechanism at the Central and State levels to embark upon energy efficiency drive in the country. Various provisions were created under the Act; including identification of Designated Consumers (DCs), Standards and Labelling of Appliances, Energy Conservation Building Codes, and establishment of an Energy Conservation Fund. The Bureau of Energy Efficiency (BEE) was also set up as a component of the Act with the primary objective of reducing energy intensity of the Indian economy through active involvement of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors. In addition, an Integrated Energy Policy was released in India in 2008; this is the first comprehensive energy policy by the Indian government that oversees all energy sectors. The policy report reflects numerous recommendations pertaining to the industrial sector and highlights the need to institutionalize measures encouraging the adoption of energy efficient technologies, particularly crosscutting technologies such as pumps, boilers, variable speed drives (VSDs) and motors. It also stresses the importance of strengthening energy service companies (ESCOs) for facilitating energy audits. Benchmarking of energy intensive sub-sectors, creating regional testing facilities and labelling of products were other important issues covered in the policy report.

The project is aligned with the India's National Action Plan on Climate Change (NAPCC) that specifically refers to sector specific National Mission on Enhanced Energy Efficiency (NMEEE). This Facility has been proposed amongst a suite of projects to support India's NMEEE implementation by the Bureau of Energy Efficiency. This suite of projects included support to large industries (Perform, Achieve and Trade); to commercial buildings, small industries and energy service companies (Partial Risk Sharing Facility, PRSF. All these projects have been supported by a combination of GEF and CTF financing. FLTCD complements these initiatives by stimulating technology push for energy efficient appliances. The other projects under preparation (PRSF and SEEP) in turn provide additional market and financial incentives to increase the take up of EE technologies. These projects are a part of a bigger portfolio supported by the Multilateral Banks / Agencies for the central and state governments of

[6] For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question.

India and other partners. Other broader issues around sector reform and market orientation are included in the sector dialogue continuously. The Government of India's National Action Plan on Climate Change (NAPCC) identifies technology transfer and adoption as amongst the major pillars to help India meet its climate change mitigation goals. This proposed plan is also in sync with the Report of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, decided at the Durban Conference of Parties in December 2011.

Moreover, the Finance Minister of India in his Budget Speech 2015-16 announced the Government's intentions to establish the ATAL Innovation Mission (AIM) in NITI and stated that initially a sum of US $ 25 million would be earmarked for this purpose. The Mission will act as a platform to promote a network of world-class innovation hubs and Grand Challenges for India. The proposed objectives of AIM are as under:

- To create an umbrella structure to oversee innovation eco-system of the country;
- To provide platform and collaboration opportunities for different stakeholders;
- To study and suggest best and novel practices to be adopted by different stakeholders in the innovation chain;
- To create awareness and provide knowledge inputs in creating innovation challenges and funding mechanism to government; and,
- To develop new programmes and policies for fostering innovation in different sectors of economy.

The proposed project will help national and regional entities to work collaboratively on solving the major prioritized climate mitigation technology challenges, guided by industry and academic experts.

The Indian National Communication to UNFCCC provides for technology transfer and deployment as critical components of the toolkit to fight climate change. The project will be seeding an innovation ecosystem, driven by rewards, to assist in the development and deployment of technologies across academia, industrial sector, government and autonomous research centres in the country. This project will coordinate with other similar international efforts, as is critical for sharing and creating knowledge that can help mitigate climate change. It is proposed that the selected institution will be part of the network with the Climate Technology Centres Network (CTCN) and can play the connecting node with other climate technology centres in developing countries. It is expected that results of experiments such as this are likely to provide experience and inputs for the National Innovation Fund.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities

The project is in line with the GEF 5 climate change mitigation goal to support developing countries and economies in transition towards a low-carbon development path.

Adoption of advanced low carbon technologies in the market has been identified as one of the critical tools available for climate change mitigation and adaption. The GEF Programming document identifies Technology Transfer as a prime area of focus, and the project supports CCM Objective 1 of promoting market transformation for energy efficiency in industry.

This proposed project would facilitate and advance technology transfer across sectors, industries, academia and countries to promote low carbon technologies including energy efficiency and other climate change mitigation measures. This project has been developed keeping in view the priority accorded by the Government of India to promote comprehensive measures to combat climate change, without compromising the Indian economy's growth path to alleviate poverty and create jobs.

This project will bring industry, academia, research institutions and new and existing enterprises to solve specific energy and climate challenges and meet identified technology gaps through facilitating deployment and dissemination of emerging innovation technologies. It will be targeted on priority areas, using expert advice and will promote competition within and amongst innovators and institutions to find new low carbon technologies and processes to solve priority environmental challenges.

A.3 The GEF Agency's comparative advantage:

Following the endorsement of the Lima Declaration in December 2013, UNIDO's mandate was reaffirmed to promote inclusive and sustainable industrial development (ISID). Recognizing that future strategies for poverty reduction need to be economically empowered, UNIDO promotes ISID to harness the full potential of industry's contribution to the achievement of sustainable development goals, and lasting prosperity for all.

UNIDO has been recognized by the Global Environment Facility (GEF) as having comparative advantage in the development and implementation of low carbon projects. With its mandate to promote ISID, UNIDO has positioned itself as one of the most relevant players to assist industries of both developing countries and economies in transition. UNIDO has long-standing sector-wide experience with the technical, policy and financing aspects of low carbon technology improvements in manufacturing and process industries. In India, UNIDO has extensive experience in cooperation with different government agencies in the development of policies and institutional frameworks to support entrepreneurship development. UNIDO also has a strong partnership with various industrial and enterprise associations, which will facilitate the successful implementation of the project. In addition, UNIDO is currently implementing a number of projects in India, with more under development that demonstrate its extensive experience in the implementation of low carbon energy-related projects; Promoting Energy Efficiency and Renewable Energy in Selected Micro, Small and Medium Enterprises (MSME) Clusters in India, Technology Upgrading and Productivity Enhancement of the Machine Tools Industry in India and Promoting Business Models for Increasing Penetration and Scaling-Up of Solar Energy.

In 2011, the United Nations Industrial Development Organization (UNIDO), with the support of the Global Environmental Facility (GEF) successfully implemented the 'Greening the COP17' project. One of the four components of the project focused on the design and implementation of the first South Africa Clean Technology Competition (2011 SA Cleantech) for green entrepreneurs and small and medium-size enterprises (SMEs) with innovative ideas and concepts in the areas of energy efficiency, renewable energy and green building practices. All participants were given the opportunity to present their products on energy efficiency, renewables and green buildings and get feedback, while the best went to receive additional training, mentoring and access to Cleantech networking events. The success of the project, which attracted a wide range of private-sector interest, identified 24 semi-finalist companies and 3 winners across three categories, has allowed it to go into a second phase in 2013.

This success also saw the Cleantech project getting expanded into other countries in 2013, namely Armenia, India, Malaysia, Pakistan, Turkey, South Africa and Thailand; more are also expected to join. National competitions in the countries participating are now under way by the end of the second quarter of the year with up to an estimated 150 entrants from each country. Around 25-50 entrants are expected to go on to get support through the cleantech accelerator programme from which 10-15 finalists will be selected, with the best from each country expected to compete at a global level. The winning ideas will be put forward into a global competition where they compete ultimately for a global prize and are able to connect with potential partners, customers and investors. Funding will be for a period of three years with the competition cycle expected to take place two to three times. In view of experience gained under the Cleantech Projects, the proposed project fits well into UNIDO's program and will contribute to achieving UNIDO's direct contributions to the UNDAF outcomes including; UNDAF Outcome 1- Inclusive growth and Outcome 6 – Sustainable Development. Under Outcome 1, the project will contribute to promoting employment, skills and livelihoods – the project will focus on improving the competitiveness of industries and contribute to private sector development (including SMEs) through improvements in skill building, access to finance and improved technologies. Under Outcome 6, the project will demonstrate the viability of energy-efficient technologies in India's MSME sector.

To ensure the success of project implementation, the UNIDO team will involve various stakeholders and co-financing partners during the formulation and implementation of the project through consultation meetings, technical workshops, and contractual agreements. In addition, the UNIDO Team consisting of the UNIDO Representative in India and the Energy Branch of UNIDO at Headquarters will oversee project implementation. Furthermore, UNIDO will seek to coordinate in the field and at UNIDO Headquarters with the various branches of UNIDO, such as the

Environment Branch, and the Business, Investment and Technology Services Branch for the successful implementation of the project.

Moreover, UNIDO, as part of its co-financing contribution to the project, will contribute US$ 170,000 in cash and US$ 300,000 In-kind to the project.

A.4. The baseline project and the problem that it seeks to address:

Background
Macroeconomic picture

The Indian economy grew at an average rate of 5% from 2009-2013. While growth has declined somewhat from its peak, GDP growth of 5-6% is projected to continue driven by population growth, latent demand, and tremendous scope for productivity increases. While India is currently the 11th largest economy, by 2030 it is expected that it will be 3rd overall. In this context, together with continued rapid increases in urbanization and industrialization, and improvements in living standards, the Indian economy will require a five-fold increase in energy supply to sustain its growth trajectory.

However, the lack of reliable power is already a constraint to growth. Annual per capita consumption is low by global standards, service quality in many states is poor, 300 million people lack access to electricity, and the peak deficit nationally is more than 10 percent. India's power supply, however, relies on its domestic coal power plants (68% of power generation was by coal in 2010), whose efficiency levels are low, and technical and nontechnical reasons have augmented the high transmission and distribution losses. In addition, the low electricity tariff has become a disincentive for investment in power supply. All of these factors have led to the lack of power supply. On 31 July 2012, a severe power outage occurred, which affected more than 600 million people in over 20 states in north, east, and north-eastern India, and was the largest blackout in global history in terms of number of people affected.

Meeting future demand will be even more challenging than before, as India faces escalating costs for developing conventional energy sources, depleting fossil fuel reserves, and an increasing mandate to address the local and global environmental and social impacts arising from the use of fossil fuels. Altogether, India's investment requirement across the entire power sector through 2035 is estimated to be around $2.3 trillion.

Sectoral and Institutional Context

It is an imperative for India to meet its growing energy demand at least cost with suitable energy mix in an efficient way so that scarce public resources can be efficiently allocated to reduce poverty and boost shared prosperity. In recognition of this, the Government of India has identified energy conservation as a critical instrument for meeting surging electricity demand, and for achieving the national target of 20–25% reduction in carbon intensity from 2005 levels by 2020. Globally, energy-efficiency (EE) has been identified as cheapest and most environmentally friendly way of bridging an electricity gap. Demand-side management is particularly applicable to India, since energy-efficiency measures are easier to install in the initial phases of building construction instead of retrofitting. Over 70% of India's commercial building stock projected to be built by 2030 has yet to be developed.

The GoI has enacted a variety of regulatory mandates and policy initiatives to unlock EE opportunities. The Energy Conservation Act of 2001 (amended 2010) established the Bureau of Energy Efficiency to take the lead on the various EE initiatives; mandated modern building codes; initiated an appliance labelling program; and empowered the Indian Government to set mandatory energy conservation standards for energy-intensive industries. The National Mission for Enhanced Energy Efficiency (NMEEE), one of eight initiatives launched by India's 2008 National Action Plan for Climate Change (NAPCC), builds on the earlier policy objectives. The NMEEE introduced a number of new market-based and financial instruments aimed at accelerating the strategic deployment of energy-efficiency across India. By far, the largest of these NMEEE initiatives is the Perform, Achieve and Trade (PAT) scheme, a globally unique program that has mandated energy-intensity targets for the country's most energy-

intensive industrial sectors. The BEE estimated that by 2014-2015, measures introduced by NMEEE can unlock an estimated US$14.8bn in savings, annual fuel savings in excess of 23 million toe, CO2 emissions mitigation of 98 million tons, and 19 GW of avoided capacity addition. Furthermore, the NAPCC includes the National Mission on Strategic Knowledge on Climate Change (NMSKCC). During implementation, the proposed project will coordinate with the NMSKCC agenda.

Indeed, substantial untapped DSM potential exists in the industrial, commercial, and agricultural sectors. By far the largest share of energy savings is in the agricultural sector, where replacement of 10 million inefficient pumps could yield annual energy savings of 30 GWh. In the industrial and commercial sector, various efficiency measures could yield an additional 14 GWh, as per government of India analysis.

In addition, BEE has undertaken project development in about 30 energy intensive clusters through the XI Five Year Plan. Almost 600 Detailed Project Reports (DPRs) were prepared for SME units, and Small Industries Development Bank of India (SIDBI) was taken in by BEE as a partner to facilitate funding of these DPRs for interested units. However, despite these interventions, enhancement of awareness and facilitation of financing, the programme has been unable to influence the units to implement identified technical interventions.

In response to the limited adoption of EE technologies, several technologies have been identified by various agencies in recent years. The technological interventions range from simple approaches such as lighting retrofits and installation of efficient motors to Variable Frequency Drives (VFDs) and efficient gasifiers, etc. The investments in most of the identified technological interventions are reasonable and their adoption by related units could lead to significant energy and costs savings.

It is pertinent to mention that in those cases where detailed audits have been conducted and investment grade DPRs are prepared, the agencies have also coordinated with Banks/Financial Institutions (FIs), in particular SIDBI, to provide financing to the units and/or ESCOs interested in implementation.

As a follow-up to the XI Five Year Plan, the BEE XII Five Year Plan is identifying 8 clusters for implementation of demonstration projects. Under this XII Five Year programme, BEE has set up an institutional mechanism in the form of a Steering Committee with which this proposed project will cooperate closely. Details of various industrial units covered under the existing projects shall be obtained from the Project Management Units (PMUs) and these industries will be invited to participate in the awareness and training programs to be organized under the proposed project. The project would also ensure coordination and build on lessons learnt under various projects of the Deutsche Gesellschaft für Internationale (GIZ) in India. These include the GIZ-BEE led "Indo-German energy programme"; "Eco Industrial Development" project; and the Indo-German programme "Advisory Services in Environmental Management (ASEM)."

The Ministry of MSMEs has launched the National Manufacturing Competitiveness Programme (NMCP) to improve competitiveness in Indian MSMEs with a specific focus on increasing productivity, upgrading technologies and conserving energy. One component of the NMCP, Technology and Quality Upgradation Support to MSMEs (TEQUP), aims to upgrade manufacturing processes with the use of energy efficient technologies, thereby reducing production costs and GHG emissions. This is achieved through capacity building of MSMEs, implementation of energy efficient technologies, establishment of Carbon Credit Aggregation Centres (CCA), encouraging MSMEs to acquire product certification from national and international bodies, and conducting impact studies. The proposed project will aim to build on the existing work of the Ministry of MSMEs in the relevant clusters, complementing the built capacity and awareness with a sustainable financing scheme to be operated in cooperation with Energy Efficiency Services Limited (EESL).

Also focusing on financing energy efficiency projects in Indian MSMEs, the "green" financial support of Agence Française de Développement (AFD) works with SIDBI to increase awareness of EE, increase the capacity of SIDBI, and encourage MSMEs to make green investments. This is achieved through €0.5 million of technical assistance and a long-term soft loan for SIDBI to distribute via direct loans or intermediary credit lines to commercial banks. SIDBI has also partnered with the Japan International Cooperation Agency (JICA) on the provision of financing schemes to MSMEs for the purchase of energy savings equipment, and with KfW (German Development Bank) on three

financing schemes focused on facilitating investment in energy efficiency measures, cleaner production measures and innovative technologies in MSMEs. The World Bank, under its projects, Financing Energy Efficiency at SMEs and Partial Risk Sharing Facility for Energy Efficiency, aims to increased demand for energy efficiency investments in selected MSMEs and builds their capacity to access commercial finance. The proposed project will build on these projects by extending the project focus to capacity building of ESCOs as the key distributors of financing, rather than the project itself.

In addition, in June 2008 the Government of India announced its National Action Plan on Climate Change (NAPCC), which includes a Mission on Enhanced Energy Efficiency (NMEEE) [7]. The Implementation Plan for NMEEE was approved by the Government in June 2010.

One of the key elements of the NMEEE aimed at industry is the establishment of a Framework for Energy Efficient Economic Development (FEEED), which mainly focuses on developing fiscal and investment guarantee instruments to promote energy efficiency [1]. FEEED includes a Partial Risk Guarantee Fund (PRGF) and a Venture Capital Fund for Energy Efficiency (VCFEE) [2] [3]. The PRGF is a risk-sharing mechanism that provides commercial banks with partial coverage of risk exposure against loans issued for energy efficiency projects. [4] [5] [6].

The Energy Efficiency Services Limited (EESL) will administer these funds. EESL is a Joint Venture of NTPC (largest coal power company), PFC (Power Finance Cooperation), REC (Rural Electrification India) and POWERGRID with a mission to facilitate market implementation of energy efficiency projects. EESL will also function as resource and expert centre and may take the role of Energy Service Company (ESCO). The initial equity of EESL will be Rs. 190 crores with equal contribution from the 4 sponsors. [4] [5].

The PGRF is a risk-sharing mechanism, which lowers the risk to the lender by substituting a portion of the risk of the borrower by providing guarantees. Guarantees provided are a maximum of 50% of the loan amount or INR 300 lakhs, whoever is less [8]; In the case there is a default, PGRF will

- Cover the first loss up to 10% of the total guaranteed amount
- Cover the remaining default amount on pari-passu basis up to the maximum guaranteed amount
- PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower.

Projects that are eligible include those that will achieve a demonstrable energy savings and mitigation in emissions of greenhouse gases; have a method for monitoring and verification of emissions and savings; be a new project; uses viable technology developed with competent energy audit/feasibility studies; implemented by BEE empanelled ESCO on performance contracting mode and; complies with environmental, health and safety standards.[7]

[7] References

[1] Government of India (2008) - National Action Plan on Climate Change.
[2] BEE (2008). National Mission for Enhanced Energy Efficiency. Draft Mission Document. Implementation Framework. December 2008.
http://www.indiaenvironmentportal.org.in/files/National%20Mission%20for%20Enhanced%20Energy.pdf
[3] Sushil Kumar Shinde. Make Energy Conservation a Mass Movement: National Missions on Enhanced Energy Efficiency to be implemented from 1 April 2010: http://www.energymanagertraining.com/NAPCC/main.htm
[4] Saurabh Kumar, BEE (2010). Promoting Innovative Energy Efficiency Financing Mechanisms, Jan 2010: http://www.asiaesco.org/pdf/presentation/6-2.pdf
[5] Energy Efficiency Services Limited (EESL) (2010). PRGF / VCFEE, 2010: http://www.eesl.co.in/website/PRGF.aspx
[6] Sanjay Dube, BEE (2010). National Mission for Enhanced Energy Efficiency, Partial Risk Guarantee & Venture, 2010: http://www.emergent-ventures.com/UploadedFiles/Catalogue/PRGF--VCF-Under-NMEEE-Sanjay-Dube-%5BRead-Only%5D.pdf
[7] Indian Climate Portal, India and International Climate Negotiations: http://www.indiaclimateportal.org/national-climate-change-action

While not focusing primarily on energy efficiency, recent initiatives implemented by GIZ have aimed to support innovative capacity in MSME clusters throughout India. This has included capacity building at automotive and electronics clusters in Aurangabad and Bangalore, respectively, and the development of a Knowledge and News Network to connect Chambers and Associations across the clusters. The study undertaken by GIZ, "Shifting the Paradigm: Mapping the Inclusive Innovation Ecosystem," indicated that a dearth of available and tailored financing schemes still remains the central barrier to investing in innovative products.

The ADB project, Madhya Pradesh Energy Efficiency Improvement Investment Program, focuses on 32 districts of the Madhya Pradesh state and provides investment funding for the installation of separate feeders for households and irrigation water pumps, and high voltage distribution systems (HVDS), provision of new power connections, etc. to ensure better quality power supply to households and financial sustainability of the distribution companies.

Overall in the industrial sector in India, a significant number of interventions in the past for capacity building, awareness, project development, technology benchmarking, etc. have not led to sufficient adoption of low carbon technologies and their replication. Therefore, a systematic approach involving a sustainable financing mechanism is required to demonstrate and scale up investments in the industrial sector.

There is a need, therefore, for an alternative approach that could build on the work done thus far, taking it a step further to the implementation stage. This would require an aggregator, facilitator, coordinator between technology vendors and units, and a financer to lay out a robust mechanism to reduce transaction costs of all stakeholders and mitigate the technical and financial risks.

The proposed project seeks to implement such an alternative approach: BEE, a public sector body under the Ministry of Power, tasked with the mandate to facilitate implementation of energy efficiency on a commercial basis, is the most suitably and strategically placed to fill in the gap at the implementation level.

The proposed project proposes this alternative approach, backed by a substantial co-financing commitment that can be invested as soon as the organization of the financing mechanism is fully underway and energy savings can be shown.

In addition to the baseline programs/projects related to industrial energy efficiency, the following projects are relevant in terms of their work in addressing energy efficiency in other sectors:

While energy efficiency measures are the most efficient from an economic perspective, they face significant implementation barriers, including but not limited to lack of financing, weak or missing regulatory incentives, and lack of marketable technologies. While India has introduced significant policy and regulatory measures to overcome the financial and regulatory barriers, less has been done to identify measures to improve the rate of acquisition or development of innovative technologies. The enabling ecosystem for technology innovation is weak in India in general, and in the energy technology sector in particular. As a consequence, India is predominantly an importer of low carbon technologies. Previous attempts to encourage domestic technology innovation have not demonstrated substantial results.

Given the large potential market for low carbon technologies, together with regulations, which encourage or mandate their use, India can do more to stimulate domestic EE technology innovation. By unlocking this market, India can unleash hidden economic potential to trigger growth and job creation for both women and men, which can lead to poverty alleviation and boost shared prosperity for all people.

---

[8] BEE. Partial Risk Guarantee Fund for Energy Efficiency. Available at http://www.superefficient.org/en/Activities/Procurement/~/media/Files/Chennai%20SL%20Workshop%20Presentations/Overview%20of%20PRGF%20for%2[7]

To accelerate the pace of market development, several barriers need to be addressed. First, more human capital needs to be allocated towards energy-efficiency innovation. While India has extraordinary talent in science and technology, the intellectual resources that are dedicated towards solving energy-efficiency challenges is relatively limited. Due to the highly regulated nature of the energy industry, innovators have not been attracted to this field. Innovation activity is concentrated in fields with demonstrated high rates of growth and low government intervention, such as information technology, biotechnology, and textile manufacture. Potential innovators need the right nudges and stimuli to direct their efforts towards energy-efficiency challenges.

Second, innovators must create technologies that are suited to the needs of technology users. It is widely documented that assured demand is an important driver for scaling up technologies beyond lab-scale demonstration projects. The flip side of this argument is that the lack of assured demand and documented interest from technology users discourages innovators from investing in opportunities in this potentially lucrative market. Innovators and technology users operate in silos and mechanisms to forge this collaboration are missing. Therefore, collaboration between industry, innovators, the research community, and technology experts to identify innovative technologies suitable to their needs must be enhanced to stimulate greater innovation.

Third, risk financing for early-stage companies and new ventures ("venture capital") is limited. While Indian firms attract significant capital (both foreign and domestic) to fund their growth, most investors target companies with revenues, a proven business model, and an existing market with high potential growth. Given that the energy efficient technology market is less well known, and therefore riskier, risk capital for innovators is scarce, especially at the early stages. Without financing, innovators cannot complete the research and development necessary to prove their technologies, let alone market and commercialize them to bring them to scale. Early stage financing for innovators is required to stimulate innovators to invest in risky projects.

In fact, limited financing for innovative technologies is a universal problem. Private investors are unable to determine the proper level of investment in new technologies due to lack of awareness, uncertainty of risks and rewards, and the incentive to free ride on early adopters. Moreover, innovations require a long research and development period before they can become commercialized, which extends the payback period by an unacceptable amount to most investors. The result for many promising entrepreneurs is that their ideas are stranded in the "Valley-of-Death," that is, the period between when their new product is launched, and when it becomes profitable. In some cases, they may have access to early-stage risk capital to help them to overcome this barrier, but such funds are limited and insufficient. The result is that even proven technologies are unable to reach commercial scale due to lack of financing.

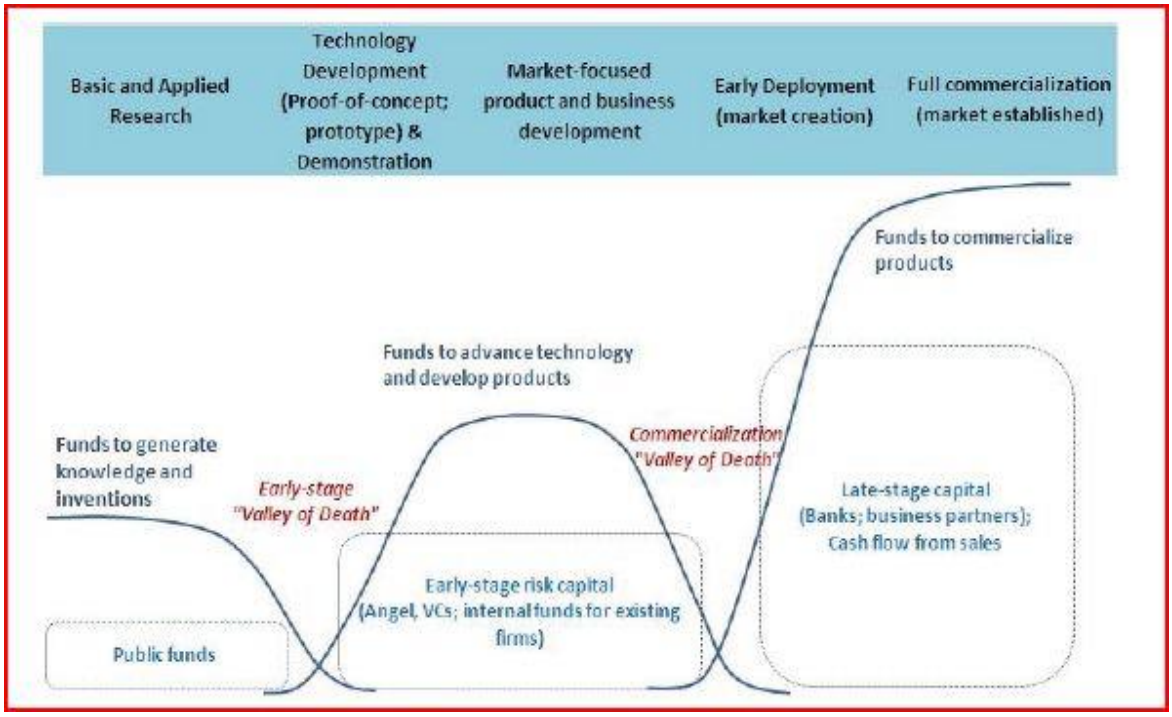


Figure 1: Commercialization Valleys of Death: Adapted from Climate Innovation Centers: Advancing Innovation to meet Climate and Development Challenges, Ambuj Sagar, IIT Delhi

In many countries, government intervention has been utilized to support the development of promising technologies that can reach commercial scale and in doing so produce economic benefits. Public policy to support technology transfer has typically been directed towards sectors of strategic national importance, such as clean energy. Government support has centered on two types of approaches. Technology-push approaches include funding for human capital formation and basic and applied research and development (R&D); regulations to create a research- and innovation-conducive intellectual property rights (IPR) regime; the creation of appropriate incentives to commercialize technology; measures to deepen relationships between academia and the productive sector; and financing for prototype development and patent protection. Demand-pull emphasizes the use of instruments to increase the demand for lower-emission technologies, such as taxes on polluting fuels or emissions, or more direct approaches such as renewable energy portfolio standards, adoption subsidies, or direct public-sector investments.

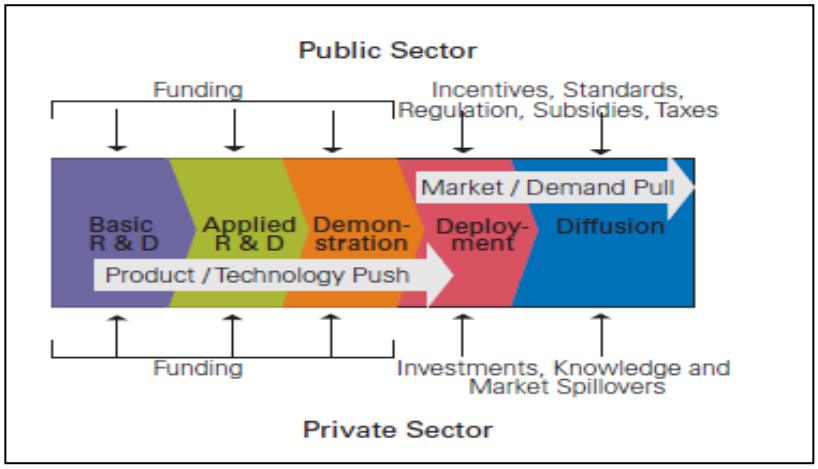


Figure 2: Stages of Innovation: Adapted from Technical Summary, Fourth Assessment Report of IPCC (2007); as used in GEF5: Focal Area Strategies

Innovation challenges or awards have been increasingly used to provide incentives for innovations in specific and focused areas. Where market forces and other traditional drivers for innovation are failing, prizes can offer a unique incentive tool to focus diverse solvers and the public on a given challenge of public importance. This is also clear from the experience gained under the GEF Cleantech project under implementation in several countries where prizes and recognition seem to have a positive impact in encouraging SMEs and agencies to invest more on research and development for new innovative clean energy technologies.

It is also recognized that innovation challenges are most productive when the following conditions are available: (a) a clear objective; (b) a relatively large population of potential problem solvers; (c) a willingness on the part of the participants to bear some of the costs and risks; (d) when the challenge is complex and multi-faceted; and (e) when the solutions cannot be predicted ex ante. With appropriately focused design that can capture a diverse array of approaches and solvers, challenges can be a key catalyst for breakthrough innovation.

Innovation challenges provide incentives for specific innovations, rather than reward excellence in general. The six basic kinds of innovation challenges are classified as following:

- Exemplar: Grant competitions that focus attention on, set standards in, or influence perceptions of a particular field or issue
- Exposition: Highlight a range of best practices, ideas, or opportunities within a field
- Network: Create and strengthen a particular innovation community
- Participation: Educate and change the behaviour of participants through the prize process
- Market stimulation: Emulate market incentives by driving costs down through competition and exposing latent demand
- Point Solution: Solve a challenging, well-defined problem that requires innovation.

Prize challenges are considered effective for three reasons. First, prizes can induce extra-ordinary levels of effort relative to the financial award, as participants' value exposure, participation in and access to networks as well as links with larger existing industries. Second, prizes can elicit ideas from a wide variety of people bringing many perspectives. As such, they allow investment in a field of innovators rather than picking winners in advance of the competition. Third, prizes can increase the level of focus and effort on selected challenges of national or regional significance. Thus, regardless of whether a specific technical outcome is achieved from a prize competition, positive knock on effects are produced which can have social and economic benefit. This also has a cascading impact on creating an innovation ecosystem by derisking investments in developing countries.

Given the nature of the innovation process, GEF support is crucial to helping establish India's FLCTD, bringing international expertise and funding. The UNIDO will avail of its credentials in building institutions and capacities to establish the Facility, with the active cooperation of industry, government, academia and international partners. The Facility will also have the mandates to push for South-South cooperation and provide technology transfer services in countries with similar climatic conditions, where such technologies can be quickly disseminated and adopted.

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

Technology innovation is recognized worldwide as an area for which public support is required. In the case of clean energy technologies, pollution externalities provide an additional case for public intervention. The project responds to a recognized failure in the market for innovation services and assets. Market demand for innovation is constrained, due to externalities, coordination challenges, and information asymmetries. Moreover, demand for innovation in low carbon technologies specifically is insufficient because (a) the environmental costs of polluting technologies are not internalized, which reduces the demand for clean alternatives; and (b) private investors are unable to determine the proper level of investment in new technologies due to lack of awareness, uncertainty over risks and rewards, and the incentive to free-ride on early adopters. This suggests an important role for public sector

resources to correct this market failure, and to spur private and individual action. It is widely recognized that the private sector in India does not supply sufficient risk capital to early stage firms. If capital constraints are lifted, it will increase the likelihood that some proportion of these firms will achieve commercial success, and produce products and services that can provide social and economic benefits, such as jobs, knowledge capital, innovation, and GHG emissions reductions.

In the case of India, it is widely recognized that there are huge untapped opportunities in clean technologies including energy efficiency and renewable energy sector. Fundamentally, energy conservation is the lowest-cost instrument to achieve India's objectives for low carbon growth. The ADB recently estimated that India must invest USD 4.5 billion per year through 2020 in order to meet established energy saving targets. In addition, opportunities for energy savings are enormous. In the case of the commercial sector, the BEE has estimated that 30-50% energy savings potential, while in the industrial sector savings on the order of 7% could easily be achieved through innovation, deployment, and market transformation.
Nonetheless, we can build a theoretical analytical framework to assess the potential magnitude and direction of the project benefits. The key assumptions are as follows:

- Total annual electricity consumed in target sectors: 171.7 TWh (2012), which includes agricultural pumps and HVAC systems used by commercial buildings. The electricity consumption for these two sectors is expected to climb to 357 TWh in 10 years.
- Potential grid electricity production that can be avoided through efficiency gains: 43 TWh. We assume that agricultural pumps and HVAC systems can reduce their consumption by 25%.
- Grid electricity production that can be avoided through waste heat recovery: 8.2 TWh. It has been estimated that 678 TWh of potential energy is wasted in the form of heat. This includes waste heat from glass furnaces, boilers, heaters, and so forth. We assume that 1% of waste heat could be utilized for distributed electricity generation, and therefore offset grid electricity by the corresponding amount (taking into account T&D losses of 15%).
- Uptake of innovation products: We use the very conservative estimate that, in the next ten years, innovative technologies supported by the program will achieve 1% market penetration in each sub-sector. In the case of agricultural pumps, for example, this would be the equivalent of the deployment of around 200,000 units in present day terms. (In the case of waste-heat, this assumes a 0.01% rate of market penetration, as we assume that only 1% of the market can theoretically be tapped, and of this, innovative products only reach 1% of the market that is within reach).

Results

As a result of market uptake of innovative technologies, grid electricity consumption is reduced by nearly 3.5 TWh over the ten-year period. This corresponds to 2.3 million tons of CO2 avoided, at a cost of $3.99 per ton. The project has a positive EIRR of 35% and an NPV of $56 million not including environmental benefits.

Technical

This project aims at meeting identified technology needs of industry by new low carbon, clean energy technologies, developed through competitive challenges and business models. The design incorporates institution of Expert Panels that will identify specific needs with industrial partners for spurring innovations. The project will rely on technical expertise from the client and industrial partners. The entire design relies on bringing together experts and innovators from different sectors, to work on technological areas of national importance in the field of low carbon clean energy technologies including energy efficiency and renewable energy.

THE PROPOSED PROJECT

Project objective

The main objective of the project is to facilitate deployment and scaling up of low-carbon technologies in India that can address technology gaps to mitigate climate change and promote use of clean energy applications in selected sectors.

In a country the size of India, innovations and inventions are made every day in different industries, sectors and parts of the country. However, deep gaps in the landscape survive, partly due to lack of information, absence of an effective coordinating mechanism and awareness about viable alternatives found through such innovations. Rapid and effective climate change mitigation requires that new investments be made to link the entities like innovators, enterprises and governments.

This GEF funding is requested to establish a Facility for Low Carbon Technology Deployments (FLCTD). This Facility would work under the broad guidelines set by the UNFCCC at the Durban Convention.

The main component of this project, and a main function of FLCTD, will be to identify high-impact challenges that if solved has potential for large-scale carbon emission reductions. Often, solutions to such challenges are unavailable in the market due to a gap between demand, supply, and financing. . Therefore this project aims to locate and link the critical connections between the stakeholders - those who are aware of the high-impact challenge, those with the technical expertise to provide solutions, and investors that can support market-based dissemination of the new solutions - to solve pin-pointed problems identified by networks of experts.

Innovation literature suggests that centralized innovation delivers sub-optimal results when compared to diffuse networks supported by a platform that handles the legalities and fiduciary responsibilities. Instead of creating a centralized brick-and-mortar centre, this project will therefore expressly focus on building an innovation ecosystem that would include networks of a diverse range of stakeholders to bring ideas from the grassroots to the central hubs that will recommend awards and scaling up through investments. This will be achieved "Innovation Challenges", an open award competition calling for solutions to The Innovation Challenges will not only provide innovative solutions to identified problems, but also will be instrumental in providing peer-to-peer networks, encouraging South-South collaboration, and attracting private investments in research to meet the goals stated under the award competition conditions.

The guiding principles of the FLCTD would be (a) Competition and market orientation of innovation; (b) Support for innovations established in industries and early adopters; (c) Technology diffusion while maintaining a tradition of strong Intellectual Property (IP) rights; (d) Rigorous and timely selection of early promising concepts; (e) matching the needs of innovation with the risk/reward equation for innovators; and (f) promoting an overall innovation ecosystem as enabling environment framework under the project.

Given the nature of the innovation process, GEF support is crucial to helping establish India's FLCTD, bringing international expertise and funding. UNIDO will avail of its credentials in building institutions and capacities to establish the FLCTD, in close cooperation with industry, government, academia and international partners. FLCTD will also have the mandates to facilitate for South-South cooperation and provide technology transfer services in countries with similar economic and social conditions as well as climatic conditions, where such technologies can be quickly disseminated and adopted.

The main objective of the projects is to facilitate the commercial deployment of low-carbon technologies in India. To achieve this objective, the project will design and conduct Innovation Challenges to stimulate demand-driven innovation in three key areas. A wide range of studies were undertaken during the PPG phase on 26-30 different energy intensive technology areas with huge potential for energy savings. Based on findings of these studies including technology status assessment, three technology areas were identified for the project low-grade industrial waste heat recovery (WHR), space conditioning (HVAC, cold storage etc.) and pumping (agricultural).

This project has been designed with substantial consultation a broad selection of stakeholders in government, academia, industry, financial services and the innovation community, over a period of almost two years. A variety of government and donor agencies have been working to support deployment of low-carbon technologies including energy efficiency and renewable technologies in India. In the field of clean-tech innovation the GEF is already supporting interventions for Small and Medium Enterprises. While the targeted focus on matching industry technology gaps with innovators has not yet been done, the project will continuously engage with relevant initiatives.

The project will be overseen by a high-level Steering Committee, with assistance from the Project Management Unit (PMU). More details on the governance structure of the project are provided in Annex F and G.

A. Project Components

Component I – Innovation Ecosystem for selecting technology innovators and instituting competitive awards and policy incentives:

The objective of component 1 is to stimulate demand-driven innovation in the three priority technology areas through Innovation Challenges.

Expected Outcome 1.1: Collaboration between government agencies, industry, innovators, the research community, financing institutions, and technology experts in the field of innovative low-carbon technologies strengthened.

Expected Outputs:

1.1.1. Expert Panels instituted for three areas namely low-grade industrial waste heat recovery (WHR), space conditioning (HVAC, cold storage etc.) and pumping (agricultural)

1.1.2. Twenty Innovation Challenge competitions conducted, resulting in at least two winning entries for each area (120 winners in total: 20 competitions x 3 sectors x 2 winners)

1.1.3. Financial institutions revalidated in the inception phase and engaged to manage the funds and provide debt and equity to the participating entities.

Three Expert Panels, one for each technology area, will be established and will be responsible for identifying the high-impact challenge and designing the Innovation Challenge competition, with support from the PMU.

For each Innovation Challenge, the Expert Panel will specify and announce a technical challenge to overcome. For example, the challenge could be "design an agricultural pump that uses 25% less electricity than the average pump available in the market today." The Expert Panel will solicit inputs from technology users to ensure that the solutions inspired through the Innovation Challenges are demand-driven, i.e. the identified challenges are real problems that are experienced by technology users, and there is a market demand for a solution.

The Innovation Challenge will be publicized broadly, aiming to elicit participation from qualified innovators, which may include but is not limited to, start-ups, MSMEs, research institutes. The GEF grant shall not be used to subsidize the big manufacturers and large commercial users. To this end a cost-sharing modality, in the context of users, will be developed for the selection process during the start-up phase, which will determine the eligibility for a grant. The Expert Panels would oversee testing of the prototypes of qualified Participants at a pre-determined time and date. In addition to prototypes, adaptation of existing technologies as well as innovations on energy management will be eligible for support provided they meet the criteria set by the Expert Panel.

Identification of the Challenges

The first stage of the process, overseen by the Steering Committee and undertaken by the Expert Panels, includes the preparation of a Technical Needs Assessment (TNA) under the pre-identified three technology

categories. The TNA would include customer requirements in the relevant areas of interventions based on potential "performance-cost frontier". The BEE and PMU will use their deployment channels (i.e. industry linkages) and seek financing for potential projects (i.e. using BEE's other resources to assist scale up; provision for outside financiers who are willing to invest etc.) to propagate the technologies.

Innovation challenges provide incentives for specific innovations, rather than reward excellence in general. The six basic kinds of innovation challenges[8] are classified as following:

- Exemplar: Grant competitions that focus attention on, set standards in, or influence perceptions of a particular field or issue.
- Exposition: Highlight a range of best practices, ideas, or opportunities within a field.
- Network: Create and strengthen a particular innovation community.
- Participation: Educate and change the behaviour of participants through the prize process.
- Market stimulation: Emulate market incentives by driving costs down through competition and exposing latent demand.
- Point Solution: Solve a challenging, well-defined problem that requires innovation.

Different deployment aims, like market creation, technology upgrade, product commercialization, etc. can be addressed by competitions of different kinds. While the precise kind of challenge will be identified by the Expert Panels for each technology area and approved by the Steering Committee and the BEE, it is expected that most of the challenges will be of the Point Solution type. The indicative size of each challenge competition award grant would be around $50,000 (component I under GEF grant). However, this would require further discussion and agreement with the expert panels during the start-up phase[9], subject to deployment and its geographical distribution and based on conditions set out in the challenge announcement. The Panels, based on industry requirements, will have the option to specify whether all participating entries meeting the specifications will be awarded, or the highest performing entries only. Additional grant or deployment support including increase in award grant, if considered necessary, would be met out of the co-financing (in cash) to be provided by the BEE.

It is expected that the cycle of challenges from identification to announcement and testing will be completed in twelve to eighteen months, followed by an additional eighteen months available for deployment.

It is expected that each of the three Expert Panels will identify two or four challenges for the competitions, such that at least two to three cycles of challenges and deployments can be completed during the project implementation period. The exact number of challenges to be set out would be decided by the Steering Committee, upon advice from BEE and Expert Panels (which will include industrial, academic and financial sector representatives).

The management of the innovation challenges will be the responsibility of BEE (the execution agency) assisted by the PMU, with advice on technological aspects of the challenge applications from the Expert Panels. The flow chart in page 37 encapsulates the process – from ideation to implantation stage.

In consultations with UNIDO, BEE has already undertaken a call for Expressions of Interest (EOI) for short-listing the suitable financial institution (details are enclosed as Annex E). After revalidation and verification of the selected financial institutions by Steering Committee during the inception phase, a detailed RFP will be sent out to the short listed financial institutions for selected the most suitable institution for implementing the facility under the supervision of PMU.

Expected Outcome 1.2. Adoption of improved low-carbon technologies in the Indian economy that would include reduced need for new energy generation capacity.

[8] Jonathan Bays, Tony Goland, Joe Newsum,: *Using Prizes to Spur Innovation* , McKinsey Quarterly, July 2009

[9] In case of several entries meeting the specifications set out in the challenge statement, the most efficient entry would be selected.

Expected Outputs:

1.2.1. Targeted innovation and development to meet identified low-carbon technology needs awarded

1.2.2. Approximately 120 low-carbon innovations demonstrated, and around one third of winning technology innovations (40) commercially scaled up and deployed as business models

Winners of the innovation challenge will receive awards as specified in the innovation announcement. The award will be allocated to winners in tranches; 50 % for success in the innovation challenge, 30% for meeting deployment-linked milestones (however, not more than 50% of the cost of each deployment will be covered under the project, with the rest expected from the award winners or the partner industries), and 20% for legal and technical services for winning prototypes that the winners can access through the PMU. Under this component, the BEE would provide deployment support including legal, incubation, intellectual property services such as feasibility report creation, to teams and innovators that emerge from the competitions. Financial support will be made available from the BEE and external venture capital funds through selected financial institutions. Selected financial institutions shall be required to provide debt / equity capital, or extend loans / grants to the eligible innovators whose designs / prototypes have been accepted for further filed testing / implementation under terms to be devised by the financial institution and approved by BEE and Project Steering Committee.

The BEE, together with the innovators, would define deployment milestones with each innovator. The innovator will receive the 50% of the award grant up front in order to fund deployment costs. If the innovator meets the milestone in the agreed time, they will be eligible to receive an additional deployment award. If they are not able to deploy their technology in the agreed volume and within the agreed time frame, they will not receive additional financial support from the project. The BEE, assisted by the PMU, would work with the teams to provide administrative and legal support to help deploy these technologies in industries, assisted by the Expert Panels, and overseen by selected Financial Institutions. For the winners that are unable to meet the defined milestones, continued support will be possible through the Technology Transfer Support Facility (component 2) and the related networking and capacity building opportunities.

Component II - Technical assistance for Technology Transfer Support Facility:

Expected Outcome 2.1. Establishment of an innovation ecosystem for deployment support of low-carbon technologies

Expected Outputs:

2.1.1. Appropriate networks and centres for research and deployment of low-carbon technologies verified.

2.1.2. Technology Transfer Support Facility established, consisting of technology-specific, application-oriented Deployment Groups and a Technology Transfer Support Cell

2.1.3. Consultations/ workshops with international/ national experts, with documentation and dissemination of the Facility carried out.

This component will support to create an innovation ecosystem for low-carbon and sustainable energy solution providers in India, and those interested in the Indian energy industry. This ecosystem is expected to play a pivotal role for India's innovation culture in low-carbon technologies and fields. A focused effort to gather and disseminate good practices will be undertaken by the project team in this regard. The proposed project will coordinate with other similar international efforts like the Climate Innovation Centres, as is critical for creating and sharing knowledge that can help mitigate climate change.

The objective of component 2 is to establish a deployment support ecosystem for clean, low carbon and energy efficient technologies. To this end the project will identify 5-10 appropriate networks and centers for research

and deployment of identified climate mitigation technologies. The PMU will also be creating an innovation ecosystem that continually provides demand for innovation and scale up investments for innovators.

Technology Transfer Support Facility, which will be established under the BEE supervision, and consist of technology-specific, application-oriented Deployment Groups and a Technology Transfer Support Cell, this will assure sustainability of the project's activities after the closure date. Under this component, capacity building activities through consultations/workshops with international/national experts, with documentation and dissemination of the Facility will be carried out. Furthermore Strategic consultations on designing a work plan for scaling-up the project in order to expand it to different regions will be started one year prior to the end of the project.

Under supervision of BEE, this component will incentivize entities (across large industries, SMEs, academia, technology vendors, etc.) from India and other countries to work collaboratively on solving the major prioritized climate mitigation technology challenges within the three pre-identified areas of industry technology, guided by industry and academic experts. It would act as a connector between several entities undertaking near-deployment trials and prototyping, critical stages of technology transfer and adoption10. In addition to being a connector, the project seeks to provide a top down assessment of industry-specified innovation needs in energy efficiency. The national ownership of the project and this top down assessment serves to ensure the sustainability and scaling up the project in a way that the technology development efforts are demand-driven and prototyping would be focused on areas identified in the assessment in an effort to strengthen the tech-to-market link. As such, GEF resources will be used to reinforce this strategy and catalyse innovations and collaborations in the Indian energy sector.

Component III: Project Monitoring and Evaluation

Expected Outcome 3.1: Monitoring and evaluation mechanisms and indicators established to facilitate successful project implementation and sound impact assessment.

Output 3.1.1. Regular monitoring exercises conducted;
Output 3.1.2. Midterm and final evaluation conducted.

This component will formulate the monitoring and evaluation mechanism, undertaking regular monitoring exercises and mid-term and final evaluations to facilitate successful project implementation and sound impact assessment, more details could be found under section C. M& E plan.

A.6. Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

Risk	Rating	Mitigation measure
Political risk: Changes in government priorities resulting in reduced support for the project, delays in activities and overall ineffectiveness of the interventions.	Low	The project seeks to facilitate deployment of low carbon technologies in India that can address technology gaps to mitigate climate change and improve the energy efficiency in selected sectors. The low carbon technology interventions are considered a high priority of the Government. Thus, the risk of a drastic change is unlikely. To mitigate this risk the Project Steering Committee will be closely involved in the project's activities, giving guidance and advice throughout the identification, selection, and intervention processes.

[10] *Development and Climate Change: A Strategic Framework for the World Bank Group;* 2008, World Bank

Technical risk: Lack of energy savings from deployment of efficient technologies	Low	The project builds upon the work done in the past where such technologies have been identified based on field studies and cluster level energy audits. Moreover, the demonstration projects to be conducted using the GEF grant will ensure that only those technologies where the technical performance risk is minimal are taken up. UNIDO and BEE will ensure this by leveraging technical expertise from all stakeholders, including industry, government and others.
Sustainability risk: The risks envisaged here include inability to scale up implementation and lack of financing beyond the project period.	Low	BEE has committed financial resources to ensure that replication occurs beyond the project's implementation period. The Technology Transfer Support Facility will be established in close coordination with a financial institution, which will also ensure that the best practices of project design and implementation are replicated in other clusters.
Financial risk: The risk of non-payment for investments made by EESL/ESCOs	Medium	UNIDO and BEE will not only provide training to industries for building their capacity on the long-term financial benefits of investing in energy efficiency, but the project will also leverage risk mitigation measures that are being set up by BEE, such as the Partial Risk Guarantee Fund under NMEEE.
Climate change risk: The project is not subject to any climate change risks.	None	While no climate changes risks are foreseen, the project will mitigate any potential risks to project demonstration sites by include criteria related to such risks in the cluster surveys, and if a risk is identified, develop a mitigation strategy before implementation begins.
Social and Gender Risk:	Low	Risk of resistance against, or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality. Low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within engineering sector. This Project will pursue thorough and gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as CSOs and NGOs promoting GEEW, and a gender expert. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field.

Overall Risk Rating Explanation

This project is designed to meet technology needs of industry, by creating an innovation ecosystem with academia, financing institutions, government, etc. This design carries inherent risks, which will be addressed during project implementation through support to the client. However, the client, BEE, has strengths in spurring innovation in the country

A.7. Coordination with other relevant GEF financed initiatives

Energy efficiency in Indian industry is supported primarily through interventions by the Government of India, as well as through projects and programmes implemented by various multilateral, bilateral and development agencies.

This support is extended across both large, as well as MSME industry sectors. The work of international organizations focuses mainly on the MSME sector; the World Bank, UNDP and UNIDO with support from the GEF are implementing projects focusing on fostering energy efficiency investments across numerous energy-intensive sectors such as foundry, forging, dairy, chemicals, brick, steel re-rolling etc. The proposed project will take advantage of synergies with the on-going and planned GEF-funded initiatives, including GEF WB projects on Financing energy efficiency at MSMEs (GEF ID #3551), and Partial Risk Sharing Facility for Energy Efficiency (GEF ID #4918). This proposed project is highly complementary to those projects that seek to promote risk reduction mechanisms. The project addresses the ESCOs and industries themselves as the main beneficiaries – helping to address barriers related to "first movers" within industry and among ESCOs. Efforts will also be made to cooperate, where relevant, with the various on-going projects that focus on chillers, railways and commercial buildings under the Programmatic Framework for Energy Efficiency in India (GEF ID #3538).

The proposed project will also take advantage of synergies with the UNIDO-GEF projects on Promoting Energy Efficiency and Renewable Energy in Selected MSME Clusters in India (GEF ID #3553), Promoting Business Models for Increasing Penetration and Scaling Up of Solar Energy (GEF ID #4788), Promoting Market Transformation for Energy Efficiency in Micro, Small & Medium Enterprises (GEF ID # 4893), and the Cleantech Programme for SMEs in India (GEF ID #5218).

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

A. Institutional and Execution Arrangements

UNIDO is the Implementing Agency (IA) of the proposed project and a member of the Project Steering Committee (PSC). UNIDO is a specialized agency of the United Nations that promotes inclusive and sustainable industrial development (ISID). The Organization draws on four mutually reinforcing categories of services: technical cooperation, analytical and policy advisory services, standard setting and compliance, and a convening function for knowledge transfer and networking.
The execution agency, BEE, will manage the challenges, assisted by a Project management unit (PMU), with technological advice on the innovation challenges from the Expert Panels. The BEE, the PMU and the Expert Panels will be referred to as "The Facility" henceforth.
The BEE is a parliament-created body mandated to provide technical and financial assistance to industrial concerns and other agencies attempting development and commercial application of indigenous technology, or adapting imported technology for wider domestic application11. The BEE has been working extensively to advance technology adoption in the areas of agriculture and agro-processing, textiles, information and communication technologies and pharmaceuticals and vaccines. BEE is financed out of access levied on all technology imports in to the country, making them financially independent of the government's regular budget. Through the proposed project the BEE expects to gain experience with the methodology of innovation challenges as an instrument to match technology gaps with innovation and deployment. Furthermore, BEE sees this experience as critical in its mission to promote clean technology innovation in India.

Following successful demonstration of the proposed concept, BEE will be able to integrate the methodology of challenge competition in their ongoing support to technology development in India. In addition, their experience with the energy efficiency sector will help them gain critical confidence in a new sector and as such, expand their support to clean-tech technology transfer. In this regard, experience gained from the early innovation challenges will be documented and disseminated in BEE and its incubation centers, for streamlining in BEEs regular operations.

The institutional structure of the Facility will constitute of the following components:

[11] Technology Development Board Annual Report, 2010-2011

National Steering Committee: The project would be overseen by a high-level Steering Committee, comprised of six eminent personalities in the field of energy. This Steering Committee, chaired by the Director General of the Bureau of Energy Efficiency (BEE), will comprise of UNIDO, technical experts (national and international) and one representative from the financial sector in India. In addition, a representative of the Ministry of Environment, Forest and Climate Change (MOEFCC) will be included as a member of the Steering Committee. This Committee will have the authority to invite external observers and advisors, as required for the project, from user representatives, industry experts, financial sector experts, government representatives, academics and other stakeholders. The UNIDO is engaged on several clean-tech development projects around the world. Appropriate linkages with these projects and experts will be explored to assist in project implementation. This committee will provide guidance and oversight to the project, decide areas of focus, and propose collaborations and partnerships. The Steering Committee will also ensure adherence to the environmental norms laid down under the project. However, the Steering Committee will not be responsible for the operations of the project. The Steering committee would meet regularly to discuss strategic direction and assess regularly progress reports and budget. In addition, any changes to the WP will be done in accordance with the approved PD and GEF document C 39.Inf 04.

BEE and Expert Panels: The BEE, as the executing agency, will appoint Members of Expert Panels for each of the three technology areas identified under the project in consultation with the Steering Committee. The Expert Panels12 will be headed by a Convenor of each technology area13. The Expert Panels will comprise of academic, technology vendor and user industry experts in addition to a BEE appointed expert14. The Expert Panels will be responsible for identification of technology gaps; design of the innovation challenges in consultation with industry; creation of prototype testing facilities for each challenge; setting the rules and conditions for judging of the entries; outlining the milestones for each challenge; and assisting the award winners to match technology gaps with the newly developed prototypes.

Convener(s): Each Expert Panel will be headed by a Convenor, appointed for the duration of the project. This convenor (who may have responsibility for multiple technology areas, as per requirement and availability of human resources) will manage the daily operations of the sub-projects under each technology area and be selected from within the Expert Panel, as advised by the Steering Committee. The PMU will collaborate with the Convenor(s) for the project activities. These convenors will be paid market-comparable remuneration, through the project's TA component.

Partner Financial Institutions: In consultations with UNIDO, BEE has already undertaken a call for Expressions of Interest (EOI) for short-listing the suitable financial institution (details are enclosed as Annex E). After revalidation and verification of the selected financial institutions by Steering Committee during the inception phase, a detailed RFP will be sent out to the short listed financial institutions for selected the most suitable institution for implementing the facility under the supervision of PMU.

Project Management Unit (PMU): The Project Management Unit (PMU) will support the Expert Panels with daily operations of the Facility. The PMU will be competitively selected. The PMU will also facilitate legal, incubation and Intellectual Property support to the winners of these award challenges (as and when required), as guided by the BEE and the Steering Committee. Since this project also aims at enhancing the collaboration between academia, industry and consumers for these areas of deployment, the PMU will facilitate technology

[12] These Experts will not be paid from the project fund, but their travel and stay for the project will be reimbursed.
[13] There can be an individual convener for each Expert Panel or a multiple (or all) of them – as per requirements during implementation.
[14] The BEE can invite additional experts from industry and the financial sector as per requirement

areas-specific seminars and meetings with top industry and academia experts to inform the innovation challenges and their participants. The PMU will be responsible for arranging the audit of milestone-based payments.

An operations manual, as prepared by BEE with UNIDO assistance, will guide the project execution. This Operations Manual details the roles and responsibilities of the BEE, the PMU, award winners etc. throughout the implementation period. This Manual also includes guidelines for design of award challenges, management, financial reporting, legal support, conflict of interest, etc. The BEE, with the support of the PMU, will ensure adherence to this Operations Manual by the various stakeholders of the project. The BEE would also use its mandate as India's technology transfer body to create links with other countries working with similar technologies.

The project structure will involve various stakeholders from the government, private, academia, financial and research sectors.

UNIDO Implementing Agency	UNIDO is a specialized agency of the United Nations that promotes inclusive and sustainable industrial development (ISID). The Organization draws on four mutually reinforcing categories of services: technical cooperation, analytical and policy advisory services, standard setting and compliance, and a convening function for knowledge transfer and networking. UNIDO is the Implementing Agency (IA) of the proposed project and a member of the Project Steering Committee (PSC).
Bureau of Energy Efficiency (BEE)	BEE will be the executing agency in the project, and DG, BEE will be the Chair of the Project Steering Committee.
GEF Operational Focal Point of India, Ministry of Environment, Forests and Climate Change (MoEFCC)	The GEF Operation Focal Point of India will be a member of the Project Steering Committee.
Gender Dimensions	Civil Society Organizations (CSOs) and Non-Governmental Organizations (NGOs): Relevant CSOs and NGOs, including those focusing on gender equality issues and advocating women's empowerment, such as women's associations (also see Annex), will be invited to participate in the implementation phase of the project, and consultations will be held to confirm their roles in project execution. Regular consultations with both female and male stakeholders and local beneficiaries will ensure that the project's impact on and appropriation by the local communities can be assessed throughout project implementation. Equal participation of women will be encouraged as experts, conveners and consultants for training and capacity building activities, as well as in expert panels. Project stakeholders, for instance partner financial institutions, will be encouraged to nominate female employees to participate in the project. Efforts will also be made to include gender focal points from relevant ministries in the Project Steering Committee meetings where possible. Project Steering Committee / National Steering Committee will make efforts to assure gender-balanced members.
Other stakeholders:	These will include national experts, consultants, vendors, suppliers, business development service (BDS) providers, local banks and financing institutions who will be participants in the training programmes and capacity building workshops (either as faculty or as recipients).

Figure 3 details the institutional structure and implementation arrangements for the project:

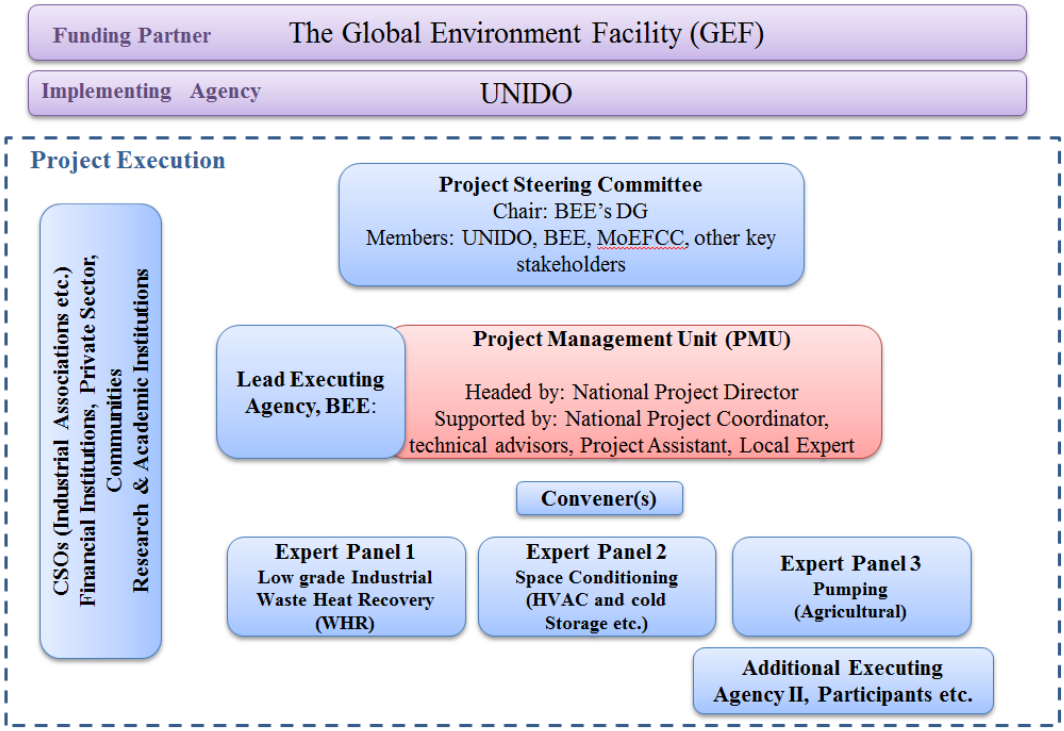


Figure 3: Institutional Structure and Implementation Arrangement

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

Given the large potential market for low-carbon technologies, together with regulations that encourage or mandate their use, India can do more to stimulate domestic low carbon technology innovation. By unlocking this market, India can unleash hidden economic potential to trigger growth and job creation for both women and men, which can lead to poverty alleviation and boost shared prosperity for all people. Since there are no adverse social impacts from the interventions, no mitigation plans have been prepared. However, the project will ensure that the interventions do not involve any land acquisition/land take/relocation/resettlement; and that there are no impacts on assets infrastructure and livelihood on any persons (with or without titles) resulting from the interventions.

This project focuses on promoting innovation in three energy efficiency technology areas mentioned above: (a) low grade industrial waste heat recovery (WHR); (b) space conditioning (HVAC and cold storage etc.); and (c) pumping (agricultural). As a first measure towards addressing the environmental concerns, the technical specifications will include environmental conditions to be met by the participating prototypes. For each of these areas, the project will address: (i) environmental guidance to be followed in the design of the challenges by the Expert Panels; and (ii) environmental protection and health and safety norms be followed during testing.

In order to facilitate this effort, the project will follow a structured Environmental Management Framework followed by UNIDO. The framework will primarily define the environmental due diligence requirements, like any exclusion criteria (for example, refrigeration or cold storage should not depend on the use of substances banned under the Montreal Protocol; any prototypes in the field of waste heat recovery should not rely on the use of material(s) that use high-potential greenhouse gases like HFCs, etc.)

The environmental protection guidelines under the project will extend only as far as the prototypes' testing. The deployment in partner industries will be commercial decision, beyond the project's scope.

In the case of India, it is widely recognized that there are huge untapped opportunities in energy efficiency. Fundamentally, energy efficiency is the lowest-cost instrument to achieve India's objectives for low carbon growth. The ADB recently estimated that India must invest USD 4.5 billion per year through 2020 in order to meet established energy saving targets. In addition, opportunities for energy savings are enormous. In the case of the commercial sector, the BEE has estimated that 30-50% energy savings potential, while in the industrial sector savings on the order of 7% could easily be achieved through innovation, deployment, and market transformation.

Nonetheless, we can build a theoretical analytical framework to assess the potential magnitude and direction of the project benefits. To start with, we consider that total electricity consumption in India in 2012 was 773 TWh (Figure 1). Industry is the largest consumption sector, followed by the domestic sector (170 TWh), agriculture (134 TWh), and the commercial sector (69 TWh). Within the commercial sector, 55% of energy consumed, or over 38 TWh, is used for heating and cooling.

As a result of market uptake of innovative technologies, grid electricity consumption is reduced by over 3.5 TWh over the ten-year period. This corresponds to 2.3 million tons of CO2 avoided, at a cost of $3.99 per ton. The project has a positive EIRR of 35% and an NPV of $56 million not including environmental benefits.

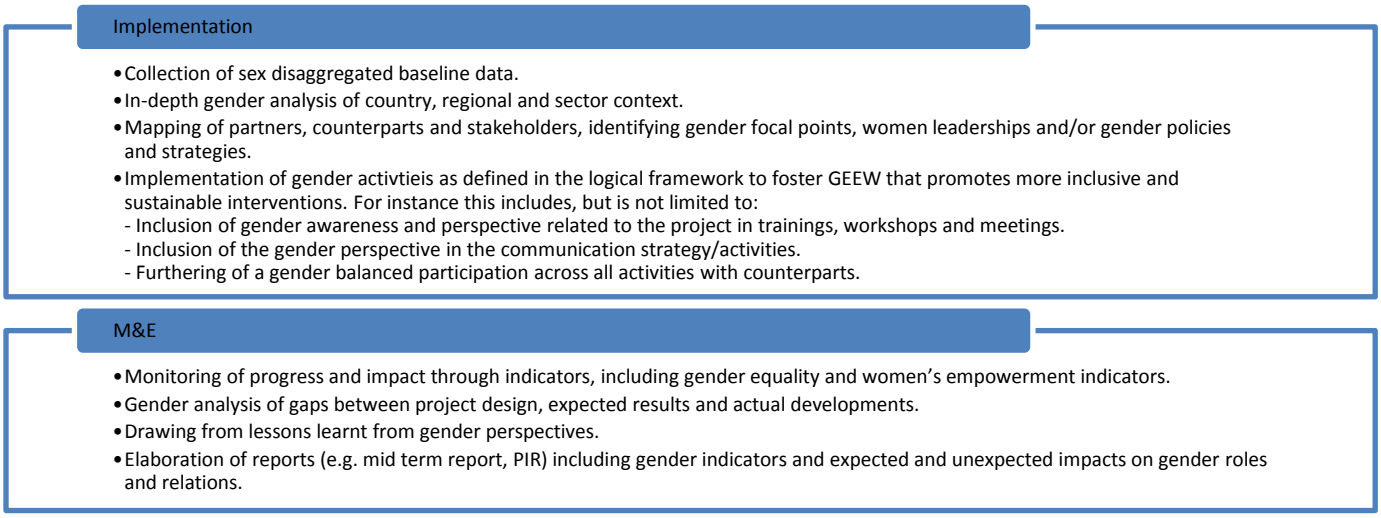
Gender Mainstreaming of UNIDO energy projects

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. In addition to the UNIDO Policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy, UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives.

All energy interventions are expected to have an impact on people and are, therefore, not gender-neutral15. In fact, due to diverging needs and rights regarding energy consumption and production, women and men are expected to be affected differently by the project (in terms of their rights, needs, roles, opportunities, etc.). Therefore, this project aims to demonstrate good practices in mainstreaming gender aspects into sustainable energy projects, wherever possible, and avoid negative impacts on women or men due to their gender, ethnicity, social status or age. Consequently, it will be considered to include gender dimensions during the whole project cycle. Figure 1: Gender mainstreaming the project cycle below provides an overview of key issues that will be further considered during the gender mainstreaming of the next steps in the project cycle. Depending on the type of intervention and scope of activities, the degree of relevance of gender dimensions may vary.

[15] ENERGIA "Turning Information into Empowerment: Strengthening Gender and Energy Networking in Africa. Leusden, 2008; Joy Clancy "Later Developers: Gender Mainstreaming in the Energy Sector", 2009

Figure 1: Key issues of gender mainstreaming the project cycle



During the project preparatory phase, a preliminary gender analysis of the country context has been conducted, based on which potential gender dimensions of project outcomes and outputs, as well as potential entry points for gender equality and women's empowerment (GEEW) were identified. To the extent possible, many expected results have already included gender-disaggregated indicators and target. Key gender dimensions of the project outcomes and outputs as well as potential gender-relevant indicators are provided in the logical framework in Table 1: Selected Gender Dimensions (Annex VI). These identified gender dimensions will be verified during a detailed gender analysis during project inception as part of the capacity assessments of the project and used as a guide during the inception and implementation of the project as well as during M&E.

Guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access, participate in, and benefit from the project, without compromising the technical quality of the project results.

In practical terms:

- Gender-sensitive recruitment will be practiced at all levels where possible, especially in selection of project staff, experts and consultants. Gender responsive TORs will be used to mainstream gender in the activities of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained and their awareness raised regarding gender issues.
- All decision-making processes will consider gender dimensions and consult, wherever feasible, representatives of CSOs and NGOs promoting gender equality and empowerment of women (providing them with equal voice). At project management level, the Project Steering Committee will make efforts to be gender balanced and/ or during meetings will invite observers or gender focal points to ensure that gender dimensions are taken into consideration. Also at the level of project activity implementation, efforts will be made to consult with stakeholders focusing on gender equality and women's empowerment issues. This is especially relevant in policy review and formulation.
- To the extent possible, efforts will be made to promote participation of women in competition activities, both at managerial and technical levels, as participants and organizers. This can include advertising of the events to women's technical associations, encouraging companies to send female employees, provide childcare and safe transport, offer scholarships or reduced fees for women, adjusting TOR for selection of the trainers, etc.

- When data-collection or assessments are conducted as part of project implementation, gender dimensions will be considered particularly with reference to the impact of low carbon technologies on the livelihood of communities. This can include sex-disaggregated data collection, performing gender analysis as part of ESIAs, etc.
- Similarly, participating industries with female entrepreneurs will also be selected on priority basis.

B.3. Explain how cost-effectiveness is reflected in the project design:

The proposed project that will benefit from the support of the GEF will result in deployment of low-carbon technologies in India that can address technology gaps to mitigate climate change and improve the energy efficiency in selected sectors. The direct energy saved from the successful implementation of the project will lead to a reduction of CO2eq emissions. Considering the GEF-GHG accounting methodology, it is estimated that 2,277,974 tonnes of CO2eq over the 10-year lifetime of the measures expected to be carried out during project implementation.

Given GEF funding of USD 8,712,328 (excluding agency fees) for this project, the avoided cost based on direct emissions reduction is 3.99 USD per tonne of CO2eq. Therefore, the cost effectiveness of the GEF contribution to this proposed project is very reasonable and acceptable.

Additional information on the calculations for GHG reductions is provided in Annex H of the Project Document.

C. DESCRIBE THE BUDGETED M & E PLAN:

Monitoring and evaluation (M&E) will include reports summarizing the overall progress and that of individual investment pilot projects that receive financing. These reports will be available for official use for the project's indicative M&E plan.

According to the M&E policy of the GEF and UNIDO, follow-up studies including final / mid-term evaluations and thematic evaluations, wherever found necessary, will be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project; and (ii) facilitate interviews with the staff and key stakeholders involved in the project activities.

A comprehensive M&E framework will be used to assess the project's impact on GHG emissions reduction in the industrial sector in India. To facilitate reporting of progress and impacts to the GEF Secretariat and UNIDO, there will be three main processes:

i) Internal Tracking: the PMU will collect market level data from official sources, private sector stakeholders, and partner government officials and agencies at regular intervals throughout the project's implementation period. This includes the monitoring of performance indicators in the Project Results Framework and the use of a GHG accounting methodology. Internal tracking will inform both the Midterm Review and the Final Evaluation. Participating stakeholders in the project such as the industries implementing EE technologies will be required to provide information on energy savings and other benefits achieved under the project as part of the agreements to be signed. The PMU will be responsible for preparation of regular progress reports with full support of, and in agreement with, the participating companies, municipalities, selected Financial Institutions and other beneficiaries.

ii) Midterm Review (MTR) and iii) Final Evaluation - The GEF Monitoring and Evaluation Policy (2010, page 1) has two overarching objectives:

Promote accountability for the achievement of GEF objectives through the assessment of results, effectiveness, processes, and performance of the partners involved in GEF activities. GEF results will be monitored and evaluated for their contribution to global environmental benefits; and
Promote learning, feedback, and knowledge sharing on results and lessons learned between the GEF and its partners, as a basis for decision making on policies, strategies, program management, projects, and programs; and to improve performance.

The Midterm Review and Final Evaluation will examine the Project's performance with respect to the planning and adaptive management requirements of both UNIDO and the GEF (The GEF Monitoring and Evaluation Policy 2010). UNIDO uses a Results Based Management approach, captured in the Project Results Framework (Annex A), which includes performance indicators, targets and timelines. In addition to the reporting on the internal tracking of performance indicators, review and evaluation will focus on the following principal dimensions that are in agreement with the general guidelines of the GEF Monitoring and Evaluation Policy 2010:

- **Relevance** – the extent to which the activity is suited to local and national environmental priorities and policies and to global environmental benefits to which the GEF is dedicated; this analysis includes an assessment of changes in relevance over time.
- **Effectiveness** – the extent to which an objective has been achieved or how likely it is to be achieved.
- **Efficiency** – the extent to which results have been delivered with the least costly resources possible.
- **Results** – in GEF terms, results include direct project outputs, short- to medium-term outcomes, and progress toward longer-term impact including global environmental benefits, replication effects, and other local effects.
- **Sustainability** – the likely ability of an intervention to continue to deliver benefits for an extended period of time after completion; projects need to be environmentally as well as financially and socially sustainable.

MTRs are important and valuable instruments for generating real-time learning as project activities unfold, and may therefore lead to mid-term improvements and evidence-based corrective actions ensuring that activities are on track to achieve planned outcomes. A review of progress at midpoint is part of the transparent and accountable management practices of UNIDO and the GEF. The MTR will have the following aims:
- To enhance project and sector-level learning;
- To enable informed decision-making about next steps;
- To strengthen the adaptive management of the Program; and
- To ensure accountability for the achievement of the Project's objective.

The MTR, TE and PIRs will be shared with GEF OFP India for review comments and rating before the same are submitted by UNIDO to the GEF secretariat on an annual basis

The monitoring and evaluation will be financed with US$ 100,000 budgeted including $45,000 for contracting external evaluation contractors - who must adhere to the internationally recognized professional standards that are applied to GEF project reviews and evaluations, as set out in the GEF Evaluation Principles and Criteria and Minimum Requirements, (The GEF Monitoring and Evaluation Policy 2010, page 27). Other costs associated with data collection will be included in the staff costs for team members in the day-to-day execution of their tasks and not tracked separately.

The PMU established in the BEE will hold responsibility for continuous monitoring of project activities execution, performance and track progress towards milestones. UNIDO will be responsible for overall implementation and tracking overall project milestones and progress towards the achievement of the set project outputs. The UNIDO Project Manager will be responsible for narrative reporting to the GEF, as indicated in the above table. The country level activities will be coordinated by the UNIDO Regional Director based in New Delhi.

All monitoring and evaluation documents, such as progress reports, final evaluation report, and thematic evaluations (such as training needs assessment), will include gender dimensions or a section reflecting gender

impacts of the project wherever possible. In addition, it will be considered to develop a gender strategy for low carbon facilitates and/ or a women's chapter allowing female innovators to connect with each other. This can be instrumental in up scaling this project into other countries.

The following table presents the budgeted monitoring and evaluation plan of this project. The M&E Plan is detailed in the Annex I.

Type of M&E activity	**Engaged Parties**	**Budget US$** *Excluding project team Staff time*	**Time frame**
Measurement of Means of Verification for Project Progress and Performance	UNIDO, M&E expert	10,000	Start verification of projects annually and at the project end
Semi-Annual project progress reports	PMU	10,000	Every six months
Knowledge Management/Promotional Materials	PMU	15,000	As required
Midterm Review	UNIDO, External consultants	20,000	At mid-point of project implementation
Project Terminal Report	UNIDO, PMU	10,000	At end of project implementation
Project Final Evaluation	Independent evaluator, PMU, UNIDO PM, and UNIDO Evaluation Group	35,000	Within 6 months of completion of project implementation
TOTAL indicative COST		**USD 100,000**	

E. LEGAL CONTEXT:

The Government of the Republic of India agrees to apply to the present project, mutatis mutandis, the provisions of the Revised Standard Technical Assistance Agreement concluded between the United Nations and the Specialized Agencies and the Government on 31 August 1956 and as amended on 3 October 1963.

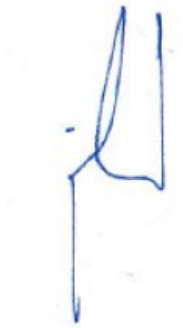
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Susheel Kumar	Additional Secretary & India's GEF OFP	MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE	09/15/2015

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency name	Signature	Date *(MM/dd/yyyy)*	Project Contact Person	Telephone	Email
Mr. Philippe R. Scholtès Managing Director Programme Development and Technical Cooperation Division - PTC UNIDO GEF Focal Point		12-18-2015	Mr. Pradeep Monga Director PTC/ENE	+43-1-26026-3018	p.monga@unido.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project Narrative	Indicator	Baseline	Target	Sources of Verification	Assumptions/Risks
Project objective To facilitate deployment and scaling up of low carbon technologies in India that can address technology gaps to mitigate climate change and promote use of energy efficiency and renewable energy technologies and systems in selected sectors.	1) Number of low-carbon technology innovation entries that meet the specifications of the challenges 2) Number of entities/industries where selected innovations have been commercially deployed 3) Investment into low carbon technologies in the three technology areas due to increased interest in the project 4) Estimated tons of future GHG emissions reduction to be directly or indirectly avoided due to market deployment of low carbon technologies	Limited direct and indirect energy savings by industry; Limited investment in energy efficiency innovations.	• Demonstration of approximately 120 low-carbon innovations that meet specifications of the challenges, at least 20-50% more efficient than the state-of-art available in the market. • Commercially scaling up and deployment of approximately 40 winning technology innovations with stakeholder companies/industries and users • Reduction of CO2eq emissions of approximately 2,3 million tonnes over the 10-year lifetime	Project Implementation Review; Semi-Annual Progress Report; Periodic Thematic Reports; Technical Reports; Terminal Review; Midterm Review; Final evaluation.	Assumes continued support of government bodies and banking institutions; Assumes it will be possible to convince industries to undertake low-risk investments.

Project Narrative	Indicator	Baseline	Target	Sources of Verification	Assumptions/Risks
Component 1: Innovation Ecosystem for selecting technology innovators and instituting competitive awards and policy incentives					
Outcome 1.1: Collaboration between government agencies, industry, innovators, the research community, financing institutions, and technology experts in the field of innovative low carbon technologies strengthened.					
1.1.1. Expert Panels instituted for three selected technology areas namely low-grade industrial waste heat recovery (WHR), space conditioning (HVAC, cold storage etc.) and pumping (agricultural) 1.1.2. Twenty Innovation Challenge competitions conducted, resulting in at least two winning entries for each area (120 winners in total;(20 competitions x 3 sectors x 2 winners) 1.1.3. Financial institutions revalidated in the inception phase and engaged to manage the funds and provide debt and equity to the participating entities.	1) Number of challenge competitions that are with at least two winning entries for each area meeting the technical specifications (gender-disaggregated) 2) Number of entities (Challenge winners) that accessed technical and advisory services under the project (gender-disaggregated) 3) Number of Financial Institutions that provide debt and equity to the participating entities	Limited institutional capacity to conduct technology innovation competitions No dedicated platform for low carbon innovation that includes a variety of actors;	• Create approximately 20 challenge competitions that are able to attract at least two winning entries for each area, meeting the technical specifications) • Complete challenge cycle, from identification to announcement and testing, in 12 to 18 months. • Approximately 120 entries (Challenge winners) that accessed technical and advisory services under the project • At least 3 Financial Institutions identified that provide debt and equity to the participating entries.	Project progress and evaluation reports; Feedback from entrepreneurs trained and mentored through surveys and interviews.	Continuous support from the Government and national partner institutions; Sufficient commitment and participation by national experts and mentors.

Project Narrative	Indicator	Baseline	Target	Sources of Verification	Assumptions/Risks
			• Targets for gender balance and women's empowerment will be defined during inception based on the baseline study		
Outcome 1.2: Adoption of improved low-carbon technologies in the Indian economy, that would include reduced need for new energy generation capacity					
1.2.1. Targeted innovation and technology development to meet identified low-carbon technology needs awarded 1.2.2. Approximately 120 low carbon innovations demonstrated and around one third of winning technology innovations (40)commercially scaled up and deployed as business models	1) Allocation of awards to winners in trenches (gender-disaggregated) 2) Number of entities participating in the competitions (not counting consortiums) (gender-disaggregated) 3)Number of commercially deployed carbon technology prototypes (gender-disaggregated)		• Allocation of awards to winners in tranches- 50% success in innovation challenge, 30% meeting deployment-linked milestones, 20% legal and technical services for wining prototypes • Demonstration of around 120 low-carbon innovations that meet specifications of the challenges, at least 20-50% more efficient than the state-of-art available in the market, and 40 winning technology innovations	Project progress and evaluation reports; Survey of competition participants and other stakeholders.	Continuous support and participation by government, R&D institutions and SMEs; Sufficient commitment and participation by the experts, mentors.

Project Narrative	Indicator	Baseline	Target	Sources of Verification	Assumptions/Risks
			commercially scaled-up and deployed as business models • Targets for gender balance and women's empowerment will be defined during inception based on the baseline study		

Project Narrative	Indicator	Baseline	Target	Sources of Verification	Assumptions/Risks
Component 2: Technical assistance for Technology Transfer Support Facility					
Outcome 2.1: Establishment of an innovation ecosystem for deployment support of low carbon technologies					
2.1.1. Appropriate networks and centres for research and deployment of low-carbon technologies verified. 2.1.2. Technology Transfer Support Facility established, consisting of technology-specific, application-oriented Deployment Groups and a Technology Transfer Support Cell 2.1.3.Consultations/ workshops with international/ national experts, with documentation and dissemination of the Facility carried out.	1) Number of networks and centres for research and deployment identified 2) Technology Transfer Support Facility is established 3) Number of consultations held to promote participatory and inclusive approach (women's associations have been consulted # and % of female/ male experts participated in the consultations/ workshops Consideration of gender dimensions in consultations/ workshops)	Presently, there is lack of awareness on such initiatives present. Absence of coordinated approach on such consultations and effective follow up	Identify 5-10 networks and centres for research and deployment of different climate mitigation technologies Technology Transfer Support Facility becomes fully operational At least 5 consultations / workshops held to promote participatory and inclusive approach Targets for gender balance and women's empowerment will be defined during inception based on the baseline study	Project progress and evaluation reports;	Continuous support from the Government and national partner institutions; Commitment from project partners and committed participation of SMEs and entrepreneurs.

Arrangements for Results Monitoring

PDO	**Project Outcome Indicators**	**Description (indicator definition etc.)**
The Project's Development Objective is to facilitate the commercial deployment of low carbon technologies (energy efficiency and renewable energy technologies) in India	1) Number of low carbon innovations demonstrated 2) Number of entities/industries where selected innovations are commercially deployed as business models 3 Estimated tons of future GHG emissions reduction to be avoided due to deployment to market of low carbon technologies	• Low carbon innovations refer to new technologies that would meet specifications of the challenges, at least 20-50% more energy efficient than the state-of-art technologies available in the market. • Commercial Scale-Up and Deployment of winning technologies refer to installation of winning technology innovations as business models with stakeholder companies/industries and users • At the end of the Project, the estimated tons of future GHG emissions avoided due to market deployment of low carbon technologies will be estimated using the methodology defined in the economic analysis
Intermediate Outcomes	**Intermediate Outcome Indicators**	**Description (indicator definition etc.)**
	1) Number of entities (Challenge winners) that accessed technical and advisory services under the project 2) Number of challenge competitions that are able to attract at least one entry meeting the technical specifications 3) Number of entities participating in the competitions (not counting consortiums)	• Entities refer to Participants in the Challenges, which could include Universities, Research Institutes, R&D Companies, small and medium industries, large industries, start-ups, etc. • Challenge competitions refer to the Innovation Challenges in Component 1 of the Project.

Project Outcome Indicators	Target Values*					Data Collection and Reporting		
	Baseline	YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Number of low-carbon innovations demonstrated	0	20	25	35	40	Regularly, based on each challenge competition	Based on actual participation and winners	PMU
Number of entities/industries where selected winning technology innovations commercially deployed as business models	0	0	5	15	20	Regularly, based on each challenge competition	Based on actual participation and winners	PMU
Estimated tons of future GHG emissions reduction to be avoided due to deployment to market of low-carbon technologies	0	0	0	0	2,277,974	At the conclusion of the project	Based on actual participation and winners	PMU

Intermediate Outcome Indicators	Target Values					Data Collection and Reporting		
	Baseline	YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Number of entities (Challenge winners) that accessed technical and advisory services under the project	0	20	25	35	40		Based on actual participation and winners	PMU
Number of challenge competitions that are able to attract 2 winning entries for each area meeting the technical specifications	0	2	4	6	8		All challenges that are successful in attracting at least one winning entry.	PMU
Number of entities participating in the competitions (not counting consortiums)	0	60	120	180	240	For each challenge competition	Based on actual participation and winners	PMU

Project timeline

Timeline: Facility for Low Carbon Technology Deployment																				
Component 1: Innovation Ecosystem for selecting technology innovators and instituting competitive awards and policy incentives	Year one				Year two				Year three				Year four				Year five			
Expected Outcome1.1 : I Collaboration between government agencies, industry, innovators, the research community, financing institutions, and technology experts in the field of innovative low-carbon technologies strengthened.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.1.1.Expert Panels instituted																				
1.1.2. 2Twenty0 Innovation Challenge competitions conducted																				
1.1.3. Financial institutions revalidated																				
Expected Outcome1.2 : Adoption of improved low-carbon technologies in the Indian economy, that would reduce need for new energy generation capacity	Year one				Year two				Year three				Year four				Year five			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.2.1 Targeted innovation and technology development to meet identified climate technology needs awarded																				
1.2.2. Approximately 120 low carbon innovations demonstrated																				
Component 2: Technical assistance for Technology Transfer Support Facility	Year one				Year two				Year three				Year four				Year five			
Expected Outcome 2.1: Establishment of an innovation ecosystem for **deployment support of low carbon technologies**	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2.1.1. Appropriate networks and centres for research and deployment of low-carbon technologies verified. 2.1.2. Technology Transfer Support Facility established																				
2.1.3. Consultations/ workshops with international/ national experts, with documentation and dissemination of the Facility carried out.																				

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Response to STAP Comments

No.	Comment	Response
1.	Network of research and innovation institutions: India is likely to have a large number of advanced technology institutions and research laboratories working on various aspects of energy technologies. It is suggested to develop criteria for selection of institutions within the context of this project.	The point is well received. The first component of the project will focus on collaboration between industry, innovators, the research community, and technology experts, to identify innovative low carbon technologies strengthened.
2.	Climate change mitigation areas: The PIF suggests 4 technologies/sectors that will be the focus of this initiative namely water heat recovery, air conditioning, refrigeration, and light. Some of these technologies such as air conditioning and lighting are the subject of significant research in many institutes in India and abroad. There is a need, however for a systematic study to access if there are any technology gaps which currently are not being addressed. Selection of technologies could be conducted after detailed assessment of technology status in India as well as the distribution of efficient systems.	Based on the PPG findings and technology status assessment, it was decided that Expert Panels instituted for three areas namely Low Grade Industrial Waste Heat Recovery (WHR), space conditioning (HVAC and cold storage etc.) and Pumping (agricultural)
3.	Capacity building in institutions: The project framework does not mention any outputs or outcomes with respect to building capacity in the institutions for R&D in selected areas. It is quite possible that many of the institutions may already have the capacity while some others may need capacity enhancement. An assessment of capacity needs is recommended.	Please refer to the Outputs of Component 2, which is focusing on the Technical Assistance for support Facility. Through the networks and centres, there will be a constitution of a Hub for Technology Transfer Support Facility, where capacity building activities will be conducted for those institutions that need capacity enhancement.

Germany's Comments:

- *The information provided on the foreseen IT-enabled system to promote virtual collaboration amongst research institutes is rather limited and more detailed information ought to be included in the final project document.*

  Please refer to the revised proposed project under section A.5 that includes changes during the PPG phase. The IT-enabled system to promote virtual collaboration is no longer proposed in the new formulated project design.

- *The calculation on which the estimation of GHG savings is based is not comprehensive (as also mentioned within the PIF). Therefore a more detailed and reasonable estimation should be included in the project proposal.*

  Please refer to the Annex H: Economic Analysis with more in detailed information on the estimation of GHG savings.

- *The importance of collaboration and coordination with other similar oriented institutions shall be highlighted at this point since comprehensive synergetic effects may be found and harnessed. Collaboration with German development cooperation (GIZ) is recommended since there are broad experiences and activities in the field of low Carbon Technology deployment in India.*

  Please refer to the Baseline project which collaboration with the GIZ has been considered.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[16]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: **NA**			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent To Date***	***Amount Committed***
Total	0	0	0

[16] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used**)**

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

NA

ANNEX E: Invitation of Expressions of Interest (EOI) for short-listing Financial Institutions for implementing the "Facility for Low Carbon Technology Deployment" Project (related file is attached**)**

ANNEX F: Detailed Project Description

India: Facility for Low Carbon Technology Deployment

1. The Project's Development Objective is to facilitate the commercial deployment of energy efficiency technologies in India. This will be achieved by:

a. Strengthening the capacities and infrastructure for research, development, and national innovation related to clean technology. The project focuses on: (a) Low-grade Industrial Waste Heat Recovery (WHR); (b) Pumping (agricultural); and (c) Space Conditioning (HVAC, cold storage, etc.);

b. Catalyzing the creation of early stage innovation finance (risk capital) to support early-stage technology companies (arising out of academic innovation, initiatives of grassroots entrepreneurs, SMEs etc.) with strong potential for commercialization and growth;

c. Strengthening the links between private sector firms and research institutions in order to steer academic intellectual assets towards industry and accelerate the process of technology commercialization[17];

d. Developing human capital in all aspects of innovation ecosystem required for developing, absorbing, diffusing, and commercializing clean tech innovation

2. Progress towards meeting the PDO will be measured by the following output indicators:

a. Number of energy efficiency technology prototypes commercially deployed

b. Number of entities/industries where selected prototypes have been commercially deployed

c. Estimated tons of future GHG emissions reduction to be avoided due to deployment to market of energy efficiency technologies

3. The project envisages achieving its development objective via two components.

a. **Component I – Innovative Ecosystem including competitive awards:** The project will run innovation and deployment challenges to induce demand-driven innovation in the three technology areas. For each innovation challenge, the Expert Panel will specify technical and performance specifications that prototypes must meet, under specific conditions, in order to receive the declared award. These specifications are expected to be at least 20-50% more efficient than the state-of-art available in the market. Innovators and teams in start-ups, MSMEs, research institutes and large companies would be eligible to participate in these competitions. The Expert Panels will oversee the testing of the prototypes based on technical specifications, and award milestone-linked awards

[17] The Impact of Government Support on Firm R&D Investments: A Meta-Analysis- World Bank Group, Paulo Correa et al.

to the winner(s) to deploy their technologies with stakeholder companies and users, as well as other deployment assistance as required. Details of the Challenge process are explained in Annex G. Additional deployment support will be available from the BEE through the co-financing. Under this component, the BEE would provide deployment support; legal, incubation, and intellectual property services; certification, validation and verification services, etc. to innovators

b. **Component II – Technical Assistance for support Facility:** One of the main thrusts of the facility is to establish a deployment support eco-system for new technologies that emerge from competitions under Component 1.By finding industrial partners for deployment, the PMU will also be creating an innovation ecosystem that continually provides demand for innovation and scale up investments for innovators.

Identification of the Challenges

4. The first stage of the process, overseen by the Steering Committee and undertaken by the Expert Panels, includes the preparation of a Technical Needs Assessment (TNA) under the pre-identified three technology categories (waste heat recovery, heat transfer and agricultural pumping). The TNA would include customer requirements in the relevant areas of interventions based on potential "performance-cost frontier". The BEE and PMU will use their deployment channels (i.e. industry linkages) and seek financing for potential projects (i.e. using BEE's other resources to assist scale up; provision for outside financiers who are willing to invest etc.) to propagate the technologies.

5. Innovation challenges provide incentives for specific innovations, rather than reward excellence in general. The six basic kinds of innovation challenges[18] are classified as following:

- **Exemplar:** Grant competitions that focus attention on, set standards in, or influence perceptions of a particular field or issue.
- **Exposition:** Highlight a range of best practices, ideas, or opportunities within a field.
- **Network:** Create and strengthen a particular innovation community.
- **Participation:** Educate and change the behaviour of participants through the prize process.
- **Market stimulation:** Emulate market incentives by driving costs down through competition and exposing latent demand.
- **Point Solution:** Solve a challenging, well-defined problem that requires innovation.

6. Different deployment aims, like market creation, technology up gradation, product commercialization, etc. can be addressed by competitions of different kinds. While the precise kind of challenge will be selected for each technology area with guidance from the Steering Committee and the BEE, it is expected that most of the challenges will be of the Point Solution type. The indicative size of each challenge competition grant would be around $50,000 (component I under GEF grant). However, this would require further discussion and agreement with the expert panels during the start-up phase[19,] subject to deployment and based on conditions set out in the challenge announcement. The Panels, based on industry requirements, will have the option to specify whether all participating entries meeting the specifications will be awarded, or the highest performing entries only. Additional grant or deployment support including increase in award grant, if considered necessary, would be met out of the co-financing (in cash) to be provided by the BEE.

[18] Jonathan Bays, Tony Goland, Joe Newsum,: *Using Prizes to Spur Innovation* , McKinsey Quarterly, July 2009

[19] In case of several entries meeting the specifications set out in the challenge statement, the most efficient entry would be selected.

7. It is expected that the cycle of challenges from identification to announcement and testing will be completed in twelve to eighteen months, followed by an additional eighteen months available for deployment.

8. It is expected that each of the three Expert Panels will identify two or four challenges for the competitions, such that at least two to three cycles of challenges and deployments can be completed during the project implementation period. The exact number of challenges to be set out would be decided by the Steering Committee, upon advice from BEE and Expert Panels (which will include industrial, academic and financial sector representatives).

9. The management of the innovation challenges will be the responsibility of BEE (the execution agency) assisted by the PMU, with advice on technological aspects of the challenge applications from the Expert Panels. BEE, the PMU and the Expert Panels will be referred to as "The Facility" henceforth. The flow chart in page 37 encapsulates the process – from ideation to implantation stage.

10. Milestone-linked disbursements: The disbursement of awards for these challenges will be done based on verification of early deployment. The award available under each challenge would help the winners achieve deployment-linked milestones. The award's components available to winning participants will be disbursed according to the following conditions– 50% for developing the prototypes at the time of selection through testing; 30% of the award will be a deployment-linked milestone payment; and 20% will be available for deployment services support that the winners can access through the PMU. During the deployment stage for milestone-linked payments, not more than 50% of the cost each deployment will be covered under the project, with the rest coming from the award winners or the partner industries. Since the disbursement will be contingent on deployment (like sales, prototype replication etc.), the PMU will undertake the requisite verifications and submit a report to the BEE, who will approve disbursement of the award. In the proposed project design, the technology vendor and user industries will be required to match the investments in early prototypes by the winning technologies 1:1. This requirement would ensure co-financing commitments from the private sector.

11. The proposed Facility will incentivize entities (across large industries, SMEs, academia, technology vendors, etc.) from India and other countries to work collaboratively on solving the major prioritized climate mitigation technology challenges within the three pre-identified areas of industry technology, guided by industry and academic experts. It would act as a connector between several entities undertaking near-deployment trials and prototyping, critical stages of technology transfer and adoption[20]. In addition to being a connector, the project seeks to provide a top down assessment of industry-specified innovation needs in energy efficiency. This top down assessment serves to ensure that the technology development efforts are demand-driven and prototyping would be focused on areas identified in the assessment in an effort to strengthen the tech-to-market link. As such, GEF resources will be used to reinforce this strategy and catalyze innovations and collaborations in the Indian energy sector.

12. A 4-step approach has been developed that outlines the full process:

a. Identify technology gaps that can be addressed through innovation ecosystems.
b. Create challenges with clear specifications to meet these technology gaps.
c. Run challenges to attract new partners and form strategic partnerships in/on innovation in energy efficiency.
d. Collaborate with industrial partners to deploy prototypes developed in these challenges.

[20] *Development and Climate Change: A Strategic Framework for the World Bank Group;* 2008, World Bank

13. After the identification of technology gaps the project will create challenges with clear specifications to meet these technology gaps. The challenges will be driven by rewards. For awards, it is said that "The victors may claim the glory, but the world will claim the spoils." This project will help create an ecosystem to innovate in energy in for solvers in India, and those interested in the Indian energy industry. This ecosystem is expected to be critical for India's innovation in other energy technologies and fields. A focused effort to gather and disseminate good practices will be undertaken by the project team in this regard. The proposed Facility will coordinate with other similar international efforts like the Climate Innovation Centers, as is critical for creating and sharing knowledge that can help mitigate climate change.

Detailed implementation arrangements and the execution structure are detailed in Annex G. The project governance structure is diagrammatically depicted in Figure .

Annex G: Implementation Arrangements

India: Facility for Low Carbon Technology Deployment

A. Project Institutional and Implementation Arrangements

1. *Multiple Stakeholders*: The project would be overseen by a high-level Steering Committee, comprised of six eminent personalities in the field of energy. This Steering Committee, chaired by the Director General of the Bureau of Energy Efficiency (BEE), will comprise of UNIDO and two domestic experts in the field of energy, one international expert and one representative from the financial sector in India.

2. This honorary Committee will have the authority to invite external observers and advisors, as required for the project, from user representatives, industry experts, financial sector experts, government representatives, academics and other stakeholders. This committee will provide guidance and oversight to the project, decide areas of focus, and propose collaborations and partnerships. The Steering Committee will also ensure adherence to the environmental norms laid down under the project. However, the Steering Committee will not be responsible for the operations of the project. The Steering committee would meet quarterly to discuss strategic direction and assess quarterly progress reports and budget.

3. *Bureau of Energy Efficiency (BEE, and Expert Panels):* The project's technical operations will be conducted by three Expert Panels constituted one for each technology area. The BEE will set up these Expert Panels, comprising of academic, industry and user industry experts. The Expert Panels, headed by the Convenor of each Technology Area, will be responsible for the operations of the project. The BEE will appoint Project Economists from its staff to each of the Expert Panels. Apart from Expert Panels, the project will collaborate with industry representatives and banks to help create projects that inspire innovations in energy efficiency applications.

4. The Expert Panels will be responsible for the definition of problem statements in the innovation challenges in consultation with the industry; creation of testing facilities for each challenge; stating the rules and conditions for judging of the entries; stating the milestones for each challenge; and assisting the grants winners to find opportunities for deployment. The Expert Panels and the PMU (see below) will be instrumental in creating industry linkages to help deployment of new technologies in these deployment areas.

5. *Convenor(s):* Each Expert Panel will be headed by a Convenor, appointed for the duration of the project. The convenor (who may have responsibility for multiple technology areas, as per requirement and availability of human resources) will manage the daily operations of the sub-projects under each technology area. The convenor will be selected from within the Expert Panel, as advised by the Steering Committee. The Project Management Unit will collaborate with the Convenor(s) for the project activities. The Convenors will have the right to invite observers and advisors to the Expert Panel, as required. The convenors will be paid market-comparable remuneration, through the project's TA component.

6. *Governance Structure:* The operation of the project, overseen by the Expert Panels, will be supported by the BEE through a Project Management Unit (PMU). This PMU will be competitively selected. The PMU will run the innovation challenges, based on guidelines set out in the Operations Manual for the project. The PMU will also provide legal, incubation and Intellectual Property support to the winners of these award challenges (as and when required), as guided by the BEE and the Steering Committee. Since this project also aims at enhancing the collaboration between academia, industry and consumers for these areas of deployment, the

PMU will facilitate technology areas-specific seminars and meetings with top industry and academia experts to inform the innovation challenges and their participants. The PMU will also assist in arranging any other meetings required for the implementation of the project. The PMU will be responsible for arranging the audit of milestone-based payments.

7. *Financial Institutions:* BEE selected Financial Institutions shall be required to execute / manage the financing for the project comprising external funds (from GEF and GoI) as well as debt / equity infusion and / or loans from its end to the intended project beneficiaries. The Financial Institutions shall also coordinate with the PMU vis-à-vis the project deliverables, and also submit reports / returns periodically based on the milestones to be incorporated in the contract to be entered into between BEE and the selected Financial Institutions. The schedule of various deliverables will be indicated in the RFP to be set to the Financial Institutions who have been shortlisted based on evaluation of the EOIs.

8. The project implementation will be guided by this Operations Manual, as prepared by BEE and reviewed and cleared by UNIDO. This document details the roles and responsibilities of the BEE, the PMU, award winners, etc. This Manual also includes guidelines for design of award challenges, management, financial reporting, legal support, conflict of interest, etc. The BEE, with the support of the PMU, will ensure adherence to this Operations Manual by the various stakeholders of the project.

9. This project is aimed at creating an eco-system for energy efficiency innovation and deployment in the country. Deployment would not be possible without deep and sustained industry links. The PMU and the BEE would engage industry experts in each of these fields in the Expert Panels, as well as invite well-known industrial, academic and other stakeholders to the Steering Committee, as and when required. The BEE would also use its good offices as India's technology transfer body to create links with other countries working with similar technologies. The following schematic provides a pictorial depiction of the governance structure:

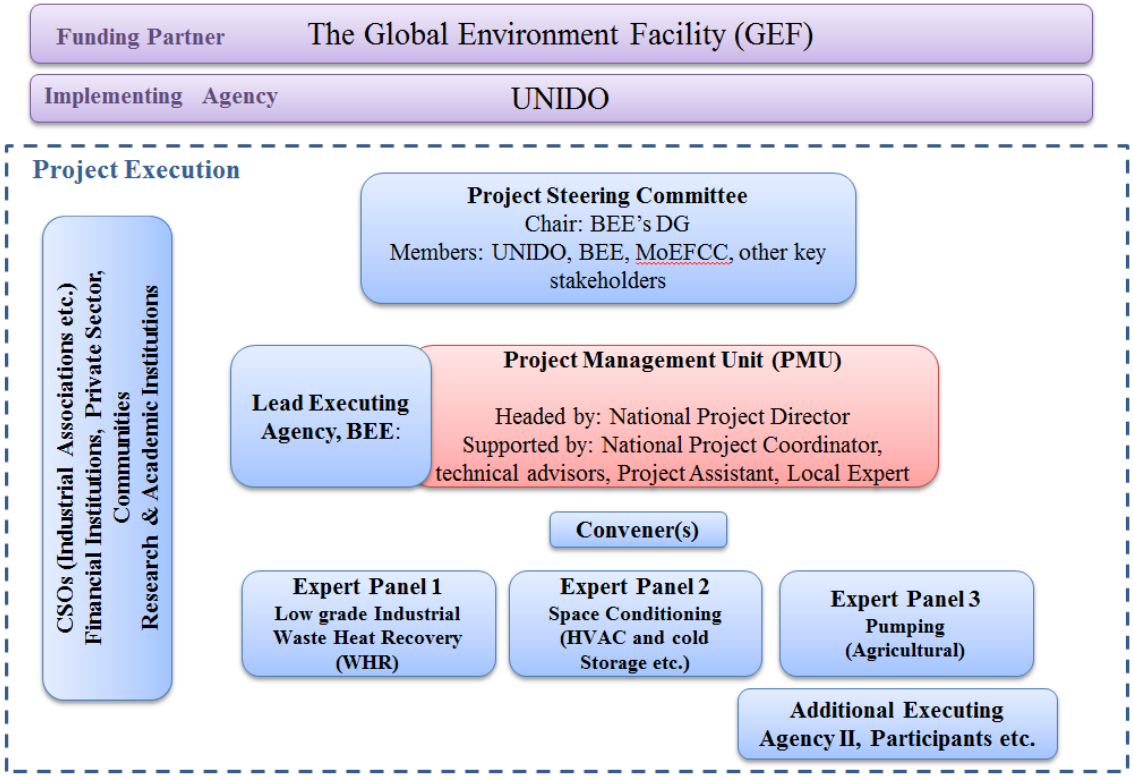


Figure 1: Project governance structure

10. *Execution Arrangement*: The management of the innovation challenges will be the responsibility of BEE (the Execution agency) assisted by the PMU, with advice on technological aspects of the challenge applications from the Expert Panels. BEE, the PMU and the Expert Panels will be referred to as "The Facility" henceforth. The following flow chart encapsulates the process – from ideation to implantation stage.

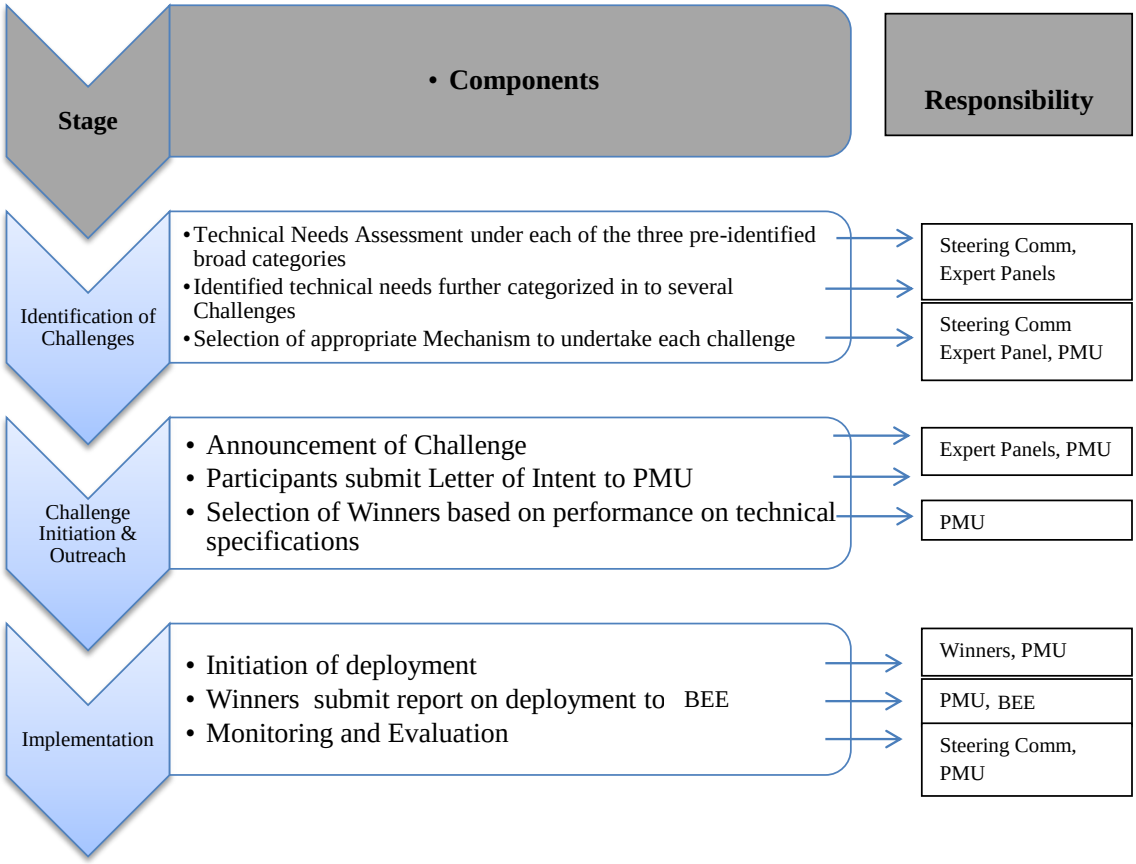


Figure 2: Project activities, roles and responsibilities

Identification of Challenges: The first stage of the process, overseen by the Steering Committee and undertaken by the Expert Panels, includes the undertaking of a Technical Needs Assessment under the pre-identified three broad technology categories (waste heat recovery, heat transfer and agricultural pumping). The Expert Panels will engage extensively with customers and partners to understand consumer preference in the relevant areas of interventions based on an informed "performance-cost frontier". The broad objective is to introduce substantially better technology (at least 20-50% more efficient than the state-of-art technologies available in the market) than what currently exists in the Indian market. The BEE and PMU will use its deployment channels (i.e. industry linkages) and financing for potential projects (i.e. provision for outside financiers who are willing to invest etc.) to propagate the technologies.

Different deployment aims, like market creation, technology up gradation, product commercialization, etc. can be addressed by competitions of different kinds. While the precise kind of challenge will be selected for each technology area with guidance from the Steering Committee and the BEE, it is expected that most of the challenges will be of the Point Solution type. The indicative size of each challenge competition grant would be up to $50,000, but the exact figure for each challenge will be decided by the Expert Panel during the start-up phase. This would also depend on the deployment grants that would become available through the co-financing to be provided by the partners, subject to the conditions set out in the challenge announcement.

It is expected that the cycle of challenges from identification to announcement and testing will be completed in twelve to eighteen months, followed by an additional eighteen months available for deployment.

It is expected that each of the three Expert Panels will identify two or three challenges for the competitions, such that at least two to three cycles of challenges and deployments can be completed during the project implementation period. The exact number of challenges to be set out would be decided by the Steering Committee, upon advice from BEE and Expert Panels.

The management of the grant challenges will be the responsibility of BEE (the execution agency) assisted by the PMU, with advice on technological aspects of the innovation challenges from the Expert Panels. BEE, the PMU and the Expert Panels will be referred to as "The Facility" henceforth.

Challenge Initiation and Outreach: After identification of the Challenges in each of the three categories, the challenge competitions will be launched. The Expert Panels, in consultation with BEE and PMU, will announce the challenges, including the (a) required performance specifications; (b) Testing protocol (to include testing conditions); (c) services available for winning technologies; and (d) deployment-linked disbursement milestones. The competition will be announced in national and international media, with the intention of reaching a diverse and vast number of potential applicants. This will include a comprehensive website, newspaper ads, posters on university campuses, email listings etc.

Additionally, the PMU will hold outreach sessions to further explain its vision and provide instructions on how to submit eligible applications. The competitions will consist of the following stages with a detailed process for the competitions and deployment phases (including safeguards) available in the annexes.
Announcement of Challenges
Submission of prototypes by participants
Review and Disbursement Approval
Deployment support services.

The completions will consist of the following stages.

Announcement of Challenges: The Expert Panels will set the specifications (performance criteria) for the prototypes to match. The Expert Panels will set the milestones of deployment to be reached by prototypes for grant disbursement. PMU will guide the BEE and the PMU in creation of appropriate testing and judging procedures. These procedures should be unbiased towards the technology and should focus on achieving the set standards, based on performance. PMU will ensure that all relevant information is available to the participants, through publication of test procedures and other information through websites, etc. and ensure that that the outreach efforts are correctly oriented to ensure maximum participation in the challenge from the targeted innovation community.

Participants Submit Application: Participants submit their Letter of Intent to participate in a Challenge to the PMU. The Letter of Intent will contain detail about: nature of the applying entity (an University, a Research Institute, R&D Company etc.), collaborating partners (particularly with industries), list of prior experience in the specific field, agreement to meet pre-specified technical specifications, agreement to fulfil pre-specified environment and safety standards, agreement to maintain a material-wise Bill of Quantities (BoQ). These applications will be made online. Participants will be required to submit the prototypes and BoQs at the time and location as specified in the "Launch of Challenge" announcement made by PMU for the actual Test.

Testing and Disbursement Approval: For objectivity in evaluation of applications, each application will be assessed and scored on basis of pre-determined technical specifications. The applicants will get the prototypes tested at specific locations, pre-determined by the PMU. If the number of applicants is less than 100, 2 test locations will be selected with adequate geographic spread. If number of applicants exceeds 100, 4 test centres will be pre-selected for the purpose. The Facility will engage appropriate consultants to run the tests across test centres. The Tests will be conducted on dates specified in the Challenge Announcement. Once the actual tests are conducted, the Facility will then discuss the individual project scores and ratings and agree on the final average assessment and decision whether or not to support the application. On-behalf of the Facility, the PMU will notify all applicants of the final decision on their POC applications as soon as the Facility minutes have signed off. The award will be allocated in tranches – 50% for developing the prototypes, 30% during deployment and 20% for other associated costs.

Implementation (Testing and Deployment Services and Facilitation): The process of selecting satisfactory prototypes will have two phases. After the announcement of the challenges, all interested innovators (individuals, corporations, consortiums, etc.) will be invited to register their intent to submit prototypes subject to the conditions

in the award challenges. The PMU will be required to engage with a variety of stakeholders, like small and medium enterprises; large industries; technology vendors; academic innovators and start-ups in the sector. The interested entities will be mandated to conform to environmental impact conditions for testing and manufacturing, as outlined in the challenge statement. The innovator entities will also be invited to join a website created for each challenge.

The PMU will announce the testing conditions and date for the prototypes, expected to be eight to ten months from the date of announcement. The PMU will keep the innovators updated using the website.

The innovators will have to submit their prototypes at a designated venue on a designated date, as set out in the challenge statement. The BEE and PMU will undertake testing, as per protocol in the challenge statement.

After the winners are chosen and the sub-grant agreements are signed between the winning participants and the PMU, the deployment support phase begins.

During this phase the Facility will provide deployment support to the winners in the form of assistance with deployment of their prototypes with industrial and commercial partners. This deployment support will consist of (a) facilitating contacts with appropriate entities; (b) deployment services like calibration, meeting legal and safety regulations, legal provisions, incubation, intellectual property, marketing, feasibility report creation and other facilities; and (c) manufacturing further prototypes for early deployment. The Facility will also provide the challenge participants assistance with IP and patent processes, strengthening industry linkages etc.

The disbursement of awards for these challenges will be done based on verification of early deployment. The award available under each challenge would help the winners achieve deployment-linked milestones. The grant's components available to winning participants will be disbursed according to the following conditions– 50% for developing the prototypes at the time of selection through testing; 30% of the grant will be a deployment-linked milestone payments; and 20% will be available for deployment services support that the winners can access through the PMU. Since the disbursement will be contingent on deployment (like sales, prototype replication etc.), the PMU will undertake the requisite verifications and submit a report to the BEE, which in turn will approve disbursement of the grant.

B. Financial management

The project is a low carbon technology innovation facility to be implemented by BEE with the support of BEE and other technical experts. The project will focus on (i) industrial low-grade waste heat recovery; (ii) pumping (agricultural) and (iii) space conditioning (HVAC and cold storage, etc.).

The mission of Bureau of Energy Efficiency (BEE) is to develop policy and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act (EC Act), 2001 with the primary objective of reducing energy intensity of the Indian economy. This will be achieved with active participation of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors.

The setting up of Bureau of Energy Efficiency (BEE) provides a legal framework for energy efficiency initiatives in the country. The Act empowers the Central Government and in some instances the State Governments to:

a) Notify energy intensive industries, other establishments, and commercial buildings as designated consumers.
b) Establish and prescribe energy consumption norms and standards for designated consumers.
c) Direct designated consumers to designate or appoint certified energy manager in charge of activities for efficient use of energy and its conservation.
d) Get an energy audit conducted by an accredited energy auditor in the specified manner and intervals of time.
e) Furnish information with regard to energy consumed and action taken on the recommendation of the accredited energy auditor to the designated agency.
f) Comply with energy consumption norms and standards, and if not so, to prepare and implement schemes for efficient use of energy and its conservation.

g) Prescribe energy conservation building codes for efficient use of energy and its conservation in commercial buildings State Governments to amend the energy conservation building codes to suit regional and local climatic conditions.
h) Direct owners or occupiers of commercial buildings to comply with the provisions of energy conservation building codes.
i) Direct mandatory display of label on notified equipment and appliances.
j) Specify energy consumption standards for notified equipment and appliance.
k) Prohibit manufacture, sale, purchase and import of notified equipment and appliances not conforming to standards.

The Energy Conservation Act, 2001 defines the powers of the State Government to facilitate and enforce efficient use of energy and its conservation. The State Governments have to designate State Designated Agencies in consultation with the Bureau of Energy Efficiency to coordinate, regulate and enforce the provisions of the Act in the State. Thus the State Designated Agencies are the strategic partners for promotion of energy efficiency and its conservation in the country.

1.2 Organization

Under the provisions of the Energy Conservation Act, 2001, Bureau of Energy Efficiency was established with effect from 1st March, 2002 by merging into it, the erstwhile Energy Management Centre, being a society registered under the Societies Registration Act, 1860, under the Ministry of Power.

The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

1.3 Functions of BEE

BEE co-ordinates with designated consumers, designated agencies and other organization; recognizes, identifies and utilizes the existing resources and infrastructure, in performing the functions assigned to it under the E.C Act, 2001. The Act provides for regulatory and promotional functions. The major functions of BEE include:

- Develop and recommend to the Central Government the norms for processes and energy consumption standards.
- Develop and recommend to the Central Government minimum energy consumption standards and labelling design for equipment and appliances.
- Develop and recommend to the Central Govt. specific energy conservation building codes.
- Recommend the Central Government for notifying any user or class of users of energy as a designated consumer.
- Take necessary measures to create awareness and disseminate information for efficient use of energy and its conservation.

Project Management

The project executing agency is BEE. A Steering Committee comprising BEE, MOEFCC, UNIDO, academia and civil society will guide and monitor the program and carry out strategic functions as specified in the project Operations Manual (OM). The PMU financed out of the project will provide assistance to BEE in executing the project. Three Experts Panels one each for waste heat, heat transfer, and pumping, will assist BEE and PMU with technological advice. The PMU will help in project execution, deployment facilitation and coordination across entities and donors as well as financial management. The Operations Manual will incorporate detailed guidelines for all stakeholders of the project and cover individual roles and responsibilities; policies and procedures involving technical, operational, fiduciary (procurement & financial management), social, legal aspects of project implementation. The OM will be reviewed and cleared by the UNIDO.

Project Components and Funding

The total project funding by GEF grant is USD 8.7 million. The project components are:
1. Innovation and deployment challenges sub-projects and
2. Technical Assistance and deployment services.
Component 1 is expected to be divided into several awards (sub-projects) in each of the three areas identified for the project. The indicative size of each award will be $50,000, but the exact figure for each challenge will be decided by the Expert Panel during the start-up phase. Indicatively 50% of the award will be available to the winner on demonstration of a satisfactory prototype at the stage of testing; 30% of the award amount will be disbursed as more deployment is undertaken; and 20% of the amount will be available for grant winners to claim for deployment support services.
Expenditures eligible for funding, subject to limits, under each of the above components are as follows:

Component 1: Innovation challenges and awards USD 63,708,746		**GEF grant USD 6,708,746**	**Co-financing USD 55,000,000**
Nature of Expenditure	**Funding limit**	**Eligible Claimants**	
Cost of prototype development	50% of each award	Winning participants	
Milestone based disbursement for the first deployments	30% of each award	Winning participants	
Legal and technical services for winning prototypes	20% of each award	Experts/ consultants appointed by PMU to facilitate deployment of winning technologies	
Component 2 Technical Assistance for support Facility **USD 3,173,582**		**GEF grant USD 1,103,582**	**Co-financing USD 2,070,000**
Nature of Expenditure	**Funding limit**	**Eligible Claimants**	
Incremental Operating Costs (IOC)			
Establishment of deployment support eco-system for energy efficiency	60% of cost	Consultants, experts, suppliers, etc.	
PMU operating expenses (max 5% of project cost)			
Travel expenses for project purposes by Expert Panel members; advisors, other invited experts, etc.	19% of cost	Expert Panel members, additional experts, observers, etc.	
Preparation of Accounting Manual for BEE and training; other consultancies for BEE	1% of cost	Consultants hired by BEE	
Testing and verification expenses of prototypes (goods)	20% of cost	Service providers	

Winning participants would be eligible for claiming 80% of the amount set aside for individual sub-projects/ awards. These parties would maintain detailed and auditable records and documents of costs associated with prototype building and deployment in order to be eligible for claims under component 1. The OM will provide detailed guidelines and formats to assist the claimants in this respect. All such expenditure records and documents in support of claims would be submitted to the PMU. PMU would review/ scrutinize the claims and subject them to audit by PMU appointed auditors. PMU will ensure that only auditable eligible expenditure claims are processed for payments.

PMU would appoint professionals to assist winning participants in prototype deployment; for testing and verification of prototypes; make payments of project related travel expenses; and also incur overheads for running/ operating the PMU. PMU will maintain proper records and documents (including contracts, bills etc.) in support of these expenditures as prescribed in the OM in order to claim reimbursements.

PMU Responsibilities

The PMU will support BEE in project execution and ensure that funds are available in a timely manner for defraying project related costs. The FM cell headed by the FD, BEE will be responsible for project FM arrangements which will be described in detail in the OM. In brief, PMU will (i) compile annual project budgets and revised estimates; (ii) make payments after due diligence and ensuring that they are eligible expenditures under the project; (iii) record all financial transactions in the project's books of accounts and maintain proper chart of accounts, records and documents including contracts, bills, reports etc. in support of the transactions; (iv) carry out periodic book closing and prepare management information reports and IUFRs for submission to the UNIDO for claiming replenishments from the UNIDO; (v) appoint internal auditors for the project in consultation with the UNIDO; (vi) prepare annual project financial statements and ensure timely audit and submission of audited project financial statements and audit report to the UNIDO; (vii) ensure regular internal audit of the project covering both technical and financial aspects and share audit reports along with details of action taken on audit observations, with the UNIDO. The PMU will ensure all legal covenants in the UNIDO agreements are complied with including timely submission of BEEs audited annual financial statement and audit report to the UNIDO. The PMU would be adequately staffed at all times to enable it to carry out its responsibilities timely and efficiently.

Quarterly IUFR

The PMU will submit quarterly IUFR to the UNIDO. The IUFR will disclose (i) funds provided by BEE for meeting project costs and outflows for eligible expenditures during the quarter, year to date and cumulative project to date; (ii) budgets/ forecasts and variances for comparable periods; (iii) forecasts for next two quarters (iv) claim for reimbursement from the UNIDO; (v) details of contracts and payments against each contract, and (vi) milestone based physical and financial progress of the project. The format of the IUFR will be provided by the UNIDO after discussions with BEE. The IUFR will be due for submission within 45 days from the end of each quarter.

Annual Project Financial Statements and Audit

The PMU will prepare annual Project Financial Statements in the prescribed format and have them audited. Following current practice of UNIDO funded projects, the audit will be carried out by CAG under agreed terms of reference and the audited statements and the audit report will be due for submission to the UNIDO by BEE by September end each year during the currency of the project. In addition, BEE as the implementing agency will be required to submit its audited entity accounts and audit report within September each year. Given the current backlog in accounts and audit finalization, BEE needs to adhere to its plan for clearing the backlog by January 2015.

ANNEX H: Economic Analysis

India: Facility for Low Carbon Technology Deployment

Traditional economic analysis is not feasible for this project, as the costs and benefits of sub-projects are unknown *ex ante*. In addition, investments in innovation produce societal benefits, which are not easily quantifiable, such as increased access to risk capital for entrepreneurs, greater collaboration on innovation[21], greater willingness on the part of policy makers to support experimental policy initiatives, and so forth. Finally, government support for innovation will typically not produce large-scale benefits in the short run, as building a successful innovation policy program takes years to gain traction.

Technology innovation is recognized worldwide as an area for which public support is required. In the case of clean energy technologies, pollution externalities provide an additional case for public intervention. The project responds to a recognized failure in the market for innovation services and assets. Market demand for innovation is constrained, due to externalities, coordination challenges, and information asymmetries. Moreover, demand for innovation in energy efficiency specifically is insufficient because (a) the environmental costs of polluting technologies are not internalized, which reduces the demand for clean alternatives; and (b) private investors are unable to determine the proper level of investment in new technologies due to lack of awareness, uncertainty over risks and rewards, and the incentive to free-ride on early adopters. This suggests an important role for public sector resources to correct this market failure, and to spur private and individual action. It is widely recognized that the private sector in India does not supply sufficient risk capital to early stage firms. If capital constraints are lifted, it will increase the likelihood that some proportion of these firms will achieve commercial success, and produce products and services that can provide social and economic benefits, such as jobs, knowledge capital, innovation, and GHG emissions reductions.

In the case of India, it is widely recognized that there are huge untapped opportunities in energy efficiency. Fundamentally, energy efficiency is the lowest-cost instrument to achieve India's objectives for low carbon growth. The ADB recently estimated that India must invest USD 4.5 billion per year through 2020 in order to meet established energy saving targets. In addition, opportunities for energy savings are enormous. In the case of the commercial sector, the BEE has estimated that 30-50% energy savings potential, while in the industrial sector savings on the order of 7% could easily be achieved through innovation, deployment, and market transformation.

Nonetheless, we can build a theoretical analytical framework to assess the potential magnitude and direction of the project benefits. To start with, we consider that total electricity consumption in India in 2012 was 773 TWh (Figure 1). Industry is the largest consumption sector, followed by the domestic sector (170 TWh), agriculture (134 TWh), and the commercial sector (69 TWh). Within the commercial sector, 55% of energy consumed, or over 38 TWh, is used for heating and cooling.

[21] F. Murray, S. Stern, G. Campbell, A. MacCormick, *Grand Innovation Prizes: A Theoretical, Normative and Empirical Evaluation:* Research Policy 41 (2012) Pgs 1779-1792

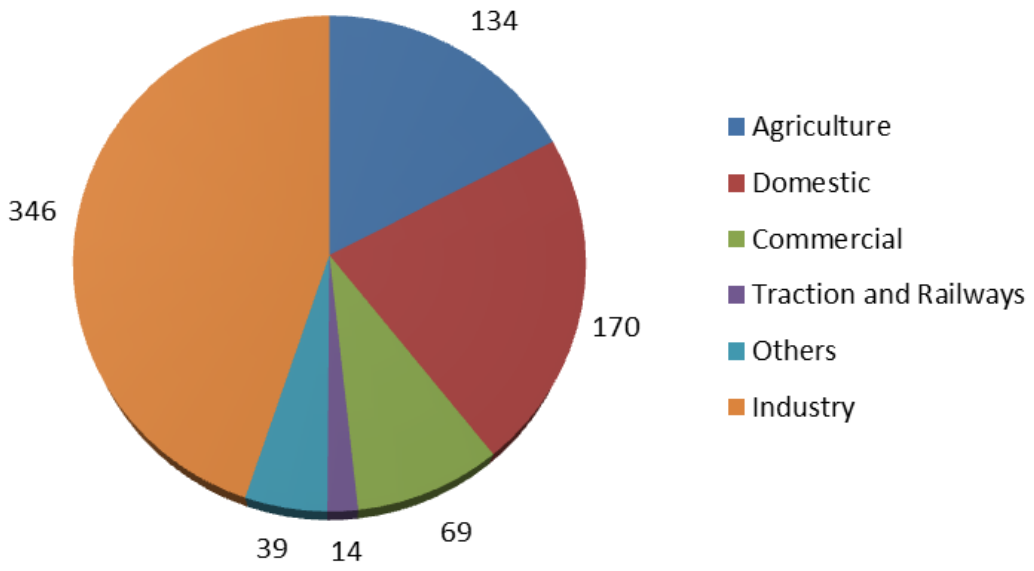


Figure 2: 2012 Electricity consumption by sector (TWh)

In summary, the key facts and assumptions are as follows:

a. *Total annual electricity consumed in target sectors*: 171.7 TWh (2012), which includes agricultural pumps and HVAC systems used by commercial buildings. The electricity consumption for these two sectors is expected to climb to 357 TWh in 10 years.

b. *Potential grid electricity production that can be avoided through efficiency gains*: 43 TWh. We assume that agricultural pumps and HVAC systems can reduce their consumption by 25%.

c. *Grid electricity production that can be avoided through waste heat recovery:* 8.2 TWh. It has been estimated that 678 TWh of potential energy is wasted in the form of heat.[22] This includes waste heat from glass furnaces, boilers, heaters, and so forth. We assume that 1% of waste heat could be utilized for distributed electricity generation, and therefore offset grid electricity by the corresponding amount (taking into account T&D losses of 15%).

d. *Uptake of innovation products*: We use the very conservative estimate that, in the next ten years, innovative technologies supported by the program will achieve 1% market penetration in each sub-sector. In the case of agricultural pumps, for example, this would be the equivalent of the deployment of around 200,000 units in present day terms. (In the case of waste-heat, this assumes a 0.01% rate of market penetration, as we assume that only 1% of the market can theoretically be tapped, and of this, innovative products only reach 1% of the market that is within reach).

[22] Source: BEE FLCTD concept note (no citation given)

Results. Nevertheless, even with such modest uptake of innovative technologies, the economic impacts are positive. As a result of market uptake of innovative technologies, grid electricity consumption is reduced by over 3.5 TWh over the ten year period. This corresponds to 2.3 million tons of CO_2 avoided, at a cost of $3.99 per ton. The project has a positive EIRR of 35% and an NPV of $56 million not including environmental benefits.

Table 1: Results of economic analysis

		Year							
	Units	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**Total**
Baseline scenario - Electricity consumption									
Agriculture	*TWh*	134	144	155	167	179	193	278	2,178
HVAC	*TWh*	38	41	44	47	51	55	79	621
Waste heat	*TWh*	-	-	-	-	-	-	-	-
Total	***TWh***	**172**	**185**	**199**	**214**	**230**	**248**	**357**	**2,799**
Total potential grid electricity savings									
Agriculture	*TWh*	33	36	39	42	45	48	70	544
HVAC	*TWh*	10	10	11	12	13	14	20	155
Waste heat	*TWh*	8	9	10	10	11	12	17	134
Total	***TWh***	**51**	**55**	**59**	**64**	**69**	**74**	**106**	**833**
Innovation products market penetration									
Agriculture	*%*	0.00%	0.00%	0.00%	0.10%	0.20%	0.30%	1.00%	
HVAC	*%*	0.00%	0.00%	0.00%	0.10%	0.20%	0.30%	1.00%	
Waste heat	*%*	0.00%	0.00%	0.00%	0.10%	0.20%	0.30%	1.00%	
Projected savings due to uptake of EE products									
Agriculture	*TWh*	-	-	-	0.04	0.09	0.14	0.70	2.33
HVAC	*TWh*	-	-	-	0.01	0.03	0.04	0.20	0.67
Waste heat	*TWh*	-	-	-	0.01	0.02	0.04	0.17	0.57
Total	*TWh*	**-**	**-**	**-**	**0.06**	**0.14**	**0.22**	**1.06**	**3.57**
Value of grid electricity saved	*USD mn*	-	-	-	3.47	7.47	12.06	57.99	194.74
CO2 emissions avoided	*Tons*	-	-	-	40,621	87,416	141,090	678,322	2,277,974
Value of avoided emissions	*USD mn*	-	-	-	0	1	1	7	23
Value of avoided local pollutants	*USD mn*	-	-	-	1	3	5	24	80
Project costs									
Grants	*USD mn*	-	2.00	2.00	2.00	-	-	-	6
Technical assistance	*USD mn*	-	1.03	1.03	1.03	-	-	-	3
TDB cofinancing	*USD mn*		6.55	6.55	6.55				20
Private cofinancing	*USD mn*	-	2.50	2.50	2.50				8
Total project benefits	*USD mn*	-	-	-	5.30	11.41	18.41	88.51	297
Total project benefits ex environment	*USD mn*	-	-	-	3.47	7.47	12.06	57.99	195
Total project costs	*USD mn*	-	12.08	12.08	12.08	-	-	-	36.24
Net	*USD mn*	-	(12.08)	(12.08)	(6.78)	11.41	18.41	88.51	261.01
Net ex environment	*USD mn*	-	(12.08)	(12.08)	(8.61)	7.47	12.06	57.99	158.50

SUMMARY STATISTICS		
EIRR	*%*	47%
EIRR ex Environment	*%*	35%
Project NPV	*USD mn*	$99.76
Project NPV ex Environment	*USD mn*	$55.94
Cost per ton of CO2 avoided	*USD/ton*	3.99

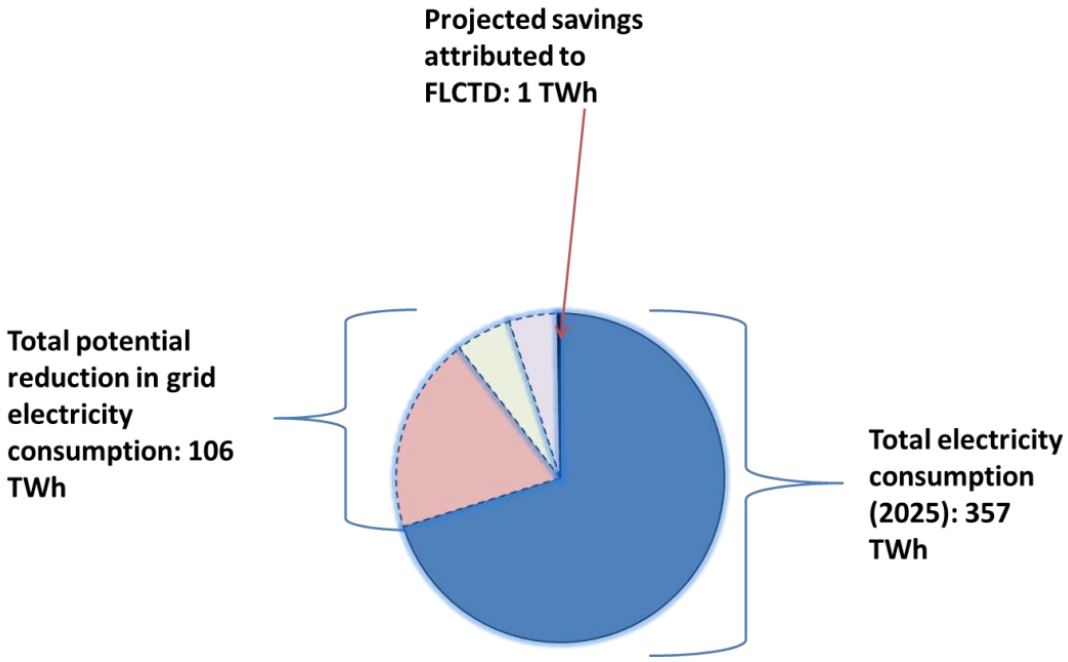


Figure 3: Projected impacts of FLCTD innovative products

The assumptions used are very conservative. As such, the expected impacts from the Project are extremely modest. In total, we estimate that commercialization of FLCTD innovations causes 0.30% of projected electricity consumption to be avoided, or a savings of 1 TWh within the project period (Figure 2). However, even in this extremely conservative scenario, where innovations supported by the Project penetrate only a sliver of the market, the economic impacts are positive. Any surprises to the upside, such as a pump which achieves a high rate of market penetration, would deliver far greater returns to the economy as whole, including reduced electricity consumption.

ANNEX I: Monitoring and Evaluation Plan

1. Monitoring

Project Inception Phase

A project inception workshop will be conducted during this phase to kick-off the project at the national level. The workshop will include the full project team, national government counterparts, co-financing partners, and key industry stakeholders. The fundamental objective of the workshop will be to introduce the project at the national level. An inception workshop report, featuring proceedings from the workshop including stakeholder insights and opinions will be prepared soon after completing the workshop.

In addition to the inception workshop, several activities will be conducted in this period to ensure all preparatory work has been completed. These will be included in an inception report and will include:

- Introductions between PMU staff and the UNIDO teams;
- Review of the logical framework and minor revisions, if deemed necessary;
- Delineation of specific responsibilities and finalization of the scope of work for PMU experts;
- Finalization of monitoring, evaluation and reporting requirements;
- Finalization of all M&E modalities, including time-frames, meeting schedules, procedures and processes;
- Development and scheduling of consulting packages in line with proposed activities and budgets;
- Formation of the Project Steering Committee (PSC) and finalization of detailed first year annual plan;
- Measurement of impact indicators and scheduling future activities for impact monitoring.

Once the activities start, the PMU will be responsible for project monitoring on a day-to-day basis. Periodic monitoring of implementation progress will be undertaken by UNIDO, as appropriate through meetings with project counterparts. UNIDO, and/or the UNIDO Country/Regional office will conduct periodic visits based on an agreed upon schedule and monitoring will occur through the PSC meetings, which will take place at least twice a year. The terminal review will be held in the last month of the project operation, for which the PMU is responsible and will submit to UNIDO. The PMU, in conjunction with the PSC members, will be responsible for the preparation and submission of the following reports that form part of the monitoring process. The MTR, TE and PIRs will be shared with GEF OFP India for review comments and rating before the same are submitted by UNIDO to the GEF secretariat on an annual basis.

1.1 Project Implementation Review (PIR)

The PIR is an annual monitoring process mandated by the GEF. It is an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from the ongoing project. Once the project has been under implementation for a year, the project team at UNIDO HQ is responsible for completing the PIR. The PIR should then be discussed at the PSC so that the result would be a PIR that has been agreed upon by project staff, the Lead Executing Agency, and UNIDO.

1.2 Semi-Annual Progress Reports

Short reports outlining main updates in project progress would be provided quarterly to UNIDO by the PMU.

1.3 Periodic Thematic Reports

As and when called for by UNIDO, the PMU will prepare Specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the PMU in written form by UNIDO and will clearly state the issue or activities that need to be reported on. These reports will be used as a form of lessons learned exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered.

1.4 Technical Reports

These reports will be prepared by the national and international consultants/consulting organizations to be engaged during the project. As part of the Inception Report, the PMU would prepare a draft reports list, detailing the technical reports that are expected to be prepared on key areas of activity during the course of the Project, and tentative due dates. This list will be on the basis of consulting packages that will be defined at project start.

1.5 Project Publications

The PMU will determine if Technical Reports merit formal publication, and will also (in consultation with UNIDO, the government and other relevant stakeholder groups) plan and produce these publications in a consistent and recognizable format. These publications may be scientific or informational texts on the activities and achievements of the project in the form of journal articles, multimedia publications, or other forms of distribution. Publications can be based on Technical Reports, or may be summaries or compilations of a series of Technical Reports and other research. In addition, promotional materials such as case studies and video footage will be prepared by the PMU, as required. These reports will be coordinated and developed by the PMU with the assistance and input of international and national experts, project counterparts and UNIDO.

1.6 Terminal Review (TR)

The TR will be held in the last month of project operation and is the responsibility of the PMU to prepare and submit it to UNIDO. It shall be prepared in draft at least two months in advance in order to allow time for review, and will serve as the basis for discussions in the TR. The TR considers the implementation of the project as a whole, paying particular attention to whether the project has achieved its stated objectives and contributed to the broader environmental objective. It decides whether any actions are still necessary, particularly in relation to the sustainability of project results, and acts as the vehicle through which lessons learned can be captured to feed into other projects under implementation or formulation.

The PMU, based on the Terminal Review, will prepare the Project Terminal Report (PTR). This comprehensive report will summarize all activities, achievements and outputs of the project, lessons learned, objectives met (or not met), and structures and systems implemented. The PTR will be the definitive statement of the project's activities during its lifetime. It will also lay recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's activities.

2. Evaluation: The project will be subjected to at least two evaluations as follows:

2.1 Midterm Review:

A midterm review will be undertaken during the third year from project commencement by an external agency/evaluator. The midterm review will measure progress made towards the achievement of outcomes and will identify corrections if needed. The evaluation will focus on the effectiveness, efficiency, and timeliness of project implementation, highlight issues requiring decisions and actions, and present initial lessons learned on project design, implementation and management. The findings of this review will be incorporated as recommendations for enhanced implementation during the second half of the project's term. The organization, terms of reference, and timing of the midterm review will be decided after consultations between the project partners. The Terms of Reference for this midterm review will be prepared by UNIDO.

2.2 Final evaluation:

An independent final evaluation will take place six months prior to project closure, and will focus on the same issues as the midterm review. The final evaluation will also review impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The Terms of Reference for this evaluation will be prepared by the UNIDO Evaluation Group.

In addition, according to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors will be obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

Annex J: BUDGET SHEET

Output Based Budget for the GEF Grant

(should follow the SAP PS layout and structure for easy synchronization)

		GEF Grant Budget Component 1					
Component 1	**Type of Expense**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Output Total**
Output 1.1	International Expertise	50,000	50,000	50,000	50,000	50,000	250,000
	Local Travel	5,000	5,000	5,000	5,000	5,000	25,000
	National Expertise	20,000	20,000	20,000	20,000	20,000	100,000
	Contractual Arrangement		300,000	300,000	300,000	300,000	1,200,000
	Training/Workshops	150,000		150,000		150,000	450,000
	International Meetings/Workshops		150,000		150,000		300,000
	Equipment		400,000	400,000	400,000		1,200,000
	Miscellaneous		5,000	5,000	5,000	5,000	20,000
	Output sub-total						**3,545,000**
Output 1.2	International Expertise	25,000	25,000	25,000	20,000	5,000	100,000
	Local Travel	5,000	5,000	5,000	5,000	5,000	25,000
	National Expertise	50,000	50,000	50,000	50,000		200,000
	Contractual Arrangement		300,000	300,000	300,000		900,000
	Training/Workshops		150,000		150,000	100,000	400,000
	International Meetings/Workshops			150,000			150,000
	Equipment		500,000	367,000	500,000		1,367,000
	Miscellaneous		5,000	5,000	5,000	6,746	21,746
	Output sub-total						**3,163,746**
TOTAL Component 1							**6,708,746**

		GEF Grant Budget Component 2					
Component 2	**Type of Expense**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Output Total**
Output 2.1	International Expertise	30,000	30,000	30,000	30,000	30,000	150,000
	Local Travel	5,000	5,000	5,000	5,000	5,000	25,000
	National Expertise	15,000	15,000	15,000	15,000	15,000	75,000

	Contractual Arrangement	45,000	70,000	70,000	70,000	70,000	325,000
	Training/Workshops	100,000		100,000			200,000
	International Meetings/Workshops		150,000		150,000		300,000
	Equipment						
	Miscellaneous	5,000	5,000	5,000	5,000	8,582	28,582
	Output sub-total						**1,103,582**
TOTAL Component 2							**1,103,582**

		GEF Grant Budget Component 3					
Component 3	**Type of Expense**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Output Total**
Output 3.1	International Expertise	10,000	10,000	10,000	10,000	10,000	50,000
	Local Travel						
	National Expertise			25,000		25,000	50,000
	Contractual Arrangement						
	Training/Workshops						
	International Meetings/Workshops						
	Equipment						
	Miscellaneous						
	Output sub-total						**100,000**
TOTAL Component 3							**100,000**

Proposed Co-financing Budget *(consider that for M&E purposes realized co-financing needs to be reported at project mid-term and terminal evaluation)*						
	Co-financing Budget Component 1					
Component 1	UNIDO	BEE	Private entities	Source 4	Source 5	**Output Total**
Output 1.1	60,000	2,000,000	50,000,000			52,060,000
Output 1.2	60,000	2,880,000				2,940,000
TOTAL Component 1						**55,000,000**

	Co-financing Budget Component 2					
Component 2	UNIDO	BEE	Private entities	Source 4	Source 5	**Output Total**
Output 2.1	70,000	2,000,000				2,070,000
TOTAL Component 2						**2,070,000**