PROJECT IDENTIFICATION FORM (PIF) [1]

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

PART I: PROJECT IDENTIFICATION

Project Title:	Organic waste streams for industrial renewable energy applications in India		
Country(ies):	India	GEF Project ID:[2]	5087
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	XXIND11X05
Other Executing Partner(s):	MNRE[3], MSME[4]	Submission Date: Resubmission Date:	15 August 2012 13 September 2012 19 September 2012 31 January 2013
GEF Focal Area (s):	Climate Change	Project Duration (Months)	60 months
Name of parent program (if applicable): ➢ For SFM/REDD+		Agency Fee ($):	316,635

A. FOCAL AREA STRATEGY FRAMEWORK[5]:

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Indicative Grant Amount ($)	Indicative Co-financing ($)
CCM-3	Outcome 3.1.: Favorable policy framework created for renewable energy (RE) investments in industrial and commercial applications	Output 3.1: RE policy and regulation in place Output 3.3: Electricity and heat produced from renewable sources	GEF TF	1,475,000	7,225,000
	Outcome 3.2.: Investment in RE Technologies increased			1,700,000	10,200,000
			Sub-Total	3,175,000	17,425,000
			Project Management Cost[6]	158,000	790,000
			Total Project Cost	3,333,000	18,215,000

[1] It is very important to consult the PIF preparation guidelines when completing this template.
[2] Project ID number will be assigned by GEFSEC.
[3] **Ministry of New and Renewable Energy**
[4] **Ministry of Micro, Small and Medium Enterprises**
[5] Refer to the reference attached on the Focal Area Results Framework when filling up the table in item A.
[6] GEF will finance management cost that is solely linked to GEF financing of the project. PMC should be charged proportionately to focal areas based on focal area project grant amount.

B. PROJECT FRAMEWORK

Project Objective: The proposed project will focus on using organic waste streams for industrial renewable energy (RE) applications in SMEs, in line with the priorities of the Government of India (GoI), as outlined in the National Action Plan on Climate Change (NAPCC) and relevant National Missions, including the National Mission for Enhanced Energy Efficiency in Industry (NMEEE), with the overall aim to increase the competitiveness of SMEs and reduce dependency on fossil fuels.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount ($)	Indicative Cofinancing ($)
Strengthening the policy and institutional framework	TA	Enhanced use of organic waste streams for industrial RE applications in target SME sectors	Detailed set of recommendations and guidelines for policy makers to stimulate the use of organic waste streams in industrial energy applications in target SME sectors	GEF TF	200,000	1,000,000
Demonstration of the most relevant technologies in selected sectors	TA	Demonstrated technical and financial viability of projects	1.Detailed technical specifications pertaining to technologies identified for deployment 2.Technology application information packages developed for target applications	GEF TF	400,000	2,000,000
	INV		3. Innovative organic waste-based industrial renewable energy (RE) applications realized in selected SME sectors, indicatively 7 – 10 in number in the 0.25 – 2 MW capacity range, demonstrating technical and financial viability of the technologies. Technology focus will primarily be on biochemical processes (anaerobic and aerobic digestion), in line with national policies.		1,700,000	10,200,000
Capacity building of public and private sector stakeholders	TA	1. Enhancement of capacity of key players in target industries 2. Promotion of knowledge and information sharing and	1. Targeted workshops (10) and domestic study tours (5) organized to successful projects for public, private sector (including manufacturers and installers) and business community	GEF TF	350,000	1,750,000

		dissemination of best practices	2. Knowledge dissemination: publication of project outputs, case studies, best practices and lessons learned disseminated to ensure larger replication and promote partnerships between local industries, international centres of excellence and technology suppliers			
Increased use of technologies in organic waste to energy applications in industry	TA	Sustainable replication model for effective scaling up of different technologies across target industries	1.Financing facility developed and established by at least 1 financing institution 2. Appropriate incentive schemes and smart subsidies designed and put in place for developing and taking forward project pipeline 3. Quality control system for organic waste streams for energy applications in SMEs in place through standards, performance guidelines and a standardization framework	GEF TF	465,000	2,325,000
Monitoring and Evaluation and Knowledge Management	TA	Project's progress towards goals confirmed and/or necessary adjustments made	1.Mid-term and final evaluation carried out; Project's progress assessed, documented and recommended actions formulated; 2.Knowledge gained shared with project partners	GEF TF	60,000	150,000
			Sub-Total		3,175,000	17,425,000
			Project Management Cost[7]	(select)	158,000	790,000
			Total Project Costs		3,333,000	18,215,000

C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, ($)

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount ($)
National Government	Min of New & Renewable Energy (MNRE), Min. of Micro Small & Medium enterprises (MSME), Ministry of Food Processing Industry (MOFPI); Other	Grant/In Kind	6,000,000
Private Sector	Under consultation	Grant/In-kind	4,000,000

[7] Same as footnote #3.

Local Government/PSU	SIDBI/IREDA	Soft Loan/Partial Credit Guarantee	4,000,000
Others/Private Banks	TBD	Hard Loan	4, 065,000
GEF Agency	UNIDO	Grant	75,000
GEF Agency	UNIDO	In-kind	75,000
Total Cofinancing			18,215,000

D. GEF/LDCF/SCCF/NPIF RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b
(select)	(select)	(select)				0
(select)	(select)	(select)				0
Total Grant Resources				0	0	0

[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

[2] Please indicate fees related to this project.

PART II: PROJECT JUSTIFICATION

A. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

A.1.1 the GEF focal area/LDCF/SCCF *strategies* /NPIF *Initiative:*

The Project is aligned with GEF's focal area strategy under Climate Change Mitigation, and most notably with Objective 3: "Promote investment in renewable energy technologies." The Project will seek to trigger investments in organic waste for industrial energy applications in India by making energetic use of the available waste streams. The Project will put together bankable projects and demonstrate a mechanism to mainstream uptake of such projects with common financial instruments. Setting up the market environment that allows and promotes the use and replication of such technologies will lead to significant GHG emission reductions.

A.1.2. For projects funded from LDCF/SCCF: the LDCF/SCCF eligibility criteria and priorities:

n/a

A.1.3 For projects funded from NPIF, relevant eligibility criteria and priorities of the Fund:

n/a

A.2. National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NIPs, PRSPs, NPFE, etc.:

Energy and climate change-related concerns of the Indian economy include the growing gap between the demand and supply of energy and environmental externalities associated with energy use, as described in India's Second National Communication[8] to the United Nations Framework Convention on Climate Change (UNFCCC). Indeed, the Indian economy has been growing rapidly since the 1990s, with an even higher growth in the energy sector. This was because the economic growth was driven by energy intensive sectors, where the energy efficiency was low by international standards. Especially in the electricity sector, the electricity consumption has grown at a rate higher than the GDP and energy for the past two decades, with the trend becoming more pronounced in the 1990s. This implies substantial increases in electric power generation and transmission capacities, petroleum products and natural gas demand and consumption.

The project is in line with the GoI National Action Plan on Climate Change (NAPCC), which was announced and launched on 30th June 2008 and which recognizes issues of energy security and climate change mitigation as priority areas for policy action. The NAPCC, guided by the principles of sustainable development (SD), aligns the environmental and economic objectives and basically is the response of the GoI to address the challenges as identified in the Second National Communication to the UNFCCC.

[8] Second National Communication to the United Nations Framework Convention on Climate Change, Ministry of Environment & Forest, Government of India, May 2012

The National Action Plan itself is built on the following seven guiding principles:[9]

1. Protecting the poor and vulnerable sections of society through an inclusive and sustainable development strategy, sensitive to climate change.
2. Achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions.
3. Devising efficient and cost-effective strategies for end user Demand Side Management.
4. Deploying appropriate technologies for both adaptation and mitigation of greenhouse gases emissions extensively as well as at an accelerated pace.
5. Engineering new and innovative forms of market, regulatory and voluntary mechanisms to promote sustainable development.
6. Effecting implementation of programmes through unique linkages, including with civil society and local government institutions and through public private-partnership.
7. Welcoming international cooperation for research, development, sharing and transfer of technologies enabled by additional funding and a global IPR regime that facilitates technology transfer to developing countries under the UNFCCC.

The action plan is being implemented through eight National Missions, which represent a "multi-pronged, long-term and integrated strategy for achieving key goals in the context of climate change". The most relevant missions to which the project will contribute are the National Mission for Enhanced Energy Efficiency (NMEEE) and the National Mission on Strategic Knowledge for Climate Change. Although the major thrust of NMEEE is on improvements in process energy efficiency, the type of RE interventions (i.e. waste utilization, fuel switch from fossil fuels to biomass) also serves the goal of the NMEEE. The industry sector is the largest user of commercial energy in India, accounting for 42% of the country's total commercial energy use during 2004-05. The Indian industry sector, comprising of large, medium, and small enterprises, registered a growth of 10.6% in April–December 2006 (MoF, 2007). As per the national greenhouse inventory, the direct CO_2 emissions from industrial sources accounted for nearly 31 % of the total CO_2 emissions from the country (data for base year 1994) (NATCOM, I). The GHG mitigation options in the industry sector suggested by the NMEEE include cross-cutting technologies and fuel switch. The latter option includes for example switching over from fossil fuels to produce gas from biomass fuels for various thermal applications.

The identification of opportunities that facilitate the use of existing resources and continued economic development through differentiated sectoral policies will assist India in reducing its vulnerability to climate change. The NMEEE document puts a great emphasis on activities related to cluster development, particularly in SMEs. The project, with its focus on an increased use of existing organic waste streams in SMEs can clearly serve these objectives.

B. PROJECT OVERVIEW:

B.1. Describe the baseline project and the problem that it seeks to address:

Industries in India generate large amounts of waste, and with the Indian economy expanding at a 7% growth rate waste generation will consequently increase. Industries generate waste of different types, ranging from organic biodegradable waste to inorganic, metallic, plastic, hazardous wastes, liquid effluents, flue gas streams containing particulates and waste heat. The cost and availability of energy is also becoming unfavourable for the industry due to shortages in power supply and rising costs of fossil fuels. Indeed, the main fossil based fuels like coal, fuel oil, natural gas are becoming scarce. During 2011 many of the coal based power plants faced shortages from both domestic sources as well as imported ones. The prices of petroleum based liquid fuels have been increasing over the past decade making the power from these fuels uneconomical. Most of the natural gas is imported and its availability faces greater risks. In this situation, it is imperative for the industry to look for alternative sources of energy and it is critically important to fully utilize the waste from industries for generation of energy (or other resources such as biochemicals).

The National Master Plan (NMP) developed by the MNRE under the UNDP-GEF high rate biomethanation projects for the first time conducted a systematic analysis of this sector and provides the baseline information. Barring a few industries, mostly large sized, most of the industries dispose of the waste as effluents or dump it to degrade in the natural course, the main reasons being uneconomical treatment for safe disposal or recovery of energy. In recent years

[9] National Action Plan on Climate Change – Government of India

some of the waste streams have been treated in the wake of strong pollution control laws and their stricter enforcement. In case of larger industries where waste quantities are larger, the industries have realized economic value of the waste and no longer treat these as wastes but as by-products. One of the lessons learned is that, despite the aim to gradually move away from a subsidy regime to self-sufficient financing, a continued grant-based approach is required in order to push the introduction of new and innovative technologies into existing sectors. This is particularly true for SMEs, where available financing resources and technical capacities are generally limited.

The NMP has documented technologies like biomethanation or anaerobic digestion of liquid or semi-solid waste streams. Besides this, there are thermo-chemical technologies available including pyrolysis, incineration, gasification and combustion of solid wastes. The choice of technology depends on the nature, quantity and calorific value of the waste stream and the desired output. The experience gained through Clean Development Mechanism (CDM) projects on waste to energy shows that a large number of industrial biomass to energy projects that have been registered under CDM. The majority of these projects typically has a capacity of 6 – 8 MW in size, with projects involving rice husk or bagasse in organized industry as large as 15 MW; for poultry litter waste plants the frequently observed size is around 3 MW. Most projects are for grid-connected renewable electricity generation (106 registered) and thermal energy production (56). The technology employed by agro-residue based projects is mostly combustion which could also include cogeneration depending on use of steam e.g. for the rice mill or the sugar mill. For poultry litter the technologies employed have been combustion or biomethanation. In few cases biomass gasifiers have also been used.MNRE has undertaken many programs in the area of recovery of energy from urban and industrial wastes urban and industrial energy, yet the major focus of its programs has been for large-scale industries. MNRE's urban and industrial waste to energy programs have been primarily supporting demonstration projects in the areas of Municipal Solid Waste (MSW), agro-waste biomass and selected industrial wastes, yet with particular focus on large-scale industries. The current government support programmes (baseline) include incentive schemes for industrial waste (up to 20% capital grant), for CHP (up to 5-7% capital grant) and for biomethanation (each with a number of eligibility criteria, conditions and caps); yet it is acknowledged that these programmes – despite their importance – provide an insufficient signal for sectors, and especially SMEs, to invest in innovative technologies, with the barriers being not only at the financial level, but also on lack of tailored technical and capacity building assistance.

The project aims at identifying sources of industrial organic waste streams for conversion to usable forms of energy, with the primary focus being conversion to (process) heat, yet wherever feasible and appropriate power will also be added (e.g. through cogeneration).

Without GEF intervention these technologies are unlikely to enter SME sectors, even where useful organic waste streams are available and companies can demonstrate financial health. Indeed, although many of the above mentioned waste to energy technologies have already proven their techno-economic viability, in most SMEs and small size units the waste quantities are smaller and these units do not have the technical and financial ability to invest in appropriate technologies.

The shift to modern technologies in the industry sector generally involves significant incremental investment, and the goal of the GEF project will exactly be to push the investment decision towards the technology innovation in sectors currently unfamiliar with these technologies, with a view to then trigger rapid replication once technology is proven successful. The project should thus "build the avenue" for these technologies to be taken up.

B.2. 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/NPIF) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

The proposed project will focus on industrial organic waste streams for renewable energy applications in SME units and/or clusters of units, to generate energy (or chemicals), since these technologies have not been able to enter the SME sectors due to lack of capacity, lack of critical size and according financial constraints. The Project aims to introduce these technologies to SME sectors and address the specific challenges which the deployment of such new technologies into SME sectors entail.

The main objective of the proposed project will be to identify and develop innovative technology investments in target industrial sectors where good potential for recovery of energy from organic waste is available.

During the development of the PIF a total of 12 industrial sectors where such waste streams emerge were studied. The focus is primarily on food processing industries such as sugar, breweries, poultry, molasses based distillery, dairy, pulp & paper, tannery, slaughter houses, cattle farms, maize and tapioca starch, rice mills and miscellaneous other industries. Besides these, industrial canteens and hotels/restaurants in clusters could also be a major source of organic waste. Looking at the niche identified, i.e. small and medium industrial clusters, the proposed initiative will focus on common waste to energy infrastructure for SME clusters in food processing industries, rice mills, dairies, pulp & paper mills, poultries, tanneries, slaughter houses, cattle farms, sugar, and maize / tapioca starch units. Standalone medium size units like distilleries, pulp & paper mills etc. could also avail of support for viable projects.

The project will identify suitable financial and institutional mechanisms for mainstreaming the uptake of such interventions in the identified and other sectors. While some of these industries like distilleries and pulp & paper have installed treatment plants to meet stringent pollution control norms, there are still a large number of industries where the problem of waste disposal is acute and at the same time the bulk of the energy demand is met through fossil fuels. The use of organic waste for generation of energy or other feed stocks (for example biochemicals/biofuels) would address both the above problems faced. This will be synergetic with previous GEF programs undertaken by UNIDO and UNDP and would address an important sector hitherto missed out.

Technologies to convert organic waste streams into useful energy have thus far only been able to enter large-scale industries, due to existing support instruments which benefit only large-scale industries. The added value of this project will therefore precisely be to bring these technologies to SME sectors, and refine existing support instruments to achieve this goal.

The planned project activities from the project through various components are elaborated below:

COMPONENT 1:

POLICY: Despite the technologies for using organic waste for renewable energy applications in industry being available, banks and financial institutions at state/national levels are however, selective in financing such projects. Projects for generating energy from organic residues (including e.g. rice husks and wastewater from many industries) are not yet preferred and are considered too risky by the banking sector; the interest of the banking sector can be created once the risk perception is properly addressed. The Policy component of the proposed program would develop tailored actions to promote project uptake in target SME sectors. Although MNRE has promoted several programs in the area, the focus has been primarily on large-scale industries. The current programs of MNRE, MSME, MOFPI will be analyzed to identify technical, financial, institutional gaps and constraints which hamper SME sectors in tapping into them more effectively, and allowing leveraging of private capital, both equity and debt. The result of this would be tailored recommendations on interventions for creating favorable financial, promotional policies and strategies to make increased use of organic waste for renewable energy technologies in industry. GEF funding in the policy component will be used to bring best practice and international experience in order to refine the existing regulatory framework, with the cofinancing for this exercise to come from national Government (incl. MNRE, MSME) and key stakeholders.

COMPONENT 2:

TECHNOLOGY DEMONSTRATION: The technologies for making use of most of the organic industrial waste to generate energy are known and available indigenously or through transfer from industrialized nations. However, their reach has thus far been limited to large scale and mechanized industries. Demonstration in the SME sector let alone large scale proliferation throughout industries is, however, lacking. Therefore, the technology demonstration component is an essential step to launch introduction of the technologies into target SME sectors. The targeted capacity range will be 0.25 to 2 MW, which is deemed highly relevant for the SME sector, but has not been taken up despite the potential. In this way the project would be a unique one that will support and complement India's energy policy priorities. In line with the ongoing policy and support instruments of MNRE, the project's technology focus will primarily be on biochemical technologies (i.e. aerobic and anaerobic digestion).

This component will prepare detailed technical specifications for the target technologies in most relevant selected sectors. Further, demonstration projects will be identified, financed and monitored so as to draw lessons to perfect the financial model. A cluster approach (i.e. using industrial waste from many SME units in clusters to generate energy) will be encouraged, thus reaching critical size and help increasing effectiveness of the investment and enable pooling of resources. This approach will be essential since the investment and scale factors make a lot of difference for the

viability of the technology investment; also given differences between industrial sectors, tailored strategies are expected to be required for different sectors. Depending on the number, size and interest shown by individual units a number of plants can be designed.

Waste collection has proven to be extremely difficult, and few business models have been successful thus far both globally and in India, especially for Municipal Waste Projects. The main barriers are mixed or low calorific waste (thus lowering efficiency of equipment and energetic output), and the lack of an economically viable business model (essentially both parties - waste provider / waste processor – expect to be paid for their waste / waste processing service). The approach will therefore be to target in the first instance organic waste streams which are sufficiently available at company level, thus ensuring availability (no fee to be paid) and homogeneity; in case organic waste streams do not reach critical quantities, the bundling of different companies with the same or energetically similar types of waste will be considered, again without jeopardising the homogeneity of the waste. In case of bundling of different companies, a collection and payment model will be worked out, taking into account the lessons learned and possibly involving a third party. The details of such approach will be further worked out during PPG phase, once the sectors, clusters and units are narrowed down and target companies have been identified.

A number of industrial waste streams which thus far have not been sufficiently targeted are sugar industry press mud, poultry industry waste and brewery wastewater. These are described in detail below, as indicative examples of the type of sectors and interventions the project intends to focus on.

In this component the cofinancing will consist of governmental support schemes, private sector contribution and bank loans, whereas GEF contribution will be used to provide an initial grant to kick-start the use of technologies in new sectors. The details of this financial mechanism will be worked out during PPG phase, and will be based on the incremental cost principle. With regards to the cofinancing in the TA part will mainly relate to activities required to bring the investment projects to financial closure (including support in development of feasibility studies, business plans, etc).

BOX 1: INDICATIVE EXAMPLES OF THE TYPE OF SECTORS AND INTERVENTIONS

SUGAR PRESS MUD

WHAT IS SUGAR PRESS MUD: Sugar mills crush sugar cane that has been procured straight from sugar cane farms. The cane is crushed in the mills and the juice is passed through large filter presses and the clear juice is further processed for sugar recovery. The filter cake - also called press mud - is collected. In many sugar mills the filter cake is used as organic manure. In some sugar mills which also have distilleries, the filter cake is sometimes mixed with the spent wash from distillery and used as organic manure. It is estimated that every ton of sugar cane crushed generates about 3 to 4% press mud. It is estimated in the NMP[10] that annually around 5.2 million tonnes of press mud is generated in sugar factories in India. It contains about 20-25% solids with sugar content (1-3%) and fibres (5-10%).

ENERGY POTENTIAL AND INVESTMENT COST: As the press mud has about 75% moisture, it is suitable for biochemical processes. Moreover, press mud contains around 20% organic carbon, hence it is possible to process it through biomethanation or an anaerobic digestion process to generate methane. The methane rich biogas can be used to generate power through either steam turbine generators (Rankine cycle) or by gas engines. The press mud from a 5000 TCD[11] sugar mill can produce around 8800 NM^3/day biogas, which can generate 880 kW power. It is estimated that the potential for power generation from this waste source is around 452 MW in the 12th Five year Plan (2013-17). The advantage of the biomethanation process is that it still generates manure as a safe and useful by-product (i.e. basically neutralized organic carbon), since the other micro-nutrients of the press mud (potassium, magnesium, calcium, iron etc.) are retained in the manure. A typical biomethanation plant for treating press mud from 5000 TCD sugar mill which would generate about 8800 NM^3/day of biogas and 880 kW power would have a capital cost of about 1.2 MUSD. The O&M cost would be in the range of 0.4 MUSD per year. However, in order to make such investments viable additional support in the form of technical assistance, capital grants, low cost debt and/or carbon revenue are deemed necessary.

POULTRY

[10] NMP: National Master Plan for Development of Waste-to-Energy in India (2006)
[11] TCD: Tonne sugar Cane crushed per Day

TYPES AND AMOUNTS OF WASTE: The typical poultry cycle generates waste at various stages; the production phase in a breeding farm/hatchery generates waste in the form of egg shells, unhatched eggs, dead birds, poultry droppings, feathers, bedding materials and waste feed. The waste volume is estimated (NMP) at 11 kg per 1000 chicks produced and 225-275 kg per 1000 parent birds per day. The development phase in layer and broiler farms generates waste containing poultry droppings, feathers, bedding material and waste feed at 180 kg per 1000 layers per day and 225-275 kg per 1000 broilers per day. The processing stage at a poultry processing unit generates waste containing poultry litter, blood and offal at around 27-29% of raw material used. The poultry waste is characterised by relatively high levels of nitrogen, potassium and phosphates. This together with organic carbon, high volatile solids and moisture makes it suitable for recovering energy. Few poultries especially in Andhra Pradesh have adopted incineration based power generation plants. Some of these projects have been registered as Clean Development Mechanism (CDM) projects under the Kyoto Protocol.

ENERGY POTENTIAL AND INVESTMENT COST: The capital cost of these projects is in the range of 1-1.2 MUSD per MW. Besides the thermo-chemical processes, biomethanation can also be used to treat poultry industrial waste. The NMP has estimated that a poultry farm of 1 million birds could produce 100 tons waste per day and generate 9600 NM^3/day of biogas and 960 kW power.

BREWERY

TYPES AND AMOUNTS OF WASTE: The breweries generate wastewater of around 3.5 – 4.2 litres per litre of beer. The brewery wastewater contains wort and beer wastes, spent grain and grain dusts, fermentation solids, yeast wastes, wastewater of cleaning and disinfection equipment, acid solutions from equipment, caustic soda from PVPP filters, alkaline wastewater from bottle cleaning system, insoluble substance, soluble substance like adhesive, salt and conveyer lubricant, oil and grease tracks from the equipment lubrication and beer wastes from returned bottles and kegs.

At present most of the brewery wastewater is aerobically treated. Yet the combined anaerobic / aerobic treatment of brewery effluent has important advantages over complete aerobic treatment especially regarding a positive energy balance, reduced (bio) sludge production and significantly lower space requirements. The Indian beer industry has been witnessing a steady growth of 10 - 17% per year over the last ten years. The rate of growth has increased in recent years, with volumes passing 196m cases (8 liter per case) during the FY 2010-2011. These factors suggest a high potential for power generation through WTE technologies in the brewery industry. In India not many WTE projects are known to be set up on brewery wastewater.

ENERGY POTENTIAL AND INVESTMENT COST: The brewery wastewater has a Biochemical Oxygen Demand (BOD) in the range of 1200 – 3600 mg/l and Chemical Oxygen Demand (COD) from 2000 to 6000 mg/l. considering the high ranges of BOD and COD, anaerobic digestion or biomethanation would be the preferred conversion process. At a methane production of 0.35 Nm^3 methane per kg COD removed, the methane production is estimated at 0.43 Nm^3 CH_4 per 100 liter beer. At a calorific heat value of 32 MJ/Nm^3 methane, the specific energy production through biogas is 13.8 MJ per 100 liter beer. The biogas produced can be used for generation of steam or for power generation. If the biogas is used to replace fossil fuel energy it can save up to 8 % of the brewery's energy requirement (typically around 170 MJ/hl). Representing cost of such projects per MW may not be appropriate as the plant contains much equipment which is not power specific. Based on international experience with few projects utilizing brewery wastewater in integrated plants with anaerobic treatment, in a first phase to generate biogas and aerobic treatment in a second phase, the cost of these plants ranges between 3.2 - 3.4 MUSD per MW. Some such projects have been registered under CDM.

While the proposed program would not meet the entire demand for such WTE projects, carefully made pilot interventions will aim to demonstrate their technical and economical potential, after which replicable model projects that will emerge from the pilot phase will lead to scale up with financing from commercial funding sources. Also, the institutional model that the proposed program would foster would ensure continuity in post project scenario.

Thus, most innovative projects will be realized in selected sectors, demonstrating technical and financial viability of the technology through favorable business models. The financial institutions working in the implementation set up, therefore, are crucial to the success of the program. The reach of these financial institutions in the Indian financial set up will play important role in scaling up the initiative at the national level in order to meet the overall goals of India's NAPCC.

The projects will be financed through appropriate financing instruments, which will be developed with the financing partners. It is anticipated that the technology demonstration phase will include a grant subsidy in order to kick-start the use of new technologies to the target SME sectors, while for the replication and scale-up phase the grant approach should fade out to ensure long-term lending sustainability.

COMPONENT 3:

CAPACITY BUILDING: Capacity Building of the major stakeholders including participating industry, banks/FIs, technology developers, local population affected by the disposed organic wastes and government agencies will be essential so as to creating interest among them. It has been an established fact that a well-informed group of stakeholders enables speedy uptake of projects. Capacity building of implementing agencies is of particular importance so that the perceived goals of the GEF5 assistance are realized by the end of the program and ensure the mainstreaming of industrial waste to energy projects from commercial sources after the project.

COMPONENT 4:

SCALE-UP: Based on the experience of the technology demonstration phase, the financing scheme will be evaluated and improved, and tailored towards effective replication and scale-up. Ultimate success of the project would be evident if organic industrial wastes are not disposed of by the industry and made use of. The main problem faced by the SME sector is that the quantity of waste generated by individual units does not make energy recovery from them cost effective. It has been observed that mostly such industries are set up in clusters. It is therefore proposed to address these at cluster level wherein, energy recovery plants will be set up in clusters, which will benefit all its member units. Appropriate models will need to be prepared and demonstrated in select SME clusters. This scale up will be implemented through appropriate financial mechanisms based on the experience of the demonstration phase. The financial institutions involved in the implementation of the program would be of critical importance in this regard. The partner ministries would provide crucial oversight in their respective focus areas.

Key government partners

The Ministry of Medium and Small Enterprises (MSME) is supporting common infrastructure development projects in SME clusters and Ministry of Food Processing industry (MOFPI) is facilitating infrastructure development in food processing parks. The project aims to bring these different actors and schemes together to increase the use of organic waste streams for industrial renewable energy applications in SMEs, with an initial focus on agro-food SME sectors. The projects are expected to be co-financed from specific assistance programs of MNRE, MSME and MOFPI through SIDBI and IREDA.

The project's key governmental stakeholders will include MNRE, MSME, potentially MOFPI and local financial institutions (e.g. SIDBI/IREDA), which in some cases are financed by a line of credit from ADB. As discussed in section A2 above the SME sector is in need of funding and institutional assistance in order to make gainful use of organic industrial waste possible. The involvement of entities like SIDBI/IREDA seems best suited for ensuring continuity after completion of the GEF project is over; these have extensive experience with financial instruments and providing credit to a wide variety of industries and companies. Lines of credit may be possible with other Indian FIs from other multilateral financial institution with a focus on RE technologies, including organic waste for energy applications in industry.

Global Environment Benefits

The Project will generate global environmental benefits to fight against climate change by avoiding the release of CO_2 into the atmosphere by using waste energy to replace fossil fuels for electricity and heat production.

The investments as part of technology demonstration are initially estimated to amount to approximately 555,000 tCO_2eq (direct emission reductions) over a 15 year lifecycle duration of the technologies.[12]

The industry sectors being considered for possible industrial application of renewable energy technologies are estimated to release in excess of 100 million tonnes of CO_2 in the atmosphere every year due to the use of fossil fuels.

As a conservative estimate a replication factor of 10 can be used, which will result in indirect emission reductions of 1,564,580 tCO_2 post -project.[13]

[12] The following assumptions are made: 7 pilot plants of 1 MW capacity each; plant factor 75% (6570 hours); CO_2 intensity national electricity sector 0.81 ton CO_2eq/MWh (Source: Central Electricity Authority India). Annual energy production is 45,990 MWh, saving 37 kton CO_2eq/yr. Over a 15-year period, the total GHG reductions are 555 kton CO_2eq.

A more detailed estimate of total GHG reductions will be prepared during the PPG phase. In addition to the avoided CO_2 emissions, the release of methane (CH_4) by organic residues will also be avoided as a result of the Project; since this cannot be estimated in detail at this stage the avoided release of methane is not taking into account; once the targeted pilot plants are defined in more detail during PPG phase, the amounts will be estimated and added to the expected GEBs.

B.3. 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). As a background information, read Mainstreaming Gender at the GEF.":

Beside these global environmental benefits, the projects treating organic industrial waste may also have local environmental benefits such as cleaning of water bodies, ground aquifers, ambient air quality etc. which affects the health of people living in nearby. The improved local environment will have positive impact on health and hygiene and improve productivity. The projects also would provide additional employment opportunities in the industries as well as ancillary industries. The projects would also lead to more investments in the industries especially SMEs which would improve employment generation. The activities such as biomass procurement, transport, processing would also lead to improvement in local income levels. In addition, the higher technologies would also improve skills and competence of local population.

As a high percentage of SME's employees are women, the additional employment opportunities and improved skills and competences will contribute to an accelerated empowerment of women.

B.4 Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:

The results of an initial risk assessment are presented below:

Risk	Risk level	Risk Mitigation
Political risk: lack of government commitment to support the project.	M	- The project objectives and activities are in line with national policies and objectives. The project will actively involve representatives from concerned ministries to ensure their full support throughout the project and beyond.
Technical risk: WTE technologies do not succeed; There is limited technical risk since RE technologies are widely used in many developing countries. The risk can however come from the selection of an unsuitable site.	M	- Suitable sites will be selected through careful analysis of target sectors and plants. - Identification of proven technologies - Quality audit of equipment - Implementation guidance by experts - Training to the operating personnel in the industry
Implementation risk: Lack of interest from industries to take up WTE projects Lack of interest from technology providers. Industry participating in demo projects goes bankrupt	M	- Development of detailed activity plans in close cooperation with in-country project partners, stakeholders and developers. - A thorough stakeholder consultation process will be conducted during the project preparation phase. - An agreed and transparent modus operandi will be designed before the start of project implementation. Importance and relevance of WTE will be explained to the industry in initial

[13] Assuming 70 units of 1 MW equivalent to 70 MW electric capacity; A 10 year horizon is taken in line with GEF guidelines; assuming the 35 MW capacity is added after 3 years, the 70 MW will be operational for 7 years over the 10 year period and the total generated energy volume is 75%*70*7*8,760= 3,219,300 MWh. The associated emission reductions are: 2,607,633 ton CO_2eq. Assuming a "GEF causality factor" of 60%, the indirect emission reductions that can effectively be attributed to the Project are: 1,564,580 ton CO_2eq.

Changes in the availability of the waste from industry		capacity building programs - Provide live case examples to the industry - Regular contact with manufacturers - Organization of events for outreach - The selection of the units for demo projects based on thorough analysis of its performance and status - Proper initial assessment of waste availability - Signing up enforceable contracts for supply of waste at agreed prices throughout the contract period - Mechanisms created during earlier UNIDO interventions e.g. Cluster Development Initiatives would be leveraged.
Financial risk: Lack of interest among banks and FIs for large scale uptake. Financial/credit constraints, high capital costs and an inhospitable investment environment prevent private sector from investing in the projects. The existing financial mechanisms are inadequate and could affect investment projects on a larger scale.	H	- In India, like in many countries worldwide, efficient financial mechanisms have been set up. Based on the national and global experience it will be possible to develop suitable financial tools for India. - Banking sector will be closely involved during the PPG phase - Proper dissemination of the results will be organised to raise awareness among banking sector
Sustainability risk: failure to achieve project outcomes and objectives after successful delivery of outputs.	H	- By making market players fully aware of the economic potential of RE technologies and by equipping them with the capacity and tools to realize and reap the benefits of such potential, the project will generate a self-reinforcing market. In addition, the financial mechanisms that will be put in place will create a positive context that is expected to ensure the attainment of the project outcomes and their sustainability.
Environmental risk: failure to mitigate environmental risks	L	- Carry out Environmental Impact Assesments as part of preparation of the technology interventions, including sanitary management of organic waste, ways to address potential odour problems caused by the biochemical process to covert waste to energy, etc.

B.5. Identify key stakeholders involved in the project including the private sector, civil society organizations, local and indigenous communities, and their respective roles, as applicable:

The Ministry of New and Renewable Energy (MNRE) as the primary counterpart of GEF in this assignment is mandated by GoI to oversee development of energy from RE sources in the country. Besides MNRE, another major partner will be the Ministry of Micro, small and Medium Enterprises (MSME), since the main stakeholders in the program will be SMEs. In addition, during the PIF scoping the Ministry of Food Processing Industry (MOFPI) was also contacted and has expressed interest in co-financing relevant projects in the food processing industry, which is one of the main generators of organic waste. Other potential partners include IREDA, SIDBI, commercial banks (e.g. ICICI), bilateral funding agencies like KfW. For technical inputs institutions like IITs in Bombay, New Delhi and Roorkee and Industry associations like ASSOCHAM, CII, FICCI and key NGOs may be partners in the program. The

role of the respective industry associations in the target sectors will especially be relevant to build awareness and willingness to innovate in target companies, as well as in the design and execution of capacity building initiatives.

B.6. Outline the coordination with other related initiatives:

The project will build on the ongoing efforts of MNRE under GEF4, specifically GEF / UNIDO's project "Promoting Energy Efficiency and Renewable Energy in Selected Micro, Small and Medium Enterprises (MSME) clusters in India", which, apart from its main focus on EE, also has a (limited) RE – including biomass – component. The 12 target clusters are: Brass (2 clusters, focus on EE only), Ceramic (3 clusters, focus on EE only), Dairy (2 clusters, focus on EE and solar), Foundry (3 clusters, focus on EE, and biomass in 1 of 3 clusters), Hand Tools (2 clusters, focus on EE and solar in 1 of 2 clusters). The RE component focuses on the provision of low temperature process heat and with only one cluster with a potential biomass component (i.e. biomass in foundry), there is no direct overlap in terms of sectors, clusters and renewable energy sources, yet the experience in the preparation and approach for implementation will prove useful in the detailed design of the project.

The UNIDO GEF-5 project "Promoting business models for increasing penetration and scaling up of solar energy in India" (currently in PPG phase) focuses on medium to high temperature applications for both heating and cooling in industry, a type of technology which is advancing rapidly and most promisingly, yet which thus far has not fully demonstrated its technological preparedness for wide-scale application. The current project on organic waste streams is expected to target established technologies, which, due to other than technological barriers (i.e. capacity, finance, awareness, scale etc.) have not been deployed according to their potential. Although in principle it is not excluded that - wherever the technical potential is available - the project on solar and the project on organic waste streams focus on the same sector or cluster, it is expected that the detailed analysis will lead to different target sectors and clusters for the respective projects.

Another relevant initiative is the completed UNDP/GEF project on "Development of High Rate Biomethanation Processes as a means of Reducing Greenhouse Gas Emissions". A National Master Plan (NMP) for Waste-to-Energy has been finalized which is being used by MNRE in their policy formulation regarding waste management and methane gas recovery. Whereas the focus of this project has been primarily on large-scale industries, the proposed project will aim to introduce available technologies to the SME sector, where such technologies thus far have gained little or no access.

Potential synergies will also be investigated on the World Bank's initiatives, most notably the financing mechanisms currently available or under development for SMEs, will be investigated in further detail during PPG phase for their applicability to the target interventions.

Expected funding partners in the project include: SIDBI, IREDA, MNRE and the Ministry of Micro, Small and Medium Enterprises (MSME). Potential linkages with the international donor community will be further investigated during the project preparation phase. For ensuring quality standards, the Bureau of Indian Standards (BIS) will be an important stakeholder. MNRE's role in the implementation of the Project will help proper synchronization with its own schemes. Banks and financial institutions like SIDBI, IREDA are also involved in financing RE projects. Coordination with these programs will be ensured so that proper leveraging of funds available under the proposed program is possible. The projects developed under the proposed program may also take benefits under the national schemes like Renewable Energy Certificates (REC).

C. DESCRIBE THE GEF AGENCY'S COMPARATIVE ADVANTAGE TO IMPLEMENT THIS PROJECT:

The GEF Council document GEF/C.31/5 gives UNIDO comparative advantage for such projects. UNIDO's mandate is to assist industries in enhancing their productivity and competitiveness. UNIDO is especially well placed to implement this project because of its experience and expertise in RE projects and its history of cooperation with key stakeholders. South-south cooperation has also been supported through UNIDO's technology centres and partner institutions. In addition, UNIDO has managed programs that promoted SME cluster development, which is being focused in the proposed GEF5 project.

C.1 Indicate the co-financing amount the GEF agency is bringing to the project:

UNIDO will contribute USD 150,000 as co-financing for the project implementation.

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount ($)
GEF Agency	UNIDO	Cash	75,000

GEF Agency	UNIDO	In-kind	75,000
Total co-financing			***150,000***

C.2 How does the project fit into the GEF agency's program (reflected in documents such as UNDAF, CAS, etc.) and staff capacity in the country to follow up project implementation:

GEF agency's program as reflected in documents such as UNDAF and CAS revolve around the objective of accelerating India's progress towards its development goals.

The overarching objective of the India –UNDAF is "Promoting social, economic and political inclusion for the most disadvantaged, especially women and girls". In order to be able to meet the aforementioned objectives, it is imperative that the economy is assisted in ridding itself of expenditure such as that on fossil fuels. Savings on that front will directly influence the government's ability to intervene and promote economic inclusion of the disadvantaged. The project, as such, fits into the program to that extent.

The World Bank Group's "Country Assistance Strategy" for India is also directed towards alleviation of poverty and presents a case for pro-poor interventions. Importantly, the CAS document lists the promotion of private sector led growth as a significant strategy. This project also looks to incentivize private investment in conversion technologies for organic waste streams in industrial applications. The CAS also describes the Bank's partnership with GEF as a long-term partnership on climate change. The climate change strategy, as per the document, is coordinated with India's power reform programs and promotes both RE and energy efficiency gains. It will assist India in building its existing technologies and capabilities in climate-friendly technologies. As such, the project is also in consonance with World Bank's assistance strategy for India.

The Project will be implemented by UNIDO field staff and HQ staff, in close collaboration with the key partners. A Project Management Unit (PMU) will be set up for the daily operational implementation of the project. Details of this PMU (such as number and profiles of staff, location, budget etc) will be detailed during PPG phase.

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 TEMPLATE. FOR SGP, USE THIS OFP ENDORSEMENT LETTER).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Mr. Hem Pande	GEF Operational Focal Point	Ministry of Environment and Forests	04/03/2012

B. GEF AGENCY(IES) CERTIFICATION

UNIDO GEF Focal Point	Signature	Date	Project Contact Person	Telephone	Email Address
Mr. Dmitri Piskounov, Managing Director PTC, UNIDO GEF Focal Point		01/31/2013	Mr. Mark Draeck, Industrial Development Officer, Energy and Climate Change Branch, UNIDO	+431 26026 5317	m.draeck@unido.org