



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project

THE GEF TRUST FUND

Submission Date: 14 September 2009

Resubmission Date: 1 December 2009

PART I: PROJECT IDENTIFICATION

GEF PROJECT ID¹: 4134 PROJECT DURATION: 5 years

GEF AGENCY PROJECT ID: 4284

COUNTRY(IES): India

PROJECT TITLE: Market Development and Promotion of Solar Concentrators based Process Heat Applications in India

GEF AGENCY(IES): UNDP, (select), (select)

OTHER EXECUTING PARTNER(S): Solar Energy Centre, Ministry of New and Renewable Energy, Government of India

GEF FOCAL AREA (S)²: Climate Change

GEF-4 STRATEGIC PROGRAM(S): SP 3 – Promoting Market Approaches for Renewable Energy

NAME OF PARENT PROGRAM/UMBRELLA PROJECT (if applicable):

NA

| INDICATIVE CALENDAR* | |
|----------------------------------|------------------------------|
| Milestones | Expected Dates mm/dd/yyyy |
| Work Program (for FSP) | Mar 2010 |
| CEO Endorsement/Approval | May 2011 |
| Agency Approval Date | June 2011 |
| Implementation Start | Aug 2011 |
| Mid-term Evaluation (if planned) | Jan 2014 |
| Project Closing Date | Jul 2016 |

* See guidelines for definition of milestones.

A. PROJECT FRAMEWORK

| Project Objective: Increased use and promotion of solar concentrators for low and medium process heat applications. | | | | | | | | |
|---|--|---|--|--------------------------|------|-------------------------|-----|----------------------|
| Project Components | Indicate whether Investment, TA, or STA ^b | Expected Outcomes | Expected Outputs | Indicative GEF Financing | | Indicative Co-Financing | | Total (\$) c = a + b |
| | | | | (\$ a) | % | (\$ b) | % | |
| 1. Technology package development and standardisation | TA | a) Technology packages developed b) Standardisation and certification facility developed | a i) Four technology packages developed at SEC for process heat applications (Fresnel, Scheffler, ARUN Solar, and Concentrator Trough). a ii) The process integration requirements for 5 sectors identified and system configuration established b i) Developing test protocols for solar concentrators for different applications (for four technologies and five sectors). b ii) Developing performance guidelines for the solar concentrator packages for identified sectors. b iii) Developing Standards for solar concentrator technology | 900,000 | 20.4 | 500,000 | 2.5 | 1,400,000 |

¹ Project ID number will be assigned by GEFSEC.

² Select only those focal areas from which GEF financing is requested.

| | | | | | | | | |
|--|--------|--|--|-----------|------|------------|------|------------|
| | | | packages- b iv) Establishing the national certification facility at SEC. | | | | | |
| 2. Awareness and Capacity Building | TA | Awareness and technical capacity of the concerned stakeholders developed and strengthened to plan, design, develop, use and manage solar concentrators for industrial/ institutional process heat applications in India. | a) Capacity of manufacturers (producers of solar concentrators) developed/strengthened. At least 10 (existing or new) b) Capacity development to assist as interface between manufacturers and users. About 500 industry specific consultants will be trained. c) Technical capacity building: Promoting industry academic partnership. This will be done through promoting research programmes to build future capacities for replication and expanding to other sectors. (15 fellowships programmes will be supported) d) Developing the technical capacity of the staff at the Solar Energy Centre. e) Awareness programmes for policy makers, academicians, industries, financial institutions, etc. to facilitate replications. f) Capacity building of professionals (50 nos) to develop Detailed Project Report (DPR) g) media campaign to promote solar concentrators h) Documentation and dissemination of good practices and lessons learnt to ensure larger replication. | 1,050,000 | 23.8 | 500,000 | 2.5 | 1,550,000 |
| 3.Planning and Operationalizing Demonstration projects | TA/INV | 30 demonstration projects in 5 sectors developed | a) Identification of demonstration sites/ units b) 30 Detailed Project Report (DPRs) for the identified units developed and approved c) The system package installed and commissioned in 30 units. | 1,770,000 | 40.2 | 18,000,000 | 93.0 | 19,700,000 |

| | | | | | | | | |
|--|----|--|---|-----------|------|------------|------|------------|
| | | | d) performance analysis carried out, database established and lessons learnt documented and disseminated | | | | | |
| 4. Identification and removal of financial barriers in the adoption of solar concentrators technology in India | TA | New and viable financial mechanisms to promote solar concentrators technology at a mass scale developed. | a) Study present promotional mechanisms and identify financial gaps and constraints and develop financial mechanisms. b) Regional and national level consultations for finalization of the financial strategy for adoption by Government of India. | 250,000 | 5.68 | 100,000 | 0.5 | 350,000 |
| 5. Project management | | | | 430,000 | 9.77 | 250,000 | 1.29 | 750,000 |
| Total project costs | | | | 4,400,000 | 100 | 19,350,000 | 100 | 23,750,000 |

^a List the \$ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.

^b TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME (in parenthesis) if available, (\$)

| Sources of Co-financing | Type of Co-financing | Project |
|---|----------------------|------------|
| Ministry of New and Renewable Energy Sources, Government of India | Grant subsidy | 6,000,000 |
| | In kind | 1,350,000 |
| Industries | In Cash | 6,000,000 |
| Financial Institutions | In Cash | 6,000,000 |
| Total Co-financing | | 19,350,000 |

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

| | Previous Project Preparation Amount (a) ³ | Project (b) | Total c = a + b | Agency Fee |
|---------------|--|-------------|-----------------|------------|
| GEF financing | | 4,400,000 | 4,400,000 | 440,000 |
| Co-financing | (in kind) | 19,450,000 | 19,450,000 | |
| Total | | 23,850,000 | 23,850,000 | |

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)¹ NA

PART II: PROJECT JUSTIFICATION

STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED: It is estimated that 15 to 20% of the total fuels used in India are consumed by industries for low and medium temperature thermal application ranging from 60 to 250 °C. Energy is required to heat water, generate steam or hot air for various industrial/institutional applications. Around 22 such industrial sectors can be identified (including, dairy processing, food processing, textiles, hotels, edible oil, chemical, marine chemicals, bulk drug, breweris, and distilleries), where boilers supply process heat either in the form of steam or hot air upto a temperature of

³ Include project preparation funds that were previously approved but exclude PPGs that are awaiting for approval.

150 °C. In addition, there is a large market for space cooling and cold storages using vapour absorption refrigeration and air conditioning systems which also require medium temperature thermal energy for operation.

India has over 15 million unorganised units (National Sample Survey Organization NSSO, 1998 – the most recent census on the unorganized sector) of which 40 % use energy for their processes. Similarly, of 4 million organised (those registered under Small Industries Development Organisation) SME (Small and Medium Enterprises defined as those with investment of maximum of 2.00 million USD) units 70 % make use of energy. NSSO reports that there are about 2.34 million textile, 1.5 million chemical processing, 4.19 food processing, 1.42 beverages, distilleries units (industries) in India. Another estimate indicates that there are about 5,000 dairy units and about 18,000 hotels (institutions). Dairy or milk-processing industry is one of the largest user of process heat. It requires thermal energy in a variety of forms and grades for a wide range of applications: from washing milk cans to pasteurization. Another example is, Textile processing that includes a variety of process heat applications such as sizing (stiffening of thread by starching), rope washing (washing fabric in rope form), cloth mercerizing (treating fabric with sodium hydroxide for lustre and dye effect), yarn mercerizing, dyeing, bleaching, starch padding (starching the finished material), etc. Currently this heat requirement is met by coal, furnace oil, natural gas, electricity etc. A typical textile mill processing 10 tons of cloth (about 100,000 metres) per day requires about 20 MT (Metric Tonnes) of oil or 50 MT of coal per day. Assuming even 1% of these units are potential units for uptake of product like solar concentrator the total number could be about 85,000 units.

The sectors chosen for the intervention of solar concentrators tentatively are, dairy, textiles processing, hospitals, chemical processing, steam requirements in institutions. These are chosen since (i) they require process heat in the low and medium range of 90 to 250° C, and (ii) these sectors constitute significant share of small scale enterprises. Solar concentrators can replace/reduce use of the conventional fuels used in these sectors. This results in considerable amount of green house gas (GHG) emissions, which can be reduced by switching to renewable energy sources such as solar.

Scope for Solar Technology

- i. India is largely located in the equatorial sun belt of the earth, thereby receiving abundant radiant energy from the sun. The country receives about 5,000 trillion kWh/year equivalent energy through solar radiation. In most parts of the country, clear sunny weather is experienced for 250 to 300 days a year. This annual global radiation is about 2200 kWh/m², which is typical of the tropical and sub-tropical regions. The average solar insolation incidence over India is about 5.5 kWh/m² per day. Just 1 % of India's land area can meet India's entire electricity requirement till 2030. Solar based power technologies are an extremely clean form of heat generation with practically no form of emissions at the point of generation. They would lead to energy security through displacement of coal and petroleum (National Action Plan on Climate Change, 2008: Pg 18).
- ii. The National Action Plan on Climate Change (NAPCC) released by the Prime Minister Council on Climate Change in 2008 identifies 8 missions to address the climate change challenge in India. One of these 8 missions is 'National Solar Mission' to promote the use of solar energy for power generation and other applications. The mission aims at installing 20,000 MW of electricity generation capacity through solar by 2020. This includes both solar photovoltaic and solar thermal. The Union Ministry of New and Renewable Energy (MNRE) is the nodal Ministry to develop an action plan and implement the targets of this national mission. Besides, under the 11th Five Year Plan, MNRE plans to cover 250,000 m² of solar thermal units for high temperature by 2012.

Experience and Learnings of installing solar concentrators

Solar concentrators systems typically made of metal or glass are used to converge solar radiation. The increased intensity of the radiation so obtained provides high temperatures as required in thermal process for industrial/ institutional applications. Concentrated solar power (CSP) is a proven technology which has been widely implemented for power generation in developed countries like the USA and many European countries. CSP has the potential and can substitute conventional energy sources supplying high temperature steam for industrial process heat applications in most of the industries demand thermal energy.

At present, four technologies of solar concentrators are available namely (i) Parabolic trough: a trough shaped parabolic reflector is used to concentrate sunlight on an insulated tube containing fluid (also called a receiver, absorber or collector) running the length of the trough, above reflectors. The fluid containing heat is transported for process heat requirement are sent to boiler for generation of steam for process heat applications. The temperature range achieved in this type of concentrators are 180 to 250 C. (ii) Scheffler (Solar parabolic dish with fixed focus): In this type, each pair of Scheffler concentrator (dishes), the sleeping dish and standing dish are placed with focus on receivers (heat exchangers). Above the

receiver is an insulated header pipe filled half with water. The cold water enters the receiver through inner pipe, gets heated due to the high temperature of the concentrated rays and the heated water goes up. The cold water again enters through inner pipe and the cycle continues till steam is generated. Temperature of about 160 C can be achieved with this type of solar concentrator. (iii) Fresnel reflectors: Fresnel reflector consists of a series of narrow, shallow curvature mirrors to focus light onto one or more receivers positioned above the mirrors. Temperature range of 180 to 230 C are achieved in this type of collectors. (iv) ARUN solar thermal concentrator system: it consists of a curved paraboloid support structure fixed with small mirrors or reflecting surfaces to form the paraboloid reflector. These have been developed by consulting engineers of Clique Developments Private Limited with research support from IIT Mumbai. The process heat generated was about 200 C. These systems are known to last for over 15 years.

About 30 solar concentrators have been installed till now cumulating to about 10,000 m² of collector area in the country. The capacities these systems ranged from 70 to 1,000 m². Nearly 22 manufacturers/suppliers are in the field of solar concentrators. About 15 solar concentrators are installed for institutional cooking, 8 systems for steam generation in hospitals, 3 systems for steam generation in dairy farms in last 8 years. The more popular applications that are being met are, steam for cooking, and pasteurisation of milk in dairy industries. M/s Arun solar and M/s Gadhia Solar Energy Systems are currently the leading manufacturers. Solar steam generating system for cooking at Tirumala Tirupathi Devasthanam (TTD), at Tirumala, Andhra Pradesh, is one of the biggest installed in India. Installed in 2002, it can generate steam of 400 kg per day at 180 °C and 10 kg/cm² pressure. The steam thus generated is used to prepare food for about 15,000 people every day. The concentrator units is of modular in nature and consists of 106 automatic tracked parabolic concentrators arranged in series and parallel combination; each of 9.2 m² reflector area. This cumulates to about 975 m². Feasibility studies carried out show that the typical pay-back periods for the solar concentrator systems replacing furnace oil using units varies between 3.5 to 9 years depending on the performance of the solar concentrator and the cost of furnace oil (which has varied from Rs 35 per liter in April 2008 to Rs 10 per liter in April 2009). Solar concentrators offer advantages of higher efficiency as well as due to tracking of the sun are able to collect larger quantities of solar energy. Currently, around 1000 to 2000 m² area of solar concentrators are being installed every year. This is very small when compared to the estimated market size. The total potential for solar collector area is projected at 140 million m² (MNRE Annual Report 2007-2008).

ARUN Solar has installed solar concentrators of varying sizes upto 400 m² capacity. ARUN 160 has been installed at Latur for milk pasteurisation in June 2005. This has resulted in saving of 16 to 24 kilo liter of furnace oil annually. Twelve more systems (ranging 160 to 400 m² capacity) are under implementation by ARUN solar.

However, given the vast potential, the numbers installed till now are miniscule. The large-scale application and commercialisation of solar concentrators faces several barriers and some of these barriers are proposed to be addressed as part of this GEF project. These barriers are as follows:

(A) Technology barrier:

- a. Lack of know how on system integration: Many industrial processes envisaging replacement of conventional energy systems require customisation. The know-how of system integration for different sectors is readily not available. So far, only few engineering organizations and research institutes have experience with concentrated solar thermal installations. Planning guidelines and tools for typical industrial process heat applications using solar energy still need to be established.
- b. Lack of expertise: Only few professionals have developed expertise to offer solutions to potential industries. Integration of solar heat into industrial process is a challenge to both process engineer and solar expert because of time dependency of solar heat, demand of the industry and fine tuning between demand and supply.

(B) Awareness and capacity barriers:

- a. Limited awareness and capacity: The number of solar thermal installations for industrial processes is very small. Most decision makers in relevant industries have never heard of, or even seen, a low and medium temperature solar system. Whole chain of stakeholders, users, financial institutions, industrial consultants, manufacturers, decision makers are not aware of solar concentrator technology and its potential to meet process heat. This is a key barrier to wide-spread adoption.
- b. Limited confidence in technology: Most process heat applications (including the sectors proposed under the project) make use of conventional energy sources and devices. The managers, workers are used to these conventional methods and it requires considerable efforts to instil confidence in them to change to something like solar technologies. Especially when critical heating processes are concerned, they almost

always choose conventional, long-term proven technology. Any potential break or interruption due to a new technology is riskier to them.

(C) Market barriers:

- a. Lack of demonstration units: Most of the solar concentrators installed are to generate steam for cooking and in dairies. There are no sample units in industrial sectors such as textiles, chemical processing. The number of units till now are dispersed and concerted efforts to create awareness to users were absent.
- b. Lack of data and information on functional units: The data relating to performance, comparative advantages are not available to the users.
- c. Lack of supply chain: There are only very limited number of manufacturers who are active in the business of producing solar concentrators. There are at present no service providers to market and provide technical back up support. At present manufacturers who are also limited in number themselves carry out the these operations.

(D) Financial barriers:

- a. Varying and unattractive paybacks: Low Solar energy for low and medium heat applications, such as water heating have proved to be economically feasible option in India and world over. However, the payback on the initial investments at present in India range from 3 to 5 years. Financial payback period on a solar concentrator are often beyond commercial acceptance levels. The payback on investment depends primarily on, capital cost, effective replacement of fuel (performance of solar thermal unit) and cost fuel envisaged to be replaced . A typical investment in a 160 m² solar thermal unit for steam generation is USD 73,000 that can replace 80 to 100 liters of furnace oil per day. The best case of payback of 3.43 years is achieved when 100 liters of FO is replaced per day and the furnace oil price is Rs 35 per liter which was the case in April 2008. However, the payback is as low as 9.5 years if the solar thermal unit replaces 80 liters of FO daily and the cost of FO fell to Rs 19 per liter as in April 2009. However, the payback on solar concentrators is in the range of 3.5 to 9 years as explained eariler makes it an unlucractive option for the industrial/institutional sector. Higher System cost: Solar thermal systems have typically higher investment costs though running cost is low. The costs are varying from 450 USD per m² to 300 per m². The experts estimate that these costs could be brought down to about 200 USD per m² with mass production.

To overcome, the above barriers the following activities are being proposed under this project:

- i) Technology package development and standardisation: Four different models of technology namely Concentrator Trough, Sheffler, Fresnel, and Arun will be developed/ up-scaled for five identified sectors namely, dairy, textile processing, hospitals, chemicals processing, institutional cooking. Technology package, test protocols, performance guidelines will be developed which will help in replications. National testing facility will be established at the Solar Energy Centre and certification procedures developed. The facility at SEC will also be used as centre for training and capacity building of technicians, professionals, Trainers, academicians, industry-academic interface, to carry out research projects by researchers that are relevant to industry etc.
- ii) Awareness and capacity building: To strengthen the awareness of different stakeholders a variety of programmes are proposed. These include, awareness programmes for policy makers, users, industries, manufacturers, financial institutions, etc. These programmes help creating awareness on solar concentrators and their potential for process heat applications to different sectors. Capacity building programmes will enable stakeholders to strengthen the supply chain. This include strengthening the manufacturing capabilities, help creating new manufacturing units to take up producing solar concentrators. Develop capabilities of designers by strengthening the industry-academic interface by supporting higher level researchers to be involved in the designing of technology packages and also develop skills of system configuration and integration. These actions will help building 'future capacities' to up-scale/replicate the solar concentrators in the country and outside as well. Media campaign, database building, documentation and dissemination of good practices will also be part of the promotional approach to popularise solar concentrators.
- iii) Demonstration projects: Though the potential in India is huge and number of sectors are many for any alternative technology meeting the process heat, a modest number of 30 demonstration units in five different sectors is being proposed. This will help in providing the much needed confidence in technology ('seeing is believing'). The sectors chosen have a large replication potential, relate very closely to many other sectors and form a representative sample. These actions along with other components help in removing the market barrier.

- iv) Identification & removal of financial barriers: As can be seen from the information available the penetration of solar concentrators in India has been extremely limited. The reasons can be attributed to high capital costs USD 300 to 400 per m² (delivering about 3000 kcal of energy per day) vis-à-vis less than 100 USD on a conventional system to generate the same amount of energy consequently low payback of as high as nine years; varying fuel especially the petroleum fuels (furnace oil mainly) prices which have an impact on payback period, etc. The concentrator systems world over also seem to face similar issues and hence, it is reported (in potential for solar heat in industrial processes. Eds Claudia Vannoni et. Al. 2008 published in CIEMAT. IEA SHC Task 33 SolarPACES Task IV: Solar Heat for Industrial Processes) that the economic incentives aiming at reducing payback periods, could be provided by different schemes (example low interest loans, tax reductions, direct financial support, third party financing, etc.). A study will be undertaken to understand the financial incentives provided for solar concentrators currently in India and other countries. Consultations with stakeholders in different sectors and different regions will be carried out in India. A roadmap of financial incentives will be developed that will help large scale replications/ up-scaling (win-win for user, manufacturer) the dissemination of solar concentrators for process heat applications.

However, large-scale deployment of the technology would require a systematic programme for removal of awareness, technical, financial barriers and market development barriers. A GEF-UNDP-MNRE supported programme will have the overall objective to introduce solar concentrators for different medium temperature process heat applications in industries and institutions to reduce greenhouse gases produced due to use of fossil fuels such as furnace oil. Providing interest subsidy to buyers of solar concentrator systems, assisting manufacturers and suppliers in market development, providing technical support for new industrial applications, increasing awareness will be the activities to achieve the objective. The programme will focus on certain industries having large potential, e.g. dairy processing, textile, hospital, chemical processing, institutional cooking. Over a period of 5 years, it can aim at increasing the market of solar concentrators in India by a factor of 10 to 20 i.e. increasing deployment of solar concentrators from current levels of 1000-2000 m² to 10,000 to 20000 m² per year. The programme could focus on states having high potential of solar insolation namely, Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, etc.

MNRE is also the involved in the National Solar Mission under the National Action Plan on Climate Change that is being governed by Prime Ministers Council. The experience of solar thermal units for process heat would provide very useful lessons and inputs to this ambitious programme.

B.DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL/REGIONAL PRIORITIES/PLANS: Government of India has accorded priority to renewable energy promotion in the country which is manifested in Integrated Energy Policy - 2006 and in 11th Five Year Plan. There are clear targets of achieving minimum of 10% share of renewables during the current FYP. Further, as response to climate change, Government of India has come out with National Action Plan on Climate Change (NAPCC) in June 2008. This is strategically located within the Prime Minister's Council so that greater coordination can be leveraged between the Ministries and Departments. The NAPCC has eight national missions one of which is 'National Solar Mission'. The National Solar Mission would promote the use of solar energy for power generation and other applications. The MNRE has been promoting a range of renewable energy technologies including solar energy technologies in the country for a number of years (since 80's). It was earlier a department as Department of Non Conventional Energy Sources and later became a Ministry. Solar water heating systems for domestic and related use are now being deployed at an accelerated pace through various promotional incentives. A total collector area of 2.45 million square meter (as on 30 September 2008) has already been installed in the country (for low temperature thermal applications). Increasing deployment of solar thermal technologies to meet the heat requirement in all sectors of the economy of the country is in the priority plan of the Ministry. This project is proposed to accelerate the market development through interaction with technologies and experts from various countries, utilising the experiences of projects undertaken in other parts of the world, making available the developments taken place in various laboratories and industries and making the technologies familiar to the targeted sections (industries, consultants, financing organisations, policy makers, technical institutions, etc.) through systematic set of activities under the project.

C.DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS: The project is line with SP 3 which is to "promote market applications for renewable energy".

D.JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES: The financing support provided by GEF will be used to create enabling environment for the promotion of Solar concentrators for process heat applications. The GEF funds will be used for awareness, capacity building of concerned stakeholders, strengthening of supply and demand chain and support discounting the interest rate (interest subsidy by about 10%) in the demonstration units. It is aimed that the renewable energy investments supported by this project will be economically viable in their own right. The expected outcome of the project will help the growth in markets for renewable heat power in India. The project will reduce consumption of petroleum fuels (India depends on import of petroleum fuels to a very large extent) with co-benefits of in tons of CO_{2e} avoided. India with significant renewable energy generation potential may make this strategic program a high priority.

E.OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES: MNRE has a Solar Energy Centre (SEC) established in 1982. The campus spreads over 200 acres. It has test facilities for testing solar flat plate collectors, meeting and auditorium to accommodate 15 to 125 persons, residential facility, etc. MNRE has promoted Solar Water Heating over last two to three decades. Subsidy was provided by MNRE till 1993 on Solar Water Heaters. In 1997, fiscal incentives were reintroduced at a rate of 2% on domestic, 3% on institutional and 5% on commercial solar water heaters. The penetration of solar water heaters is about 400,000 square meters annually and till now, about 2.5 million square meters of collector area has been covered. But the potential for solar water heating in India is 140 million square meter. Global Solar Water Heater Project is supported by GEF/UNEP/UNDP is being implemented by MNRE in India to accelerate the penetration of solar water heaters. Other countries which are involved are, Albania, Algeria, Chile, Lebanon, and Mexico. The project envisages to accelerate and sustain the solar water heating market growth in India and to use experiences and lessons learned in promoting a similar growth in other countries. It envisages to leverage a total of 10 million square meter of new installation by 2012. This project is also being implemented by same agency, MNRE. Thus helps in leveraging the experiences from here to the present proposal. MNRE is also involved in promoting industrial process heat applications and solar thermal power generation. UNIDO is developing a Full Scale Proposal titled, "Promoting energy efficiency and renewable energy in selected micro SME clusters in India". This project is aimed at the following MSME (Micro Small and Medium Enterprises) sectors namely, Iron casting, ceramics, brass, hand tools, and dairy processing. Large focus of the project is on energy efficiency and renewables. Among the renewable the focus is on biomass gasifiers, solar flat plate collectors (can give temperature of 50 to 70 C) and to a limited extent solar concentrators. The proposed project is on solar concentrators use in industrial sectors and institutions that have medium scale temperature requirements. The project compliments the efforts of UNIDO in helping the solar concentrator technology packages available for SME clusters.

The Solar Heating and Cooling (SHC) programme by the International Energy Agency (IEA), under its Task 33, undertook a number of activities regarding heat applications of solar energy (e.g. industrial processes, space heating of production and industry halls). The activities carried out included the investigation of promising industrial applications, the study of the potential for these applications in participating countries, the assessment of different technologies and configurations, and the economic evaluation of these technologies and configurations. Under its Task 43, which is proposed to take place during 2009 -2012, the SHC programme will examine testing and certification procedures for low, medium and high temperature solar thermal collectors and systems. The proposed GEF project will build on the experience and lessons learnt from the SHC programme, and will seek to cooperate with and contribute to the programme's ongoing efforts (in particular in the context of developing technology packages, testing protocols and standards under the proposed component one).

F.DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING : In the absence of the project, the exploitation of solar concentrators would remain limited to the current rate of penetration of just 1000 to 2000 m² per year whereas with a focused programme it is possible to achieve 10,000 to 20,000 m² per year of solar concentrators, while the overall potential remains much more. The potential industries for interventions would be both small and medium industries. Some sectors that may benefit are, (i) Dairy, (ii) Textile, (iii) institutional cooking, etc. For reduction of GHG emissions, it is required to expand this technology though appropriate market development. Market development of this technology has high potential because the solar heating collectors for medium temperature applications have been developed in many countries of the world, the solar thermal applications are becoming cost effective with increasing prices of conventional fuels and advancement of technologies apart from the fact that these technologies are environmentally benign. The project will help in creation of basic infrastructure and human

resource development for accelerative market penetration of solar thermal energy for process heat application in Indian industries.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MITIGATION MEASURES THAT WILL BE TAKEN:

| RISK | DEGREE | RISK MITIGATION STRATEGY |
|--|--------|--|
| Lack of participation by industries | Medium | The project attempts to provide viable financial incentives while developing and strengthening the supply and demand chain for the promotion of solar concentrators in the industrial sector. |
| Lack of demand for solar concentrator | Medium | The project aims at driving the demand through a number of awareness and capacity building activities. |
| FIs may not be forthright in funding SMEs on solar concentrators | Medium | Preparation of bankable DPRs is being supported under this project for 30 demonstration units as well as developing the capacity of local consultants to act as interface between industry and the other stakeholders. Further, the proposed financial incentives are targeted to reduce the payback period. |

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT: The project will reduce GHG emission through market development of solar assisted industrial process heat technologies. Approximately 110,000 tons of CO₂ emission per year will be mitigated. A typical solar concentrator considered for intervention is 2,000 m² of collector area. This can replace about 568 kg of furnace oil (FO) daily and about 170 tons of FO annually. This translates to a reduction of 639 tons of CO₂ annually. Thus, 30 demonstration units under this project can reduce FO consumption by 93,995 tons in 20 years period translating to 352,480 tons reduction of CO₂ emissions. This translates to cost of CO₂ reduction (through GEF grants) is 14.19 USD per ton. These estimates are tentative and accurate figures will be arrived during the PPG stage.

I. Justify the COMPARATIVE ADVANTAGE of GEF agency: Environment and Sustainable Development remains one of the four core goals of UNDP's Strategic Plan for 2008-2011. UNDP activities in Environment and Sustainable Development for 2008-2011 emphasize mainstreaming of environment and energy concerns into national development frameworks and environmental finance to enable markets to create effective solutions for sustainable development, which is also the main focus of this proposed GEF project. Furthermore, this project will help in directly achieving the MDG goals 7 (Ensure environmental sustainability) and 8 (Develop a global partnership for development). UNDP and other UN agencies are actively supporting the Government of India in its efforts to achieve MDGs by supporting capacity building measures.

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 [country endorsement letter\(s\)](#) or [regional endorsement letter\(s\)](#) with this template).

| NAME | POSITION | MINISTRY | DATE (Month, day, year) |
|-----------|---|-------------------------------------|-------------------------|
| Hem Pande | Joint Secretary and GEF Operational Focal Point | MINISTRY OF ENVIRONMENT AND FORESTS | 09/14/09 |
| | | | |

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

| Agency Coordinator, Agency name | Signature | Date (Month, day, year) | Project Contact Person | Telephone | Email Address |
|--|-------------|-------------------------------|------------------------|-------------|---------------------------|
| Yannick Glemarec, UNDP/GEF Executive Coordinator | Y. Glemarec | 12/01/2009 | Francisco Arango | +6622882713 | francisco.arango@undp.org |