



# PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL SIZED PROJECT

THE GEF TRUST FUND

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Submission date: 9 March 2009

Re-submission Date: 27 August 2009

## PART I: PROJECT IDENTIFICATION

GEFSEC PROJECT ID: 3921

GEF AGENCY PROJECT ID: XX/PAK/09/X01

COUNTRY: Pakistan

PROJECT TITLE: Promoting sustainable energy production and use from biomass in Pakistan

GEF AGENCY: UNIDO

OTHER EXECUTING PARTNERS: Alternate Energy Development Board (AEDB) and Small and Medium Enterprise Development Authority, Government of Pakistan

GEF FOCAL AREA: Climate Change

GEF-4 STRATEGIC PROGRAM: SP4 – Promoting sustainable energy from biomass.

INDICATIVE CALENDAR	
Milestones	Expected Dates
Work Program (for FSP)	June 2009
CEO Endorsement/Approval	October 2010
GEF Agency Approval	December 2010
Implementation Start	January 2011
Mid-term Review	January 2013
Implementation Completion	December 2015

## **PROJECT FRAMEWORK THE COMMENTS MADE ON THE GAMBIA PROJECT ARE BROADLY RELEVANT HERE**

**Project Objective:** To promote market based adoption of modern biomass energy conversion technologies for process heat generation in SMEs<sup>1</sup> in clusters and power generation in rural areas in Pakistan.

Project Components	Type	Expected Outcomes	Expected Outputs	Indicative GEF Financing		Indicative Co-financing		Total (\$)
				(\$)	%	(\$)	%	
1. Demonstrating technical feasibility and commercial viability and promoting market environment for scaling up the use of modern biomass energy conversion technologies in SMEs in clusters and for power generation in rural areas	TA / Investment	<ul style="list-style-type: none"> <li>- Recognition of the technical feasibility and commercial viability of the use of modern biomass energy conversion technologies for process heat and electricity generation in SMEs in clusters and rural areas.</li> <li>- Market environment developed for the adoption of modern biomass energy technology contributing to growth in the application of renewable energy:</li> <li>- Capacity of installed modern biomass energy technologies increased by about 7MW and GHG emissions avoided.<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>1.1 Modern biomass energy technologies are adopted in 3 sites to demonstrate technical feasibility and commercial viability</li> <li>1.2 The 3 demonstration projects are independently evaluated and lessons learned widely disseminated to all stakeholders at national, regional and international levels.</li> <li>1.3 Detailed investment strategy for modern biomass energy conversion technologies in SME clusters in rural areas is developed.</li> <li>1.4 Investment projects to implant modern biomass energy conversion technologies in SME clusters and rural areas are implemented.</li> </ul>	1,300,00	19	5,500,000	81	6,800,000

<sup>1</sup> Small and Medium Scale Enterprises

<sup>2</sup> Exact GHGs emission reductions to be achieved by the project will be established at the PPG stage

2. Establishment of policy and associated regulatory framework promoting the adoption of modern biomass energy conversion technologies.	TA	Policy and associated regulatory framework for the promotion of modern biomass energy technologies in SME clusters and in rural areas is adopted.	2.1 Policy and associated regulatory framework document for the promotion of the use of modern biomass energy conversion technologies, with concrete policy instruments and provisions, is produced and presented to the national authorities for adoption.	200,000	28	500,000	72	700,000
3. Capacity building and institutional strengthening.	TA	Key market players and market players have capacity to provide services to the market driven dissemination of modern biomass energy conversion technologies.  Institutional mechanisms to promote modern biomass energy systems are strengthened.	3.1 Key markets enablers and players including policy makers, project developers, financial services providers, SMEs; equipment manufacturers etc. are trained to effectively operationalize the market of modern biomass energy conversion technologies for use in SMEs.  3.2 A cadre of 30 service providers for projects involving modern biomass energy conversion technologies is trained (using the train-the-trainer approach) in providing technical expertise to such projects.  3.2 Training programs for strengthening institutions that support markets for modern biomass energy conversion technologies are designed and training conducted.	150,000	23	500,000	77	650,000
4. Project management and coordination	TA	Strengthen capacity of project office to implement and manage project.	4.1 Project management office (PMO) is established, website dedicated to the project is established and project milestones, reports etc are regularly posted on the website.  4.2 PMO and other stakeholders including private sector are trained on biomass energy conversion based project management.	170,000	19	700,000	81	870,000
<b>Total project costs</b>				<b>1,820,000</b>		<b>7,200,000</b>		<b>9,020,000</b>

**B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME (in parenthesis) if available, (\$)³**

Sources of Co-financing	Type of Co-financing	Project
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³ Breakdown between cash and in-kind contribution will be determined during the PPG phase.

Project Government Contribution	In-kind/cash	1,100,000
GEF Agency(ies)(UNIDO)	Grant	290,000
Bilateral Aid Agency(ies)	In-kind / cash	1,360,000 <sup>4</sup>
Multilateral Agency(ies) ()	Soft Loan	1,850,000
Private Sector	Hard Loan	2,600,000
<b>Total Co-financing</b>		<b>7,200,000</b>

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

	Previous Project Preparation Amount	Project	Total	Agency Fee
GEF Grant		1,820,000	1,820,000	182,000
Co-financing		7,200,000	7,200,000	
<b>Total</b>		<b>9,020,000</b>	<b>9,020,000</b>	<b>182,000</b>

## PART II: PROJECT JUSTIFICATION

### A. THE ISSUE, HOW THE PROJECT SEEKS TO SOLVE IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

**The issue:** The energy situation in Pakistan is characterized by an increasing gap between demand and supply, high dependence on fossil fuels for electricity generation, and a highly energy intensive industrial sector. Pakistan's commercially exploitable energy resources consist of coal, gas, oil, hydropower, and nuclear power, but there is also large-scale use of traditional fuels in the form of fuel wood, and agricultural and animal wastes. The current primary commercial energy supply matrix is a composite of various sources. Oil and gas form the bulk (82.5%, of which oil is 38.3%, gas is 43.8%, LPG is 0.4%). The other energy sources include coal (5.4%), hydro electricity (11.3%) and nuclear (0.9%). The total installed electricity generation capacity stood at 19,478 MW in 2003-4, with the gap between demand and supply reaching more than 10% during peak time. Biomass energy, on the other hand, accounts for 86% of total household energy consumption, with firewood alone accounting for 54% of the total energy consumed by households. It is estimated that over 50% of the population has no access to electricity; in rural areas the levels are as high as 70%. The current shortage of reliable and affordable modern forms of energy in rural areas is one of the major barriers hampering overall economic development in Pakistan.

The contribution of SMEs, including household manufacturing industries, to Pakistan's economy can be seen from the fact that 90% of all private sector manufacturing units employ less than 99 workers and that SMEs employ some 78% of the non-agricultural labour force. Focusing on Pakistan's rural areas, there are over 290,000 established SMEs located in these areas, and they are involved in diverse activities including tobacco curing, gur making, blacksmithing, lime manufacture, pottery, rural bakeries etc. These SMEs are seen as having the potential to support the industrial development of rural Pakistan and so contribute significantly to poverty reduction and employment creation. However, most of these SMEs have difficulties in accessing modern energy services. Nationally, it is estimated that the industry sector was responsible for over 27%<sup>5</sup> of the total final energy consumption in 2005. Data on the energy consumption in SMEs in rural areas is not readily available but most of them depend on fossil fuel based heat and power generation.

Keeping in view the challenges to meet the ever growing energy demand and lack of access to the grid in the country's remoter rural areas, the expected "business as usual" scenario for SMEs would involve increasing power and heat generation from stand-alone petroleum fuel based capacity. This will effectively lock energy supply in remote areas into fossil fuel based systems. Therefore, the use of modern biomass energy technologies to provide process heat for SMEs in clusters and power generation in rural areas will have a double dividend of avoided GHG emissions and increased security of energy supplies to these SMEs and increased access to modern energy services in rural areas.

Among all the country's renewable energy resource endowments, Pakistan has very good potential for developing biomass based electricity generation for supplying rural communities through local grids and biomass based heat production for use in SME clusters in rural areas. The country's large agricultural and livestock sector produces copious amounts of biomass in the form of crop residues, such as bagasse and rice husks, and animal waste such as dung. Most of this waste is currently collected and used in a very inefficient manner. Besides bagasse based cogeneration systems that are only emerging now, no other significant commercial biomass-based technology is presently in use. Available realistic potential (i.e. taking into account both biomass resource and sustainability concerns) of biomass energy is estimated at over 20,000 MW. The use of modern biomass energy technologies, especially gasification technology, to generate heat and power from this waste will usher multiple benefits to SMEs that include modernization of production systems, increased reliability of energy supply, and improvement in the quality of products. However, the

<sup>4</sup> Two bilateral agencies have been approached and have since expressed interest to provide co-finance to some of the proposed project activities that are in line with their ongoing or planned activities. Since these discussions have been preliminary, the details of this potential co-financing will be finalized at PPG stage.

<sup>5</sup> This could well be higher since energy consumption by SMEs located in residential areas is normally not disaggregated and could easily be counted as consumption by the residential sector.

key challenge is to produce biomass-based energy in a sustainable and cost effective way. The deployment of modern biomass energy conversion technologies for both electricity generation and heat applications SME clusters and rural areas faces a number of barriers including:

- Lack of appreciation of the technical feasibility and economic viability of modern biomass energy technologies that are applicable at a small-scale level.
- Lack of policy and regulatory frameworks that would create a level playing field for the introduction of modern biomass based power generation and heat generation in SME clusters and power generation in rural areas;
- Weak institutional support for market players involved in promoting modern biomass energy technologies; and
- Lack of capacity by market players and enablers to effectively function including entrepreneurship skills for potential project developers etc.

**The project:** The project is designed to provide a systematic approach to removing these and associated barriers. To demonstrate the technical feasibility and economic viability of the use modern biomass energy conversion technologies, and gasification in particular, for heat applications in SMEs and power generation in rural areas, the project will install 3 demonstration projects.

With regards to the lack of policy and associated regulatory framework, the project will develop a comprehensive policy for promoting the use of modern biomass conversion technologies in SME clusters in rural areas to be adopted by the government. The effort to develop such a policy will make use of lessons and experiences in the development of similar policies for other renewable energy technologies in the country and experiences in the region. In addition, the project will develop investment strategy for modern biomass conversion technologies to advance the operationalisation of the new policy and stimulate greater investments of these technologies in SME clusters.

With regards to the weak institutional framework to support market players and enablers, the project will conduct a detailed assessment of capacity needs of all key institutions, develop targeted training programmes and conduct training programmes.

To increase capacity and raise awareness of market players and enables, the project will assess capacity needs of various stakeholders, including project developers, technology manufacturers, policy makers, financial services providers etc and conduct training programmes and awareness raising activities.

It is envisaged that these project activities will catalyze the scaling up of the use of modern biomass energy conversion technologies in SMEs in clusters and in rural areas with a possibility of being used in other sectors.

**Global environmental benefits:** The overall outcome of this project will significantly reduce GHG emission with direct Global environmental benefits. A detailed calculation of GEB of this project will be conducted at the PPG phase. A rough and indicative estimation of GHG emissions to be realised was determined assuming the following: emission factors of 0.893kg(CO<sub>2</sub>)/kWh and 73 kg (CO<sub>2</sub>)/GJ; renewable energy installed capacity of 7MW ( 5MW<sub>el.</sub> and 2 MW<sub>th.</sub>) and capacity factor of 50%. The total annual reduced GHG emissions will be about 22,000 tCO<sub>2eq.</sub> In addition, further GHG emission reductions will be achieved in the case where agriculture residue, that would normally be left to decay in the open producing methane, will instead be used for power or heat generation. Detailed estimation of the total emission reductions will be conducted at the PPG phase. Given the potential replication of the project's activities, more GHG emission reductions can be achieved beyond the project life and scope.

In addition to these global benefits, the project will also lead to an increase in the use of modern biomass energy technologies in SME clusters for process heat and power generation in rural areas, which in turn will contribute to socio-economic development at the local level.

#### **B. CONSISTENCY OF THE PROJECT WITH NATIONAL/REGIONAL PRIORITIES/PLANS:**

The Government of Pakistan has accorded special priority to renewable energy utilization through various policies and institutional measures. Realizing the importance of renewable energy sources to meet the country's increasing demand for energy, the Government of Pakistan established the Alternate Energy Development Board (AEDB) in 2003 to promote and encourage the development of renewable energy in Pakistan. AEDB's mission is to introduce renewable energy at an accelerated rate so as to achieve a 5% to 10% share for renewable energy within the overall national energy mix by 2010.

More specifically, in 2006 the Government established a Renewable Energy Policy that, among other things, established investor friendly conditions, such as buy back guarantees, risks coverage etc. for the wind energy sector. In addition, the AEDB facilitates with wind energy projects' environmental requirements, which include the preparation of EIAs and the issuance of relevant government permissions. The project envisages that the precedent of these favourable conditions for wind energy projects will provide valuable lessons that will be instructive in the work to develop modern biomass energy conversion technologies. Therefore, although it is clear that wind energy is different from biomass energy, the experiences and lessons learned from one technology type will be useful in efforts to promote the other technology type.

#### **C. CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND FIT WITH STRATEGIC PROGRAMS:**

The project is designed to promote the development of modern biomass energy technologies for electricity generation for rural areas and for process heat applications in SME clusters in remote areas. The project will thus contribute to GEF Climate Change focal area, and in particular SP4 – Promoting sustainable energy from biomass.

The project will mainly focus on the use of organic waste as feedstock, especially agricultural waste. The project will consider, albeit to a very limited extent, the use of dedicated forests, especially for power generation in communities. Taking note of GEF's position on sustainable biomass energy use, dedicated forests will only be used on a very small scale and after ensuring that the production of biomass for energy is sustainable and does not contribute to deforestation, reduced soil fertility, competition with food production systems or increased GHG emissions beyond project boundaries. The dedicated forests will comply with internationally recognized safeguards and will also make use of lessons learned from GEF funded research projects on this issue. In addition, extensive consultation will be held with local communities so as to inculcate concept of sustainability in the setting up of dedicated forests at community level.

#### **D. THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:**

GEF resources being requested for this project will be targeted at establishing a market environment that will promote investments in modern biomass energy conversion technologies to provide process heat in SMEs in clusters and power generation in rural areas. More specifically, GEF funding will be used to partly finance the following project activities: (i) developing 3 pilot projects to demonstrate the technical feasibility and economic viability of modern biomass energy conversion technologies in SMEs in clusters or in rural areas; (ii) strengthening policy and regulatory frameworks and institutional mechanisms; (iii) capacity building and awareness raising. As such no financing support will be provided under this project.

#### **E. COORDINATION WITH OTHER RELATED INITIATIVES:**

At the local level, the project will build on the projects and programmes initiated by Government, GEF, and multi/bilateral agencies and cooperating institutions to promote modern biomass energy in Pakistan. In particular, the project will closely link up to the ongoing and/or planned GEF and national initiatives in the field of renewable energy:

- Productive Use of Energy in Northern Pakistan (UNDP) – The overall project objective is to increase rural enterprises and income generation from local productive activities, through improved energy services and business capacities.
- Sustainable Development of Utility-Scale Wind Power Production - The overall project objective is to facilitate a low CO<sub>2</sub> path for development by establishing and demonstrating the commercial viability of a package for widespread harnessing of wind energy in remote areas. Although this project focuses on grid-connected systems and wind energy, the designing of the current project will draw lessons from this project in similar areas such as resource assessment, investment profiling, stakeholder mobilization and project strategy.
- Study on Biomass Residues and Conversion technologies, which were recently launched by the Planning Commission of Pakistan. The proposed project will make use of the findings of this study; in particular, the identification and definition of pilot projects and availability of residues in different areas will be based on the findings of this study.

The project will also draw lessons from various projects and programmes promoting modern biomass energy conversion technologies that were implemented or are currently underway in other countries in the region, such as the Philippines, India, China etc. As an example, the EC-ASEAN COGEN Programme offered a systematic process to the development of cogeneration projects in the region. The proposed project will draw lessons from this programme and make use of technical outputs of the programme in designing and implementing this project.

Special efforts will be made to exchange information on lessons learned, best practices and experience gained under these and other relevant ongoing projects to ensure synergies for wide scale replication and dissemination of results.

#### **F. VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT:**

Without the GEF project, the "business as usual" scenario would involve increase in fossil fuel based heat generation for SMEs in clusters and power generation in rural areas. This would imply increased reliance on fossil fuels for electricity generation, with the associated emissions of GHG. At the local level, this would imply continued and unsustainable dependence on traditional biomass energy resources and consequent deforestation in rural areas, missed opportunities for earning income from SMEs due to lack of reliable energy for agro-processing and other productive uses not being exploited. In addition, the sustainable development policy objectives of Pakistan of exploiting the available renewable energy resources to support rural electrification purposes will not be realised.

GEF funding is being requested to remove barriers to market based promotion of appropriate and viable modern biomass energy conversion technologies for process heat applications in SME clusters and for power generation in rural areas in direct response to the prevailing energy circumstance and in line with overall sustainable development needs of the country. More specifically, GEF funding will be used to: (i) develop 3 pilot projects to demonstrate the technical feasibility and economic viability of modern biomass energy conversion technologies in selected SME clusters and rural areas; (ii) strengthening policy and regulatory frameworks; (iii) strengthen institutions mechanisms; (iv) building capacity of market enablers and market players and raising awareness; and (v) project monitoring and evaluation and project management.

The overall goal of the project is to promote market based dissemination of modern biomass energy technologies for process heat generation in SMEs in clusters and power generation in rural areas in Pakistan in support of rural electrification efforts. Main outcomes envisaged are: (i) market environment for the adoption of modern biomass energy technologies are established and operationalised; (ii) Policy and regulatory framework for promoting modern biomass energy technologies are strengthened; (iii) Institutional framework to promote modern biomass energy systems are strengthened and capacity of market enablers and players enhanced and awareness of the benefits of modern biomass energy technologies and their benefits raised; (iv) demonstration projects evaluated and lessons disseminated widely; and (v) support project management and coordination mechanisms.

Cofinancing is expected from multilateral agencies and private sector. Once the market barriers are removed, it is envisaged that local, regional and international private sector will take advantage of business opportunities created to invest in modern biomass energy technologies for process heat in SMEs and power generation in rural areas.

#### **G. RISKS THAT MIGHT PREVENT THE PROJECT OBJECTIVE FROM BEING ACHIEVED, AND RISK MANAGEMENT MEASURES TO BE UNDERTAKEN:**

**Technical risks** - Modern biomass energy technologies are not technically viable for electricity generation and heat applications. Rating: low, since many countries, both developed and developing, have since demonstrated the technical viability of gasification technologies. Action: Only focus on technologies with a well-proven track record and that have been successfully introduced in countries with similar conditions to those of Pakistan.

**Economic risks** – Modern biomass energy technologies are not economically viable. Rating: low. Action: Introduce modern biomass energy technologies to SMEs with a focus on productive uses so as to support revenue generation, while for power generation in rural areas focus on communities that demonstrate willingness and ability to pay for the power.

**Fall in electricity / fossil fuel prices** – The international price of oil may fall to levels where fossil fuel power generation will be more cost effective than renewables. Rating: low, since electricity demand has been increasing at a much higher pace than production in Pakistan, and the trend in fossil fuel prices is volatile. Action: Investment modern biomass energy technologies should always include an assessment of externalities, which will place renewables at a comparative advantage to fossil fuels.

**Sustainability risks** – Biomass production is not sustainable or does not conform to sustainability standards. Rating: low, since the project is going to focus on organic waste and only consider dedicated tree plantations in isolated cases. Action: In the case of dedicated tree plantations, the project will ensure compliance with internationally recognized safeguards<sup>6</sup> to eliminate potential trade-offs. Much effort will go into community awareness raising on the need for safeguards and compliance with sustainability standards.

**Policy risks** - Policy framework not put into place. Rating: low, since the Government of Pakistan has accorded priority to the development of renewable energy resources, and national institutions are already working towards formulating national policy frameworks to promote renewable energy for electrification. Action: ensure the involvement of the Government of Pakistan throughout the project and ensure that the adoption of policies will be the principal deliverable from the Government.

#### **H. THE EXPECTED COST EFFECTIVENESS OF THE PROJECT:**

The project is considered to be a cost-effective intervention for the GEF due to the CO<sub>2</sub> emission reductions arising from substantial avoided use of fossil fuels and the avoided generation of methane from the expected enhanced use of modern biomass technologies. Cost effectiveness in terms of \$/ton of CO<sub>2</sub> abated will be established during the project preparatory phase employing the following steps: (i) making use of the existing GHG inventories as in the recent National Communications and reports of energy used of SMEs and rural areas, the current GHG emissions from the different industry clusters and rural areas will be estimated. (ii) The potential of using modern biomass energy conversion technologies projects that can be developed by this project will be determined, and the corresponding potential avoided GHG emission to be realised will be estimated along with the associated costs of each project.

#### **I. THE COMPARATIVE ADVANTAGE OF UNIDO:**

The project fits squarely into the GEF Strategic Program 4: Promoting Sustainable Energy Production from Biomass. The GEF Council document GEF/C.31/rev.1 gives UNIDO comparative advantage for this Strategic Program under the Intervention Type Capacity Building/Technical Assistance. The project has a strong industrial focus, which is UNIDO's overall mandate. UNIDO is especially well placed to implement this project because of its experience and expertise in dealing with industrial sector in Pakistan, its long history of cooperation with key stakeholders in SME sector, and its high standards of fiduciary responsibility. UNIDO's mandate is to assist SMEs for wealth creation with an emphasis on enhancing their productivity and competitiveness. UNIDO has been very successful in facilitating engagement with SME associations, improving their productivity in beneficiary countries and helping in mobilizing resources and transformation of markets so that global environmental benefits flow as a result of introduction of clean RE technologies.

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<sup>6</sup> The choice of which safeguard to use will be determined at the PPG stage and in consultation with local authorities.

### PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT AND GEF AGENCY

#### A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT ON BEHALF OF THE GOVERNMENT:

Mr. Ishtiak Ahmad Khan GEF Political/Operational Focal Point Additional Secretary Ministry of Environment, Local Government and Rural Development	Date: 23 September 2008
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#### B. GEF AGENCY CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.	
Mr. Dmitri Piskounov Managing Director Programme Development and Technical Cooperation Division UNIDO <b>GEF Focal Point</b>	Mr. Alois Mhlanga Industrial Development Officer Renewable and Rural Energy Unit Energy and Climate Change Branch PTC Division, UNIDO <b>Project Contact Person</b>
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