PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL SIZE PROJECT
THE GEF TRUST FUND

Submission Date: 5 June 2009
Resubmission Date: 1 December 2009

PART I: PROJECT IDENTIFICATION

GEF PROJECT ID: 3953
PROJECT DURATION: 36 months
GEF AGENCY PROJECT ID: PIMS 4223
COUNTRY(IES): Indonesia
PROJECT TITLE: Wind Hybrid Power Generation (WHyPGen) Marketing Development Initiatives
GEF AGENCY(IES): United Nations Development Programme (UNDP)
OTHER EXECUTING PARTNER(S): In Indonesia - Agency for Assessment & Application of Technology (BPPT)
GEF FOCAL AREA (S)[1]: Climate Change
GEF-4 STRATEGIC PROGRAM(S): Renewable Energy (see preparation guidelines section on exactly what to write)
NAME OF PARENT PROGRAM/UMBRELLA PROJECT (if applicable**):** N.A.

INDICATIVE CALENDAR*	
Milestones	**Expected Dates mm/dd/yyyy**
Work Program (for FSP)	Mar 2010
CEO Endorsement/Approval	Dec 2010
Agency Approval Date	Jan 2011
Implementation Start	Mar 2011
Mid-term Evaluation (if planned)	Oct 2012
Project Closing Date	Jun 2014

* See guidelines for definition of milestones.

A. PROJECT FRAMEWORK

Project Objective: Facilitation of commercial on-grid Wind Hybrid Power Generation (WHyPGen) systems for environmentally sustainable electricity supply in Indonesia.

Project Components	Inv, TA, or STA[b]	Expected Outcomes	Expected Outputs	Indicative GEF Financing[a]		Indicative Co-Financing[a]		Total ($) c =a + b
				($) a	%	($) b	%	
1. WHyPGen Technology Application Assessments	TA	Enhanced knowledge of potential WHyPGen applications; Improved knowledge of WHyPGen system benefits, and cost; Enhanced interest in investing in WHyPGen system projects	Updated wind maps of areas with significant wind energy potentials; Techno-economic feasibility assessments of potential WHyPGen application projects	263,700	52	243,600	48	507,300
2. WHyPGen Technology Demonstration	TA & Inv	GHG emission reductions from WHyPGen demo projects; Increased number of WHyPGen projects planned and implemented; Increased share of wind energy in the national power generation mix	Successfully implemented WHyPGen application demos; WHyPGen project replications planned and implemented	616,400	14	3,747,200	86	4,363,600
3. Financing WHyPGen Initiatives	TA	Increased investments on WHyPGen projects; Local banks/financing institutions providing loans for WHYPGEN projects	Completed trainings and promotions for banking/financial institutions in financing WHyPGen projects; Designed financing schemes for WHyPGen projects.	307,700	56	243,600	44	551,300

[1] Select only those focal areas from which GEF financing is requested.

4. Policy & Institutional Support for WHyPGen Initiatives	TA	Approved and enforced policies supportive of WHyPGen projects	Completed policy studies on wind hybrid energy systems; Proposed policy frameworks supportive of WHyPGen projects	200,400	27	543,300	73	743,700
5. WHyPGen Promotion	TA	Enhanced awareness of the benefits of WHyPGen; Planned and implemented WHyPGen projects	Designed and implemented WHyPGen promotional and advocacy program	272,900	25	823,600	75	1,096,500
6. WHyPGen Market Development and Industry Support	TA	Improved local WHyPGen system design & engineering capacity; Ensured availability of local service providers for WHyPGen facilities; Availability of quality components of WHyPGen systems that are locally made; Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia	Completed capacity building and technical support programs for the: (a) Local manufacturing of WHyPGen system components; (b) Design & engineering of WHyPGen projects; and, (c) Installation, operation and maintenance of WHyPGen facilities; Completed survey and evaluation of electricity demand areas served by WHyPGen facilities	325,100	16	1,723,700	84	2,048,800
8. Project Management				170,000	43	225,000	57	395,000
Total Project Costs				2,156,200	33	7,550,000	67	9,706,200

[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
Project Government Contribution	Cash	2,995,400
Project Government Contribution	In-kind	1,005,800
Private Sector	Cash	3,548,800
Total Co-financing		7,550,000

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

	Previous Project Preparation Amount (a)[2]	Project (b)	Total c = a + b	Agency Fee
GEF financing	0	2,156,200	2,156,200	215,620
Co-financing	0	7,550,000	7,550,000	
Total	0	9,706,200	9,706,200	215,620

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)[1] – N.A.

[2] Include project preparation funds that were previously approved but exclude PPGs that are waiting for approval.

PART II: PROJECT JUSTIFICATION

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

For a nation like Indonesia, whose economic growth has brought about increased energy consumption and greenhouse gas emissions, the concept of sustainable environmentally sustainable development must be an essential goal. Currently, it is facing a growing population while at the same time pushing hard to develop its economy that will further push demand for energy particularly electricity. With the current energy usage manifesting a high fossil primary energy mix, Indonesia will face further pollution from emissions and economic challenges through the import of primary energy past 2011, the year when Indonesia is predicted become a net oil importing country. It is anticipated that by that time the country will start experiencing the consequences of dependency on energy imports. Indonesia is facing tremendous growing demand in electricity, and in its current situation and the Government of Indonesia (GoI) alone will not be able to tackle this challenge. The private sector is a willing partner in the development of the country's energy sector and it would of the country's great interest to facilitate such partnership.

Indonesia is endowed with abundant and various energy sources, from fossil fuels to renewable energy. Considering its finite reserve, oil, which at present dominates the country's energy consumption mix, the GoI encourages the substitution/replacement of fossil fuels with other indigenous sources of energy. Since the country's oil reserve is decreasing, it is imperative to identify and implement other measures to reduce dependency in oil. Wind energy is a renewable energy resource that is available in Indonesia. Several studies have been conducted in the past to assess the country's wind energy potential and overall the general conclusions from those studies are as follows: (1) Several locations in Indonesia show good to excellent potentials for wind power generation; (2) Despite the very good potentials there are very few wind power generation installations in the country; (3) Further research is necessary to map Indonesia's wind potential as a base for commercial utilization of wind power; and, (4) To be able to continuously operate at higher load factors and high reliability, wind power systems should be in hybrid with other power generation systems (e.g., PV systems, diesel power generator systems). The country's Ministry of Energy & Mineral Resources estimates a total potential of 448 MW wind power generation in areas with best wind conditions such as in the south coastal areas of South of Sulawesi and Nusa Tenggara[3]. In 2008, the total installed power generation capacity in the grid systems of PLN that are located in the wind rich areas of East Nusa Tenggara, South and West Sulawesi, Maluku and Papua, was 285.7 MW[4].

Despite the fact that the potentials are significant, there are several factors have hindered the promotion of wind energy development and utilization in the country, in general, and wind hybrid power generation systems, in particular. Some of these are immediate and lend themselves to direct project intervention. Others are more systemic (such as energy pricing policy), which the proposed project will address through and enabling activities which, while may not fully overcome all of the barriers, work with the existing situation to enhance project success. These include, among others: (1) Lack of wind data and limited wind data assessments; (2) Lack of information and awareness about the benefits of wind energy particularly in areas where the wind energy potentials are very good, and specifically on WHyPGen; (3) Lack of demonstrable applications of WHyPGen, with the current demonstrations limited only to stand-alone low wattage power generation, and applications for mechanical power (e.g., ground water pumping); (4) Lack of wind energy markets – while some of the existing grids (e.g., along the coasts, or in island grids) are also accessible from areas where the wind energy potentials are very promising, the idea of grid-connected WHyPGen has not yet been adopted by the power utilities; (5) WHyPGen system components are imported; (6) Limited financing allocated for a perceived "not-yet-proven" power generation technology; (7) Lack of local technical service providers for the installation, operation and maintenance of WHyPGen systems; (8) Lack of technical knowhow in the design and engineering of WHyPGen systems; (9) Lack of specific policies and guidelines to support wind power generation initiatives; and, (10) Low national and local government capacity in developing comprehensive local energy planning particularly in those provinces where WHyPGen can be a cost effective means of providing electricity supply.

[3] Previous studies conducted by the US National Renewable Energy Laboratory shows excellent potentials for wind power generation in areas of the country located at 9^O – 10^O S latitude. The wind speeds in these areas range from 6.3 – 10.1 m/s, and a stand-alone wind power density of 300 -1000 W/m^2 (@ 30 m altitude). Prevailing wind is from the east at 90^O. The ASEAN Centre for Energy estimates this at 480 MW @3-5 m/s wind speeds.

[4] In 2008, the total effective power generation capacity was 246 MW; total power generation was 936.1 GWh (average peak demand = 182.2 MW); and, average load factor was 54.6%

The proposed project will address, among others, this cost issue through interventions that will improve significantly the overall capacity (technical, policy, planning, institutional, fiscal, financial) both in the public and private sectors, to develop, design, engineer, finance, install and commercialize the utilization of WHyPGen technology for grid electricity supply[5]. The envisioned major activities include: (1) Validation of the WHyPGen technology potentials for grid electricity supply; (2) Demonstration of feasible WHyPGen technology applications in selected gird networks; (3) Development of appropriate financial schemes to support WHyPGen application projects; (4) Development of institutional and policy frameworks that are supportive of WHyPGen projects; (5) Promotional and advocacy programs for WHyPGen applications; and, (6) Technical support for the local manufacturing of WHyPGen system components and development of the WHyPGen market.

Component 1: WHyPGen Technology Application Assessments – This component is aimed at addressing the lack of information about the wind energy potentials in Indonesia. The lack of information is one of the main factor preventing the development of wind power generation systems in the country – there is no certainty as to where and

[5] For clarity sake, it should be emphasized that the proposed project is aimed for the promotion, development and application of cost-effective and commercially viable on-grid wind hybrid power generation. Although the scheme calls for operating wind turbines in combination with diesel power generation, the project is not for promoting diesel power generation. It is not intended for 100% wind power systems (e.g., single wind turbine or wind farms) that are connected to the grid since such systems were initially found by the BPPT to be not economically and commercially viable. Diesel power generation is the baseline for this proposed project. The proposed alternative to this is the proposed wind hybrid power generation system. The main incremental feature of the proposed alternative is the conversion of the baseline diesel power generation to a wind-diesel hybrid power generation system. Technical assistance will be provided in the design, engineering, installation, operation and maintenance, as well as the performance monitoring and evaluation of the proposed alternative. There are 2 main options for on-grid wind power systems that were previously investigated by the BPPT. These are: (1) 100% wind power systems (e.g., single wind turbine or wind farms) to be connected to the existing grid; and, (2) wind hybrid power systems to be connected to the existing grid. Both options do not aim for full displacement of the diesel power generation in the grid. Rather, in order to improve the availability factor and system reliability, the wind energy resource will be utilized in combination with existing diesel systems that can operate during times when the wind speed dips below the required level (Option 2). For Option 2 the following system configuration will be implemented, where feasible:

(a) As an alternative to a budgeted diesel power plant rehabilitation project in diesel power plants in wind resource rich areas and involving the replacement of old diesel gensets wind turbines will be installed instead to carry the load that the replacement units would have served.
(b) As an alternative to a budgeted diesel power plant expansion project in diesel power plants in wind resource rich areas (and involving the installation of new diesel gensets), wind turbines will be installed instead to serve the increased demand that the new diesel units would have served.
(c) As an alternative to a budgeted new diesel power plant project in wind resource rich areas (and involving the installation of diesel gensets), wind turbines will be installed along with new diesel units. The wind turbines will replace part of the required diesel engine capacity.
(d) A new wind-diesel hybrid power generation plant installed in a wind resource rich area and connected to the existing grid. Depending on the capacity, one or several of the existing diesel power plants are decommissioned.

A major aspect of the demonstration of the grid-connected wind hybrid power generation system is addressing the technical issues concerning inter-connection. These aspects are among the pre-requisites of power utilities for power producers hooking up to their grid. Experiences on, and problems encountered in, previous inter-connection projects particularly those dealing with safety, system reliability, synchronization, as well as metering will be addressed and showcased in the demonstration. Such standard operational design and very important technical issue will be addressed through the technical assistance that will be provided in the design, engineering, installation, operation and maintenance as well as performance monitoring and evaluation of the proposed alternative.

The demonstration of the wind hybrid system will be carried out with PLN or private entrepreneurs interested in the energy supply business with PLN in the wind resource rich areas of Indonesia. It so happens that the most appropriate hybrid combination is the wind-diesel system since there are no other feasible RE resource in these areas apart from solar energy. Negotiations with these entities to consider changing their planned and budgeted diesel power generation projects into wind hybrid power generation systems and using such converted projects as demonstration for the proposed WHyPGen project will be carried out during the PPG exercise. If considered and agreed as a demonstration activity, the budget for the relevant components of the baseline diesel power generation project that will be included in the demo (e.g., wind turbines, transformer, balancing load control, protective relays/switchgears, etc) is considered as co-financing for the UNDP-GEF project, including part of the baseline budget that will be reallocated to purchase/install wind energy system components.

the magnitude of the wind energy resources[6]. The outcomes from this component of the project include an enhanced knowledge of potential WHyPGen applications; improved knowledge of WHyPGen system benefits and cost; and enhanced interest in investing in WHyPGen system projects. To realize these outcomes a number of activities will be carried out to deliver the following outputs: (a) Updated wind maps of areas with significant wind energy potentials; (b) Techno-economic feasibility assessments of potential WHyPGen application projects; and, (c) Requirements for the development and implementation of WHyPGen projects.

Component 2: WHyPGen Technology Demonstration – Under this project component, several activities will be carried out together with the private sector and the national utility company that will bring about the following major outputs: (a) Successfully implemented WHyPGen application demonstrations[7]; (b) Documentation of the results of the demonstrations; and, (c) Planned and implemented WHyPGen project replications. These outputs are expected to bring about the following outcomes: (a) GHG emission reductions from WHyPGen demo projects; (b) Increased number of WHyPGen projects planned and implemented; and, (c) Increased share of wind energy in the national power generation mix.

Component 3: Financing WHyPGen Initiatives – This component is aimed at addressing the difficulty in securing financing for potential WHyPGen projects. The interventions that will be carried out under this project component are envisioned to result in: (a) Increased investments on WHyPGen projects; and, (b) Local banks/financing institutions providing loans for WHYPGEN projects. The activities that will be carried out, which are mainly capacity building and technical assistance will deliver the following major outputs, the realization of which will contribute to the achievement of the envisioned outcomes: (a) Completed training courses and promotional activities for the banking & financial institutions in financing WHyPGen projects; and, (b) Designed financing schemes for WHyPGen projects[8].

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[6] This refers to the difficulty that prospective power developers in the country, particularly the private entrepreneurs currently have to contend with regarding their plans to invest in wind power generation. While there are information from studies and tests conducted by and for government agencies such as the Indonesian National Space and Aeronautics Administration (LAPAN), the Ministry of Mines and Energy, and the BPPT, these are not published and are not available to the private sector. What would be useful to the private sector are definite set of data and information as to the magnitude of wind energy potentials in the wind-rich areas of the country that they can use in their planning of their wind power generation projects. As learned from consultations with prospective private power developers, detailed wind maps and information regarding the wind energy resource in the 4 identified wind rich regions would be helpful in their planning and development of wind-based power generation projects. Such kind of information should be made available to the public. The wind energy resource assessments that are proposed to be carried out as part of the technical assistance and capacity building from the proposed project is expected to remove the barriers related to (1) Lack of wind data and limited wind data assessments; (2) Lack of information and awareness about the benefits of wind energy particularly in areas where the wind energy potentials are very good.

[7] The demonstrations will be on the application of WHyPGen (specifically wind-diesel hybrid power generation) technology, as well as showcasing the process of designing, engineering, constructing, commercially operating and maintenance of new WHyPGen facilities or retrofit of existing diesel power generation installations to operate in hybrid with wind power systems. Most of the demonstrations will be with the national utility (PLN). PLN operates grid systems in areas in Indonesia with very favorable wind regimes like in East Nusa Tenggara area (between 5^{o} S & 10^{o} S latitudes). Based on its expansion plans, it will be installing new and replacing old diesel power generation units during the period 2010-2018 in these systems. The initial plan, which will be further investigated during the PPG exercise for this proposed project, is to consider PLN's power generation expansion projects in their grid systems in areas where there are excellent wind regimes (6.3 – 8.2 m/s; wind power density of 300 – 600 W/m^2) for example in Sumba Island, Nusa Tenggara for the demonstration. A number of wind power generation units to operate in hybrid or coupled with other power generation systems (new or existing) with power generation capacities totaling **2 MW** will be installed under the proposed project. For these demos, depending on the agreed arrangements, PLN will use part of its allocated budget for the diesel power plant expansion project for the installation of basic wind turbine systems. GEF will provide the TA and financing assistance for the purchase and installation of the incremental wind turbines. Consultations with private entities interested in hosting other WHyPGen demonstrations under the project will also be carried out during the PPG exercise.

[8] Technical assistance will be provided to enhance investment capacity by developing a pipeline of finance-ready WHyPGen application projects and building the commercial capacities of local engineering businesses and interested banking &financial institutions (FIs). The Project will work directly with private companies and FIs, responding to their individual needs to structure investments, develop products, build their capacity to deliver WHyPGen project financing, and market their WHyPGen projects. Two FIs in Indonesia (Bank Buana Internastional Indonesia and Bank NISP) have commercial lending services for Indonesian SMEs. The financing schemes that will be developed under Project will build on (by expanding the coverage to include financing for WHyPGen applications) existing similar schemes as that of these 2 local banks during the PPG exercise. Presently, most of the FIs are not

Component 4: Policy & Institutional Support for WHyPGen Initiatives – The realization of approved and enforced policies supportive of WHyPGen projects is the expected outcome from the interventions that will be carried out under this project component. The outputs from the anticipated activities that will be carried out (e.g., Completed policy studies on wind hybrid energy systems; and proposed policy frameworks supportive of WHyPGen projects) will contribute to the realization of the desired outcome. Some of the anticipated activities include: (1) A study to identify the available tax benefits for RE projects such as WHyPGen applications with further improvement for better market environment; (2) Formulation and recommendation of appropriate policies and incentives addressing the technical, financial, and market barriers[9]; and, (3) Capacity building to the relevant government agencies to come up and support the establishment, implementation and enforcement of such policies (technical, financial, market). The last one is to ensure that the replication of the WHyPGen demonstrations will happen.

Component 5: WHyPGen Promotion – With the objective of enhancing the awareness of the Indonesian power sector about the benefits of WHyPGen, this project component will be designed to comprise of activities that will bring about the following major outputs: (a) Designed and implemented WHyPGen promotional and advocacy program; and, (b) Planned and implemented WHyPGen projects. The focus will be in generating awareness and better understanding of the WHyPGen technology and applications through exhibitions, and information dissemination activities, particularly for PLN and interested small power producers. It is expected, as a result of the advocacy campaigns that will be carried out under this component, that policy makers would further appreciate the possibilities for the WHyPGen market, and are able to introduce suitable support policy and regulatory initiatives. Public awareness raising materials will be prepared and seminars conducted to increase the awareness of the decision makers on RE technologies.

Component 6: WHyPGen Market Development and Industry Support – In order to support the future WHyPGen installations that are envisioned to be realized through the interventions that this proposed project will carry out, specific technical assistance activities aimed at achieving such objective will be implemented under this project component. The expected deliverables from such activities include, among others: (a) Completed capacity building and technical support programs for the: (i) Local manufacturing of wind energy system components of WHyPGen systems; (ii) Design & engineering of the wind energy system components of WHyPGen projects; and, (iii) Installation, operation and maintenance of the control systems for the coupling of wind energy systems to other power generation systems; and, (b) Completed survey and evaluation of electricity demand areas served by WHyPGen facilities. These deliverables will contribute to the realization of the following outcomes: (a) Improved local WHyPGen system design & engineering capacity; (b) Ensured availability of local service providers for WHyPGen facilities; (c) Availability of quality components of WHyPGen systems that are locally made; and, (d) Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia

It is envisioned that the planned interventions under this project will lead to the creation of an enabling environment that would facilitate and influence the development and growth of the WHyPGen market. The project will directly (through the wind energy system demonstrations) bring about 82,640 tons CO2 emission reduction (assuming 20 years useful life). Based at least on the PLN expansion plans, the project is expected to facilitate the installation of an additional 100 MW wind power generation systems (in hybrid with other power generation systems) installed capacity (new and retrofitted/repowered) 3 years after the end of the project (i.e., 2015)[10]. This installed capacity would bring about a cumulative GHG emission reduction of about 1.77 million tons CO_2.

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supporting technology development and application initiatives in Indonesia. It is expected that this component will facilitate immediate and future financing for WHyPGen projects to ensure their replication and sustainability.

[9] All possible/applicable policies and frameworks will be evaluated depending on the nature and extent of the fiscal/financial, technical and market barriers and those that are found feasible will be formulated and recommended. These could include, but not limited to favorable tariffs, preferential grid-access, wind-energy project support, investment grants and credits, etc.

[10] Based on the revised PLN General Planning of Power Plant Installation (RUPTL) 2009 – 2018 for its grid systems in East Nusa Tenggara, South Sulawesi, Maluku and Papua, there is sufficient potentials for WHyPGen as alternative option for new power generation unit installations as well as old diesel power generation replacements (as retrofit/repowering). For the next 3 years after the end of the proposed project, it is estimated that there will potentially be 100 MW wind power generation capacity installed + the 2 MW demos in these wind resource abundant areas of Indonesia. Considering the forecast load factors and the conservative capacity

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

The proposed project is in line with the GoI's aim to restructure the energy sector in the light of the country's decreasing oil reserves and for maintaining environmental balance. The GoI has introduced two policies to restructure energy sector development. These are the: (1) National Energy Policy; and, (2) Policy on Renewable Energy Development and Energy Conservation. Among the actions that are promoted at the government level to support both policies are: (1) Renewable Energy; and, (2) Technical, technological and professional development in the energy sector. Under its electricity generation policy, the following are among those that are being promoted: (a) Development of a small grid connected electricity power plant; and, (b) Increased deployment of renewable energy technology such as hybrid technology of wind power, photovoltaic and diesel generator. In this regard, the proposed project is in line with all of these actions being promoted by the GoI.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The proposed project aims to promote the adoption of Wind Hybrid Power Generation (WHyPGen) technology through the facilitation of commercial on-grid WHyPGen systems for on-grid power supply within the Indonesian market, and when and where possible pass on the replication to the electricity markets in other countries such as those in the ASEAN region. It is designed in line with the GEF's Climate Change Strategic Program 3 (CC SP-3) on promoting on-grid renewable energy, i.e., increased production of renewable energy in electricity grids. The proposed project is on the promotion, development, application and facilitation of the commercialization of a cost-effective system of utilizing Indonesia's wind energy resource. It will focus only on cost-effective and potentially commercially viable systems, which in this case is that of grid-connected wind-diesel hybrid power generation.

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

Since bulk of the activities that will be carried out under the proposed project are for the removal of barriers to the widespread development and application of WHyPGen technology in the Indonesian power sector, the requested GEF funds will be used as grant. The proposed barrier removal activities are the incremental activities that are needed to facilitate and/or influence the realization of the global environmental benefits (i.e., CO2 emission reduction from the displacement of fossil fuel used in the typical power generation modes) from the widespread application of WHyPGen technology. In that regard, the requested GEF funds will be used for: (a) fully funding some of the incremental activities; (b) augment the funds for implementing some of the baseline activities; and (c) supplement the co-financing for proposed alternative activities.

Although it is known that there are financial barriers that need to be addressed in order to facilitate the widespread application of the WHyPGen technology in the Indonesian power sector, it is expected that during the project preparation stage we can get a clearer understanding of the nature of these barriers. So far, the envisioned interventions in the area of financing are based on the current knowledge about the financial barriers. In that regard, the initially proposed barrier removal activities could include technical assistance in facilitating the design, establishment and implementation of appropriate mechanisms for financing wind energy projects, in general, and WHyPGen application initiatives, in particular. The appropriate financing schemes will be designed to assist: (1) WHyPGen project owners/developers; and, (2) Local manufacturers in producing WHyPGen system components. The GEF funds will be used in the conduct of the required background studies and reviews of financing schemes in the country and abroad, and in the design and development of the appropriate financing schemes.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

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factor of 0.30 for the wind energy component, the estimated cumulative CO2 emission reduction (from the displacement of diesel-based electricity generation) 10 years after the project is about 1.77 million tons (inclusive of the demonstration project). This does not include any other replications during the 4th to the 10th year after the end-of-project. Moreover, this amount will be more if the capacity factor for the wind component can be increased. All of these estimates will be verified during the PPG exercise for this proposed project.

The project development team will consult and involve the implementers of all ongoing projects of commercial on-grid-systems for the supply of electricity in the country in the design and development of the project. The project team will also establish partnerships with other projects on WHyPGen that are currently under implementation and/or being planned. In particular, the team will collaborate with power project owners/developers that have indicated interest in hosting the demonstration schemes under this project. It will also coordinate with the Research and Development Center of Energy and Electricity Technology (EERDC) of the Ministry of Energy and Mineral Resources (MEMR), as well as with the BPPT and the country's meteorological and geophysics agency (BMG) and space and aeronautical administration (LAPAN) on their ongoing/planned activities and projects on wind energy that are relevant to the proposed GEF-supported project in order to explore and possibly make use of potential synergies, and ensure complementarity and building on best practices and lessons learned[11].

The team will also consult implementers of ongoing WHyPGen application projects in other countries to share information and successful experience with them. The establishment of links with these ongoing projects/programs is expected to help in identifying the relevant activities that will build on their respective achievements. The project will be developed in close cooperation with its stakeholders as well as with the UNDP-GEF Regional Coordination Unit for Asia-Pacific in Bangkok (UNDP-GEF A&P RCU). The UNDP country office in Indonesia will be fully involved in the project development through its participation in the various stakeholder and co-financing consultation meetings and technical workshops during the project development phase, and in the multipartite review meetings. Consultations will also be done with UNDP-GEF, New York during the project development phase.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

In the absence of the proposed GEF supported project on the promotion of on-grid RE-based electricity systems, the common practice of developing and operation of highly polluting and non-environment friendly fossil fuel-fired power generation systems would still be favored for power generation in the country. Rising from the financial crisis in the later part of the last decade, Indonesia has been one of the fastest growing countries in the ASEAN region with growing demand for electricity. To meet this demand, the installation of new conventional power generation facilities (coal fired and diesel power plants) is still expected in view of the availability of fuel and the relatively lower cost for the mature technology involved. In particular, island grid systems (as well as coastal areas) which are currently served by diesel-based power plants will not be able to benefit from the use of available RE resources such solar and wind energy. In combination with other RE resources that maybe available in the area or even with the supplementary use of diesel fuel, this power generation technology can contribute to improving the environment in such areas of the country. Although, diesel fuel may still be needed for reliable power generation from RE-based systems (i.e., the hybrid systems, which in this case wind-diesel hybrids), the displacement of part of the diesel fuel consumption for power generation would be still be significant to contribute to GHG emission reductions from power generation.

Without the GEF support for the incremental cost for removing the identified barriers to the development and application of WHyPGen technology in on-grid power supply systems in Indonesia, the opportunity for employing such relatively low GHG-emitting power generation technology will remain untapped. Wind energy applications will as in the past be limited to either low wattage power production or mechanical power. Without this proposed project, Indonesia would have limited success in establishing a suitable environment for the development and adoption of WHyPGen technology as a viable environment friendly energy system particularly in its wind resource rich areas. The project will, among others showcase the commercial viability of WHyPGen in the islands where the wind resource is favorable for power generation[12]. This would be among the initial steps towards the creation and enhancement of the

[11] Since 2001, BPPT has carried out specific wind energy pilot projects (including wind hybrid systems) in wind resource-rich areas of Indonesia. Some of these are still being monitored and experience gained as well as lessons learned from these pilot projects will be put to good use in the design of the proposed project. Lessons can also be learned from previous and ongoing wind pilot studies being carried out by the Indonesian meteorological and geophysics agency (BMG) and space and aeronautical administration (LAPAN).

[12] The project will target areas with island grid systems (as well as coastal areas) which are currently served by diesel-based power plants. In these areas, the only viable RE resource are solar and wind. While the areas may have micro-hydro and geothermal energy, these RE resources are limited and are not found in the specific areas in wind-rich areas that are targeted by the project. In the target areas where there is favorable wind energy resource, wind energy has the potential to displace/supplant part of the diesel fuel consumption for power generation. To make the harnessing of the available wind energy resource in these areas cost-effective and

WHyPGen market in Indonesia. With the GEF support for the incremental cost needed to demonstrate the feasible WHyPGen applications, efforts in the creation of the envisioned WHyPGen market can be realized. The GEF support will, therefore, accelerate the strategic dissemination of the WHyPGen technology in power markets in Indonesia and perhaps in other countries, and will ultimately achieve a significant GHG reduction.

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:

Although wind power generation is a proven commercially feasible technology in many developed countries such as those in Europe, in the case of developing countries like Indonesia, the promotion of the application of such technology, let alone wind hybrid power generation systems, could be very hard. The general perception regarding such "atypical" type of technology application projects is that they are high risks.

The proposed project itself comprises of several barrier removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. It will be carefully designed to facilitate close coordination and consultation of the relevant stakeholders in each of the proposed activities. Activities aimed at enhancing the local technical capacity to improve understanding and implementation of all aspects of WHyPGen designs, financing, installations and operations; to build effective awareness programs targeted to optimize technology diffusion; to build the confidence of financing institutions to reduce risks of loans to finance WHyPGen projects; and to develop policies and regulations to reduce the regulatory efforts of WHyPGen project implementations, will comprise the proposed project. In that regard, the project will actually address such risks directly.

The following summarizes the initial findings of the BPPT regarding the potential risks (including the mitigating actions) of implementing a project for the promotion, development, application and facilitation of the commercialization of WHyPGen projects:

Risk	Mitigating Actions	Risk Level
• Comprehensive wind maps will not be publicly available • Locations of favorable wind energy resources are highly dispersed and maybe far from existing grids thereby discouraging potential wind power generation system project developers. • People may not be receptive to wind-hybrid power systems.	• Proposed project will involve wind energy resource assessments that will at least provide the capacity building for Indonesia to develop, prepare and interpret wind maps. • Detailed technical and economic evaluation of grid extension to any far flung wind rich resource area will be carried out under the project as part of the wind energy resource assessments. • Advocacy campaigns under the project will be designed to assist potential wind-hybrid system project developers in the techno-economic evaluation of wind hybrid systems in remote areas.	Medium
• GOI continues to subsidize fuel and electricity prices	Measures to reflect true cost of fuel and electricity prices will be determined through conduct of energy cost and market studies.	Medium
• Non-repayment or delayed repayment of loans for WHyPGen projects	Financing schemes studies on new applicable approaches to help finance WHyPGen systems will be conducted to find the best arrangements that will deliver the loans at acceptable terms and conditions for better repayment performance and apply them to the demonstration plants for replication to others	Medium
• Financing institutions are constrained by corporate policies in providing financing to RE projects, in general, and wind energy projects, in particular	Capacity building for financing institutions to appreciate and support new technology delivery financing mechanisms for RE-based power generation are incorporated in project activities to encourage them to include lending for such kind of projects in their portfolio	Low

increase the chances of commercial viability, the wind energy system should be coupled to, or operate in combination with, another power generation system in order to improve the overall system reliability. This refers to wind hybrid energy systems, which in this case is wind-diesel hybrid.

Risk	Mitigating Actions	Risk Level
• Host company backs out from their commitment to make their WHyPGen part and parcel of the proposed UNDP-GEF WHyPGen project	Constant coordination and follow-up of commitments and formalization of agreement as to the project definition and timetable. The cooperation of the MEMR and PLN will be sought to make sure that the implementation gaps are solved. Additional demonstration sites will be identified as backup in case there will be unexpected backing out so as to complete the total number of demo projects.	Low
• Rural communities prefer other RE resources than wind	Intensive information, promotion and advocacy activities to highlight local benefits and foreign exchange savings with wind energy applications are included in the activities	Low

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

As envisioned, the successful implementation of the project activities is expected to result in improved market demand for WHyPGen applications. The proposed project is expected to facilitate the installation of a potential 200 MW capacity of WHyPGen system facilities in the wind resource abundant areas of Indonesia within 3 years after the proposed project. Considering the forecast load factors and the conservative capacity factor of 0.30 for the wind energy component, the total estimated CO_2 emission reduction (from the displacement of diesel-based electricity generation) is about 208,600 tons/year (inclusive of the demonstration project)[13]. The table below summarizes the estimated annual WHyPGen capacity installations as well as the expected CO2 emission reductions from the displacement of diesel fuel consumption by wind energy.

Table A: WHyPGen Installed Capacity and CO2 Emission Reductions

Year	2013	2014	2015	2016	2017 to 2023	Totals
Total WHyPGen Capacity, MW	10	25	73	205	205	210
Diesel Engine Capacity, MW	8	14	38	104	104	108
Wind Energy Capacity, MW	2	11	35	101	101	102
Annual Power Generation from Wind Energy, MWh	5,256	28,908	91,980	265,428	1,857,996	2,249,568
Annual CO2 Emission Reduction, tons	4,132	22,722	72,296	**208,626**	1,460,385	1,768,161

= Project Period = Post Project Period

Considering the period coverage of the PLN projections, which is 10 years after the first installation of the demo WHyPGen unit in mid 2012 (10 MW, of which the wind energy component is 2 MW), the total potential CO2 emission reductions for the same period (i.e., after 10 years) is estimated at about 1.77 million tons. This is a conservative estimate, focusing only on the confirmed and budgeted expansion plans of PLN until 2023. The

[13] The CO2 emission reduction estimates are based on the electricity demand and load factor projections of the national power utility in Indonesia (Perusahaan Listrik Negara or PLN) and their rehabilitation/expansion plans in areas where there are identified wind energy potentials (2009-2018). PLN operates diesel power generation plants in these areas. Wind energy is planned to supplant part of the diesel-based power generation capacity in these areas. Based on PLN projections, a total of wind-diesel hybrid systems can be installed during the duration of the implementation period of the proposed WHyPGen project. Three years after the end of the proposed 3-year project (i.e., starting 2013) an estimated cumulative 200 MW capacity of WHyPGen facilities would be installed. The CO2 emission reductions corresponding to the diesel fuel displacement brought about by the wind power generation component of the wind energy component is about 208,600 tons starting 2016 (Table A above). This estimated amount will be realized each year during the post-project period.

WHyPGen potentials in other remote areas with very good wind energy resource that are currently served by PLN are not included in this estimate but will form part of the indirect CO2 emission reductions[14].

For a 10 year period (2013-2022), this translates to a unit abatement cost (UAC) of about US$1.7/ton CO_2 (i.e., GEF$ per ton CO_2). While this is based on the assumption that the WHyPGen project would have created the enabling conditions that will facilitate the widespread application of wind energy systems in the country's power sector by 2013, this measure of the project's cost effectiveness (i.e., UAC) will be tracked using a monitoring and evaluation system that will be developed for the proposed project. This preliminary UAC estimate will be re-evaluated and updated during the project design and development, which is expected to be supported with a proposed project preparation grant from the GEF, particularly in quantifying the potential energy savings from the confirmed demonstration projects and projected replications and in coming up with the CO_2 emission reduction estimates. The updated CO_2 emission figures and UAC will be indicated in the project document that will be submitted later for CEO endorsement.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:

As per the comparative advantage matrix, UNDP's comparative advantage in the area of renewable energy is on capacity development and technical assistance. As can be gleaned from the envisioned components of this project all of the proposed activities are on capacity building in the various aspects of WHyPGen development and applications, as well as the provision of technical assistance in the removal of barriers.

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)*
Agus Purnomo	Special Asst. to Minister for Int'l Environmental Issues & Partnerships	State Ministry for Environment	September 11, 2008

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	Manuel L. Soriano, UNDP-GEF Reg'l Tech'l Advisor	+66-2-2882720	manuel.soriano@undp.org

[14] The range of indirect CO2 emission reduction, based on the forecast CO2 emission reduction in the entire PLN power grid system in Nusa Tenggara (this is the province where most of the favorable wind energy potentials are found) is 2.0 million to 3.5 million. This range of values is derived using the GEF Methodology for estimating GHG benefits and shown as follows:
Bottom Up Approach: Based on a Replication Factor = 2, double the direct CO2 emission reduction, the resulting indirect CO2 emission reduction is about 3.532 million tons.
Top Down Approach: The total potential CO2 emission reduction from wind-diesel hybrid systems in the Nusa Tenggara power grid system during the 2014-2023 influence period (i.e., 10 years after the project) is about 3.334 million tons. Using a GEF Causality Factor = 0.6 (Substantial but modest), the resulting indirect CO2 emission reduction is about 2.0 million tons.