Terminal Evaluation Report:

"Wind Hybrid Power Generation Market Development Initiative Project", Indonesia

(PIMS 4223; GEF 3953)

Report
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Country	**Indonesia**
Region	**Asia Pacific**
Focal Area	**Climate Change**
Implementation Partners	**BPPT (Badan Pengkajiandan Penerapan Teknologi) (Agency for the Assessment and Application of Technology), Indonesia**

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Disclaimer

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LIST OF ACRONYMS

ADB	Asian Development Bank
AEP	Annual Energy Production
APR/PIR	Annual Project Review/Project Implementation Review
AWP	Annual Work Plan
BAPPENAS	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BMKG	*Badan Meteorologi, Klimatologidan Geofisika* (Agency for Meteorological, Climatology, and Geophysics)
BOOT	Build, own, operate, transfer
BPPT	*Badan Pengkajiandan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)
B2TE	*Balai Besar Teknologi Energi* (Center for Energy Technology)
CO_2	Carbon dioxide
CDM	Clean Development Mechanism
DANIDA	Danish International Development Agency
DGNREEC	Directorate General for New Energy, Renewable Energy and Energy Conservation
DJEBTKE	*Direktur Jenderal Energi Baru, Terbarukandan Konservasi Energi* (Directorate General for New Energy, Renewable Energy and Energy Conservation)
EE	Energy Efficiency
EOP	End of Project
EPC	Engineering, Procurement and Construction
ESCO	Energy Service Company
ESP3	Environment Support Program Phase 3
FE	Final Evaluation
FiT	Feed-in Tariff
FSP	Financed full-sized project
GW	Gigawatt, 1000 MW
GWh	Gigawatt-hours
GEF	Global Environment Facility
GHG	Greenhouse Gas
HL	Highly Likely
HS	Highly Satisfactory
HU	Highly Unsatisfactory
IDR	Indonesian Rupiah (USD 1 = 11,600 IDR over August 2013-August 2014)
IPP	Independent Power Producer
IPB	*Institut Pertanian Bogor* (Bogor Agriculture University)
ITB	*Institut Teknologi Bandung* (Bandung Institute of Technology)
ITS	*Institut TeknologiSepuluh November* (10th November Institute of Technology)
IWA	Indonesia Wind Association
IWES	Indonesia Wind Energy Society
JI	Joint Implementation
KESDM	*Kementerian Energidan SuberDaya Mineral* (Ministry of Minerals and Energy Resources)
km	kilometre
KPDT	Ministry of Disadvantaged Region
kW	kilowatt
kWh	kilowatt-hour
LAPAN	*Lembaga Penerbangandan Antariksa Nasional* (National Institute of Aeronautics and Space)
LIPI	*LembagaIlmu Pengetahuan Indonesia* (Indonesian Institute of Science)
LNG	Liquid Natural Gas
M&E	Monitoring and Evaluation
MEMR	Ministry of Minerals and Energy Resources
METI	Indonesia Renewable Energy Society
ML	Moderately Likely
MS	Moderately Satisfactory
MTI	Ministry of Trade & Industry
MTR	Mid-Term Review

MU	Moderately Unlikely
MU	Moderately Unsatisfactory
MW	megawatt (million Watt)
NIM	National Implementation Modality
NGO	Non-Government Organization
NPD	National Project Director
NPM	National Project Manager
NREL	National Renewable Energy Laboratory
NTB	*Nusa Tenggara Barat* (West Nusa Tenggara)
NTT	*Nusa Tenggara Timur* (East Nusa Tenggara)
O&M	Operation and Maintenance
P3B	*Penyalurandan Pusat Pengatur Beban* (Distribution and Load Control)
PB	Project Board
PIF	Project Identification Form
PLN	*Perusahaan Listrik Negara* (State Electricity Company)
PMU	Project Management Unit
PPA	Power Purchase Agreement
Prodoc/ ProDoc	Project Document
P4TKBMTI	*Pusat Pengembangan dan Pemberdayaan Pendidik dan Tenaga Kependidikan Bidan gMesin dan Teknik Industri*(Centre for Development and Empowerment of Trainer and Education support in the Mechanical and Industrial sectors)
RE	Renewable Energy
R&D	Research and Development
RTA	Regional Technical Adviser
S	Satisfactory
SMI	*Sarana Multi Infrastruktur* (State Financial institution)
TOR	Term of Reference
TTS	*Timor Tengah Selatan* (South of Centre Timor)
TTU	*Timor Tengah Utara* (North of Centre Timor)
U	Unlikely
U	Unsatisfactory
UI	*Universitas Indonesia* (Indonesia University)
UGM	*Universitas GadjahMada* (GadjahMada University)
UN	United Nations
Unair	*Universitas Airlangga* (Airlangga University)
UNDAF	United Nations Development Assistance Framework
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
UNDP CO	United Nations Development Programme, Country Office
US	United States
USAID	United States Agency for International Development
USD	US dollar
UNS	*Universitas Sebelas Maret* (Sebelas Maret University)
WRA	Wind Resources Assessment
WESMA	Wind Energy System Manufacturers Association
Wh	Watt-hour
WHyPGen	Wind Hybrid Power Generation
Wp	Peak Watt

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EXECUTIVE SUMMARY

Project summary table

Table 1: Project Summary

Project Title:	**Wind Hybrid Power Generation (WHyPGen) Marketing Development Initiatives**			
			Committed at endorsement (USD Million)	*Realized at completion (USD million[1])*
GEF Project ID:	3953	GEF financing:	2.1562	2.156
UNDP Project ID:	PIMS 4223 Atlas ID 76672	IA/EA own:	0.15	0.15
Country:	Indonesia	Government:	1.335	1.335
Region:	Asia Pacific	Others (private):	36.00	0.33
Focal Area:	Climate Change	Total co-financing:	37.4846	1.815
FA Objectives, (OP/SP):	CCM-3: Promote investment in renewable energy technologies (GEF-5)	Total Project Cost:	39.6408	3.971
Executing Agency:	UNDP	GEF endorsement:	Feb 2012	
				ProDoc Signature (date project began): Aug 2012
Other Partners involved:	BPPT	(Operational) Closing Date:	Proposed Feb 2015	Actual July 2016

Introduction and brief description of the project

In spite of Indonesia having good resources for renewable power (including wind and solar), the share of renewable sources of energy in the overall energy mix of the country is negligible. Considering that with the increasing demand for commercial energy, fossil fuel resources in Indonesia will exhaust in a short time (Indonesia has already become an importer of oil from an exporter a few years back) and in order to meet its future energy demands in a sustainable manner, Indonesia is promoting use of wind energy, by removing the barriers towards its wider adoption. The Wind Hybrid Power Generation project (WHyPGen) was designed and implemented with this consideration in mind. The stated goal[2] of the WHyPGen project was reduction in the rate of growth of GHG emissions in the power sector of Indonesia. The project objective was facilitation of commercial development of on-grid WHyPGen systems in Indonesia through government and private sector cooperation.

The project was to address the barriers towards commercial development of WHyPGen systems in Indonesia, through the 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 for grid-connected supply. Table 2 provides the outlines of the project and its different components.

[1]Exact figures could not be made available during the TE. Thus, best available estimates have been used

[2]As per Project Document

The terminal evaluation (TE) of the project was conducted just after the project was closed. The evaluation was initiated by UNDP CO, Indonesia, in accordance with evaluation requirements set forth by GEF. The objective of the TE is to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from the project, and aid in the overall enhancement of UNDP programming.

Table 2:WHyPGen Project Objectives, Outcomes and Outputs

Project Goal: Rate of growth of GHG emission in the power sector is reduced **Project Objective:** Facilitation of commercial on-grid WHyPGen systems for environmentally sustainable electricity supply
Component 1:WHyPGen Technology Application Assessments; **Outcomes;** • Enhanced knowledge ofpotential wind power generation (including WHyPGen) applications • Improved knowledge of wind power generation system benefits and costs • Enhanced interest in investing in wind power generation (including WHyPGen) projects **Output 1.1:** Updated wind maps of areas Area with significant wind energy potentials **Output 1.2**: Techno-economic feasibility studies(FS) of potential WHyPGen application projects **Output 1.3:** Completed feasibility assessments of the local manufacturing/production of WHyPGen system components
Component 2: WHyPGen Technology Demonstration; **Outcomes;** • GHG emission reduction from WHyPGen demo projects • Increased number of WHyPGen projects planned and implemented • Increased share of wind energy in the national power generation mix. **Output 2.1:** Successfully implemented WHyPGen pilots/demos **Output 2.2** WHyPGen project replications planned and implemented
Component 3:Financing of WHyPGen Initiatives; **Outcomes;** • Increased investments on wind power generation (including) WHyPGen projects • Local banks and financing institutions providing loans for wind power generation projects. **Output 3.1:** Completed training and promotions for banking/financing institutions in financing WHyPGen projects **Output 3.2:** Designed financing schemes for WHyPGen projects
Component 4: Policy & Institutional Support for WHyPGen Initiatives; **Outcomes;** • Approved and enforced policies supportive of wind power generation (including WHyPGen) projects **Output 4.1**: Completed policy study on WHyPGen system **Output 4.2**: Proposed policy frameworks supportive of wind energy (including WHyPGen) projects
Component 5: WHyPGen Promotion; **Outcomes;** • Enhanced awareness of the benefits of wind power • Planned and implemented wind power generation (including WHyPGen) projects **Output 5.1**: Designed and implemented WHyPGen promotion and advocacy program
Component 6: WHyPGen Market Development and Industry Support; **Outcomes;** • Improved local wind energy (including WHyPGen) system design & engineering capacity • Ensured availability of local service provider for wind energy facilities • Availability of quality components of wind energy (including WHyPGen) systems that are locally made • Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia **Output 6.1**: Completed capacity building and technical support program for the: (a) Local manufacturing of WHyPGen system components; (b) Design and engineering of WHyPGen projects; and, (c) Installation, operation and maintenance of WHyPGen facilities **Output 6.2**: Completed survey and evaluation of electricity demand areas served by wind power generation (including WHyPGen) facilities.

This terminal evaluation report is structured around the five UNDP/GEF evaluation criteria: Relevance, Effectiveness, Efficiency, Results/Impacts and Sustainability.

Summary of assessment regarding attainment of the results and objectives of different components of the project and the project at an aggregate level is given in Table 3.

Table 3:Summary of Attainment of Results / Outcomes of component and the project

Project Goal / Objective / Component	Rating
Project Goal: Rate of growth of GHG emission in the power sector is reduced	MS
Project Objective: Commercial on-grid WHyPGen systems for environmentally sustainable electricity supply	MS
Component 1: WHyPGen Technology Application Assessments	S
Component 2: WHyPGen Technology Demonstration	MS
Component 3: Financing of WHyPGen Initiatives	U
Component 4: Policy & Institutional Support for WHyPGen Initiatives	U
Component 5: WHyPGen Promotion	S
Component 6: WHyPGen Market Development and Industry Support	U
Project	MS

Evaluation Ratings

As per the requirements of the TOR for Terminal Evaluations, Table 4 provides the ratings for relevance, effectiveness, efficiency, sustainability, and impacts of the project. The Table also provides the ratings for Monitoring and Evaluation (M&E), Implementing Agency (IA) & Executing Agency (EA) Execution, and Assessment of Outcomes. Ratings have been provided using the obligatory GEF rating scale.

Table 4: Terminal Evaluation Ratings

1.Monitoring and Evaluation	rating[3]		2. Implementing Agency (IA) & Executing Agency (EA) Execution	rating
M&E design at entry	S		Quality of UNDP Implementation	S
M&E Plan Implementation	MS		Quality of Execution - Executing Agency	S
Overall quality of M&E	S		Overall quality of Implementation / Execution	S
3. Assessment of Outcomes	**rating**		**4. Sustainability**	**rating[4]**
Relevance	S		Financial resources	L
Effectiveness	MS		Socio-political	ML
Efficiency	MS		Institutional framework and governance	L
Overall Project Outcome Rating	MS		Environmental	L
			Overall likelihood of sustainability	L

Summary of conclusions

The WHyPGen project which started with the PIF (Project Identification Form) in the year 2009 as a project to promote, 'on grid diesel-wind hybrid systems' ended in the year 2016 with the resultant promotion of large scale 'on grid wind power projects'. One of the significant achievement of the WHyPGen project has been that it has lead to a situation where the market forces has taken over development of the wind power projects in Indonesia.

[3] Ratings for Outcomes, Effectiveness, Efficiency, M&E, I&E Execution: Highly Satisfactory (HS): no shortcomings；Satisfactory (S): minor shortcomings; Moderately Satisfactory (MS) 3. Moderately Unsatisfactory (MU): significant shortcomings; Unsatisfactory (U): major problems; Highly Unsatisfactory (HU): severe problems

[4]Ratings for Sustainability: Likely (L): negligible risks to sustainability; Moderately Likely (ML): moderates risks; Moderately Unlikely (MU); significant risks; Unlikely (U): severe risks

Some of the specific achievements of the project are; wind resource assessment for a number of potential locations for wind power projects; Identification of potential wind power sites; Introduction of curriculum regarding wind power technology in the engineering education; Successful deployment / testing of automatic control systems for small wind-solar-diesel hybrid systems. Some of the issues where the project has fallen short of achieving the success are; Establishment of a policy for feed in tariff for wind energy based power generation; Demonstration of commercially viable small on grid wind-diesel hybrid systems.

The WHyPGen project has been able to address the barriers as far as large size grid connected wind power projects are concerned. But the barriers of successful commercial demonstration (for small wind-diesel hybrid systems) and the regulatory barriers in terms of absence of transparent policy regarding feed in tariff for wind power projects could not be addressed to the full extent. It is important to note that generally the large size wind power projects have the capacity and the strength to negotiate on a power purchase agreement on a case-to-case basis, the smaller operators and entrepreneurs generally lack it.

Although there is no direct reduction in the emissions of GHG, the project would lead to significant indirect reduction in the emissions after the project. The WHyPGen project was expected to lead to the reductions in the emission of GHG and it has done so, although there are questions regarding the extent of emission reductions and its classification in different categories (direct, direct after the project and indirect).

Recommendations

Project design suffered due to the fact that, while the PIF was prepared for smaller 'on grid wind –diesel hybrid' the project design focused on larger wind power plants and while doing so it missed out on making the corresponding changes in different components and activities for the project.

Recommendation1*: The corrective action for the design on the project is that in all the cases where there is a significant change in the focus of the project from the PIF stage to the project design stage, corresponding changes in all the components and the activities should be made. If required the components, indicators, activities and the corresponding outcomes may be re-written.*

There were differences amongst the government ministries and departments, regarding what all should be supported under the GEF project. While some of the government stakeholders were in favour or supporting promotion of 'on grid wind-diesel hybrid systems', the others were in favour of supporting large size wind grid connected wind projects. Yet to some other stakeholders these issues did not really matter. These kind of issues leads to lack of ownership and interest on part of some of the stakeholders which was visible in the case of this project.

Recommendation 2*: The corrective action for the monitoring and evaluation is that the members of the project board should have an agreement about the objectives and activities to be carried out under the project.*

The PIF of the project was conceived, considering that the wind component of the WHyPGen would be able to part replace the diesel based power generation capacity. This assumes that wind energy will be available through out the year. The idea of part replacement of diesel-based power generation capacity with wind (in a hybrid mode) is not a realistic situation. The fact that implementation of diesel-hybrid system would require additional capital expenditure (not just incremental, as wind is not a continuous source and the seasonal variations are from 0 to 100%) got missed out. The reason for this seems to be the lack of inputs from the wind energy experts at the time of project design.

Recommendation 3: *It is recommended that at the time of project design, inputs from the technical experts for the technology being promoted must be taken.*

As was pointed out in the MTR as well, when it comes to the project goals, the targets were a bit ambitious. This is considering that the timeframe assumed for implementation of the pilot / demonstration projects is very

optimistic, as the time required for collection of wind data and doing a realistic wind resource assessment itself takes more than one year.

Recommendation 4*: The corrective action for project design is that while putting up a time frame for the demonstration projects a realistic time frame needs to be provided, considering the technology specific project implementation issues and required timelines.*

The assumption that it would be possible to create capacities / capabilities to produce wind turbines locally within the implementation period of the project was slightly unrealistic. The important point which got missed out while making this assumption is that the softer part of the technology (design and detailed engineering) of the wind turbines and wind power technology is important and having good engineering facilities within the country alone is not sufficient to enable production of components and parts of wind turbines. The lesson learnt is that while making efforts towards producing high-tech capital equipment in a country, it is necessary to lay equal emphasis on the software (designs, technical know-how and detailed engineering) as well as hardware part (precision manufacturing technology).

Recommendation 5: *It is recommended that for the project which has a component of developing local technical capacity for production of sophisticated equipment, at the time of project design there should be emphasis on the software part of the technology (know-how, detailed engineering, designs etc.) as well and identification of technology source should be included as one of the activities.*

Generally speaking, the initial set of demonstration / pilot projects to remove the barriers, need to be provided financial support. In the present case, the design of the project did not had any provision for providing financial support to the initial set of demonstration / pilot projects and it totally relied on 100% private sector investment even for the pilot / demonstration projects. This is one of the reasons that the private sector parties, which committed to establish demonstration projects, did not fulfil the commitment.

Recommendation 6: *It is recommended that while designing the projects having a demonstration component, some fiscal incentives should be provided to such demonstration projects.*

The project design has rightly recognized technology gaps and skills as one of the barriers. To address this barrier, the provisions made in the project design were not adequate. The critical part that was missed is the identification of the right and most appropriate technology, its source and the ways to infuse it in the country. Thus, an important technology consideration of the design of rotor blades and the connected generator was not addressed in the project design.

Recommendation7: *For addressing the barriers of technology (particularly in cases where the technology is not locally available), apart from capacity building and training, equal emphasis should be given to technology sourcing and the ways to infuse the technology in the local conditions.*

One of the significant achievement of the project has been uptake of 'large scale grid connected' wind power projects in Indonesia. This happened due to the support and help provided under the WHyPGen projects in terms of wind resource assessment, identification of potential sites for wind power projects, etc. The technical information created under the project was widely disseminated through the dedicated web site.

Recommendation 8*: In order to continue to get the benefits from the database and useful technical information, it is recommended to continue the availability of information at the website.*

From the view point of policy and regulations, one of the issues is that the WHyPGen project has not been able to get approved a feed in tariff policy for wind power projects. Absence of such a policy regarding feed in tariff is one issue which may impact the benefits of the WHyPGen project.

Recommendation 9: *It is recommended that the efforts be continued to get the approval for the feed in tariff for wind power projects. This may be perused by the newly created, Wind Association or any other suitable organisation*

1. INTRODUCTION

1.1 Context, purpose of the terminal evaluation and objectives

The project, "Wind Hybrid Power Generation Market Development Initiative Project" (WHyPGen Project) in Indonesia is aimed at removing the barriers towards larger use of wind energy for generation of power. In-spite of having a good potential for wind energy based power generation, the contribution of wind based power generation in the overall power generation in Indonesia is insignificant. It is considered that this situation is due to presence of a number of barriers towards wider use of wind energy for power generation.

Some of the barriers which were envisaged at the time of project design, include lack of demonstration; lack of experience to design, install and operate larger wind power generation facilities; lack of availability of finance. In order to remove the barriers towards sustainable investment of wind power generation in Indonesia, the 'Wind Hybrid Power Generation Market Development Initiative Project' (WHyPGen) was initiated in the year 2012. The duration of the project was three years. Based on the the recommendations at the time of Mid Term Review the timelines for the project were extended by one year. The project has been implemented with funding from Global Environment Facility (GEF) and United Nations Development Programme (UNDP). With the project approaching its end, a terminal evaluation of the project has been carried out. This is as per the standard practice for all UNDP-GEF projects. UNDP CO invited an independent international consultant to carry out the Terminal Evaluation of the project as per the scope and terms of reference given in **Annex A**. The broader defined objectives of the terminal evaluation were as follows:

- To compare planned outputs of the project to actual outputs.
- Identify (if applicable) the causes and issues which contributed to non-achievement of the targets of the project.
- Draw lessons that can both improve the sustainability of benefits from the project, and aid in the overall enhancement of UNDP programming.

The consultant, Dinesh Aggarwal (India) was selected and contracted by UNDP, Indonesia country office to carry out the terminal evaluation.

1.2 Scope and methodology of the terminal evaluation

The evaluation has been carried out in accordance with the UNDP-GEF, Guidance for Conducting Terminal Evaluations of UNDP-supported Projects, as provided in the 'Handbook on Planning, Monitoring and Evaluating for Development Results'. Prior to the start of the Terminal Evaluation an inception report was prepared and shared with the UNDP CO at Indonesia and the project team. The inception report provided the outlines of the approach and methodology to be followed while carrying out the evaluation. It also provided the proposed timelines for the evaluation. The inception report included a table providing the criteria for the evaluation and the list of main evaluation questions. The table of terminal evaluation criteria and the questions is given in **Annex B**. Accordingly, the methodology for carrying out the Terminal Evaluation was comprised of following activities:

- **Review of Documents and Project Website:** Review of 'Project Design Document' and all relevant sources of information including documents prepared during the preparation Phase. This included the review of information on the project website. The review of documents included a review of financial data, mid-term evaluation report, sample of back to office reports, samples of project communication material etc. **Annex C** provides the list of documents reviewed.
- **Mission to Indonesia, Interviews with stakeholders and site visits**. A mission to Indonesia was undertaken from 1st August to 12th August 2016. The mission started with a briefing by the UNDP CO and the project team (including the National Project Director). The mission concluded with a

presentation regarding the initial findings. During the mission, interviews with different stakeholders and project participants were carried out. The mission includes a site visit to the wind project site at Nusa Pineda, Bali. **Annex D** provides the overall schedule of the missions and the stakeholders interviewed during the mission. The mission also served the purpose of collecting the missing documents to be reviewed. Some of the documents to be reviewed were also received after the mission.

The assessment of project performance has been carried out, based upon the expectations set out in the Project Logical Framework/Results Framework, which provides performance and impact indicators for project implementation along with their corresponding means of verification. While doing so, the modified set of indicators, as suggested at the Mid Term Review (MTR) of the project, have also been taken into account. While carrying out the evaluation, emphasis has been placed on evidence based information that is credible, reliable and useful.

The review of documents provides the basic information regarding the activities carried out to attain the desired outcomes and outputs and the actual achievements. However, the mission was needed to verify the information, get missing data and to learn the opinion of stakeholders and project participants to interpret the information. During the mission, the interviews with the key stakeholders' / project participants were based on open discussion to allow respondents to express what they feel are the main issues. This was followed by more specific questions on the issues mentioned. During the interviews, the evaluation criteria and the questions (Please see **Annex B**) were used as the check list to raise relevant questions and issues.

The evaluation has been conducted in accordance with the principles outlined in the United Nations Evaluation Group 'Ethical Guidelines for Evaluation' as given in **Annex E**.

1.3 Structure of the Terminal Evaluation Report

The structure of the report is as per the format suggested in the Terms of Reference for the terminal evaluation. However, the contents of the chapter on findings has been split into three chapters due to the size of the text.

The report starts with a chapter providing an introduction which is followed by the chapters of project description, findings. The last chapter of the report provides the conclusions and the recommendations. Additional information is provided in the Annexes to the report. While Executive Summary of the report is provided in the beginning of the report, rest of the report is organised as follows:

- Chapter 1: Introduction to the project
- Chapter 2: Project description and development context.
- Chapter 3: Findings: Project design and formulation
- Chapter 4: Findings:Project implementation
- Chapter 5: Findings: Project results
- Chapter 6: Conclusions, recommendations and lessons

As has been stipulated before the Findings have been organised in three chapters (instead of one single chapter as suggested in the TOR) due to the size of the text. **Annex B** shows where the main criteria and questions of the Terminal Evaluation can be located in different sections of the report.

2. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

2.1 Project start and duration

The project, "Wind Hybrid Power Generation Market Development Initiative Project" (WHyPGen Project) in Indonesia was aimed at removing the barriers towards larger use of wind energy for generation of power. In-spite of having a good potential for wind energy based power generation, the contribution of wind based power generation in the overall power generation in the country is insignificant. It is considered that this situation is due to presence of a number of barriers towards wider use of wind energy for power generation.

The objective of the project is to promote wind energy based power generation (including Wind HybridPowerGeneration technology - WHyPGen[5]) through "facilitation of commercial on-grid WHyPGen systems for environmentally sustainable electricity supply in Indonesia" through government and private sector cooperation. The WHyPGen project comprised of activities aimed at removal of barriers. This would reduce the perceived risks by the entrepreneurs in the adoption of WHyPGen technology.

Some of the barriers envisaged include lack of demonstration, lack of experience to design, install and operate larger wind power generation facilities. In order to remove the barriers to the sustainable investment in wind power generation, the 'Wind Hybrid Power Generation Market Development Initiative Project' (WHyPGen) was initiated in the year 2012. The duration of the project was three years. Based on the the recommendations at the time of Mid Term Review the timelines for the project were extended by one year. The project was implemented with funding from Global Environment Facility (GEF) and United Nations Development Programme (UNDP). The project was implemented by the Center for Energy Technology (B2TE) at the Agency for the Assessment and Application of Technology (BPPT). The project was designed as a full-sized project with the planned funding as follows:

- GEF financing of USD 2,156,200 (of which USD 170,000 for project management cost)
- Co-financing of USD 37,484,600, consisting of in-kind contribution by government
- UNDP financing of USD 1,484,600
- Cash contribution by the private sector associated with investment in site preparation and wind farm construction (USD 36,000,000).

The project document was endorsed by the CEO in February 2012. The project document was singed in August 2012. Actual implementation of the project could start only in October 2012 for a period up till March 2015. Recommendation was made at the time of Mid-Term Review (MTR) of the project to grant an extension. Thus, an extension was granted until June 2016.

2.2 Problems that the project sought to address

Indonesia transitioned from a robust energy exporter to an importing nation in the year 2000 and is concerned with rising production costs, energy subsidies, and climate change. In the year 2008, fossil fuels provided 93% of the economy's total energy capacity. Unlike previous years when excess energy was exported to neighboring markets, aging wells and limited investment forced Indonesia to import oil and to eventually remove itself from the Organization of Petroleum Exporting Countries (OPEC). Similarly, Indonesia was once the world's leading exporter of natural gas, but now ranks 56th because investment restrictions and contract uncertainty caused new production to go undeveloped. At current extraction rates, it is expected that the total proven and

[5]A hybrid system combines two or more of sources of generation, such as diesel and wind, solar and diesel, diesel-solar-wind or other combinations (such as natural gas-solar, etc.). Wind very much fluctuates; during periods of low wind speeds; other sources (a diesel engine or another source of renewable energy) take over energy supply and this complementarity increase the reliability of the system in terms of continuity of power production. Hybrid systems can be grid-connected, but are often used in rural electrification to power isolated grid systems. For proper understanding, the reader should note that in the context of the WHyPGen Project the definition of 'hybrid system' has been widened, in fact, encompassing all wind power systems that are not stand-alone, including power generation facilities connected to a grid system that only consist of wind as source of energy.

potential reserves of crude oil and natural gas in Indonesia would get depleted in the near future (about 10 - 32 years), while coal is expected to last longer (about 65 years). The high population growth in Indonesia coupled with rapid expansion and economic growth in the country's residential, industrial, transportation, agricultural, commercial and public services sectors is leading to rise in energy consumption, and hence the need to import fossil fuels. The WHyPGen project sought to address the problem of increasing financial burden for importing the fossil fuels.

One of the other problems, which the WHyPGen project sought to address, is the availability of commercial energy in the remote locations that are not connected to the grid. Although, Indonesia is endowed abundantly with various energy sources such as fossil fuels and renewable energy, many areas that need such resources are not served because of absence of distribution networks and high cost of energy and limited power subsidies.

To appease local energy consumers, the government has maintained high energy subsidies. When supply was high and demand was low, the subsidies stimulated economic growth with low, stable energy prices. But as demand began to outpace supply, the subsidies became a burden on the nation's fiscal budget and low energy prices became a deterrent to investments in cleaner, renewable resources. In the year 2008, subsidies exceeded $20 billion. As oil prices declined, subsides decreased to $10 billion in the year 2009, but were expected to increase again in 2010. In addition, Indonesia's fuel subsidies have the negative consequence of making growth an unaffordable expense to the Government of Indonesia, which must pay more money for every new unit of electricity sold. It is expected that with the development of wind energy (due to the WHyPGen project) over long term, the burden of subsidy will reduce.

Apart from the development and economic benefits the project also sought the facilitation of the commitment of reduce the emissions of GHG. In the year 2008, Indonesia emitted 116 million metric tons of CO2 equivalent of GHG. In the business as usual scenario, the emissions would increase to 270 million tones of CO2 equivalent by the year 2018.

The WHyPGen project sought to address these problems by removing the barriers towards larger uptake of wind power generation projects in Indonesia.

2.3 Immediate and development objectives of the project

The development objective of the WHyPGen project was reduction of the rate of growth in GHG emissions in the power sector of Indonesia, so that the future energy needs can be meet in a sustainable manner. One of the other development objective was to facilitate availability of commercial energy in the remote areas which are not connected to the grid. The project objective is the facilitation of the commercial development of on-grid Wind Hybrid Power Generation (WHyPGen) systems for an environmentally sustainable electricity supply in Indonesia through government and private sector cooperation.

2.4 Baseline and expected results

An overview of the expected results (its objective, expected outcomes, indicators and targets) is provided in **Table 5**. Expected Project Results have been taken from the log-frame of the project. One of the recommendations during the mid term review of the project was to revise the indicators. This recommendation was accepted by the project team in the management response. Thus, the list of revised indicators as recommended during the MTR has also been included in the table. Assessment of the strengths and weaknesses of the log-frame is provided in the next chapter. Analysis of the attainment of project Outputs, Outcomes and Objectives is presented in Chapter 4, which compares the values of the indicators at the end of the project with the values at the baseline and targets.

Table 5:Expected Results of the Project (Based on the Log-Frame of the Project)

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
Project Goal: Rate of growth of GHG emission in the power sector is reduced						
		Tons of CO2 emission/year reduced from substitution of fossil fuel-based power generation by WHyPGen38 by end-of-project (EOP), MT CO2			0	17,071
		% of reduction in CO2 emissions from the power sector by EOP			0.006	0.027
Project Objective: Facilitation of commercial on- grid WHyPGen systems for environmentally sustainable electricity supply						
	1	Installed capacity of WHyPGen facilities by EOP, MW			0.7	9.4
	2	Total electricity generation from installed WHyPGen facilities by EOP, GWh/year			1.35	19.27
	3	Total WHyPGen capacity planned for installation, MW			0	100
			1	Installed wind power		
				o Number of projects (based on Indicators 11 and 12)	1	2
				o Capacity (MW)	0.734	50.7
				o Electricity generation (GWh/yr.)	1.6	111.1
				o Direct emission reduction ($ktCO_2$/yr.)	3	82
			2	Short-term planned wind power		
				o Number of projects (see Indicator 13)	0	3
				o Capacity (MW)		162.5
				o Electricity generation (GWh/yr.)		355.9
				o Post-project emission reduction ($ktCO_2$/yr.)		256.9
			3	Longer-term planned wind power		
				o Number of feasible projects	0	4
				o Capacity (MW)		220.5
				o Electricity generation		373.4
				o Indirect emission reduction		270.8
Component 1: WHyPGen Technology Application Assessments **Outcomes** • Enhanced knowledge of potential wind power generation (including WHyPGen) applications • Improved knowledge of wind power generation system benefits and costs						

[6] In the log-frame of the project as given in the project document the indicators were not numbered. The numbering of the indicators was suggested and carried out during MTR for easy reference.

[7] One of the recommendations during the MTR was to revise the list of indicators. The indicators suggested in the MTR are included in this table.

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
• Enhanced interest in investing in wind power generation (including WHyPGen) projects						
Output 1.1: Updated wind maps of areas with significant wind energy potentials	4	Number of provinces covered by the new & updated wind maps by EOP	4	Provinces covered by the new & updated wind maps	0	9
	5	Number of assessed locations with wind power generation potentials by EOP	5	Number of assessed locations with wind power potentials	0	25
	6	Number of identified locations with wind resources that are feasible for wind-based power generation by EOP	6	Number of identified locations with feasible wind resources	0	20
Output 1.2: Techno-economic feasibility studies(FS) of potential WHyPGen application projects	7	Number of evaluated existing wind energy systems by EOP	7	Number of evaluated wind energy system	0	11
	8	Number of completed wind power generation (including WHyPGen) project feasibility studies by EOP	8	Number of completed wind power feasibility studies	0	10
		Number of seminar-workshops on wind energy (including WHyPGen) applications and promotion of potential wind power projects by EOP			0	6
Output 1.3: Completed feasibility assessments of the local manufacturing /production of WHyPGen system components	9	Number of local equipment manufacturers that can potentially produce wind energy (including WHyPGen) system components by EOP	9	Number of assessed local equipment manufacturers that can potentially produce	0	15
	10	Number of local equipment manufactures that are ready to produce wind energy (including WHyPGen) system components by EOP	10	Number of local equipment manufacturers that can potentially produce wind energy components	0	10
Component 2: WHyPGen Technology Demonstration **Outcomes** • 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.						
Output 2.1: Successfully implemented WHyPGen pilots/demos	11	Number of planned WHyPGen replication projects by EOP			0	10
	12	Number of WHyPGen pilots/demos that are successfully implemented by EOP			0	3
		Cumulative electricity production from successfully implemented 2MW WHyPGen pilots/demos by EOP, GWh			0	3.85
		Cumulative CO2 emission reductions from successfully implemented 2MW WHyPGen pilots/demos by EOP, MT CO2			0	3,073
			11	Number of projects under operation/construction/rehabilitation	1	5

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
			12	Number of projects under negotiation (PPA, finance)	0	3
Output 2.2:Increased share of wind energy in national power generation		Number of WHyPGen projects implemented by EOP (including pilot/demo projects) (cumulative)			0	6
	13	% contribution of WHyPGen in the electricity supply in Indonesia by EOP	13	This indicator was deleted on recommendation during MTR	0	0.0062
Component 3:Financing of WHyPGen Initiatives **Outcomes** • Increased investments on wind power generation (including) WHyPGen projects • Local banks and financing institutions providing loans for wind power generation projects						
		Number of completed capacity building programs for banks/FI by EOP			0	3
		Number of completed capacity building programs for project developers and service providers and equipment manufacturers by EOP			0	6
	14	Number of banks/financing institutions trained on WHyPGen project financial feasibility evaluation by Year 3			0	3
Output 3.1: Completed training and promotions for banking/financing institutions in financing WHyPGen projects	15	Number of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable project proposals by Year 3			0	28
	16	Number of local banks/FIs that provide affordable financing schemes for WHyPGen projects by EOP			0	3
		Number of Local Governments that fund WHyPGen projects by EOP			0	2
		Number of venture capital funded WHyPGen projects planned and implemented by EOP			0	1
	17	Number of financing schemes designed and approved for wind energy projects as well as for WHyPGen component manufacturing by EOP			0	3
		Number of wind energy projects planned with approved financing scheme by EOP			0	2
	18	Number of wind energy projects implemented with financial support through the approved financing scheme by EOP			0	2

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
Output 3.2: Designed financing schemes for WHyPGen projects	19	Volume of financing provided to implemented wind energy projects through the approved financing scheme by EOP, US$ million			0	16
			15	Volume of finance offered by local banks as part of financing schemes (loans, guarantees, other) for wind power (m*illion USD)*	0	3
			16	Total volume of project-linked finance invested by implemented wind projects (million USD)	0	16
			17	Completed study on sources of funding and issues and options in financing commercial wind power with recommendations for one or more financing schemes	0	1
Component 4: Policy & Institutional Support for WHyPGen Initiatives **Outcomes** • Approved and enforced policies supportive of wind power generation (including WHyPGen) projects						
Output 4.1: Completed policy study on WHyPGen system		Number of existing WHyPGen-related policies evaluated by EOP			0	6
	20	Number of policy recommendations proposed for facilitating, promoting and supporting wind power generation (including WHyPGen) investments by EOP			0	3
			18	Completed review of existing policies and regulations (tax incentives, regulations, tariffs) and applicability for wind energy development (big, medium, small)	0	2
			19	Status and number of policy regulations on feed-in tariff and facilitating market access		
				o Proposed	0	1
				o Approved	0	2
Output 4.2: Proposed policy frameworks supportive of wind energy (including WHyPGen) projects	21	Supporting policies for wind power generation including WHyPGen formulated			0	6
		Supporting policies for wind power generation including WHyPGen endorsed by the government			0	3
	22	Number of local companies actively engaged in the wind power generation (including WHyPGen) business by EOP (cumulative)			0	14

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
Component 5: WHyPGen Promotion **Outcomes** • Enhanced awareness of the benefits of wind power generation projects • Planned and implemented wind power generation (including WHyPGen) projects						
	23	Number of completed promotional materials on wind energy, in general, and WHyPGen, in particular by Year 2	21	Number of promotional materials completed	0	15
	24	An operational and widely used central database system on wind energy by Year 2	22	Functioning website, users (counter) and central infobase with wind data with number of visitors	0	1 -9000
			23	Number and type of promotional events organized with WHyPGen project support (with IWA and others)	Events -Annual forum 3 - Worksh ops1	Events -Annual forum 0 - Worksh ops 1
			24	Guide for investors in wind energy	0	1 -9000
Output 5.1: Designed and implemented WHyPGen promotion and advocacy program		Average number of satisfied users of the WHyPGen website (for promotion and information exchange) each year starting Year 2			0	1000
		Number of local businesses and entrepreneurs that engage in the WHyPGen business by EOP			0	30
	25	Number of engineering schools that offer courses on wind energy technologies (including WHyPGen applications) in their engineering curricula by EOP			0	3
	26	Average number of coordination activities of WESMA (wind energy system manufacturers association) each year starting Year 2			0	4
		Average number of WESMA members participating in coordination activities each year starting Year 2			0	8
		Number of wind energy (including WHyPGen) projects that are lined up for implementation in Indonesia by EOP (including project which receiving finance facility from the component 3 from the WHyPGen project) (cumulative)			0	6
Component 6: WHyPGen Market Development and Industry Support **Outcomes** • Improved local wind energy (including WHyPGen) system design & engineering capacity • Ensured availability of local service provider for wind energy facilities • Availability of quality components wind energy (including WHyPGen) systems that are locally made • Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia						

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
	27	A fully established and operational wind energy clearing house by Year 2	25	Clearing house operational (number of users, such as developers, investors, service/equipment providers) that make use of the facility	0	1 (10)
			26	Completed report containing an assessment of (technical) capacity building and training needs and plan for project-supported activities per market cluster	0	1
			27	Number of engineering schools that offer wind power subjects in their engineering curricula	3	5
	28	Number of project developers, investors, technical service, and local equipment manufacturers that make use of the clearing house each year starting Year 2			0	8
			28	Number of vocational training institutes that including wind power operation and maintenance	0	3
	29	Cumulative number of local equipment manufacturers trained under the capacity development program by EOP			0	15
			29	Number of (technical) trainings and staff trained (engineers and operators; service/consultancy providers) on wind energy topics	0	100
Output 6.1: Completed capacity building and technical support program for the: (a) Local manufacturing of WHyPGen system components; (b) Design and engineering of WHyPGen projects; and, (c) Installation, operation and maintenance of WHyPGen facilities	30	Number of wind energy projects (including WHyPGen projects) that are designed and engineered by local technical service providers by EOP			0	4
	31	Number of wind power generation R&D projects completed through WESMA by EOP			0	2
		Number of trained local equipment manufacturers that are manufacturing quality wind energy system equipment & components by EOP (cumulative)			0	10
		Number of local technical service providers trained under the capacity development program by EOP (cumulative)			0	15

Output	#	Indicators[6]	#	Revised Indicators[7]	Base Line	Target
		Number of trained local technical service providers that are actively engaged in the servicing (installation & maintenance) of wind energy systems (including WHyPGen) by EOP (cumulative)			0	7
		Number of trained local technical service providers that are actively engaged in the servicing (design & engineering) of wind energy systems (including WHyPGen) by EOP (cumulative)			0	7
	32	Percentage of all trainees of the capacity development programs that are actively engaged in the Indonesia wind energy market by EOP, %			0	60
		Number of power generation engineers and operators certified to operate and maintain wind power generation (including WHyPGen) systems by EOP (cumulative)			0	18
		Number of wind power generation (including WHyPGen) projects facilitated through the WESMA by EOP			0	2
Output 6.2: Completed survey and evaluation of electricity demand areas served by wind power generation (including WHyPGen) facilities.	33	Number of areas with completed electricity demand analyses and forecasts by EOP			0	25
	34	Number of power project developers and technical service providers that make use of the electricity demand analyses and forecasts by EOP			0	8
			30	Study on grid-related issues (ability of grids to absorb intermittent production, grid stability, dispatching rules, charges, etc.)	0	1

An analysis of the attainment of project Outputs, Outcomes and Objectives is presented in Section 5.1 (Project Results and Impacts), which compares the values of the indicators at the end of the project with the values at the baseline and targets. An assessment of the strengths and weaknesses of the log-frame is included in Section 3.1 (Assessment of Project Design Logic, Strategic approach and Scope)

2.5 Main stakeholders

The MTR of the project compiled a list of the stakeholders which is reproduced in **Table 6**. The table also provides an overview of the main stakeholders:

Table 6: List of main stakeholders involved in the WHyPGen project

Stakeholder	Description
Government	
BBPT (*BadanPengkajiandanPenerapanTeknologi*,)(Agency for the Assessment and Application of Technology)	BBPT is a non-departmental government agency under the coordination of the Ministry of Research and Technology, which has the task of assessment and application of

Stakeholder	Description
B2TE (*Balai Besar TeknologyEnergi,* Energy Technology Center)	technology, acting as a technology clearinghouse and providing technology advisory services and audits to the Government. B2TE is one of the 16 subsidiaries under BPPT, working in the field of energy technologies, especially in energy conversion (renewable energy as well as fossil fuel energy) and energy conservation, assisting the Government through assessment and applied research of energy technologies. B2TE is the implementing partner and has committed itself to promote and work on the marketing development of WHyPGen applications.
MEMR (Ministry of Energy and Mineral Resources) – *ESDM (KementerianEnergidanSumberDaya Mineral)* **DGNREEC** (Directorate General for New Energy, Renewable Energy and Energy Conservation – *DJEBTKE* (DirektoratJenderalEnergiBaru, Terbarukan, danKonservasiEnergi)	MEMR is the main policy maker in the energy sector. Its DGNREEC has the function of preparing and implementing the policies in the fields of new, renewable energy and energy conservation, as well as preparing the standards, norms, guidelines, criteria, and procedures in the fields of new, renewable energy and energy conservation, providing technical guidance and evaluation. This includes formulation of policies and regulations for wind energy development (including feed-in tariffs) as well as promoting pilot projects. MEMR is one of the owners of the existing wind hybrid power plant (0.735 MW) at Nusa Penida, Bali and is planning a number of other pilots in Indonesia in the range of 0.5-1 MW
PLN (*Perusahaan Listrik Negara*, State Electricity Company)	PLN is the state-owned electricity company responsible for the production, transmission and distribution of electric energy. PLN still has an effective monopoly on electricity distribution (except in villages with less than 50 households). More info on the subject is in the main text. Its subsidiary PLN Bali is one of the owners of the existing wind hybrid power plant at Nusa Penida.
SMI (*PT. Sarana Multi Infrastruktur*)	SMI was established in 2009 and 100% owned by the Government of Indonesia. PT. SMI intends to accelerate provision for national infrastructure funding through partnership with private and/or multilateral financial institutions. It is a state financial institution with its role as a catalyst for infrastructure investment through financing (by means of equity, leans, working capital, guarantees) as well as providing financial and investment advisory and project preparation services. SMI has several energy infrastructure projects all over the country; on wind it is currently working with VironEnergy to develop a wind facility at Sukabumi (10 MW)
LAPAN (National Institute of Aeronautics and Space) – *LembagaPenerbangandanAntariksaNasional*	LAPAN's Energy Conversion Division has been involved in wind measurements, wind mapping and selection of sites, especially during 1994-2005. LAPAN is also involved in research and rural electrification pilots with small wind systems (0.2-10 kW) for water pumping and off-grid power generation.
Private sector	
UPC Renewables-PT BinatekReka Energy	UPC Renewables is a US-based global company that has installed wind and solar power with a total of over 2,000 MW. Binatek is a local developer with experience in hydropower. The two have teamed up to put up wind power projects at Indonesia

Stakeholder	Description
Viron Energy	Viron energy is a potential wind project developer that has planned to develop a 10MW wind farm at Sukabumi and is now contemplating extension upto 50 MW
Medco Capital	Medco is a private company which main business is in petroleum oil. As project developer, Medco has collaborate with the WHyPGen Project in developing 150MW wind farm at Garut, West Java
Asia Green Capital	Asia Green Capital is an investor of Indo Wind Power Holdings that is currently developing a 62.5 MW wind project at Jeneponto. Indo Wind Power Holdings plans to develop a 20MW wind farm at Oelbubuk, NTT.
Alpen Steel	Alpen Steel can provide components and equipment for wind turbines. The company is also involved in small solar, hydro and wind power projects.
NGOs	
IWES	Indonesia Wind Energy Society (IWES) is a non-profit organization consisting of businesses, researchers, and wind energy experts in Indonesia. The organization facilitates the discussion and dissemination of information on wind energy potential and development status in Indonesia.
Institutes	
Apart from LAPAN and BPPT, energy R&D is undertaken by a number of institutes, including: - Indonesian Institute of Sciences (LIPI, *LembagaIlmuPengetahuan Indonesia)* - Institute of Technology Bandung (ITB) Universities, such as; - GadjahMada University (UGM) - SepuluhNopember Institute of Technology (ITS) - Airlangga University (Unair), Indonesia university (UI) - Sebelas Maret University (UNS) - University of Sumatra Utara (USU) - Bogor Agriculture University (IPB) - Diponegoro University	

As the implementation of the project progressed the roles of private sector participant in the project underwent changes, as the demonstration projects under the project could not be established.

3. FINDINGS: PROJECT DESIGN AND FORMULATION

The main questions for terminal evaluation are; (please see Annex B)

- **Were the project's objectives and components clear, practicable and feasible within its time frame?**
- **Were the capacities of the executing institution(s) and its counterparts properly considered when the project was designed?**
- **Were lessons from other relevant projects properly incorporated in the project design?**
- **Were the partnership arrangements properly identified and roles and responsibilities negotiated prior to project approval?**
- **Were counterpart resources (funding, staff, and facilities), enabling legislation, and adequate project management arrangements in place at project entry?**
- **Were the project assumptions and risks well articulated in the PIF and project document?**
- **Whether the planned outcomes were "Smart"?**

3.1 Analysis of LFA/Results Framework

The log-frame of the project providing the objectives, the expected outcomes and results along with corresponding indicators has been presented as Table 5 in section 2.4. During the MTR it was recommended that the indicators be revised. This recommendation was accepted by the management team. The new set of indicators recommended during MTR is also provided in the log-frame table.

The project design is targeted at removal of different barriers towards uptake of WHyPGen in Indonesia. Although a footnote in the log-frame table given in the project document provides the definition of the term 'WHyPGen', there was confusion regarding what all is included in WHyPGen. For example, even during the inception of the project the issue of definition on WHyPGen got raised. The project logic is sound as far as 'on-grid wind-diesel hybrid power projects are concerned, but has limitations when it comes to comparatively larger standalone (not hybrid with diesel based power generation) grid connected wind power projects.

The PIF document was quite clear about the definition[8] of WHyPGen at that time. While graduating from PIF to the project document, the perception regarding the type and configuration of the power generation systems to be supported under the project changed. This is evident from the log-frame of the project, which used the phrase 'including WHyPGen' at number of places. Clearly, while preparing the project document the mind set was large wind farms. As such there is no harm in promoting large grid connected wind farms, but it requires a different set of promotional measures than those for comparatively smaller wind-diesel hybrid systems. For example, development of local capacity (for equipment manufacturers, for financial institutions etc.) is more important for the smaller wind-diesel hybrid systems, rather for large wind farms. Further, the target audience and the technical assistance needs for the large wind farms are much different than those for on grid wind-diesel hybrid systems. This was highlighted in the MTR as well and corresponding corrective actions were also suggested.

What seems to have happened is that while moving from 'grid connected wind-diesel hybrid systems' (as envisaged in the PIF) to large grid connected wind farms, the required corrections in the project objectives the outcomes and outputs got missed out. Thus, the project objectives (in terms of indicators) got achieved even in the absence of achievement against different components / outcomes of the project. The key lesson learnt is that while making a fundamental change in a project concept, it is important to make corresponding changes in all the elements of the overall project design. One of the recommendations is that, in the situations where there is a shift in the focus of the project, corresponding corrections in the project outputs and the objectives should be made.

[8]The PIF states as follows:

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 operation of wind turbine 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. Diesel power generation is the baseline for this project. The proposed alternative to this is the proposed wind hybrid systems.

The PIF of the project conceived the project considering that wind component of the WHyPGen would be able to part replace the diesel based power generation capacity. This assumes that wind energy will be available through out the year. The idea of part replacement of diesel based power generation capacity with wind (in a hybrid mode) is not a realistic situation. The reason for this seems to be the lack of inputs from the wind energy experts at the time of project design. It is recommended that at the time of project design, inputs from the technical experts for the technology being promoted must be taken.

The fact that implementation of diesel-hybrid system would require additional capital expenditure (and not just incremental) got missed out. For example, for getting an output of 5 MW out of a diesel-wind hybrid system, one would need the capital equipment for 5 MW of wind turbine and a matching capital equipment for 5 MW of diesel (to take care of the seasons / time of the day) when enough wind is not blowing. In case of wind diesel hybrid systems, the only return on the additional capital investment is the savings in the diesel as and when wind energy is available. It is partly because of this reason that during its implementation, the project found it difficult to attract the required investment for the demonstration / pilot projects. This is particularly considering that no financial support / incentive was being provided to the initial set of demonstration / pilot projects.

As was pointed out in the MTR as well, when it comes to the project goals, the targets were a bit ambitious. This is considering that the timeframe assumed for implementation of the pilot / demonstration projects was very optimistic. As the time required for collected wind data and doing a realistic wind resource assessment itself takes more than one year. However, in the present case wind data for doing the wind resource assessments for different locations was already available. The assumption that it would be possible to create capacities / capabilities to produce wind turbines locally within the implementation period of the project was slightly unrealistic. The important point which got missed out while making this assumption is that the software part of the technology (design and detailed engineering) of the wind turbines and wind power technology is important and having good engineering facilities within the country alone is not sufficient to enable production of components and parts of wind turbines. The lesson learnt is that while making efforts towards producing high tech capital equipment in a country, it is necessary to lay equal emphasis on the software (designs, technical know-how and detailed engineering) as well as hardware part (precocious manufacturing technology).

Generally speaking, the initial set of demonstration / pilot projects to remove the barriers need to be provided financial support. In the present case the design of the project did not had any provision for providing financial support to the initial set of demonstration / pilot projects and it totally relied on 100% private sector investment even for the pilot / demonstration projects. Based on the recommendations at MTR, this situation was addressed to some extent by providing financial support for rehabilitation of one of the old non-functioning wind turbines at Nusa Panida (Bali). It is recommended that while designing the projects having a demonstration component, some fiscal incentives should be provided to such demonstration projects.

The project design has rightly recognized technology gaps and skills as one of the many barriers. To address this barrier, the provisions made in the project design were not adequate. The project design (Outputs 6.1 and 6.2 along with the corresponding activities mentioned in the project document) had tried to address this by capacity building and technical support programs for the: (a) Local manufacturing of wind power generation system components; (b) Design & engineering of wind power generation projects; and, (c) Installation, operation and maintenance of wind power generation facilities. The corresponding activities included identification of the potential local producers of the components, their needs assessment and capacity building. The critical part which got missed is the identification of the right and most appropriate technology, its source and the ways to infuse it in the country. It needs to be appreciated that the success of the wind power generation facility is dependent on the deployment of the most appropriate design of the turbine (and the control system), given the wind profile of the location and other consideration. This important technology consideration of the design of rotor blades and the connected generator did not got addressed in the project design. The lesson learnt is that for addressing the barriers of technology (particularly in cases where the technology is not locally available), apart from capacity building and training equal emphasis should be given to technology sourcing.

One of the other issues with the log-frame is that it uses too many indicators and some of these indicators are directly inter-related. For example, there is a direct relation between wind power electricity generation and the GHG emission reduction. The indicators are not targeted to the outcome of an activity but to the quantity of activity. For example, in case of training, the indicator is the number of participants or number of workshops organized and not the number of persons trained.

3.2 Assumptions and Risks

During the project development stage, possible risks towards smooth implementation of the project were identified and the risk mitigation measures were proposed. Different risks that were identified during the project formulation and the recommended mitigation measures and comments on the need for mitigation measures are provided in Table 7.

Table 7: Risk Analysis of WHyPGen Project (as per Project Document)

#	Description	Type	Concerns	Risk Level	Risk Mitigation Measures
1	Lack of ongoing, long-term central government support for wind-based power generation	Political	The risk would prevent the project from delivering on its objectives for Outcome 4 (Policy & Institutional Support)	Medium	• Formulation of revised policy and implementing guidelines for issuance and enforcement. • Lobbying for government approval of favorable policy recommendations, preparation and approval of policy IRRs, and the policy enforcement • Dissemination of draft policies and IRRs to all stakeholders
2	Locations of wind-rich resources are remote and far from existing grids, therefore discouraging project proponents	Financing	The risk would prevent the project from delivering on its objectives for Outcome 6 (Market Development)	Medium	• Detailed technical and economic evaluation of grid extension to the wind-rich areas will be carried out; linkage with financing institution will be facilitated by the proposed project.
3	Non-repayment or delayed repayment of loans for WHyPGen projects	Financing	The risk would prevent the project from delivering on its objectives for Outcome 6 (Market Development)	Medium	• Financing schemes and 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
4	Lack of comprehensive wind maps data	Technical	The risk may hinder the selection of right area for the project implementation	Medium	• The proposed project will work closely with the key partners to conduct wind energy resources that will at least provide capacity building to develop, prepare and interpret wind maps.
5	Price for wind-based generated electricity is not competitive due to government's subsidy policy for fossil fuel	Policy	The risk may lower interest in wind-power generation investment	Medium	• Measures to reflect true cost of fuel and electricity prices will be determined through conduct of energy cost and market studies

The risk regarding delayed payment of loans for the WHyPGen demonstration project (risk numbered 3 in the table above) is not really a risk to the WHyPGen project, as the possibility of this happening (if at all) during the implementation timelines of the project is negligible. This can at best be a risk to sustainability of the

results and outcomes of the project. Risk numbered 4 in the table above is not a risk for the WHyPGen project, rather it is one of the reasons for doing the project.

Apart from the risks mentioned in the above table there were some more risks which were identified in the PIF. These risks were:

- Financial institutions constrained by corporate policy in providing finance to RE projects in general and wind power projects in particular
- Host companies back out from their commitment to make their WHyPGen part and parcel of the UNDP-GEF WHyPGen project
- Rural communities prefer other RE resources than wind

During the project design stage these risks were dropped as they were considered as low level risks. These risks which were dropped during the project design state are the most relevant risks to the project. In fact, they have been some of the reasons which limited the achievement of the results of the project.

Some of the key assumptions made during the project design are as follows:

- Economic growth rate of Indonesia continues to improve.
- GOI overall policy on supporting Renewable Energy development and utilization is at least, maintained.
- Increased demand of updated wind maps for wind power generation project development purpose.
- IPPs share wind assessment reports.
- Access to existing wind energy system facilities and data is provided by owners.
- Monitoring reports prepared by host demo companies.
- Other relevant entities share reports of wind energy projects.
- WHyPGen demos are replicated by interested power project developers and investors.
- Economic growth sustains continued growth of wind energy business in Indonesia.
- Economic growth sustains continued growth of WHyPGen business.
- Central database and project website will remain operational even after the WHyPGen Project.
- Limited or none – constraints in the conduct of electricity demand surveys at different locations within Indonesia.

The assumptions made during the project design are reasonable enough.

3.3 Lessons from other relevant projects

Over a period of time a number of renewable energy development projects has been undertaken under GEF across different locations. This includes a number of the wind power projects. These projects were targeted at removal of barriers to the renewable energy projects. Sharing of lessons learned and awareness of relevant wind renewable energy projects in general and the wind power projects in particular would have been helpful.

The GEF has supported a number of wind power projects in the past. For example[9], a UNDP publication (2008) draws upon the experience of 14 wind energy projects, of which the majority (11) were grid-connected medium to large wind farms (5 MW and above) located in Africa (South Africa), Asia and the Pacific (Pakistan, Iran), Arab States (Tunisia), Latin America (Uruguay and Mexico) and Europe and CIS (Kazakhstan, Azerbaijan, Ukraine). There are many other projects on renewable energy that could have been looked into for the lessons learnt from the projects supported in the past.

There is no evidence to suggest that the lessons from the past projects were taken into account while preparing the project document for the WHyPGen project.

[9]Quoted from the MTR

The lesson learnt is that UNDP, at the time of project design, could facilitate the knowledge management (including lessons learned from other projects). This could be done by including the requirement of taking into account the lessons learnt from other projects, in the TOR for the consultant(s) preparing the project document.

3.4 Planned stakeholder participation

In section 2.5 a list of main stakeholders to the project was provided. The project was designed in a manner which required close coordination and consultation of the relevant stakeholders in each of the project component. The activities included those aimed at enhancing the local technical capacity to improve understanding and implementation of all aspects of WHyPGen designs, financing, installations and operations; building effective awareness programs targeted to optimize technology diffusion; enhancing the confidence of financing institutions to reduce risks of loans to finance WHyPGen projects; and enforcing developed policies and regulations to reduce the regulatory efforts of WHyPGen project implementations.

3.5 Replication approach

Replication was an integral component of the project design. During the project preparation phase, wind power projects which were to be implemented during the WHyPGen project (as demonstrations) for showcasing the "business angle" of wind power generation (including WHyPGen) technology applications were identified. The project design envisaged that replication of the demonstrations units will take place once such replication is supported by the enabling activities.

The project document has also projected further replication beyond the implementation of the project, leading to more wind power generation capacity addition. This was projected to be achieved due to establishment of the enabling environment that would feature favourable policies and RE electricity tariffs, financing schemes for wind energy projects, investments in new wind energy power generation (including WHyPGen) facilities, and the availability of locally manufactured wind energy system components.

3.6 UNDP comparative advantage

UNDP is one of the agencies of GEF which are responsible for creating project proposals and for managing GEF projects. UNDP's partnership with GEF reinforces its efforts to mainstream or incorporate global environment concerns into its internal policies, programs and projects.

UNDP's comparative advantage for the GEF lies in its global network of country offices, its experience in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation. UNDP assists countries in promoting, designing and implementing activities consistent with both the GEF mandate and national sustainable development plans. UNDP also has extensive inter-country programming experience.

UNDP's assistance in Indonesia is implemented by national entities, including line ministries and the Ministry of National Planning and Development, and at the subnational level by line departments, provincial and district authorities as well as community groups. While each programme supported by UNDP has specific and varied objectives, capacity development is one aim that all UNDP programmes – in Indonesia and worldwide – have in common. UNDP is supporting Indonesia in maintaining and managing the country's rich environment, including Indonesia's vast marine and terrestrial biodiversity and energy resources. UNDP is working for a sustainable environment and development policy, which integrates climate change concerns and at the same time provides poverty reduction and human development. UNDP carried with it a rich experience of implementing GEF projects for promotion of wind energy in many countries.

3.7 Linkages between project and other interventions within the sector

More extensive contact could have been made with other relevant ongoing initiatives in the renewable energy, energy access, climate change mitigation in Indonesia to learn from them and to enhance prospects of sustainability of the project outcomes. In some of the cases, a collaborative approach could have been used.

There are a number of development projects for renewable energy being implemented by different agencies which would have provided opportunities to collaborate. One such project is being implemented by USAID.

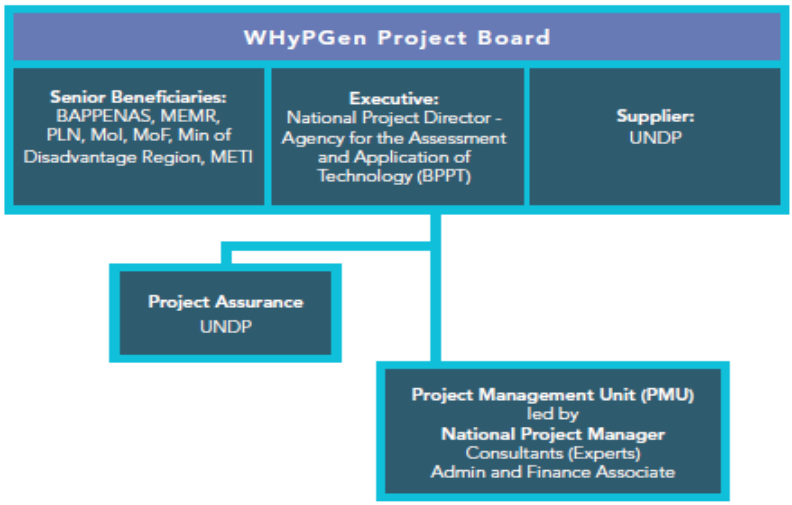
The USAID supported project 'Indonesia Clean Energy Development (ICED)' started in 2011. The ICED project established a network of public and private sector partners involved in clean energy development and greenhouse gas (GHG) emissions reduction in the energy sector. Partners included national, provincial and district-level government agencies; banks and financial institutions; project developers; the national electric utility (PLN); industry trade associations; and research institutions. The project is presently in its second phase. It is claimed that as a part of the project, guidelines were published by PLN and are now required for all new grid-connected projects. Also the project worked with PLN's Planning and Renewable Energy Division on the integration of large-scale wind farms into PLN's high-voltage transmission network. The project has also submitted an impact analysis of three proposed wind power projects (195 MW) planned for commissioning in South Sulawesi in the 2015–2019 time-frame.

3.8 Management arrangements

BPPT was designated as the Implementing Partner for the project. It was to execute the project on behalf of the Government of Indonesia under the National Implementation Modality (NIM) of the UNDP. UNDP, which provided support to the project on behalf of the GEF took the role of the Senior Supplier.

A Project Board was established by the Implementing Partner, with core members comprised of representatives of BPPT, other stakeholders and UNDP. The main function of the Board was to strategically guide the course of the project towards achieving its objective.

To execute the project, BPPT appointed a national project director (NPD) who was responsible for effective coordination among the stakeholders and achievement of project objectives. At the management level, a Project Management Unit (PMU) was created. This entity was responsible for the overall operational and financial management' and reporting in accordance with the rules and regulations of the Government of Indonesia and UNDP. The PMU managed day-to-day operations of the project. The PMU was responsible for the overall day to day operational and financial activities, developing the AWPs, progress reports, M&E framework, in close coordination with the Responsible Parties and key- stakeholders. The PMU comprised of the following key posts: National Project Manager (NPM). NMP was supported by an operational team of professional staff including experts in wind power generation technology, renewable energy financing, finance associates, and other staff functions including communication, IT, administration, drivers and secretarial posts. The figure[10] below provides an overview of the project's management arrangement.



[10]Taken from MTR

4. FINDINGS: PROJECT IMPLEMENTATION

4.1 Adaptive management and Feedback from M&E used for adaptive management

The main questions for terminal evaluation are; (please see B)

- **Did the project undergo significant changes as a result of recommendations from the mid-term review? Or as a result of other review procedures? Explain the process and implications.**
- **If the changes were extensive, did they materially change the expected project outcomes?**
- **Were the project changes articulated in writing and then considered and approved by the project steering committee?**
- **Whether feedback from M&E activities was used for adaptive management?**
- **Whether changes were made to project implementation as a result of the MTR recommendations?**

Feedback from M&E activities was used successfully for adaptive management. The best example of this is that as a direct result of the recommendations made by the project MTR, financial support was provided for rectification of the defunct state-owned wind turbines at Nusa Penida. This was beneficial and a good example of adaptive project management based on M&E feedback. However, not all recommendations made by the MTR were followed.

Considering that there was lack of interest amongst the stakeholders in the hybrid wind power systems, the project team, as an adaptive management focused on wind farms. For establishment of demonstration units the project team had to change the location and the implementation partner a number of times due to lack of commitment from the the potential private sector partners which initially committed to the project. This was taken care of by directing the resources towards rehabilitation of the Nusa Penida wind power project. TheWHyPGen project has responded towards the need to adaptive management by collaborating with PT. Sarana Multi Infrastructure (PT.SMI) in assisting developer to access financing.

As a result of MTR some recommendations were made. These recommendations were agreed upon by the project management in the 'management response' to MTR. As a result of the MTR recommendations, following specific adaptive management actions were undertaken.

- Financial support for rehabilitation of wind turbine at Nusa Penida, instead of establishment of pilot / demonstration projects
- Under the project, PT. SMI (a government-owned financial institution) was to manage USD 300,000 of micro-capital grant as seed money for leveraging funding by SMI for wind power. Based on the recommendations at MTR this fund was used by SMI to provide financial and project preparation services.

As has been stipulated before not, all the recommendations of MTR could be taken care. Some of the important recommendations of the MTR which could not be acted upon are;

- Adjusted list of indicators with baseline and end-of-project targets: To better monitor progress it was recommended to revise the indicators.
- Preparation of end-of-project status report on wind power development.
- Study on green funding and financing sources available for wind power in Indonesia. This was suggested as a new activity.
- Assessment of (technical) capacity building and training needs and plan for project-supported capacity strengthening and training activities.
- Study on grid-related issues to deal with wind power transmission and grid connection issues.

4.2 Partnership arrangements

The main questions for terminal evaluation are; (please see Annex B)

- **Were there adequate provisions in the project design for consultation with stakeholder?**
- **Whether effective partnerships arrangements were established for implementation of the project with relevant stakeholders involved in the country/region, including the formation of a Project Board?**

BPPT was the designated 'implementing partner' for the project. Another partner to the project, UNDP, which was to provide support to the project on behalf of GEF took the role of the Senior Supplier. The Project Board having representation from a number of government ministries and departments was established.

At the design stage of the project itself it was recognised that the partnership with the private sector and the assistance of different government and non-governmental agencies would be required to meet the objectives of the project. **Table 6** provides the list of important stakeholders to the project. Most of the stakeholders were designed to be the partners in the project. BPPT, through its B2TE (Energy Technology Centre) was taken on board to promote and work on initiating the marketing development of WHyPGen application in Indonesia.

Under the project B2TE was to work with LAGG (Aero-Gas Dynamic and Vibration Laboratory) to assess WHyPGen technology, especially establishment of the testing standards and testing facilities for WHyPGen components. B2TE was to work closely with LAPAN (National Institute of Aeronautics and Space) as a working partner for WHyPGen assessment to develop potential map of WHyPGen application.

Provisions were made in the project design to partner with banks and financial intermediaries to facilitate financing for the demonstration units. Particularly SMI was to provide alternative source of fund to finance the wind power projects by working with all stakeholders to obtain an appropriate financing solution. It was intended to promote Public Private Partnerships in financing various infrastructure projects in Indonesia.

Throughout the project lifetime, different technological solutions were to be facilitated through the project by the partnerships with foreign wind energy technology developers and/or suppliers. The project design provided for partnership with engineering schools for developing and implementing 'specialized wind energy technology design and application courses'.The project design provided for partnership with local equipment manufacturers to facilitate production of components and parts of wind energy generation systems locally.

4.3 Project Finance

The main questions for terminal evaluation are; (please see Annex B)

- **Whether there was sufficient clarity in the reported co-financing to substantiate in-kind and cash co-financing from all listed sources?**
- **What are the reasons for differences in the level of expected and actual co-financing?**
- **To what extent project components supported by external funders were well integrated into the overall project?**
- **What is the effect on project outcomes and/or sustainability from the extent of materialization of co-financing?**
- **Whether there is evidence of additional, leveraged resources that have been committed as a result of the project?**

The planned expenditure for the project and its distribution amongst different components of the project is given in Table 8.

Table 8: Project Cost (figures in Million USD)

Project Component	Co- Financing	GEF	Total
WHyPGen Technology Application Assessments	0.746	0.283	1.029
WHyPGen Technology Demonstration	34.069	0.576	34.645
Financing WHyPGen Initiatives	0.302	0.301	0.604
Policy & Institutional Support for WHyPGen Initiatives	0.517	0.109	0.626
WHyPGen Promotion	0.437	0.337	0.774
WHyPGen Market Development and Industry Support	0.734	0.379	1.113
Project Management	0.679	0.170	0.849
Total	**37.485**	**2.156**	**39.640**

Out of total project cost of USD 39.640 million, the costs for all incremental activities funded by GEF was

USD 2.156 million. The Government of Indonesia (BPPT) and the private sector (Alpen Steel and Viron Energy) were to provide a combined total amount of USD 37.485 million co-financing for implementing the project's baseline activities in the form of in-kind and in-cash contributions. Out of total co-financing of USD 37.485 million, USD 36 million was to be provided by private sector participants for establishing the demonstration projects (USD 30 million towards wind power generation system hardware and USD 6 million for development of demonstration projects).UNDP was to contribute USD 0.150 million in kind and the government of Indonesia was to contribute USD 1.335 million in kind. **Table 9** provides details of the planned and actual expenditure for the project under different heads.

Table 9: Planned and actual project expenditure

Co-financing (type/source)	UNDP own financing (mill. US$)[11]		Government (mill. US$)[12]		Partner Agencies (mill. US$)[13]		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants (GEF)	2.156	2.156					2.156	2.156
Loans/ Concessions								
In-kind support	0.150	0.150	1.335	1.335			1.485	1.485
Pvt. Sector (Demo Projects)					36.000	0.33	36.000	0.33
Totals							39.641	3.971

As can be seen co-financing for the demonstration projects is negligible, this is considering that no demonstration project as envisaged in the project design could be realised. The lesson learnt is that in the absence of investment support / fiscal incentives, it is generally not possible to get the required investment for the demonstration projects from private sector, particularly for the areas where the viability of the demonstration projects is not already proven.

The in-kind and in cash contribution by the the government, UNDP, and the private sector could not the confirmed/ validated during the terminal evaluation due to absence of any document to do so.

4.4 Monitoring and evaluation: design at entry

The main questions for terminal evaluation are; (please see Annex B)

- **Is the M&E plan well conceived at the design stage?**
- **Is M&E plan articulated sufficient to monitor results and track progress toward achieving objectives?**
- **Was the M&E plan sufficiently budgeted and funded during project preparation and implementation?**
- **How effective are the monitoring indicators from the project document for measuring progress and performance?**

A monitoring and evaluation plan was put in place at the time of the design of the project. There was a provision to review the plan at the time of project inception. As per the plan, the project was to be monitored through the periodic quarterly and annual monitoring. There were provisions for preparation of PPR / PIR. The APR/PIR combines both UNDP and GEF reporting requirements. Apart from this, provisions were made for periodic site visits by UNDP CO and the UNDP RCU. Provisions were also made in the project design for an independent Mid Term Review and the Terminal Evaluation. GEF Focal Area Tracking Tools were also to be prepared before the MTR and at the TE. As per the plan stipulated in the project document, the project team was to prepare a Project Terminal Report, to summarize the results achieved (objectives, outcomes, outputs), lessons learnt, problems met and areas where results may not have been achieved. The set of indicators to be monitored and the corresponding targets were provided in the log-frame of the project. The results of the monitoring and evaluations were to be provided to the project board.

[11] UNDP has provided in kind support. Figures regarding actual funding provided could not be made available. The figure has been considered based on the fact that support was provided by UNDP as was committed in the project design. In the absence of figures it has been assumed that the available GEF funding has been completely utilized.

[12] BPPT and other government agencies were to provide in-kind support. At the time of TR, the figures regarding actual funding provided could not be made available. The figure has been considered based on the fact that support was provided by BPPT and other agencies as was committed in the project design

[13] As the time of TE, the figures of co-funding under this head could not be provided. The co-funding by the private sector was largely the investment leveraged by the WHyPGen project in the demonstration / pilot projects. Expenses of USD 0.33 million were reported in the MTR largely towards project development efforts. As the private sector later backed out, it is considered that no expenses were incurred by them after the mid-term of the project.

As is evident, the M&E plan at the design stage was well conceived. The plan was well articulated and was sufficient to monitor results and track the progress toward achieving the objectives, except for some issues with the indicators used (please see section 3.1). Adequate provisions were made in the budget for monitoring and evaluation activities. **The M&E design at entry has been rated as Satisfactory**.

4.5 Monitoring and evaluation: implementation

The main questions for terminal evaluation are; (please see Annex B)

- **Whether the logical framework was used during implementation as a management and M&E tool?**
- **What has been the level of compliance with the progress and financial reporting requirements/ schedule, including quality and timeliness of reports?**
- **What has been the effectiveness of the monitoring reports and evidence that these were discussed with stakeholders and project staff?**
- **What is the extent to which follow-up actions, and/ or adaptive management, were taken in response to monitoring reports (APR/PIRs)?**
- **Whether APR/PIR self-evaluation ratings were consistent with the MTR. If not, were these discrepancies identified by the project steering committee and addressed?**

The quarterly monitoring reports were produced regularly. Annual PIRs were produced using the set of indicators provided in the log-frame. However, PIRs for the year 2013 were not prepared. Further, some of the indicators in the quarterly reports and the PIRs were not covered. The quarterly reports and the PIR did not include impact-oriented information but rather described things such as how many training sessions had been undertaken. Probably it was recognised later in the project that there is a need to focus more on impact while still monitoring inputs and activities as per the indictors.

The PB did not meet as often as was needed to provide the project with the necessary oversight and direction. The Board could manage to meet only three times during the entire duration of four years (mid 2012 to mid 2016) of project implementation. This includes the board meeting at the time of inception of the project. This limited the effectiveness of the PB in providing overall supervision and direction to the project. During the meetings the project board did take note of the situation and suggestions were also made, but no concrete decision on critical issues came from the board. On part of the project management no follow up action was carried out (post the board meeting) on key issues. Similarly, there is no evidence to suggest any follow up action taken or adaptive management in response to the PIR.

Although the project management accepted the recommendations of the MTR, not all the recommendations were implemented (pl. see section 4.1). The PIR self-evaluation ratings for the year 2014 was Moderately Satisfactory, which is consistent with the MTR rating for the progress towards results. The MTR and the TE were conducted within the specified time period according to GEF guidance on MTR and TE.

M&E Plan Implementation has been rated as Marginally Satisfactory. Overall quality of M&E is rated as Satisfactory

4.6 UNDP and Implementing Partner implementation / execution coordination, and operational issues

The main questions for terminal evaluation are; (please see Annex B)

- **Whether there was an appropriate focus on results?**
- **Was there adequate UNDP support to the Implementing Partner and project team?**
- **Quality and timeliness of technical support to the Executing Agency and project team**
- **Were the management inputs and processes, including budgeting and procurement adequate?**

BPPT was the designated Implementing Partner for the project. It executed the project on behalf of the Government under the National Implementation Modality (NIM) of UNDP. UNDP provided the support to the project on behalf of GEF and took the role of the Senior Supplier. A Project Board was established by the Implementing Partner, with core members comprising of representatives of BPPT, UNDP and other

stakeholders. The main function of the Board was to strategically guide the course of the project towards achieving its objective.

UNDP provided helpful and important support to the Project. However, UNDP could have usefully applied itself in its capacity as a knowledge management broker to an even greater extent. For example, UNDP could have, done more sharing of lessons learned from other wind power projects and renewable energy barrier removal projects at the stage of project design. **Quality of UNDP Implementation is rated as Satisfactory**.

The NIM implementation modality for this project was good and BPPT was the appropriate institution within the government institutions to act as the coordinating entity. BPPT collaborated effectively with its partners in the project. Project management and administration has been satisfactory.**The quality of Execution by Executing Agency has been rated as Satisfactory.**

5. FINDINGS: PROJECT RESULTS

5.1 Overall results

The main questions for terminal evaluation are; (please see Annex B)

- **What has been the achievements of the objectives against the end of the project values of the log-frame indicators, with indicators for outcomes/outputs, indicating baseline situation and target levels, as well as position at the close of the project?**
- **What is the achievements /Results in terms of contribution to sustainable development benefits, as well as global environmental benefits (direct and indirect GHG emission reduction)?**
- **How does the GEF Tracking Tool at the Baseline and the one completed right before the Midterm Review compare with that, prepared at the time of Terminal Evaluation?**
- **What are the possible issues with employing WHyPGen systems?**

A summary of the attainment of the overall project objectives is presented in this section of the report. Achievement of different components of the projects (and different Outcomes of the components) in terms of indicators has been presented first, which is followed by the presentation regarding the achievement of the project goals and the project objectives. This is because the achievements of the project goals and the objectives has been assessed both, in terms of the indicators (for project goals and objectives as given in the log-frame) and in terms of the achievement for different components.

As per the requirements the attainment of the results evaluation has been carried out for the six individual components / outcomes of the of the project as well. The attainment of results has been carried out in terms of the indicators of the log-frame. Wherever relevant, the reasons for non-attainment of the target values of the indicators have also been provided.

The mandatory ratings for the attainment of overall results has also been provided. Although, rating is not mandatory for achievement against each component and the indicator, the rating has been provided. This has been done to facilitate the ratings for the individual components of the project and the project at an aggregate level. The evaluation of the attainment of overall results has been carried out keeping in mind the main questions for terminal evaluation, as given in the Box at the beginning of this section.

5.1.1 Attainment of objectives– Component 1

As per the project design (Project Document) the expected outcomes of component 1 of the project were as given in Box 1.

Box 1: Outcomes for Component 1

Component 1: WHyPGen Technology Application Assessments

Outcomes

- Enhanced knowledge of potential wind power generation (including WHyPGen) applications
- Improved knowledge of wind power generation system benefits and costs
- Enhanced interest in investing in wind power generation (including WHyPGen) projects

Table 10 provides the details of the the level of attainment of the indicators for different targeted outputs of component 1. The values of the indicators at termination of the project are more or less as per PIR for the year 2016 (accept for some cases where it has been marked as comments in the table), which was provided to the evaluator. For reference, the baseline values of the indicators and those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also provided in the table.

Table 10: Attainment of objectives – Component 1: Indicators and status

Ind. #[14]	Indicators / *Revised Indicators*[15]	Base Line	Target	MTR	PIR	TE	Rating[16]	Comments
	Output 1.1: Updated wind maps of areas Area with significant wind energy potentials						**HS**	
4	Number of provinces covered by the new & updated wind maps by EOP	0	9	13	17	17	HS	
5	Number of assessed locations with wind power generation potentials by EOP	0	25	19	27	27	S	
6	Number of identified locations with wind resources that are feasible for wind-based power generation by EOP	0	20	16	24	24	HS	
	Output 1.2: Techno-economic feasibility studies(FS) of potential WHyPGen application projects						**S**	
7	Number of evaluated existing wind energy systems by EOP	0	11	8	11	11	S	
8	Number of completed wind power generation (including WHyPGen) project feasibility studies by EOP	0	10	10	10	10	S	
	Number of seminar-workshops on wind energy (including WHyPGen) applications and promotion of potential wind power projects by EOP	0	6					Not reported in PIR. It was pointed out in MTR as well
	Output 1.3: Completed feasibility assessments of the local manufacturing /production of WHyPGen system components						S	
9	Number of local equipment manufacturers that can potentially produce wind energy (including WHyPGen) system components by EOP	0	15	15	16		Not Rated	
10	Number of local equipment manufactures that are ready to produce wind energy (including WHyPGen) system components by EOP[17]	0	7	10	11		Not Rated	

This component of the project has achieved much more than what was designed to be achieved. This is considering that as an adaptive management more efforts and resources were used for this component of the project as the progress against other components of the project was facing different kind of hurdles.

There is a critical problem with the indicators for Output 1.3 (indicators 9 and 10), in the sense that it pre-determines the results of the feasibility assessment carried out as an activity under Output 1.3. As feasibility assessment is not a capacity building exercise it does not impact / alter the capability of the local equipment manufactures to produce 'wind energy system components'. Due to this reason, no level of achievement has been marked in the TE against these two indicators (see footnote 14 as well). Considering that a detailed assessment of the competency of local equipment manufactures was undertaken, the achievement against Output 1.3 has been rated as Satisfactory.

There is a mismatch between the Outcomes for Component 1 (please see Box 1) and the indicators. However, considering that the achievements against different outputs for **Component 1**(in terms of indicators) has been satisfactory, the aggregate achievement for Component 1 is rated as **Satisfactory.**

[14]In the log-frame of the project as given in the project document the indicators were not numbered. The numbering of the indicators was suggested and carried out during MTR for easy reference

[15]A revised set of Indicators were suggested during MTR for some of the Outputs, although the recommendation was accepted by the project management, the revised indicators were not monitored and recorded in subsequent PIR. The revised indicators have been included in the table. For ease of reading and clarity the revised indicators has been given a ***different color and style***.

[16]Highly Satisfactory (HS): no shortcomings; Satisfactory (S): minor shortcomings; Moderately Satisfactory (MS) 3. Moderately Unsatisfactory (MU): significant shortcomings; Unsatisfactory (U): major problems; Highly Unsatisfactory (HU): severe problems

[17]PMU defines 'Ready to produce' as willingness to produce and presence of some basic infrastructure. It does not mean availability of technical know how, designs and competent human resources and capacity to produce

5.1.2 Attainment of objectives – Component 2

Component 2 of the project is focused on establishment of demonstration projects. As per the project design (Project Document) the expected outcomes of component 2 of the project were as given in Box 2.

Box 2: Outcomes for Component 2

Component 2: WHyPGen Technology Demonstration
Outcomes
- 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.

Table 11 provides the details of the level of attainment of the indicators for different targeted outputs of component 2. The values of the indicators at termination of the project are more or less as per PIR for the year 2016. For reference, the baseline values of the indicators and those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also included in the table.

Table 11: Attainment of objectives – Component 2: Indicators and status

Ind. #	Indicators / *Revised Indicators*[18]	Base Line	Target	MTR	PIR	TE	Rating[19]	Comments
	Output 2.1: Successfully implemented WHyPGen pilots/demos						MS	
11	Number of planned WHyPGen replication projects by EOP	0	10	7	19	19	S	
12	Number of WHyPGen pilots/demos that are successfully implemented by EOP	0	6	1	2	1	MS	Nusa Penida
11	*Number of projects under operation/construction/rehabilitation*	*1*	*5*	*1*		1	U	This corresponds to indicator 12 above
12	*Number of projects under negotiation (PPA, finance)*	*0*	*3*	*1*		3	S	
	Output 2.2:Increased share of wind energy in national power generation							
13	% contribution of WHyPGen in the electricity supply in Indonesia by EOP	0	0.0062					Not reported in PIR This indicator was recommended to be deleted during MTR

The overall idea of this component of the project was to establish demonstration projects, which was expected to lead to establishment of replication projects. The achievements against the targeted outputs for the component has not been that good.

For indicator 11, the reported achievement is the number of new green field wind power projects planned. The issue in this case is how replication can take place without the demonstration / pilot. The other issue is the extent of contribution by WHyPGen project towards these planned projects. However, considering that in the end, it is the result on record which matters, the achievement against this indicator has been rated as Satisfactory.

For indicator 12, it is important to note that the set of private sector participants in the project who had committed to establish the demonstration / pilot projects at the time of project preparation did not go ahead

[18] Please see footnote 14
[19] Please see footnote 15

with it. The reasons as sighted by the PMU is the absence of feed in tariff for wind power projects. While it is true that in the absence of a committed feed-in tariff, no private sector party would implement a wind power project, there are other reasons as well which lead to this situation. These include the commercial viability of small wind power plants. Under the project, a feasibility study of small (750 kW) wind power project at Leipori was undertaken. The main finding of the feasibility study was that capital grants up to the extent of 45 percent would be needed to make the project commercially viable and attractive enough for investment by a private sector party. Apart from the absence of feed-in tariff, one of the other factor which is responsible for non-establishment of the demonstration projects is the absence of fiscal instruments (grants, feed-in tariff support, interest draw down etc.) to provide incentives for the demonstration projects. The lesson learnt is that in the absence of fiscal instruments it is unlikely to get private sector investment for the demonstration projects. It is recommended that in future projects, wherever, there is a provision for demonstration units, such demonstration units should be supported by appropriate fiscal incentives and instruments.

Further, considering that the overall time required for establishment of a wind power projects may take up to 3 years, it was unreasonable to expect that the the demonstration projects would get commissioned within the duration of three years of WHyPGen project.

As has been stipulated before, the WHyPGen project could not manage to establish any demonstration / pilot project. As an adaptive management one of the government owned defunct wind turbines at Nusa Peneda (at Bali) was repaired and rehabilitated. Although this truly does not qualify as a demonstration / pilot project, the project could at least create a functional wind turbine in Indonesia. In view of this achievement against Indicator 12 has been considered as Moderately Satisfactory.

At an aggregate level the attainment for **Component 2 is rated as Moderately Satisfactory**. This is largely considering that 19 large size wind power projects are now planned.

5.1.3 Attainment of objectives – Component 3

Component 3 of the project was aimed at removal of financial barriers by doing the enabling activities to facilitate availability of finance for implementation of wind power projects. The idea was that availability of finance would ensure replication and sustainability of WHyPGen technology applications in Indonesia, and ultimately lead to reduction of the WHyPGen technology cost. This component of the project involved training and promotion for banking/financing institutions in financing WHyPGen projects; and design of financing schemes suited for WHyPGen projects. As per the project design, the expected outcomes of this component of the project were as given in Box 3.

Box 3: Outcomes for Component 3

Component 3:Financing of WHyPGen Initiatives
Outcomes
- Increased investments on wind power generation (including) WHyPGen projects
- Local banks and financing institutions providing loans for wind power generation projects

Table 12 provides the details of the the level of attainment of the indicators for different targeted outputs of component 3. The values of the indicators at termination of the project are more or less as per PIR for the year 2016. For reference, the baseline values of the indicators, those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also included in the table.

Table 12: Attainment of objectives – Component 3: Indicators and status

Ind. #	Indicators/ *Revised Indicators*[20]	Base Line	Target	MTR	PIR	TE	Rating[21]	Comments
	Output 3.1 Increased investment on wind power generation (including WHyPGen) projects						U	
	Number of completed capacity building programs for banks/FI by EOP	0	3	Not Reported	Not Reported	0	U	Dropped in PIR. No reason provided
14	Number of completed capacity building programs for project developers and service providers and equipment manufacturers by EOP	0	6	2	4	4	U	
	Number of banks/financing institutions trained on WHyPGen project financial feasibility evaluation by Year 3	0	3	Not Reported	Not Reported	0	HU	Dropped in PIR. No reason provided
15	Number of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable project proposals by Year 3	0	28	10	10	10	U	
14	*No. of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable project proposals by Year 3*	*0*	*25*	*10*	*Not Reported*	10	U	It is same as indictor 15 above
16	Number of local banks/FIs that provide affordable financing schemes for WHyPGen projects by EOP	0	3	1	1	1	MU	This is referring to SMI
	Number of Local Governments that fund WHyPGen projects by EOP	0	2	Not Reported	Not Reported	0	HU	Dropped in PIR. No reason provided
	Number of venture capital funded WHyPGen projects planned and implemented by EOP	0	1	Not Reported	Not Reported	0	HU	Dropped in PIR. No reason provided
	Output 3.2: Designed financing schemes for WHyPGen projects						U	
17	Number of financing schemes designed and approved for wind energy projects as well as for WHyPGen component manufacturing by EOP	0	3	Not Reported	Not Reported	0	MU	
	Number of wind energy projects planned with approved financing scheme by EOP	0	2	0	Not Reported	0	HU	Dropped in PIR. No reason provided
18	Number of wind energy projects implemented with financial support through the approved financing scheme by EOP	0	2	0	Not Reported	0	HU	
19	Volume of financing provided to implement wind energy projects through the approved financing scheme by EOP,)million US$)	0	16	0	Not Reported	0	HU	
15	*Volume of finance offered by local banks as part of financing schemes (loans, guarantees, other) for wind power (million USD)*	*0*	*3*	*0*	*Not Reported*	0	HU	
16	*Total volume of project-linked finance invested by implemented wind projects (million USD)*	*0*	*16*	*0*	*Not Reported*	0	HU	
17	*Completed study on sources of funding and issues and options in financing commercial wind power with recommendations for one or more financing schemes*	*0*	*1*	*0*	*Not Reported*			

[20]Please see Footnote 14

[21]Please see Footnote 15

There is a monitoring issue in this case. As can be seen, a number of indicators that were there in the log-frame were dropped in the PIR. No reason was provided by the PMU for this.

As can be seen from the table, the performance as far as attainment of targets is concerned has not been that good. One of the reasons is the unrealistic expectations that it would be possible to see actual implementation of wind power demonstration and replication projects within the implementation period of the WHyPGen Project.

The only story to share for this component is some collaborative work done with SMI (state owned financial institution). SMI provided some training on development of bankable proposals and business plans. The project provided USD 0.3 million to SMI and SMI was supposed to leverage it to get ten times of this amount as investment in wind power projects. With no small wind power projects coming forward and considering that this amount was not sufficient for larger wind power project, this amount was later utilised by SMI for preparation of feasibility studies for a couple of wind power projects.

It is evident that component 3 of the project was originally designed (at the time of PIF) keeping in mind the comparatively smaller WHyPGen projects. At a later stage due to change in focus on larger wind power projects (without making the required changes in component 3 of the project), this component of the project became a misfit. Larger wind power projects, which are generally implemented by comparatively larger multinational players, do not face the same kind of financial barriers.

Almost the entire budget for component 3 of the project was provided to SMI for developing and managing a scheme for financing wind power projects. This did not leave any funds for carrying out other activities under this component of the project. At an aggregate level the **attainment of objectives for component 3 is rated as Unsatisfactory**.

5.1.4 Attainment of objectives – Component 4

This component of the project was aimed at facilitation of promulgation of the policies and regulations that would promote adoption of wind power technology. To realize its objectives, a number of activities were to be carried out, which included review of existing policy and regulatory framework for renewable energy; working out the policy and regulations specifically targeted at wind power. One of the critical aspects which was to be taken care by this component of the project was the feed in tariff for wind power. The projected outcomes of this component of the project were as given in Box 4.

Box 4: Outcomes for Component 4

Component 4: Policy & Institutional Support for WHyPGen Initiatives
Outcomes
• Approved and enforced policies supportive of wind power generation (including WHyPGen) projects

Table 13 provides the details of the the level of attainment of the indicators for different targeted outputs of component 4. The values of the indicators at termination of the project are more or less as per PIR for the year 2016. For reference, the baseline values of the indicators, those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also included in the table.

Table 13: Attainment of objectives – Component 4: Indicators and status

Ind. #	Indicators / *Revised Indicators*[22]	Base Line	Target	MTR	PIR	TE	Rating[23]	Comments
	Output 4.1: Completed policy study on WHyPGen system						U	
	Number of existing WHyPGen-related policies evaluated by EOP	0	6	Not Reported	Not Reported	0	U	This was dropped by PMU in the PIR. No reasons provided
18	*Completed review of existing policies and regulations (tax incentives, regulations, tariffs) and applicability for wind energy development (big, medium, small)*	*0*	*2*	*1*	Not Reported	*0*	*U*	
19	*Status of and number of policy regulations on feed-in tariff and facilitating market access*							
	o Proposed	*0*	*1*	*1*	*1*	*1*	*S*	
	o Approved	*0*	*2*	*1*	*0*	0	U	
	Output 4.2: Proposed policy frameworks supportive of wind energy (including WHyPGen) projects							
20	Supporting policies for wind power generation including WHyPGen formulated	0	6	4	5	1	U	
21	Supporting policies for wind power generation including WHyPGen endorsed by the government	0	3	0	3	0	U	
22	Number of local companies actively engaged in the wind power generation (including WHyPGen) business by EOP (cumulative)	0	14	15	26	0	U	

As in case of other components of the project, for this component of the project as well, a number of indicators which were there in the log-frame got dropped in the PIR. No reason was provided for this.The activity of evaluation of existing policy and regulations which are relevant to wind power could not be carried out.

For indicator 20 and 21 the PMU has reported formulation / approval of the following policies and regulations for wind power project.

- Draft policy on wind power Feed in Tariff
- Draft National Standard on Design requirements for small wind turbines IEC – 61400-2
- Draft National Standard on Power Performance measurement of electricity producing wind turbines IEC-61400-12-1
- Draft national standard on measurement and assessment of power quality characteristics of connected wind turbines IEC-61400-21
- Draft National Standard on SKKNI (National Occupational Standards of Competence), on wind energy implementation plan

Policies approved by BSN

- National Standard, SNI IEC-61400-2-2016:
- National Standard, SNI IEC-61400-12-1-2016
- National Standard, SNI IEC-61400-21-2016

[22]Please see footnote 14

[23]Please see footnote 15

IEC 61400 is a set of design requirements published by 'International Electro-Technical Commission, to ensure that wind turbines are appropriately engineered against damage from hazards within the planned lifetime. The standard concerns most aspects of the turbine life from site conditions before construction, to turbine components being tested, assembled and operated. While it is good to adopt these standards for Indonesia, they can certainly be not considered as policy and regulations for promotion of wind power projects. The project document is very clear that what was required was the fiscal, regulatory and policy measures for promotion / facilitate wind power technology.

For indicator 22, the interpretation of the phrase 'local companies actively engaged in the wind power generation (including WHyPGen) business', by PMC is a company which is planning to put up wind power projects. This interpretation doesn't seem to be appropriate. The evaluator is of the view that actively engaged means in business (getting revenues out of it).

Thus, the only achievement for this component of the project is formulation of the policy for feed-in tariff for wind power projects. This policy is yet to be approved by the government. In view of not that good performance, at an aggregate level the **attainment of objectives for component 4 is rated as Unsatisfactory**.

5.1.5 Attainment of objectives – Component 5

Component 5 of the project was intended to support creation of the local WHyPGen market in Indonesia. It was to involve implementation of an active promotional program for WHyPGen to bring about enhanced awareness of the public and other stakeholders on the benefit of WHyPGen applications. The projected outcomes of this component of the project were as given in Box 5.

Box 5: Outcomes for Component 5

Component 5: WHyPGen Promotion
Outcomes
- Enhanced awareness of the benefits of wind power generation projects
- Planned and implemented wind power generation (including WHyPGen) projects

Table 14 provides the details of the the level of attainment of the indicators for different targeted outputs of component 5. The values of the indicators at termination of the project are more or less as per PIR for the year 2016. For reference, the baseline values of the indicators, those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also included in the table.

Table 14: Attainment of objectives – Component 5: Indicators and status

Ind. #	Indicators / *Revised Indicators*[24]	Base Line	Target	MTR	PIR	TE	Rating[25]	Comments
	Output 5.1: Designed and implemented WHyPGen promotion and advocacy program							
23	Number of completed promotional materials on wind energy, in general, and WHyPGen, in particular by Year 2	0	15	15	31	31	S	
24	An operational and widely used central database system on wind energy by Year 2	0	Yr. 2	2014	Achieved	Achieved	S	
21	*Number of promotional materials completed*	0	15	15	31	31	S	It is same as indictor 23
22	*Functioning website, users (counter) and central info base with wind data with number of visitors*	0	1 -9000	1- 2900				
23	*Number and type of promotional events organized with WHyPGen project support (with IWA and others)*							

[24]Please see footnote 14
[25]Please see footnote 15

Ind. #	Indicators / *Revised Indicators*[24]	Base Line	Target	MTR	PIR	TE	Rating[25]	Comments
	-Annual forum	*0*	*3*	*0*				
	- Workshops	*0*	*1*	*1*				
24	*Guide for investors in wind energy*	*0*	*1*	*0*				
25	*Clearinghouse operational and (number of users)*	*0*	*1 (10)*	*0 (10)*				
	Average number of satisfied users of the WHyPGen website (for promotion and information exchange) each year starting Year 2	0	9000	1000				The website doesn't have a counter
	Number of local businesses and entrepreneurs that engage in the WHyPGen business by EOP	0	30					
25	Number of engineering schools that offer courses on wind energy technologies (including WHyPGen applications) in their engineering curricula by EOP	0	3	5	10	10	S	
26	Average number of coordination activities of WESMA (wind energy system manufacturers association) each year starting Year 2	0	4	0	4	4	S	
	Average number of WESMA members participating in coordination activities each year starting Year 2	0	8					Not reported

The highlights of attainments for this component of the project are creation of a functional website, promotion material for wind power and introduction of courses on wind energy in technical education institutes. One of the minor problems from the monitoring view point is that the website doesn't have a counter. The **attainment of objectives for component 5 is rated as Satisfactory.**

5.1.6 Attainment of objectives – Component 6

This component of the project was aimed at addressing the barriers that hinder development of the market. The idea was to create the skills and capacity locally for wind energy system design, engineering, installation, operation and maintenance, as well as system component manufacturing. The expected outcomes of this component of the project were as given in Box 6.

Box 6: Outcomes for Component 6

Component 6: WHyPGen Market Development and Industry Support
Outcomes

- Improved local wind energy (including WHyPGen) system design & engineering capacity
- Ensured availability of local service provider for wind energy facilities
- Availability of quality components wind energy (including WHyPGen) systems that are locally made
- Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia

Table 15 provides the details of the the level of attainment of the indicators for different targeted outputs of component 6. The values of the indicators at termination of the project are more or less as per PIR for the year 2016. For reference, the baseline values of the indicators, those at the time of MTR and those self assessed in PIR for the terminal year (2016) are also included in the table.

Table 15: Attainment of objectives – Component 6: Indicators and status

Ind. #	Indicators / *Revised Indicators*[26]	Base Line	Target	MTR	PIR	TE	Rating[27]	Comments
	Output 6.1: Completed capacity building and technical support program for the: (a) Local manufacturing of WHyPGen system components; (b) Design and engineering of WHyPGen projects; and, (c) Installation, operation and maintenance of WHyPGen facilities							
27	A fully established and operational wind energy clearing house by Year 2	0	Yr. 2	0	0	0	U	
25	*Clearinghouse operational and (number of users, such as developers, investors, service/equipment providers that make use of the facility)*							Same as indicator 28
26	*Completed report containing an assessment of (technical) capacity building and training needs and plan for project-supported activities per market cluster*	0	1					
27	*Number of engineering schools that offer wind power subjects in their engineering curricula*	3	5					
28	Number of project developers, investors, technical service, and local equipment manufacturers that make use of the clearing house each year starting Year 2	0	8	0	0	0	U	
28	*Number of vocational training institutes that including wind power operation and maintenance*	0	3					
29	*Number of (technical) trainings and staff trained (engineers and operators; service/consultancy providers) on wind energy topics*	0	100					
	Number of trained local equipment manufacturers that are manufacturing quality wind energy system equipment & components by EOP (cumulative)	0	10					
	Number of local technical service providers trained under the capacity development program by EOP (cumulative)	0	15					
	Number of trained local technical service providers that are actively engaged in the servicing (installation & maintenance) of wind energy systems (including WHyPGen) by EOP (cumulative)	0	7					
	Number of trained local technical service providers that are actively engaged in the servicing (design & engineering) of wind energy systems (including WHyPGen) by EOP (cumulative)	0	7					
	Number of power generation engineers and operators certified to operate and maintain wind power generation (including WHyPGen) systems by EOP (cumulative)	0	18					
	O**utput 6.2**: Completed survey and evaluation of electricity demand areas served by wind power generation (including WHyPGen) facilities.							
29	Cumulative number of local equipment manufacturers trained under the capacity development program by EOP	0	15	0				
30	*Study on grid-related issues (ability of grids to absorb intermittent production, grid stability, dispatching rules, charges, etc.)*	0	1					

[26]Please see footnote 14

[27]Please see footnote 15

Ind. #	Indicators / *Revised Indicators*[26]	Base Line	Target	MTR	PIR	TE	Rating[27]	Comments
30	Number of wind energy projects (including WHyPGen projects) that are designed and engineered by local technical service providers by EOP	0	4	0	4	1	MU	
31	Number of wind power generation R&D projects completed through WESMA by EOP	0	2	0	0	0	U	
32	Percentage of all trainees of the capacity development programs that are actively engaged in the Indonesian wind energy marker by EOP (%)	0	60		40		MU	
33	Number of areas with completed electricity demand analyses and forecasts by EOP	0	25		26	26	S	
34	Number of power project developers and technical service providers that make use of the electricity demand analyses and forecasts by EOP	0	8		1	1	U	

As can be seen, a number of indicators got dropped out and were not reported in the PIR. No reason for the same has been provided.

For indicator 30 the PMU has sited following work done by the local service providers

- Detailed engineering design of a wind hybrid power generation at Karmapa Island, the Regency of Kayoing Utara, West Kalimantan was carried out by a local service provider: PT Asia Niagara Instruments.
- The hybrid control system at Nusa Penida was developed by a local service provider: PT TML
- PT. SEL was involved in the repair of inverter system in Baron Techno Park
- In the revitalization of Nusa Penida, two local companies were involved, PT. Citre Katon and PT. Adiguna. The two companies involved in improving one of the wind turbines and also in the design and construction of the hybrid control system and remote monitoring system.

Repair of one of the old wind turbines does not adequately represent the activity of design and engineering of a wind energy project. Moreover, the indicator asks for the number of projects and not for the number of technical service providers. The level of achievement for indicator 30 is thus rated as Marginally Unsatisfactory.

For indicator 32, it is claimed that the training program for the local manufacturers and engineering services have been conducted by the project. PT. Citra Katon has been attending and joining the training programs from WHyPGen. PT. Citra Katonis, one of the two companies which carried out revitalization of one of the wind turbines at Nusa Penida. However, it is not clear how PT. Citra Katom accounts for 40 percent of all the trainees who participated in the training programs. The level of achievement for this indicator is rate as Marginally Unsatisfactory.

The **attainment of objectives for Component 6 at an aggregate level is rated as Unsatisfactory**

5.1.7 Attainment of project goals, project objectives

Attainment of the the project goals and the project objectives has been assessed based on the assessment of the attainment of goals and objectives of the individual components of the project, which was presented in the earlier paragraphs. The assessment is supplemented by the evaluation of the attainment against the indicators for project objectives.

The project document stipulates the project goal as “Rate of growth of GHG emission in the power sector is reduced”. The target values for the project goal is reduction of 17071 tons of CO2 / year in the emissions of GHG due to substitution of fossil fuel-based power generation. This goal of the projects was to be achieved by the end of the project. The stated (as per Project Document) objective of the project is facilitation of commercial on- grid WHyPGen systems for environmentally sustainable electricity supply.**Table 16** provides

the indicators for assessing the achievement against project objectives. A revised set of Indicators were suggested during MTR. Although the recommendations of MTR were accepted by the project management, the revised indicators were not monitored and recorded in the subsequent PIR. The revised indicators have also been included in the table (*in a different color and style*).

Also given in the table are the values of the indicators at the start of the project, the target values at the end of the project, achievement as assessed by the project management in the PIR for terminal year (year ending June 2016) and the achievements as assessed during the terminal evaluation.

Table 16: Attainment of project objectives: Indicators and status

#	Indicators / Revised Indicators[28]	Base Line	Target	Achievement as per PIR[29]	Achievement as per TE
1	Installed capacity of WHyPGen facilities (MW)	0.70	9.40	0.75	0.14
2	Electricity generation from installed WHyPGen facilities (GWh/Yr.)[30]	1.35	19.27	0.23	0.23
3	WHyPGen capacity planned for installation (MW)	0.00	100.00	1187.50	1187.50
1	*Installed wind power*				
	o Number of projects	*1*	*2*		*0.00*
	o Capacity (MW)	*0.73*	*50.7*		*0.00*
	o Electricity generation (GWh / Yr.)	*1.6*	*111.1*		*0.00*
	o Direct GHG emission reduction ($ktCO_2$ / Yr.)	*3*	*82*		*0.00*
2	*Short-term planned wind power*[31]				
	o Number of projects		*3*		*19*
	o Capacity (MW)		*162.5*		*1187.5*
	o Electricity generation (GWh/ Yr.)		*355.9*		
	o Post-project GHG emission reduction ($ktCO_2$/ Yr.)		*256.9*		
3	*Longer-term planned wind power*[32]				
	o Number of feasible projects		*4*		
	o Capacity (MW)		*220.5*		
	o Electricity generation (GWh / Yr.)		*373.4*		
	o Indirect GHG emission reduction ($ktCO_2$ / Yr.)		*270.8*		

No demonstration wind power project could be implemented. Same is the case with the replication projects. In order to have a working wind turbine for demonstration, the WHyPGen project facilitated revamping of one of the old non-working wind turbines at Nusa Penida. Although the WHyPGen project failed to deliver, when it comes to establishment of demonstration wind power projects and establishment of further wind power projects as replication projects, at the end of the WHyPGen project, 19 large size wind power projects with a total proposed capacity of 1187.5 MW are at different stages of planning. However, none of these 19 projects has actually started physical implementation of the wind power project. This is one of the significant achievement of the WHyPGen project. In view of this the **attainment of the project objectives has been rated as Marginally Satisfactory**.

5.1.8 Global environmental benefits

The global environmental benefits of the project are the reduction in the emission of Green House Gases (GHG) to help the global community to address climate change. The project document stipulates the project goal as "Rate of growth of GHG emission in the power sector is reduced". The target values for the project goal was set at reduction of 1707 tons of CO_2 / year in the emissions of GHG due to substitution of fossil fuel-based power generation. This goal of the project was to be achieved by the end of the project. Details of the

[28] A revised set of Indicators were suggested during MTR. Although the recommendation was accepted by the project management, the revised indicators were not monitored and recorded in subsequent PIRs. The revised indicators have been included in the table. For ease of reading and clarity the revised indicators has been given a ***different color and style***.

[29] As per PIR for terminal year (year ending June 2016)

[30] Includes solar PV facilities in the wind solar Hybrid

[31] The achievement column given the value for both short term and long term wind power projects.

[32] Aggregated with small term projects

projected GHG emissions at the time of project design and the corresponding set of assumptions is given in **Table 17**.

Table 17: Projected GHG emissions at Project design and the assumptions[33] (fig. in tons CO_2)

Category	Quantity	Remarks
Direct	341	From the 10 MW demonstration units (20 years life)
Direct Post Project	1707	From 100 MW replications (10 years influence period)
Indirect (Bottom-up)	345600	Based on RUPTL projections
Assumptions:		
• GHG emission factor of 0.886 kg CO2/kWh considering fuel oil based power generation as the baseline.		
• Installed capacity of the demonstration projects having capacity of 9.4 MW (9 MW wind + 0.4 MW Solar PV), will be operational towards the end of project.		
• Demonstration project will achieve 22% annual Plant Load Factor (capacity factor), this will generate 18.115 GWh per year.		
• Useful life for the wind power generation facility is 20 years		
• Apart from the demonstration projects, additional 100 MW wind power generation facilities (replication projects) from commercial investors will come on stream by end of the WHyPGen project. The average influence period of this capacity would be 10 years. GEF causality factor = 0.6		
• Plant Load Factor (capacity factor) for the commercial projects would be 22%		
• Following demo units and the 100 MW commercial replication units after the end of WHyPGen project wind energy based generation will supply 15% of the national generation. This would lead to indirect GHG emission reduction of 345600 tons CO_2		

As the actual situation at the time of MTR was much different than what was envisaged and assumed at the time of project design, the projections regarding GHG emissions reductions due to the WHyPGen project were revised. **Table 18** provides the details of the projected emissions reduction worked out at the time of MTR. The table also gives the corresponding set of assumptions and considerations.

Table 18: Projected GHG Emission Reduction as done at the time of MTR

Wind Power Project Details	Capacity (MW)	Power Generation (MWh /Yr.)	Emission Reductions ($ktCO_2$/Yr.)
Direct emission reductions			
Installed/under construction			
1. Nusa Penida	0.73	1,599	3
2. Samas	50	109,500	79
Total	50.73	111,099	82
Cumulative		2,221,974	1,641
Post-project direct			
Under PPA negotiation			
3. Sidrap	50	109,500	79
4. Jeneponto	62.5	136,875	99
5. Lebak	50	109,500	79
Total	162.5	355,875	257
Cumulative		7,117,500	5,139
Indirect (bottom-up)			
Preparation for negotiation			
6. TTS	20	43,800	32
7. Garut	150	328,500	237
8. MEMR pilot	0.5	1,095	2
9. Sukabumi	50	109500	79
Total	220.5	373,395	271
Cumulative		17,125,800	6,998
Grand Total	433.73	840,369	610
Assumptions:			

[33] As per Project Document

- Some of planned wind power projects would come on board before the end of the WHyPGen project.
- Life of the wind power project is 20 years.
- The baseline emission factor is 0.74 kg of CO2 per kWh.

Direct and indirect GHG emission reductions due to the project were projected both during the design stage of the project and later during the MTR of the project. Details of the projections were provided in the earlier paragraphs. While doing so, the Direct GHG emission reductions (both during the project and after the project) have been considered to be ones which will happen due to establishment of wind power units. The actual situation at the termination of the project is quite different than what was envisaged while making the projections regarding reduction in the emission of GHGs.

The definition of direct GHG emission reductions as per GEF guidelines is one which happens due to investments made by GEF or leveraged as a part of the project. As no demonstration or replication wind power project got established during the implementation phase of WHyPGen project, there are no direct GHG emission reductions due to the project. It is difficult to establish that the investment in the three wind power projects (Sidrap, Jeneponto, Lebak) with an aggregate capacity of 162.5 MW which is likely to come on stream was leveraged by the GEF project. Thus, there is no direct GHG emission reductions due to the WHyPGen Project. However, this is just an accounting detail and the issue relating to classification of GHG emission reduction amongst direct and indirect reductions. The fact remains that the WHyPGen project was expected to lead to reduction in the emission of GHG and it has done so. However, the question is regarding the extent of emission reductions.

The projected GHG emission reductions at the project design stage and at the time of MTR were based on a set of assumptions which has been elaborated in Table 17 and 18. Computations of GHG emission reductions due to the project has been done again as a part of terminal evaluation of the project with following set of assumptions and considerations:

- The baseline conditions and situation has not changed significantly since last two years (MTR was carried out during September 2014). Thus, it is not necessary to make changes in the baseline assumptions.
- As no demonstration or replication project got established during the implementation phase of the WHyPGen project and the investment in the wind power projects which are likely to come on stream post termination of the WHyPGen project, it can be considered that there is no direct GHG emission reductions due to the project.
- At the termination of the WHyPGen project, 19 large size wind power projects (with an aggregate capacity of 1187.5 MW) are at different stages of implementation. Some of these wind power projects would eventually get implemented leading to indirect reduction in the emission of GHG.
- It is not possible to establish how many of these projects would go on stream and the time line for the same. Also, it is not possible to establish how many of these projects would have got conceived, in case WHyPGen project would not have taken place.
- GEF methodology for computation of indirect reductions in GHG emission due to the project allows for computation for a maximum of ten years post implementation of the project.
- For the purpose of estimating indirect GHG emission reduction, it is assumed that during the next 5 years only 25 percent of the planned capacity of 1187.5 MW would go on stream. Further, it is assumed that this capacity would come on stream in a phased manner over a period of next 5 years. It is considered that for the next ten years on an average the wind power generation capacity would be 200 MW
- GEF causality factor is used to correct the 10-year potential of GHG emission reductions by the "baseline shift," i.e., that part of the potential that would have been tapped by the market without a GEF intervention. The GEF causality factor describes how much of the emission reduction can be attributed to the GEF intervention, and how much would have happened in the business-as-usual scenario in the long-term. In the case of WHyPGen project at Indonesia, GEF causality factor at level 3 is considered to be appropriate. The value of causality factor corresponding to level 3 is 60%. Causality factor at level 3 seems to be most appropriate considering that in Indonesia there are other strong factors that would have lead to establishment of wind power projects. This is evident from the fact that wind data for a large number of

potential wind power sites was already available at the time of design of the GEF project and a number of private sector parties were already exploring the possibilities to establish wind power projects in Indonesia.

Considering the above and a GEF casualty factor of 0.6, capacity factor of 22% and emission factor as 0.74 kg CO_2 / kWh, the indirect GHG emission reductions due to the project are estimated to be about 1711 thousand tons of CO_2 up to the the year 2026.

A comparison of the projected GHG emission reductions at the design stage, at MTR and at TE is given in **Table 19**.

Table 19: Projected GHG emission reductions due to WHyPGen Project (figures in K tons of CO_2)

	At Project Design	At Mid Term Review	At Terminal Evaluation
Direct Emission Reductions	6.82	1641.00	0.00
Direct Emission Reduction – Post Project	17.07	5139.00	0.00
In-direct Emission Reductions	3456.00	6998.00	1711.00

5.2 Relevance

The main questions for terminal evaluation are; (please see Annex B)

- **To what extent is the activity suited to local and national development priorities and organizational policies, including changes over time?**
- **To what extent is the project in line with UNDP Operational Programs or the strategic priorities under which the project has been funded?**

The WHyPGen project and the activities planned within the project are highly relevant to the development needs of Indonesia. This is considering that the project addresses the issue of availability of sustainable energy to all at one end, while on the other it addresses the issue of pressure on the economy due to the subsidies provided to energy sector. The project is in line with the UNDP operational programs for Indonesia. This is explained further in the following paragraphs.

Indonesia transitioned from a robust energy exporter to an importing nation in the year 2000 and is concerned with rising production costs, energy subsidies, and climate change. In the year 2008, fossil fuels provided 93% of the economy's total energy capacity. Unlike previous years when excess energy was exported to neighbouring markets, aging wells and limited investment forced Indonesia to import oil and to eventually remove itself from the Organization of Petroleum Exporting Countries (OPEC). Similarly, Indonesia was once the world's leading exporter of natural gas, but now ranks 56th because investment restrictions and contract uncertainty caused new production to go undeveloped. At current extraction rates, it is expected that the total proven and potential reserves of crude oil and natural gas in Indonesia would be depleted in the near future, about 10 - 32 years, while coal is expected to last longer at 65 years. The high population growth in Indonesia coupled with rapid expansion and economic growth in the country's residential, industry, transportation, agriculture, commercial and public services sectors is leading to rise in energy consumption, and hence the need to import the fossil fuels. The WHyPGen project sought to address the problem of increasing financial burden caused by importing fossil fuels.

One of the other problems that the WHyPGen project sought to address is the availability of commercial energy in the remote locations that are not connected to the grid. Although Indonesia is endowed abundantly with various energy sources such as fossil fuels and renewable energy, many areas that need such resources are not served because of absence of distribution networks and high cost of energy and limited power subsidies.

To appease local energy consumers, the government has maintained high energy subsidies. When supply was high and demand was low, the subsidies stimulated economic growth with low, stable energy prices. But as demand began to outpace supply, the subsidies became a burden on the nation's fiscal budget and low energy prices became a deterrent to investments in cleaner, renewable resources. In the 2008, subsidies exceeded $20 billion. In addition, Indonesia's fuel subsidies have the negative consequence of making growth itself an unaffordable expense to the Government of Indonesia, which must pay more money for every new unit of electricity sold. It is expected that with the development of wind energy (due to the WHyPGen project), over

long term, the burden of subsidy will reduce.

Apart for the development and economic benefits, the project also sought to facilitate reduction in the emissions of GHG. In the year 2008, Indonesia emitted 116 million metric tons of CO2 equivalent of GHG. In the business as usual scenario, the emissions would have increased to 270 million tones of CO2 equivalent by the year 2018.

The development objective of the WHyPGen project was reduction of the rate of growth of GHG emissions in the power sector of Indonesia, so that the future energy needs can be meet in a sustainable manner. One of the other development objective was to facilitate availability of the commercial energy in the remote areas which are not connected to the grid. The project objective is facilitation of the commercial development of on-grid Wind Hybrid Power Generation (WHyPGen) systems for an environmentally sustainable electricity supply in Indonesia through government and private sector cooperation.

The WHyPGen project has become even more relevant for the country in the present day context. For example, Indonesia has adopted a revised National Energy Plan in 2014 (NEP14). NEP14 replaces the 2006 National Energy Plan and introduces a number of important changes to energy policy planning. NEP14 has set out the ambition to transform the energy mix by 2025, wherein the share of renewable energy is to be increased to 23%, which would require renewables to grow more than eleven-fold by the year 2025. The concerns regarding increasing dependency on imports is also reflected in the NEP14's, call to reduce energy subsidies both for fossil fuels and for electricity. Stopping short of calling for market-based pricing, NEP14 aims for an energy price that reflects "the economic equality value", which is a basic concept of Indonesia's economic development meaning that all Indonesians should have affordable access to energy. NEP14 also aims to complete the electrification of the country by the year 2020 and to ensure full access to energy, which is a difficult undertaking without the use of subsidies (for oil-based power) unless renewables are used at a larger extent for providing electricity in isolated locations.

UNDP's assistance in Indonesia is implemented by national entities, including line ministries and the Ministry of National Planning and Development, and at the subnational level by line departments, provincial and district authorities as well as community groups. While each programme supported by UNDP has specific and varied objectives, capacity development is one of the aims that all UNDP programmes – in Indonesia and worldwide – have in common. UNDP is supporting Indonesia in maintaining and managing the country's rich environment, including Indonesia's vast marine and terrestrial biodiversity and energy resources. UNDP is working for a sustainable environment and development policy, which integrates climate change concerns and at the same time provides poverty reduction and human development. UNDP carries with it a rich experience of implementing GEF projects for promotion of wind energy in many countries.

The WHyPGen project is coming to an end at the time, when the government has set targets for renewable energy and wind power and the country has experience with independent power producers (IPPs) in the energy sector. Thus, the conducive atmosphere created by the project will be of great help to the country in realising its targets and the objectives of the 'National Energy Plan 2014'. **The relevance of the WHyPGen project has been rated as Satisfactory (Relevant).**

5.3 Effectiveness & Efficiency

The main questions for terminal evaluation are; (please see Annex B)

- **To what extent the objectives have been achieved?**
- **To what extent the results have been delivered with the least costly resources possible?**
- **What are the positive and negative, foreseen and unforeseen changes to and effects produced by a development intervention?**

The goal of the WHyPGen project was reduction of the GHG intensity of the power sector in Indonesia. The project document had set the goal for the project as "Rate of growth of GHG emission in the power sector is reduced". The stated (as per Project Document) objective of the project was facilitation of commercial on- grid WHyPGen systems for environmentally sustainable electricity supply in Indonesia.

Though, the WHyPGen project failed to deliver when it comes to establishment of demonstration wind power projects and establishment of further wind power projects as a replication projects, at the end of the WHyPGen project, 19 large size wind power projects with a total proposed capacity of 1187.5 MW are at different stages of planning / implementation. Thought none of these 19 projects have actually started physical implementation of the wind power project yet, significant wind energy based power generation capacity is expected to be implemented and come on stream during next two to three years and also thereafter. This is one of the significant achievement of the WHyPGen project. **The Effectiveness of the project is rated as Marginally Satisfactory**.

The contribution of the WHyPGen project in terms of in direct GHG emission reductions is expected to be 1711 thousand tons of CO_2. Considering the total GEF support provided to the project as USD 2.156 million, the cost of GHG mitigation works out to be USD 1.2 per ton of CO_2, which is very good. However, the project did not achieve any direct GHG emissions as was originally envisaged in the project. Although the results of the project in terms of projected indirect GHG emission reductions have been achieved in a very cost efficient manner, and **the efficiency of the project is rated as Marginally Satisfactory**, as the project could not achieve any direct GHG emission reductions. On a long term basis, the project would facilitate availability of sustainable energy at the isolated locations leading to economic development.

5.4 Country ownership

The main questions for terminal evaluation are; (please see Annex B)

- **Was the project concept in line with development priorities and plans of Indonesia?**
- **Were the relevant country representatives from government and civil society involved in project implementation, including as part of the project steering committee?**
- **Was an inter-governmental committee given responsibility to liaise with the project team, recognizing that more than one ministry should be involved?**
- **Have the government(s), enacted legislation, and/or developed policies and regulations in line with the project's objectives?**

The WHyPGen project was in line with the development priorities and plans in Indonesia. Particularly the project targeted to address two important development priorities, first the energy access to the isolated locations and the second, meeting the energy needs in a sustainable manner.

The project design and the implementations was carried out in close coordination and consultation with different government agencies. BPPT which is a government agency was the designated Implementing Partner for the project. It was to execute the project on behalf of the Government of Indonesia under the National Implementation Modality (NIM).

A Project Board was established by the Implementing Partner, with core members comprised of representatives of BPPT, other government ministries and departments.However, the project board could meet only three times during implementation of the project. Thus, the involvement of the government bodies other then BBPT was quite limited.

One of the issues which came up from time to time was the definition of WHyPGen and hence the scope of the project. There were disagreement amongst different government bodies and hence the members of the Project Board on this issue. This is evident from the fact that this issue come up for discussion during the first board meeting (project inception meeting) and the second board meeting as well. Thus, at the board level the thoughts were divided regarding what needs to be promoted and on what activities, the project should focus.

The NIM implementation modality for this project was good and BPPT was the appropriate institution within the government institutions to act as the coordinating entity. However, the approach for implementation of the project on part of BPPT was more of 'hands off', wherein all the major decisions and management was left to the PMC headed by the 'National Project Manager'.

One of the important components of the project (Component 4) was targeted at providing policy & institutional support for wind power projects. Under this component, fiscal, regulatory and policy measures for promotion of wind power technology were to be developed and approved by the concerned authorities. One of such policy matters was the approval of feed-in tariff for wind power projects. The only achievement for this component of the project is the formulation of the policy for feed-in tariff for wind power projects. This policy is yet to be approved by the government.

5.5 Mainstreaming

The main questions for terminal evaluation are; (please see Annex B)

- **How is the project successfully mainstreaming other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and women's empowerment?**
- **Whether it is possible to identify and define positive or negative effects of the project on local populations (e.g. income generation/job creation, improved natural resource management arrangements with local groups, improvement in policy frameworks for resource allocation and distribution, regeneration of natural resources for long term sustainability).**
- **If the project objectives conform to agreed priorities in the UNDP country programme document (CPD) and country programme action plan (CPAP).**
- **Whether there is evidence that the project outcomes have contributed to better preparations to cope with natural disasters.**
- **Whether gender issues have been taken into account in project design and implementation and in what way has the project contributed to greater consideration of gender aspects, (i.e. project team composition, gender-related aspects of pollution impacts, stakeholder outreach to women's groups, etc.)**

While examining the issue of the extent to which the WHyPGen project has helped in main streaming renewable energy in Indonesia, it is important to consider that the Government of Indonesia has supported the project aimed at removing the barriers towards larger use of wind energy for generation of power. Support for the promotion of wind energy is a part of the efforts on part of the government to promote all forms of renewable sources of energy.

The government understands the importance of promoting all forms of renewable energy. The success of this project will help the government to mainstream other forms of renewable energy as part of the its ongoing policy. This approach will help in making renewable energy technologies an integral part of the initiatives in the energy sector.

At the level of UNDP, although there is no direct contribution of this project towards mainstreaming its other priority areas of work like poverty alleviation, improved governance, prevention and recovery from disasters, gender equality, it has no negative impact on any of the other priority areas of the UNDP.

5.6 Sustainability

The main questions for terminal evaluation are; (please see Annex B)

- **Are there financial risks that may jeopardize the sustainability of project outcomes?**
- **What is the likelihood of financial and economic resources not being available once GEF grant assistance ends?**
- **Are there social or political risks that may threaten the sustainability of project outcomes?**
- **What is the risk for instance that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained?**
- **Do the various key stakeholders see that it is in their interest that project benefits continue to flow?**
- **Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?**
- **Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits?**
- **Are requisite systems for accountability and transparency, and required technical knowhow, in place?**
- **Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes?**

The project strategy was to remove barriers and create an enabling atmosphere for wind power generation. The main achievements / outcomes of the project are wind resource assessment for a number of locations, identification of locations having good wind power generation potential and creation of awareness regarding wind power potential in Indonesia. The project has lead to a situation where the market forces have taken over the development of wind power projects. This is evident from the fact that at the termination of the project

there are 19 large size wind power projects with an aggregate capacity of 1187.5 MW which are at different stages of implementation. These projects are commercially viable on their own and do not require any financial support. Thus, there is no financial and economic risk towards implementation of the wind power projects.

From the social and political view point, there is not much threat to the sustainability of the results and outcomes of the project. Although some of the stakeholders consider solar PV, a better and reliable solution for supplying power in the isolated locations, they realise the limitations of solar PV in terms of the scale of operations.

From the view point of policy and regulations one of the issues is that the WHyPGen project has not been able to get approved, a feed in tariff policy for wind power projects. Even in the absence of a policy for the feed in tariff, two upcoming wind power projects were able to sign PPAs (Power Purchase Agreements) with PLN on the a business-to-business case basis. The basis for determination of the power purchase price, in the PPAs was financial feasibility studies. As is known, wind profile plays an important role in the financial feasibility of a wind power project. For all future wind power projects that will attempt to sign PPA with PLN, the price offered to the two wind power projects, would become the bench mark. This can hamper the commercial viability and hence the implementation of the future wind power projects at the locations having lower wind resource potential (and hence the capacity factor), (lower than the locations for which the PPAs has already been signed). Absence of a policy regarding feed in tariff is an issue which may impact the sustainability of the outcomes of the WHyPGen project.

There are practically no negative environmental impacts of the project. Thus, from the viewpoint of institutional framework and environmental sustainability, the outcomes of the project are likely to sustain. **The overall sustainability of project results is Likely.**

One of the very important outcomes of the WHyPGen project has been the identification of potential locations for wind power projects and the wind resource assessment of these locations. The project had made this information available to the stakeholders through its website. BBPT has shown commitment towards continuing the website and the dissemination of useful information. Thus, this outcome of the project would sustain.

The outcomes and results of the WHyPGen project are Likely to Sustain.

5.7 Impact

The main questions for terminal evaluation are; (please see Annex B)

- **Whether, the project has demonstrated verifiable improvements in ecological status?**
- **Whether, the project has demonstrated verifiable reductions in stress on ecological systems through specified process indicators, that progress is being made towards achievement of stress reduction and/or ecological improvement?**

The most direct impact of the project, in terms of GEF objectives is the reduction in the emission of GHG. Although, the project could not achieve its objective of direct reduction in the emission of GHG, it provided for a long term indirect GHG emission reduction which will be achieved after the project. The outcomes of the WHyPGen project will lead to GHG emission reductions from the power sector in Indonesia on a long term basis. This will have the environmental and ecological co-benefits in terms of reduction in the emissions of particulate matter; lead, mercury and other heavy metals; acid gases like NOx and SOx.

6. CONCLUSIONS, RECOMMENDATIONS & LESSONS

The main questions for terminal evaluation are; (please see Annex B)

- **Did the project provide cost-effective solutions in order to address barriers?**
- **Are these solutions provided in an efficient way?**
- **What are the best and worst practices in addressing issues relating to relevance, performance andsuccess?**
- **Corrective actions for the design, implementation, monitoring and evaluation of the project**
- **Actions to follow up or reinforce initial benefits from the project**
- **Proposals for future directions underlining main objectives**

The WHyPGen project, started with the PIF in the year 2009 as a project to promote, 'on grid diesel-wind hybrid systems', ended in the year 2016 with the resultant promotion of large scale 'on grid wind power projects'. In the process, the term, 'WHyPGen' and the objectives of the WHyPGen project got re-defined a couple of times to suit the conditions and the objectives in mind.

The end result of the project is the uptake of 'large scale grid connected' wind power projects in Indonesia. At the end of the WHyPGen project, 19 large size wind power projects with an aggregate capacity of 1187.5 MW are in the pipeline. Two of these projects have already signed 'Power Purchase Agreements' (PPAs) with PLN. Many of these large size wind power projects would eventually get implemented. One of the significant achievements of the WHyPGen project has been that it has lead to a situation where the market forces have taken over development of the wind power projects in Indonesia.

Some of the specific achievements of the project are as follows:

- Wind resource assessment for a large number of potential locations for wind power projects
- Identification of potential wind power sites
- Introduction of curriculum regarding wind power technology in the engineering education
- Development and successful deployment / testing of automatic control systems for small wind-solar-diesel hybrid systems. Such systems are particularly suited for remote isolated locations

Some of the issues where the project has fallen short of achieving the success are as follow:

- Establishment of a policy for feed in tariff for wind energy based power generation
- Demonstration of commercially viable small on grid wind-diesel hybrid systems

The WHyPGen project has been able to address the barriers as far as large size grid connected wind power projects are concerned. However, the barriers of successful commercial demonstration (for small wind-diesel hybrid systems) and the regulatory barriers in terms of absence of transparent policy regarding feedin tariff for wind power projects could not be addressed to the full extent. It is important to note that generally the large size wind power projects have the capacity and the strength to negotiate a power purchase agreement on a case to case basis, whereas, the smaller operators and entrepreneurs lack it.

The goal of the project i.e. "Rate of growth of GHG emission in the power sector is reduced" was to be achieved by establishment of wind power projects. Although there is no direct reduction in the emissions of GHG, the project would lead to significant indirect reduction in the emissions after the project. The WHyPGen project was expected to lead to reduction in the emission of GHG and it has done so. Though, there are some question regarding the extent of emission reduction and its classification in different categories (direct, direct after the project and indirect).

The WHyPGen project and the activities planned within the project are highly relevant to the development needs of Indonesia. This is considering that the project addresses the issue of availability of sustainable energy to all at one end, while on the other it addresses the issue of pressure on the economy due to the subsidies provided to the energy sector. The WHyPGen project is coming to an end at the time, when the government

has set targets for renewable energy and wind power and the country has had experience with independent power producers (IPPs) in the energy sector.

One of the issues which came up from time to time was the definition of WHyPGen and hence the scope of the project. There seems to be some disagreement amongst different government bodies and hence the members of the Project Board on this issue.

6.1 Corrective actions for the design, implementation, monitoring and evaluation of the project

The project design was well thought off and targeted towards different barriers to Wind Power projects in India. However, the project design suffered due to the fact that while PIF was prepared for smaller 'on grid wind –diesel hybrid' the project designfocused on larger wind power plants and while doing so it missed out on making the corresponding changes in different components and activities for the project.

Recommnedation1*: The corrective action for the design on the project is that in all the cases where there is a significant change in the focus of the project from the PIF stage to the project design stage, corresponding changes in all the components and the activities should be made. If required, the components, indicators, activities and the corresponding outcomes may be rewritten.*

There were a differences amongst different the government ministries and departments, regarding what all should be supported under the GEF project. While some of the government stakeholders were in favour or supporting promotion of 'on grid wind-diesel hybrid systems', the others were in favour of supporting large size wind grid connected wind projects. To some other stakeholders these issues did not really matter. These kinds of issues lead to lack of ownership and interest on part of some of the stakeholders that was visible in the case of this project.

Recommendation 2*: The corrective action for the monitoring and evaluation is that the members of the project board should have an agreement about the objectives and activities to be carried out under the project.*

The PIF of the project was conceived the project considering that the wind component of the WHyPGen would be able to part replace the diesel based power generation capacity. This assumes that wind energy will be available through out the year. The idea of part replacement of diesel based power generation capacity with wind (in a hybrid mode) is not a realistic situation. The fact that implementation of diesel-hybrid system would require additional capital expenditure (not just some incremental as wind is not a continuous source and the seasonal variations are from 0 to 100%) got missed out. The reason for this seems to be the lack of inputs from the wind energy experts at the time of project design.

Recommendation 3:*It is recommended that at the time of project design, inputs from the technical experts for the technology being promoted must be taken.*

As was pointed out in the MTR as well, when it comes to the project goals, the targets are a bit ambitious. This is considering that the timeframe assumed for implementation of the pilot / demonstration projects is very optimistic, as the time required for collection of wind data and doing a realistic wind resource assessment itself has taken more than one year.

Recommendation 4*: The corrective action for project design is that while putting up a time frame for the demonstration projects, a realistic time frame needs to be provided, considering the technology specific project implementation issues and required timelines.*

The assumption that it would be possible to create capacities / capabilities to produce wind turbines locally within the implementation period of the project was slightly unrealistic. The important point which got missed out while making this assumption is that the software part of the technology (design and detailed engineering)

of the wind turbines and wind power technology is important and having good engineering facilities within the country alone is not sufficient to enable production of components and parts of wind turbines. The lesson learnt is that while making efforts towards producing high tech capital equipment in a country, it is necessary to lay equal emphasis on the software (designs, technical know-how and detailed engineering) and hardware part (precision manufacturing technology).

Recommendation 5: *It is recommended that for the project that has a component of developing local technical capacity for production of sophisticated equipment, at the time of project design emphasis should also be places on the software part of the technology (know-how, detailed engineering, designs etc.) and identification of technology source should be included as one of the activities.*

Generally speaking, the initial set of demonstration / pilot projects to remove the barriers needs to be provided financial support. In the present case, the design of the project did not had any provision for providing financial support to the initial set of demonstration / pilot projects and it totally relied on 100% private sector investment even for the pilot / demonstration projects. This is one of the reasons that the private sector parties, who committed to establish demonstration projects, did not fulfil the commitment.

Recommendation 6:*It is recommended that while designing the projects having a demonstration component, some fiscal incentives should be provided to such demonstration projects.*

The project design has rightly recognized technology gaps and skills as one of the many barriers. To address this barrier, the provisions made in the project design were not adequate. The project design (Outputs 6.1 and 6.2 along with the corresponding activities mentioned in the project document) had tried to address this by capacity building and technical support programs for the: (a) Local manufacturing of wind power generation system components; (b) Design & engineering of wind power generation projects; and, (c) Installation, operation and maintenance of wind power generation facilities. The corresponding activities included, identification of the potential local producers of the components, their needs assessment and capacity building. The critical part which is missing is the identification of the right and most appropriate technology, its source and the ways to infuse it in the country. It needs to be appreciated that the success of the wind power generation facility is dependent on the deployment of the most appropriate design of the turbine (and the control system), given the wind profile of the location and other consideration. This important technology consideration of the design of rotor blades and the connected generator did not get addressed in the project design.

Recommendation7: *For addressing the barriers of technology (particularly in cases where the technology is not locally available), apart from capacity building and training equal emphasis should be given to technology sourcing and the ways to infuse the technology in the local conditions.*

6.2 Actions to follow up or reinforce initial benefits from the project

One of the significant achievement of the project has been uptake of 'large scale grid connected' wind power projects in Indonesia. This could happen because of the support and help provided under the WHyPGen projects in terms of wind resource assessment, identification of potential sites for wind power projects etc. The technical information created under the project was widely disseminated through the dedicated web site.

Recommendation 8*: In order to continue to get the benefits from the data base and the useful technical information, it is recommended to continue availability of information at the website.*

From the view point of policy and regulations one of the issues is that the WHyPGen project has not been able to get approved a feed in tariff policy for wind power projects. Absence of a policy regarding feed in tariff is one issue that may impact the benefits of the WHyPGen project.

Recommendation 9: *It is recommended that the efforts be continued to get the approval for the feed in tariff for wind power projects. This may be perused by the newly created, Wind Association or any other suitable organisation.*

6.3 Proposals for future directions underlining main objectives

The government of Indonesia has launched "Indonesia Terang" (Bright Indonesia) program. Under the program the government is planning to build power generators using new and renewable energies (EBT) to provide electricity for the rural areas / villages using renewable sources of energy. The program is targeted at the villages which are still without electricity(currently, 12,659 of 74,754 villages in Indonesia are still without electricity[34] and 65 percent of them are in six provinces in the eastern parts of Indonesia). The Ministry of Energy and Mineral Resource is prioritizing the development of power infrastructure in six eastern provinces through the "Indonesia Terang" Program. Through this program the government has a target to provide electricity for 10,300 villages by the year 2019 (thereby achieving electrification rate of 97.35 percent for the country). The electricity infrastructure under the program is proposed to be built through different approaches, such as decentralization and island-based infrastructure using (wherever possible) the renewable energy sources. The objectives of 'Indonesia Terang' program are very much in line with one of the objectives of WHyPGen project. Possibilities to collaborate with the Terang Program may be explored.

The Energy and Mineral Resources (ESDM) Ministry in Indonesia, encourages innovations in the energy sector through maximum utilization of renewable energy technologies and energy conservation that directly benefit the people, particularly in the electricity sector. The ministry has a program named **Patriot Energy**, which looks for young people who want to explore renewable energy in remote areas and build a power plant in these areas. Launched in 2005, the program has selected 3,600 applicants and 80 young people for participation in Patriot Energy, which needs persons with technical competence, perseverance, social-mindedness and optimism, and a sincere attitude. There is a possibility to collaborate with the "Patriot Energy Program".

6.4 Best and worst practices in addressing issues relating to relevance, performance and success

The WHyPGen project was to address the issue of availability of sustainable energy to all at one end, while on the other it was to address the issue of pressure on the economy due to the subsidies provided to energy sector. One of the other problems that the WHyPGen project sought to address was the availability of commercial energy in the remote locations that are not connected to the grid.

When it comes to relevance one of the issues is the relative suitability of solar PV and wind as two competing solutions for providing decentralised commercial energy at isolated locations. One of the other issues is that although to appease local energy consumers the government has maintained high energy subsidies, but when it comes to providing fiscal incentives for promotion of renewable energy at these locations, there is a hesitation.

As far as project implementation is concerned, one of the issues was the lack of guidance and involvement from the project board. The board could meet only three times during implementation of the project. Further, there was no follow up action post the board meetings.

[34] Source: News reports

ANNEXA: TERMS OF REFERENCE

Terminal Evaluation Terms of reference

GENERAL INFORMATION

Title: Terminal Evaluation Lead Consultant for Wind Hybrid Power Generation Market DevelopmentInitiative Project (International)
Project Name: Wind Hybrid Power Generation Market Development Initiative (WHyPGen)
Reports to: Programme Manager of Environment Unit
Duty Station: Home based
Expected Places of Travel (if applicable): Bali and Yogyakarta Provinces
Duration of Assignment: May 2016 – June 2016 (30 working days)

REQUIRED DOCUMENTS FROM HIRING UNIT
8 – Senior Specialist

CONFIRMATION OF CATEGORY OF LOCAL CONSULTANT, please select:
(1) Junior Consultant
(2) Support Consultant
(3) Support Specialist
(4) Senior Specialist
(5) Expert/ Advisor

CATEGORY OF INTERNATIONAL CONSULTANT, please select:
(6) Junior Specialist
(7) Specialist
(8) Senior Specialist
X APPROVED e-requisition

REQUIRED DOCUMENTATION FROM CONSULTANT
X CV
X Copy of education certificate
X Completed financial proposal
X Completed technical proposal

Need for presence of IC consultant in office:
X intermittent (deliverables-based)
☐full time/office based (needs justification from the Requesting Unit)

Provision of Support Services:
Office space: Yes, X No
Equipment (laptop, etc.): Yes, X No
Secretarial Services Yes X No
If yes has been checked, indicate here who will be responsible for providing the support services:
Signature of the Budget Owner: Verania Andria <verania.andria@undp.org>

I. **BACKGROUND**

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference, (TOR) sets out the expectations for a Terminal Evaluation (TE) of Wind Hybrid Power Generation Market Development Initiative Project (PIMS 4223).

The essentials of the project to be evaluated are as follows:

PROJECT SUMMARY TABLE

Project Title:	**Wind Hybrid Power Generation Market Development Initiative Project**			
GEF Project ID:	3953		*at endorsement (Million US$)*	*at completion (Million US$)*
UNDP Project ID:	PIMS 4223 Atlas ID 76672	GEF financing:	2,156,200	
Country:	Indonesia	IA/EA own:	150,000	
Region:	Asia-Pacific	Government:	20,834,600	
Focal Area:	Climate Change	Other:	16,500,000	
FA Objectives, (OP/SP):		Total co-financing:	37,484,600	
Executing Agency:		Total Project Cost:	39,640,800	
Other Partners involved:		ProDoc Signature (date project began):		2 August 2012
		(Operational) Closing Date:	Proposed:	Actual:

Wind Hybrid Power Generation Market Development Initiative (WHyPGen) project is a 4 years nationally implemented project with USD 2,156,000 funding support from Global Environment Facility (GEF) through UNDP since 2012. The Center for Energy Conservation Technology (B2TKE) at the Agency for Technology Assessment and Application (BPPT) is the project implementing partner. The WHyPGen 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 focuses on promotion, development and facilitation for the commercialization of cost-effective gridconnected wind hybrid power generation. The project is comprised of several barrier removal activities which would substantially reduce any risk in the adoption of WHyPGen technology.

Ministry of Energy & Mineral Resources estimates a total potential of 448 MW of wind power generation in areas with best wind conditions such as in the south coastal areas of South Sulawesi and Nusa Tenggara. Previous studies by the US National Renewable Energy Laboratory (NREL) shows excellent potential for wind power generation in the country at areas near 9o to 10o S latitude. Wind speeds in these areas range from 6.3 – 10.1 m/s and a stand-alone wind power density of 300 –1,000 W/m2 at 30 m altitude. The ASEAN Center for Energy estimates this at 480 MW for 3 – 5 m/s wind speeds. Despite of high wind power potential, the electricity generation in Indonesia is highly depending on fossil fuel.

In order to remove the barriers to the sustainable investment of wind power generation, the WHyPGen project (2012 2016) implement six Component Activities:

1. WHyPGen technology Application Assessment
2. WHyPGen Technology Demonstration
3. Financing WHyPGen Initiatives
4. Policy and Institutional Support for WHyPGen initiatives

5. WHyPGen Promotion
6. WHyPGen Market Development and Industry support

In line with the UNDP-GEF Guidance on Terminal Evaluation (TE), a Lead International Consultant will be recruited to conduct Terminal Evaluation for SPARC project. The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

II. **SCOPE OF WORK, ACTIVITIES, AND DELIVERABLES**

Scope of Work

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects. The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

a) **Evaluation criteria and ratings**: An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework, which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluator will at a minimum cover the criteria of **relevance, effectiveness, efficiency, sustainability, and impact**. Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales can be seen in Annex D.

Evaluation Ratings:			
1. Monitoring and Evaluation	***rating***	**2. Implementing Agency (IA) & Executing Agency (EA) Execution**	***rating***
M&E design at entry		Quality of UNDP Implementation	
M&E Plan Implementation		Quality of Execution - Executing Agency	
Overall quality of M&E		Overall quality of Implementation / Execution	
3. Assessment of Outcomes	**rating**	**4. Sustainability**	**rating**
Relevance		Financial resources:	
Effectiveness		Socio-political:	
Efficiency		Institutional framework and governance:	
Overall Project Outcome Rating		Environmental :	
		Overall likelihood of sustainability:	

b) **Provide evidence based information** that is credible, reliable and useful. The evaluator will review all relevant sourcesof information, such as the project document, project reports – including Annual APR/PIR, project budget revisions,midterm review, progress reports, GEF focal area tracking tools, project files, national strategic and legal documents,and any other materials that the evaluator considers useful for this evidence-based assessment.

c) **Project Finance/Co-finance:** The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recentfinancial audits, as available, should be taken into consideration. The evaluator

will receive assistance from the CountryOffice and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US$)		Government (mill. US$)		Partner Agencies (mill. US$)		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants (GEF)								
Loans/ Concessions								
In-kind support								
Pvt. Sector (Demo Projects)								
Totals								

d) **Mainstreaming**: UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention andrecovery from natural disasters, and gender.

e) **Impact:** The evaluators will assess the extent to which the project is achieving impacts or progressing towards theachievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.

f) **Conclusion, recommendations** & **lessons**: the evaluation report must include a chapter providing a set of **conclusions**, **recommendations** and **lessons**.

g) **Implementation Arrangements**: The principal responsibility for managing this evaluation resides with the UNDP CO inIndonesia. UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangementswithin the country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the government, etc.

h) **Visit WHyPGen project locations** in Nusa Penida (Bali Provinces) and Baron Technology Park (Yogyakarta Provinces).

i) **Application of a collaborative and participatory approach**2 ensuring close engagement with the Project Team,government counterparts (the GEF Operational Focal Point), the UNDP Country Office(s), UNDP-GEF Regional TechnicalAdvisers, and other key stakeholders.

Expected Deliverables

Deliverables/ Outputs	Target Due Dates	Review and Approval Required
Inception Report	18 May 2016 (4 days)	
TE evaluator clarifies objectives, methods and timeframe of Terminal Evaluation		UNDP Country Office Indonesia, Programme Manager and UNDP Regional Technical Advisor
Presentation of initial findings Based on field mission, meetings and interviews	06 June 2016 (10 days)	
Final Report* Based on revised Draft report with audit trail detailing how all received comments have	30 June 2016 (16 days)	

been addressed.		

*When submitting the final evaluation report, the evaluator is required also to provide an "audit trail", detailing how
all received comments have (and have not) been addressed in the final evaluation report.

III. **WORKING ARRANGEMENTS**

Institutional Arrangement

a. The principal responsibility for managing this TE resides with the Commissioning Unit. TheCommissioning Unit for this project's TE is *UNDP Indonesia.*
b. The commissioning unit will contract the consultant(s) and ensure the timely provision of per diems andtravel arrangements within the country for the TE evaluator.
c. The WHyPGen Project Team will be responsible for liaising with the TE team to provide all relevant administrative and financial support to provide documents, set up stakeholder interviews, and arrange field visits as required for the completion of the work.
d. The expected frequency of the reporting is as stated in the Expected Deliverables mentioned above.

Duration of the Work

a) The duration of work is 30 days from May to June 2016.
b) The expected starting date is 13th May 2016 with expectation of completion on 30th June 2016.
c) The unforeseen delay will be further discussed by UNDP as basis for possible extension.
d) The feedback from UNDP and government partners to the submitted report can be expected within 10 working days from the date of submission.

Duty Station

a) The contractor's duty station will be home-based with possibility of travel to Jakarta, Bali and Yogyakarta province during field visit to project sites.
b) The consultant is working on the output-based, thus no necessity to report or present regularly.

Travel Plan

a) The return travel cost from country of origin to Jakarta is to be included in the financial proposal.
b) Travel cost (ticket and daily allowance) to project sites in Bali and Yogyakarta will be covered by theproject separately from the contract, based on agreed plan and following UNDP's standard. Theduration of field mission to project sites will be 10 days.

IV. **REQUIREMENTS FOR EXPERIENCE AND QUALIFICATIONS**

Academic Qualifications:
A Master's degree in engineering, environmental science, social science, economics

Years of experience:

- Experience in relevant technical areas for at least 15 years;
- Experience working in renewable energy projects and in Asia Pacific countries would be an advantage butnot mandatory;
- Experience with result-based management evaluation methodologies;
- Experience applying SMART indicators and reconstructing or validating baseline scenarios;

- Experience working with the GEF or GEF-evaluations would be an advantage but not mandatory;

III. Competencies and special skills requirement:

- Competence in renewable energy projects management/application.
- Demonstrate understanding of issues related to gender and climate change mitigation; experience in gendersensitive evaluation and analysis.
- Excellent communication skills;
- Demonstrate analytical skills;
- Project evaluation/review experiences within United Nations system will be considered an asset.

V. **EVELUATION METHOD AND CRITERIA**

Cumulative analysis
When using this weighted scoring method, the award of the contract should be made to the individual consultant whose offer has been evaluated and determined as:
a) responsive/compliant/acceptable, and
b) Having received the highest score out of a pre-determined set of weighted technical and financial criteria specific to the solicitation.

- Technical Criteria weight; 70%
- Financial Criteria weight; 30%

Only candidates obtaining a minimum of **70 point** would be considered for the Financial Evaluation

Criteria Weight MaximumPoint

Technical

Criteria A: qualification requirements as per TOR:	**40%**
1. A Master's degree in engineering, environmental science, social science,economics.	10
2. Experience in relevant technical areas for at least 15 years;	10
3. Experience working in renewable energy projects in Asia Pacificcountries	10
4. Experience with result-based management evaluation methodologiesand experience working with the GEF or GEF-evaluations, an advantagebut not mandatory	5
5. Experience applying SMART indicators and reconstructing or validatingbaseline scenarios;	5
Criteria B: Brief Description of Approach to Assignment	**60%**
1. Understands the task and applies a methodology appropriatefor the task?	25
2. Important aspects of the task addressed clearly and insufficient detail?	20
3. Is planning logical, realistic for efficient projectimplementation?	15

Criteria C: Further Assessment by Interview (if any) N/A

VI. **EVALUATOR ETHICS**

Evaluation consultants will be held to the highest ethical standards and are required to sign a Codeof Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted inaccordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluations'

ANNEX B: TERMINAL EVALUATION CRITERIA AND THE QUESTIONS

Before undertaking the Terminal Evaluation, an Inception Report was presented, including the proposed tasks, activities and deliverables, as well as a table of main evaluation questions that need to be answered to determine and assess project results. This table of evaluation/review criteria and questions is presented in the Box below.

Contents	Main questions and Terminal Evaluation Scope
3. Findings: Project design and formulation	
3.1 Analysis of LFA/Results Framework 3.2 Assumptions and Risks 3.3 Lessons from other relevant projects 3.4 Planned stakeholder participation 3.5 Replication approach 3.6 UNDP comparative advantage 3.7 Linkages between project and other interventions within the sector 3.8 Management arrangements	• Were the project's objectives and components clear, practicable and feasible within its time frame? • Were the capacities of the executing institution(s) and its counterparts properly considered when the project was designed? • Were lessons from other relevant projects properly incorporated in the project design? • Were the partnership arrangements properly identified and roles and responsibilities negotiated prior to project approval? • Were counterpart resources (funding, staff, and facilities), enabling legislation, and adequate project management arrangements in place at project entry? • Were the project assumptions and risks well articulated in the PIF and project document? • Whether the planned outcomes were "Smart"?
4. Findings: Project Implementation	
4.1 Adaptive management Feedback from M&E activities used for adaptive management	• Did the project undergo significant changes as a result of recommendations from the mid-term review? Or as a result of other review procedures? Explain the process and implications. • If the changes were extensive, did they materially change the expected project outcomes? • Were the project changes articulated in writing and then considered and approved by the project steering committee? • Whether feedback from M&E activities was used for adaptive management? • Whether changes were made to project implementation as a result of MTR recommendations?
4.2 Partnership arrangements	• Were there adequate provisions in the project design for consultation with stakeholder? • Whether effective partnerships arrangements were established for implementation of the project with relevant stakeholders involved in the country/region, including the formation of a Project Board?
4.3 Project Finance	• Whether there was sufficient clarity in the reported co-financing to substantiate in-kind and cash co-financing from all listed sources. • What are the reasons for differences in the level of expected and actual co-financing? • To what extent project components supported by external funders were well integrated into the overall project? • What is the effect on project outcomes and/or sustainability from the extent of materialization of co-financing? • Whether there is evidence of additional, leveraged resources that have been committed as a result of the project?

Contents	Main questions and Terminal Evaluation Scope
4.4 Monitoring and evaluation: design	• Is the M&E plan well conceived at the design stage? • Is M&E plan articulated sufficient to monitor results and track progress toward achieving objectives? • Was the M&E plan sufficiently budgeted and funded during project preparation and implementation? • How effective are the monitoring indicators from the project document for measuring progress and performance?
4.5 Monitoring and evaluation: implementation	• Whether the logical framework was used during implementation as a management and M&E tool? • What has been the level of compliance with the progress and financial reporting requirements/ schedule, including quality and timeliness of reports? • What has been effectiveness of the monitoring reports and evidence that these were discussed with stakeholders and project staff? • What is the extent to which follow-up actions, and/ or adaptive management, were taken in response to monitoring reports (APR/PIRs)? • Whether APR/PIR self-evaluation ratings were consistent with the MTR and TE findings. If not, were these discrepancies identified by the project steering committee and addressed?
4.6 UNDP and Implementing Partner implementation / execution coordination, and operational issues	• Whether there was an appropriate focus on results • Was there adequate UNDP support to the Implementing Partner and project team? • Quality and timeliness of technical support to the Executing Agency and project team • Were the management inputs and processes, including budgeting and procurement adequate?
5. Findings: Project Results	
5.1 Overall results	• What has been the achievement of the objectives against the end of the project values of the log-frame indicators for outcomes/outputs, indicating baseline situation and target levels, as well as position at the close of the project? • What is the achievements /Results in terms of contribution to sustainable development benefits, as well as global environmental benefits (direct and indirect GHG emission reduction)? • How does GEF the Tracking Tool at the Baseline and the one completed right before the Midterm Review with that Prepared at the time of Terminal Evaluation compare? • What are the possible issues with employing WHyPGen systems?
5.2 Relevance	• To what extent the activity is suited to local and national development priorities and organizational policies, including changes over time? • To what extent the project is in line with UNDP Operational Programs or the strategic priorities under which the project was funded?
5.3 Effectiveness & Efficiency	• To what extent the objectives has been achieved? • To what extent the results have been delivered with the least costly resources possible? • What are the positive and negative, foreseen and unforeseen changes to and effects produced by a development intervention?
5.4 Country ownership	

Contents	Main questions and Terminal Evaluation Scope
5.5 Mainstreaming	• Was the project concept in line with development priorities and plans of the country (or countries)? • Were the relevant country representatives from government and civil society involved in project implementation, including as part of the project steering committee? • Was an intergovernmental committee given responsibility to liaise with the project team, recognizing that more than one ministry should be involved? • Have the government(s), enacted legislation, and/or developed policies and regulations in line with the project's objectives?
5.6 Sustainability	• How the project is successfully mainstreaming other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and women's empowerment. • Whether it is possible to identify and define positive or negative effects of the project on local populations (e.g. income generation/job creation, improved natural resource management arrangements with local groups, improvement in policy frameworks for resource allocation and distribution, regeneration of natural resources for long term sustainability). • If the project objectives conform to agreed priorities in the UNDP country programme document (CPD) and country programme action plan (CPAP). • Whether there is evidence that the project outcomes have contributed to better preparations to cope with natural disasters. • Whether gender issues had been taken into account in project design and implementation and in what way has the project contributed to greater consideration of gender aspects, (i.e. project team composition, gender-related aspects of pollution impacts, stakeholder outreach to women's groups, etc.) ***<u>Financial risks:</u>*** • Are there financial risks that may jeopardize the sustainability of project outcomes? • What is the likelihood of financial and economic resources not being available once GEF grant assistance ends? ***<u>Socio-economic risks:</u>*** • Are there social or political risks that may threaten the sustainability of project outcomes? • What is the risk for instance that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? • Do the various key stakeholders see that it is in their interest that project benefits continue to flow? • Is there sufficient public/stakeholder awareness in support of the project's long-term objectives? ***<u>Institutional framework and governance risks:</u>*** • Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? • Are requisite systems for accountability and transparency, and required technical knowhow, in place? ***<u>Environmental risks:</u>*** • Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes?
5.7 Impacts	

Contents	Main questions and Terminal Evaluation Scope
	• Whether, the project has demonstrated verifiable improvements in ecological status? • Whether, the project has demonstrated verifiable reductions in stress on ecological systems through specified process indicators, that progress is being made towards achievement of stress reduction and/or ecological improvement?
6. Findings: Conclusions, Recommendations & Lessons	
6.1 Corrective actions for the design, implementation, monitoring and evaluation of the project 6.2 Actions to follow up or reinforce initial benefits from the project 6.3 Proposals for future directions underlining main objectives 6.4 Best and worst practices in addressing issues relating to relevance, performance andsuccess	***CONCLUSIONS*** • Did the project provide cost-effective solutions in order to address barriers? • Are these solutions provided in an efficient way? • What are the best and worst practices in addressing issues relating to relevance, performance and success? ***RECOMENDATIONS*** • Corrective actions for the design, implementation, monitoring and evaluation of the project • Actions to follow up or reinforce initial benefits from the project • Proposals for future directions underlining main objectives

ANNEX C: DOCUMENTS REVIEWED

Project Documents

- Project Identification Form (PIF) (June 2009)
- Project Preparation Grant (PPG) (June 2009)
- Project Document (August 2012)
- Project Inception Report (November 2012)
- Project Brochure (2014)
- UNDP- Indonesia: Country Programme Action Plan (CPAP) 2011 – 2015
- UNDP: WHyPGen Project Result Sheet
- Mid Term Review Report
- Management Response to Mid Term Review Report

Periodic Plans and Reports

- Project Implementation Report (PIR) (2014, 2015, 2015)
- Annual Work Plans (2012, 2013, 2014, 2015, 2016)
- Quarterly Monitoring Reports (2012: Q4; 2013: Q1, Q2, Q3, Q4; 2014: Q1, Q2, Q3, Q4; 2015: Q1, Q2, Q3, Q4; 2016: Q1, Q2)
- Minutes of Meetings, Project Board (Dec 2012, Dec 2013, Jan 2015)
- Combined Delivery Reports (CDR) (2012, 2013, 2014, 2015, 2016)
- Audit Report (2013)

Outputs of the the Project

- Report on Wind Resource Assessment
- Feasibility Study for Wind-Solar Hybrid Power Plant at Village Sub Coating, Karimata District, West Kalimantan Province
- Feasibility Study of 68 MW Wind Power Plant, Lebak, Banten, Indonesia, Prepared by PT SMI
- Report on Capabilities of Local Manufacturers of Wind Power Plant Components (2015)
- Projections of electricity in Indonesia relating to Wind Energy
- Project Teaser for Leipori Wind Farm (750 KW) prepared for PT Pertamina (Persero) by SMI
- Feasibility Study of 750 KW Wind Power Plant at Leipori, East Nusa Tenggara
- Report on 'Training for Trainers on Wind Power Systems
- Report on "Training for Trainers", Upgrading the knowledge and skill on Wind Energy Technologies to engineering school teachers (October-November 2014)

Collaboration with Partners

- Agreement between Directorate General of New Energy, Renewable and Energy Conservation, Ministry of Energy and Mineral Resources and PACE Energy Private Limited, regarding Cooperation in the field of development of Power Plant in Malingping, Bayu, district Lebak, Banten province
- Agreement between 'Agency for Assessment o Technology Application and PLN for assessment and use of technology application of new renewable energy sources and technology in the field of electricity generation
- Agreement between WHyPGen project and PLN, Bali regarding Utilisation and Technology Cooperation on Wind Turbine Hybrid at Nusa Penida
- Agreement between WHyPGen Project and PLN (Persero) for Technical Assistance for Cooperation for 50 MW Power project at Samas

- Memorandum of Understanding between BPPT and UPC Renewables on Road Map to Manufacture and Develop Wind Farms with 1000 MW Capacity

Other Documents and Sites

- WHyPGen Website (www.**whypgen**-bppt.com)
- WHyPGen Video Profile of the Project on You Tube (https://www.youtube.com/watch?v=8d3mb7xb164)
- Draft Feed in Tariff policy for wind power project
- Presentation on TERANG Program in Indonesia to Electrify Rural Villages using Renewable Energy
- Presentation on Support Tariff for Wind Power Projects, Stakeholder Consultation Meeting, November 2014
- Samples of Back to Office Reports

ANNEX D: FIELD VISITS AND LIST OF PEOPLE INTERVIEWED

Date	Meeting with	Persons Meet
01 Aug 2016	Meeting with UNDP CO, Person Responsible for WHyPGen Project (at BPPT office)	• Mr. Lulu M, Technical Analyst • Mr.Hery Desha, Prog. Associate
	Meeting with PMU and the project team (at BPPT office)	• Dr. Sorripno Martosaputra, Project Manager • Ms. Nila Murti, Consultant • Mr. Budi Prasetyo, Consultant • Mr. Didik Eko, Finance Associate • Mr. Joko Wardoyo, Office Support
	Terminal Evaluation – kick off meeting and briefing (at BPPT Office)	• Dr Andhika Prastawa, BPPT (National Project Director) • Mr. Abdui Rosysi, BPPT (Dy. National Project Director) • Ms. Nila Murti, Consultant, WHyPGen Project • Dr. Sorripno Martosaputra, Project Manager • Mr., Finance Associate, WHyPGen Project • Mr. Hery Desha, Prog. Associate, UNDP • Mr. Lulu M, Technical Analyst, UNDP • Mr. Budi Prasetyo, Consultant, WHyPGen Project
02 Aug 2016	Meeting with Project Team	• Dr. Sorripno Martosaputra, Project Manager • Mr. Didik Eko, Finance Associate
	Meeting with Indonesia Wind Energy Association	• Mr. Ifnaldi Sikumbank, General Secretary • Mr. Agung Hermawan, Chariman
	Meeting with PT. Rancang Bangun Putra Nusan Tara (Promoter of wind power project in Indonesia)	• Mr. Agung Hermawan, Director
	Director General of New and Renewable Energy and Energy Conservation, Ministry of Mines and Mineral Resources	• Ms. Maritje Hutapea, Director
03 Aug 2016	PACE Energy	• Mr. Michael Vawser, CEO • Mr. Kam Ho, COO
	UPC Renewable (on Skype)	• Mr. Cris Caffyn, VP
04 Aug 2016	WHyPGen Project Office	
	PT PLN (persero)(Perusahaan Listrik Negara, State Electricity Company)	• Mr. Budi, Dy Director
	PT. SMI	
	PT. Citrakaton Dwidayalestari	• Mr. Mulyadi Rahardjo
05 Aug 2016	Travel Jakarta to Bandung	
	Meeting with P4TKBMTI - Bandung	• Mr. Wanto, Civil Trainer • Mr. Niamul Huda, Mechanical Engineer
	Travel from Bandung to Jakarta	
06 Aug 2016 (Sat) 07 Aug 2016 (Sun)	**Data Compilation and analysis**	
08 Aug 2016	Travel to Bali	
	Meeting with PLN Bali	Mr. Didi Kurniawan
09 Aug 2016	Travel from Bali to Nusa Penida	
	Meeting with PLN Nusa Penida	Mr. Dewa Gade Jimi Sanjaya
	Site Visit to Hybrid System Power Generation - Nusa Penida Bali	
	Travel from Nusa Penida to Bali	
10 Aug 2016	Travel from Bali to Jakarta	
11 Aug 2016	Data compilation, review and analysis, preparation of presentation for debriefing	

12 Aug 2016	Data compilation, review and analysis, preparation of debriefing presentation	
	Debriefing Meeting: Presentation of Initial Findings	• Dr Andhika Prastawa, BPPT (National Project Director) • Ms. Nila Murti, Consultant, WHyPGen Project • Dr. Sorripno Martosaputra, Project Manager • Mr. Didik Eko, Finance Associate, WHyPGen Project • Mr. Djatmiko Adi, B2TKE • Mr. OO Abdul R, B2TKE • Mr. Mam Oktaufik, B2TKE
	Closure of the mission	

ANNEX E: SIGNED UNEG CODE OF CONDUCT FORMS

Evaluators/reviewers:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimise demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrong doing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation/reviewer Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Dinesh Aggarwal

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at: New Delhi

Signature: 

ANNEX F: TE REPORT AUDIT TRAIL

To the comments were received on 23 October 2016 on the draft report on 'Terminal Evaluation' of "Wind Hybrid Power Generation Market Development Initiative Project", Indonesia

The following comments were provided in track changes to the draft Terminal Evaluation Report; they are referenced by institution ("Author" column) and track change comment number ("#" column):

#	Author	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken
			There was no comment on the draft report. Except for the request to do the required spell check, editing and formatting.	The required corrective actions taken

ANNEX G: EVALUATION REPORT CLEARANCE FORM

Evaluation Report Reviewed and Cleared by

UNDP Country Office

Name: _____

Signature: _____ Date: _____

UNDP GEF RTA

Name: _____

Signature: _____ Date: _____