**Mid-Term Evaluation of the UNDP/GEF project:**

***“Indonesia: Wind Hybrid Power Generation and Market Development Initiative (WHyPGen)”*** *(PIMS 4223; GEF 3953)*

**REPORT**

**Submitted to UNDP Indonesia**

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|  |  |
| --- | --- |
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Disclaimer

*Please note that the analysis and recommendations of this report do not necessarily reflect the views of the United Nations Development Programme, its Executive Board or the United Nations Member States. This publication reflects the views of its authors.*

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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, Klimatologi dan Geofisika* (Agency for Meteorological, Climatology, and Geophysics)

BOOT Build, own, operate, transfer

BPPT *Badan Pengkajian dan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)

B2TE *Balai Besar Teknologi Energi* (Center for Energy Technology)

CO2 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, Terbarukan dan Konservasi Energi* (Directorate General for New Energy, Renewable Energy and Energy Conservation)

EE Energy Efficiency

EPC engineering, procurement and construction

ESCO energy service provider

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 Teknologi Sepuluh November* (10th November Institute of Technology)

IWA Indonesia Wind Association

IWES Indonesia Wind Energy Society

JI Joint Implementation

KESDM *Kementerian Energi dan Suber Daya Mineral* (Ministry of Minerals and Energy Resources)

km kilometre

KPDT Ministry of Disadvantage Region

kW kilowatt

kWh kilowatt-hour

LAPAN *Lembaga Penerbangan dan Antariksa Nasional* (National Institute of Aeronautics and Space)

LIPI *Lembaga Ilmu 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 *Penyaluran dan Pusat Pengatur Beban* (Distribution and Load Control)

PB Project Board

PLN *Perusahaan Listrik Negara* (State Electricity Company)

PMU Project Management Unit

PPA Power Purchase Agreement

Prodoc Project Document

P4TKBMTI *Pusat Pengembangan dan Pemberdayaan Pendidik dan Tenaga Kependidikan Bidang Mesin 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 Gadjah Mada* (Gadjah Mada 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

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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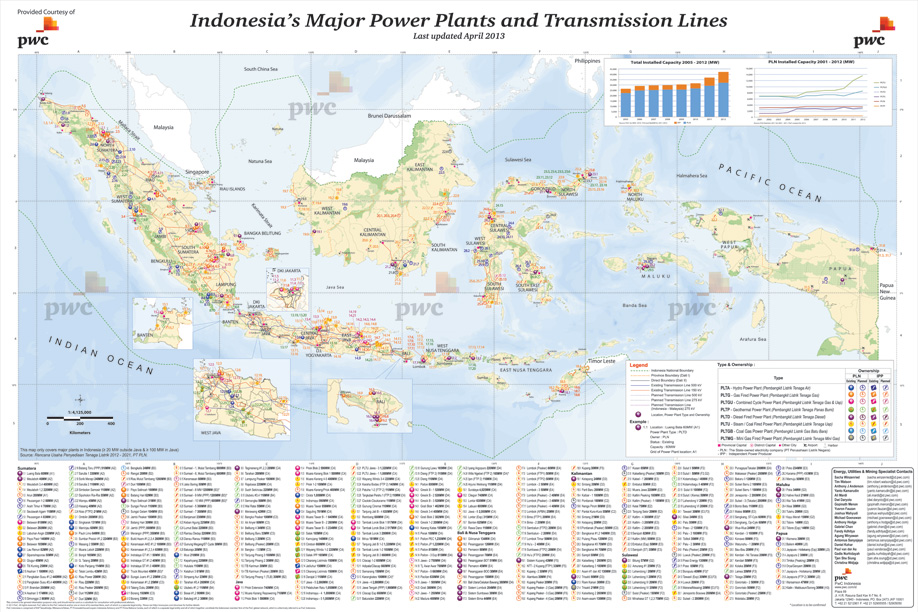
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The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations



Source: <http://www.pwc.com/id/en/publications/indonesian-power-map.jhtml>

# EXECUTIVE SUMMARY

**Project information table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Title:** | **Wind Hybrid Power Generation (WHyPGen) Marketing Development Initiatives** | | | |
| GEF Project ID: | 3953 |  | *Committed at endorsement (USD Million)* | *Realized co-financing / spent GEF budget at midterm review (USD 106)* |
| UNDP Project ID: | 4223 | GEF financing: | 2.1562 | 2.1562 |
| Country: | Indonesia | IA/EA own: | 0.15 | 0.075 |
| Region: | South East Asia | Government: | 1.3346 | 0.883 |
| Focal Area: | Climate Change | Others (private): | 36.00 | 3.321 |
| FA Objectives, (OP/SP): | CCM-3: Promote investment in renewable energy technologies (GEF-5) | Total co-financing: | 37.4846 | 4.279 |
| Executing Agency: | UNDP | Total Project Cost: | 39.6408 | 6.4352 |
| Other Partners involved: | BPPT | GEF endorsement: Feb 2012 | | ProDoc Signature (date project began): Aug 2012 |
| (Operational) Closing Date: | Feb 2015 | Proposed in MTR:  Julne 2016 |

**Introduction and brief description of the project**

The country’s estimates a total potential of 450 MW of wind power generation in areas with best wind conditions (3-5 m/s) such as in the south coastal areas of South Sulawesi and Nusa Tenggara. To date, wind energy still has insignificant contribution to the national energy mix. Only 1.6-2 MW worth of wind power installations have been developed countrywide, and most of it still for research purposes and/or concentrating on stand-alone or mini-grid electricity production in rural and remote areas. The largest wind power generation facility was installed during 2005-2007 at Nusa Penida-Bali, with the total wind power capacity of 735 kW in a hybrid configuration with existing diesel generators with a peak load of 1.2 MW. The facility consists of 9 turbines, of which 3 owned by the state power utility PLN (85 kW each) and 6 by the Ministry of Minerals and Energy Resources (MEMR) (80 kW each). Due to hardware failure, damage to rotor blades, and breakdown of individual control systems, the wind farm has been out of order, unfortunately.

There has been no substantial experience in the design, installation and operation of larger wind power generation facilities (> 1 MW). In order to remove the barriers to the sustainable investment of wind power generation, the WHyPGen project (2012-2015) was initiated with funding support from the Global Environment Facility (GEF) and UNDP (United Nations Development Programme) and implemented by the Center for Energy Technology (B2TE) at the Agency for the Assessment and Application of Technology (BPPT). The project aims to promote the adoption of Wind Hybrid Power Generation (hence the acronym WHyPGen) technology through the “facilitation of commercial on-grid WHyPGen systems for environmentally sustainable electricity supply in Indonesia” through government and private sector cooperation, in which “WhyPGen” is broadly defined as any wind turbine connected to the national grid system or smaller grid system. The project is comprised of several barrier-removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. It was designed to facilitate close coordination and consultation of the relevant stakeholders in each of the project components:

1. WHyPGen Technology Application Assessments;
2. WHyPGen Technology Demonstration;
3. Financing of WHyPGen Initiatives;
4. Policy & Institutional Support for WHyPGen Initiatives;
5. WHyPGen Promotion;
6. WHyPGen Market Development and Industry Support.

The project has been designed as a full-sized project with GEF financing of USD 2,156,200 (of which USD 170,000 for project management cost) and co-financing of USD 37,484,600, consisting of in-kind contrubution by government and UNDP of USD 1,484,600 and cash contribution by the private sector associated with investment in site preparation and wind farm construction (USD 36,000,000). After signing the project document in February 2012, planned for April 2012, implementation started with delay in October 2012 for a period up to March 2015.

**Project progress summary and MTR ratings**

The main **findings** of the mid-term review is that the overall impression of the project is marginally satisfactory, of which the justification for such a rating[[1]](#footnote-1) is discussed below.

**Results / project effectiveness**

|  |  |
| --- | --- |
| **Attainments of outcomes** | **Rating** |
| *Component 1 WHyPGen Technology Application Assessments*  The project has been most successful in carrying out the wind resource assessments at 19 locations, site assessments and evaluations as well as 10 feasibility analyses of wind energy projects. In addition, an assessment has been made of the capabilities of 15 local companies to produce spare parts and equipment for wind turbines | HS |
| *Component 2 WHyPGen Technology Demonstration*  The lack of success stories on wind power generation in Indonesia is a critical risk and having a success story is crucial in attracting future investors. The project has been supporting project development in a two-pronged way:   * Assist PLN and MEMR in assessment of rehabilitation options of the Nusa Penida wind farm; the Project might support required safety, equipment protection, and system controls needed to switch automatically when transitioning between Islanded and grid-connected modes; * Support the establishment of the first commercially grid-connected wind turbine. The Project has provided independent advice and info to PLN and commercial developers (such as UPC Renewables-Binatek; Viron Energy, Medco, Bakrie) in their negotiations to conclude a future purchase power agreement (PPA). The PPA negotiations for the first wind farm, 50 MW at Samas, is expected to be successfully concluded in the 4th quarter of 2014 | S |
| *Component 3 Financing of WHyPGen Initiatives*  Some trainings have been provided on bankable proposal and business plan development. The project has allocated some grant money (USD 300,000) to the state financial institution SMI, supposed to be leveraged to USD 3 million by SMI, as an example of a credit line. However, the amount is too small for the medium-sized and large wind farms (10 MW and above), while the larger investors/developers can organize their own financial resources. Smaller developers (1-10 MW) have not come on board yet without the existence of a favourable feed-in tariff. In general, the component suffers from a lack of focus on the needs of financial support by investors/developers in the various market segments (large > 50 MW, medium (10-50), small-medium (1-10) and small grid system developers (< 1 MW). Banks are generally interested in larger wind farms (> 50 MW), while it is the smaller investors that need the finance as these may not have sufficient equity to invest in wind energy projects. An analysis is needed on financing needs and options of the various actors and green funding available for the various market segments. | U |
| *Component 4 Policy & Institutional Support for WHyPGen Initiatives*  Large investors negotiate the sales business-to-business with PLN. A feed-in tariff proposal has been submitted to the MEMR that, if approved, will become the reference for PLN and medium-sized project developers in the negotiation process. This is crucial as cost per kWh of smaller farms will be higher than of large wind farms due to economics of scale reasons. | S |
| *Component 5 WHyPGen Promotion*  The WHyPGen Project has supported the promotion of grid-connected wind and the wind potential in Indonesia by conducting seminars, workshop, participating in exhibition and one-on-one meetings with some of the relevant stakeholders. The project also has its own website [www.whypgen-bppt.com](http://www.whypgen-bppt.com). | S |
| *Component 6 WHyPGen Market Development and Industry Support*  The disappointing Nusa Penida experience may relate to the lack of qualified operators and engineers in the wind power sector. WHyPGen Project plans to conduct training for the operation and maintenance staff as well as strengthening/expanding the curricula of five technology institutes that are involved in renewable energy as well as the vocational training centre P4TKBMTI. Some training has been provided to Nusa Penida staff, designed to improve their knowledge and skill of day-to-day operational basis of a wind power generation, simple maintenance and troubleshooting. Apart from the above, no training has been offered and the Component would benefit from a good assessment of technical capacity building needs of various actors (developers, equipment suppliers, consultants and engineers, system operators and mechanics) in the various wind power market clusters (large, medium, small-medium and small sized)  Contacts have been established with MEMR to strengthen the planned ‘clearinghouse’ for sustainable energy, which will be established with support of the Danish-funded ESP3 project. | MU |
| Overall rating, Progress towards results | MS |

The project objective in terms of emission reduction is related to installed capacity of 9.4 MW and associated emission reduction and an expected replication/scaling up impact of 100 MW. So far, the Nusa Penida wind hybrid system is not functioning (0.735 MW), while no other demo or pilot project has been implemented yet. Fortunately, in addition to government-led projects such as Nusa Penida, commercial developers are appearing in Indonesia. The likely outcome at the project’s end is that either a) 0 MW has been installed, because the wind farms are still under negotiation, rehabilitation or construction, or b) 50 MW will be operational if the first wind farm at Samas will be commissioned. Based on the feasibility studies supported by the WHyPGen project and the interest shown so far by commercial developers, the replication potential could surpass 400 MW.

**Conclusions**

Project design and formulation

The target set for demonstration and replication/scaling up seems to be based focussing on the particular market segment of small-medium scale 0.5-10 MW wind facilities; i.e. 9.4 MW based on the installed capacity of three 3 MW-sized wind facilities. The logic reasoning behind that project seems that with an appropriate feed-in tariff; a financial mechanism to provide soft loans to developers, this market segment will be encouraged to have a these wind facilities developed within the 3-year timeframe of the project. This is clearly wishful thinking. As happened in other countries as well, the most likely first candidates appear to be large wind farms whose developers can profit from better economics of scale (and generate power at lower cost per kWh) and have access to large investors with sufficient financial muscle. Smaller developers will be encouraged once the first pioneers have showcased the first functioning wind farms and that is likely to be *after* the short 3-year period of the project, and only when a feed-in tariff has been formulated. Even if a small-medium wind farm of the size 1-10 MW would be established, the project period would be too short for the demo component to have results in terms of installed capacity. The period needed from site assessment, feasibility analysis, negotiation, financial closure and construction and commissioning can easily take 2-3 years, so it is not likely that any new wind farm would become operational in Indonesia in the short timeframe of the WhyPGen project (3 years and planned to be operationally closed by Feb/March 2015).

Given the shift in focus in beneficiary market segment, some outputs and activities need to be re-assessed and their corresponding progress indicators need to be reformulated. Already the first Project Implementation Review has a revised list of indicators and the MTR Team is suggesting to revise this list of indicators even further, basically by a) adding indicators that give a more precise picture of the state of development of various wind power initiatives and b) condensing the long list of indicators associated with the Components 5 and 6 of the project corresponding to changes in expected outcomes of these Components.

A major drawback in the project document therefore is that it suggests lowering a range of barriers in a timeframe which seems way too short and serving a range of beneficiaries market clusters (large developers, medium developers; institutional developers, rural electrification) without explicitly mentioning them and without properly identifying the capacity strengthening needs of each market cluster. Regarding these market clusters or (segments), throughout the cycle of preparation, inception and implementation of WhyPGen, the main target beneficiaries have shifted from small to medium-scale to medium-large and large developers/investors without being accompanied by re-assessment of the barriers each market cluster faces and the need for WHyPgen support. The mid-term reviewers suggest a rating of marginally unsatisfactory.

On relevance, the MTR team notices that as such the WHyPGen is coming at the right time in terms government commitment. Indonesia’s policy-makers have set targets for renewable energy and wind power (by 2025) and the country has experience with independent power producers (IPPs) in the energy sector. Feed-in tariffs, for example, have already been introduced for a number of renewable energy technologies, so potentially being able to offer IPPs secure payments at acceptable rates of return.

Project implementation

The project started only after delay in October 2012, but nonetheless the Project Team has had some significant results up to now, notably in the first Components as well as in Component 4 (feed-in tariffs). In terms of adaptive management, the Team rightly has shifted focussing on market clusters that are most crucial and promising in getting the first wind farms in Indonesia operational, i.e. large commercial (> 10-50 MW scale) market segment. In coordination with the UNDP Country Office and the Project Board, the PMU has provided effectively periodic oversight in implementation by means of overviews of inputs, realistic work schedules and informative results according to the reportorial requirements of UNDP and GEF. On stakeholder relations, the Project has been advancing most in Component 1 and has successfully analysed, gathered and disseminated information on wind resources and potential wind power sites to various stakeholders from the Government and related agencies (Ministries, PLN) as well as to potential wind project developers. Information on the project’s activities has been conveyed through seminars and workshops, brochures, bulletins as well as wind assessment and feasibility studies. The Project Team has been trying to assist both PLN as well as the commercial project proponent by providing objective information. The Project has established first contacts with technological institutes as well as institutes for vocational training, although the general approach for technical training and capacity strengthening, in cooperation with these institutes, needs to be developed.

On implementation and adaptive management, the MTR Team feels that satisfactory is the appropriate rating.

Sustainability

Until recently, the lack of confidence by government entities (PLN and MEMR) and commercial wind power developers led to the potential of wind for power generation being ignored. A successful pilot project is required to convince both government and private stakeholders. The wind-solar-diesel hybrid facility at Nusa Penida (with 0.73 MW of wind, built during 2005-2007, was meant to be the eye-catching project, but damage to turbines and other problems have caused the wind farm to be out of electricity production. The WHyPGen project is currently encouraging the rehabilitation of this facility by means of an assessment of the repair and maintenance issues. Second, the project has been assisting PLN by providing technical assistance in the review and evaluation to a number of potential commercial wind farms. The first one, a 50 MW wind farm at Samas can hopefully become the first success story of large commercial wind project in Indonesia, now that the PPA negotiation is getting close to successful conclusion.

After the first experiences in wind power development in Indonesia, it will then depend on how private investors take wind power as a cost-effective and profit-making venture. Big investors (20-50 MW) will negotiate PPA as business-to-business deals with the state utility PLN. Developers of smaller farms (< 20-50 MW) will face higher installed cost and will benefit from a reasonable and competitive price for wind. Although it will not solve all the issues with wind-energy development in Indonesia, a reasonable and competitive feed-in tariff (FiT) for wind energy is very strategic for the development of wind power generation in Indonesia. The WHypGen project has been assisting PLN-MEMR in formulating a draft FiT for wind energy, which is currently under discussion. Feed-in tariff would be for facilities up to 10 MW, but suggestions have been made to expand to 50 MW.

Given the above-sketched development and the favourable wind energy potential in (as shown by wind resource and site feasibility assessments by the WhyPGen project), the sustainability of the wind technology (WHyPGen) can be considered moderately likely (ML).

**Recommendations**

*1) Adjusted list of indicators with baseline and end-of-project targets*

To better monitor progress in each of the six Components, the MTR Team has analysed the current list and revised into a list of 34 progress indicator, giving the quantified baseline, mid-term situation and end-of-project target, which is presented in Box 13 of this MTR report.

*2) Extension of project period until June 2016*

The MTR team recommends extending the project’s closing date to July 2016 without any budget increase, basically to allow the first wind farms to reach the stage of commissioning and or financial closure within the project’s period and the project to provide support as needed in the wind farm design process, as well as to allow for certain capacity strengthening activities (financial mechanism, technical trainings) to be developed targeting specific market cluster beneficiaries and subsequently implemented.

*3) Suggested actions for the monitoring and adaptive management:*

*3a. Develop a strategic plan to cover barrier-removal activities*

A budgeted strategic plan 2014-2016 would serve to fine-tune the various outputs and activities to the needs of the actors in the various market clusters groups (large wind farms, medium, medium-small; utility as investor or power purchaser; private investors and developers), particularly in the Components that so far has shown less results, i.e. the Components 3 (financial) and 6 (technical training and capacity building).

*3b. End-of-project status report on wind power development*

Towards the end of the project, it might be worthwhile to undertake a qualitative stocktaking on remaining barriers and issues and suggestions for BPPT, MEMR and other stakeholder on actions needed to address these gaps and future directions.

*4) Activities needed to strengthen project impacts*

*4a. Support to rehabilitation of Nusa Penida.*

While PLN and MEMR should take responsibilities for the repairs needed on the wind turbines, it is suggested that the Project make available some funds to provide a state-of-the-art safety, equipment protection, and system controls needed to switch automatically when transitioning between Islanded and grid-connected modes.

*4b. Study on green funding and financing sources available for wind in Indonesia*

A new activity is proposed which would map the need for financial support and instruments per various market cluster (large investors/developers), analyse readiness of banks and institutions to provide loans for the various market segments (in particular the needs of developers of medium and small-medium sized wind projects)

*4c. Discussion on SMI financing scheme*

The government-owned financial institution SMI is managing USD 300,000 of micro-capital grant as seed money for leveraging funding by SMI for wind power. However, typically investments in wind power are ‘macro’ capital rather than ‘micro’. A discussion is needed between SMI, UNDP and the Project on the use of these funds. The micro-capital funds being relatively small, the MTR team can support the idea of SMI providing financial and project preparation services.

*4d. Review on the impact of policies and regulations*

After approval of the proposed feed-in tariff (FiT) for wind (hopefully in 2014), it might be useful to review impact of the feed-in tariff policy in 2016 in terms attracting investors as well as to assess the impact of policy, regulations and incentives (tax policy, grid-related issues, permitting and licensing) on wind energy development in the various market clusters (large, medium, small wind farms).

*4e. Guide for investors in grid-connected wind power development*

This guide would provide information on wind resources, potential sites and potential, linked with data available on the WhyPGen website, relevant policies and regulations, case studies, investment opportunities.

*4f. Annual wind energy promotional event*

To promote wind power and raise awareness as well as to facilitate business contacts, one suggestion is organize a ‘wind energy’ forum and exhibition on an annual basis, in cooperation with MEMR and the wind energy associations (IWES, IWA) among wind power investors, developers, support providers and project implementers.

*4g. Cooperation with ESP3 on strengthening RE and EE Clearinghouse at MEMR*

The project has been exchanging data on wind resources with the Danish-funded ESP3 project at MEMR Apart from data and info exchange, the two projects could work together and pool resources for examples in jointly commissioning the review analysis on impact of the feed-in tariff policy and other regulations on wind power (recommendation 4d), the guide for investors in wind energy (recommendation 4e) and grid connection impact study (recommendation 4j). As part of the project’s exit strategy, it should also be looked into with BPPT and MEMR how the Clearinghouse could be a depository of information, database, reports and documents after the proposed end of the project in 2016.

*4h. Assessment of (technical) capacity building and training needs and plan for project-supported capacity strengthening and training activities*

The MTR Team proposes this as a sub-study of the before-mentioned strategic plan (2014-2016) focussing on assessment of the technical capacity building needs (in additional to the financial capacity strengthening of Outcome 3) of various types of beneficiaries (government and utility staff, large developers, investors and financiers, small developers, equipment providers, individual engineers and maintenance experts and subsequently presenting a plan of capacity strengthening (courses, workshops, seminars) within the budget availability of the WHyPgen project.

*4j. Study on grid-related issues*

Often grid stability risks are overestimated by utilities and the potential contribution of intermittent sources of power underestimated. This assessment would deal with wind power transmission and grid connection issues, develop technical parameters and modelling for the grid connected wind farms to check grid stability and reliability of power supplies.

**Lessons learned**

Despite being considered as having low wind speeds, nonetheless commercial wind project developers are getting interested in Indonesia for the following reasons:

* Internationally there is trend towards exploring lower-speed wind areas for wind farms, as fewer higher-speed wind areas are available, while wind technology is being developed to target this market;
* Indonesia is a vast country with a large enough wind energy potential in selected areas;
* New policies have been introduced over the past decade that encourage wind power developers and investors, including a commitment by policy makers (by means of national wind power target), experience with dealing with IPPs (independent power producers) and regulations that allow offering long-term contracts with secure payment mechanisms and an acceptable rate of return. Feed-in tariffs are one example, but the design and adequacy to local conditions and regular revisions will be critical to their success.

Some lessons learned from the WhyPGen project are:

* The project implementation period has been overly optimistic, only 3 years; not enough to cover the lengthy preparation time to bring a typical wind power facility from identification, concept, feasibility to negotiation, financial closure and construction;
* Not all barriers are equally important and may need different timeframe to be lowered, while removal of one barrier may be a precondition for other barriers to be removed or lowered. For example, wind resource assessments (info barriers) and education & training (capacity barrier) will not lead to effective wind farms, if there is no conducive supportive wind energy policy (policy barrier) and a profitable economic model for developers (financial barrier);
* Different beneficiaries (the above-mentioned market clusters) face different barrier or in different magnitude. For example, large project developers will be able to mobilise their own finance and negotiate a PPA as business-to-business with PLN. Smaller developers will face less economic s of scale resulting in higher production price in terms of USD/kWh. This market segment will need a favourable feed-in tariff (as is under discussion in Indonesia). With banks typically interested in the large projects (> 50 MW), this market segment may face barriers in organising the right financial package of equity and loans. A financial mechanism may help banks in lowering their demand for a large share of equity that this market segment may be unable or unwilling to risk;
* The project has shifted focus in terms of target beneficiaries. Going from conceptualization, project document formulation to the current implementation, WHyPGen’s attention has moved from small and small-medium projects to the developers of large and medium-sized wind power projects. There has been good reasons for this shift in focus, but should have been accompanied by a thorough re-assessment of barriers that the various market clusters face and of their need of WHyPGen-supported activities;
* Ownership, operation and maintenance in particular becomes an issue when the project is transferred during its course (e.g. by developer in a BOOT setup to the utility; or a government-supported wind facility that is transferred to a local authority or organization) and it should be clear how O&M as well as major overhauls will financed and who will bear responsibility;

# introduction

## Purpose of the mid-term review and objectives

The WHyPGen project has been initiated with funding support from the Global Environment Facility (GEF) and UNDP (United Nations Development Programme) and implemented by the Center for Energy Technology (B2TE) at the Agency for the Assessment and Application of Technology (BPPT). The project aims to promote the adoption of Wind Hybrid Power Generation (hence the acronym WHyPGen) technology through the “facilitation of commercial on-grid WHyPGen systems for environmentally sustainable electricity supply in Indonesia” through government and private sector cooperation. It focuses on cost-effective and potentially commercially viable grid-connected wind-diesel hybrid power generation, referred to as WHyPGen systems.

The project started in 2012 with a planned duration of 3 years. As per UNDP and GEF guidelines, a Mid-Term Review (MTR) needs to be carried out for all GEF-financed full-sized project by one or more independent consultants, ‘independent’ meaning not previously involved in the project’s design, management or implementation of activities. The consultants Johannes Van den Akker (Netherlands) and Himsar Ambarita (Indonesia) were selected in consultation with the project implementing partner and contracted by UNDP Indonesia to carry out the review assignment.

Objective

The purpose of this mid-term review is[[2]](#footnote-2):

* Promote accountability for the achievement of GEF objectives through the assessment of results, effectiveness, processes and performance of the partners involved in GEF activities. GEF results will be monitored and evaluated for their contribution to global environmental benefits;
* Promote learning, feedback and knowledge sharing on results and lessons learned among the GEF and its partners, as basis for decision-making on policies, strategies, program management, and projects and to improve knowledge and performance.
* Identify problems that have been encountered as on date of the project implementation period, and provide recommendations of how to address these problems to ensure project is on track during rest of the project implementation period or as per adjusted schedule as applicable.

## Scope and methodology

Before undertaking the MTR, an *Inception Report* was presented, including the proposed of tasks, activities and deliverables, as well as a table of main review questions that need to be answered to determine and assess project results, and to identify where the information is expected to come from (e.g. documents, interviews and field visits). This *table of mid-term review criteria and questions* is presented in Annex E. The Table of Contents of this report has changed slightly from the one mentioned in the Inception Report or suggested in the Terms of Reference, but follows the format as given in the new *Guidance for Conducting Midterm reviews of UNDP-supported, GEF-financed Projects* (UNDP, 2014).

The review has been based using the following *sources of data* and *data collection tools* to answer the MTR evaluation questions:

* Desk review of progress reports and project documents; national policy strategies and plans, and other relevant reports and documents.
* Mission to Indonesia to hold interviews with stakeholders[[3]](#footnote-3), beneficiaries and key informants in order to obtain in-depth information on impressions and experiences, explore opinions about the initiative and their suggestions for future action. The mission was carried out during 8-21 August 2014. The mission schedule is given in Annex B.

The mission started with a briefing at the UNDP office on 8 August, in which also the responsible UNDP/GEF Regional Technical Advisor from the UNDP Bangkok Regional Centre was present. Regarding possible wind development site visits, the WHyPgen Project Team suggested the following selection: 1) Lebak (Banten), 2) Samas (DYI), 3) Sukabumi (West Java) and 4) Nusa Penida (Bali). However, it was decided to concentrate on visits to stakeholders in Jakarta and surroundings only, due to the following considerations:

* Only Bali (Nusa Penida) has a visible wind power development, with other sites having wind measurement equipment only. The UNDP Regional Technical Specialist TA, Mr. Gadde (based in Bangkok), already had visited the Nusa Penida site in week before mid-term review mission and has passed relevant info on Nusa Penida[[4]](#footnote-4);
* Most stakeholders have their office or headquarters in or near the Jakarta area;
* Limited time availability; some sites would take two days to visit with little to see but a wind measurement tower, which would not justify the time and cost needed for travel.

The review of review and documents provides the basic facts and information for developing a first draft mid-term review report, while the mission is needed to verify the basic facts, get missing data and to learn opinions of respondents to help interpret the facts. The individual interviews with key informants were based on open discussion to allow respondents express what they feel as main issues, followed by more specific questions on the issues mentioned. The before-mentioned list of mid-term review questions (see Box 2) were used as a checklist to raise relevant questions and issues during the interviews that correspond to the level and type of involvement of the interviewee or the organization visited[[5]](#footnote-5).

Regarding the *data analysis and methods for analysis,* the documents listed in Annex C were analysed. The notes of the interviews with key informants were used to verify facts and information presented in reports and documents and helped to formulate the conclusions and recommendations. A two-week mission has the limitation of potentially giving a snapshot impression only. Nonetheless, the mid-term reviewers feel that this mix of data collection and analysis tools has yielded viable answers to the evaluation/review questions within the limits of budget resources for the review and time availability.

This review has been conducted in accordance with the principles outlined in the United Nations Evaluation Group ‘Ethical Guidelines for Evaluation’ (see Annex G).

## Structure of the mid-term review report

The review has been undertaken in accordance with the new UNDP guidelines on mid-term reviews (UNDP, 2014)[[6]](#footnote-6), also taking into account the guidelines for final evaluations[[7]](#footnote-7) as well as general criteria of UNDP evaluations. This report is structured according to the table of contents that is given in Annex B of the MTR guidelines (UNDP, 2014), starting with an Introduction chapter, followed by Project description, Findings and ending with a chapter on Conclusions and recommendations, plus annexes.

# Project description and context

## Development context

The country’s estimates a total potential of 450 MW of wind power generation in areas with best wind conditions (3-5 m/s) such as in the south coastal areas of South Sulawesi and Nusa Tenggara. To date, wind energy still has insignificant contribution to the national energy mix. Only 2 MW worth of wind power installations have been developed countrywide, and most of it still for research purposes and/or concentrating on stand-alone or mini-grid electricity production in rural and remote areas. Wind power is also harnessed for water pumping for agriculture purposes and for battery charging. Up to recent, no grid-connected medium or large-scale applications have been realized in Indonesia.

There has been no substantial experience in the design, installation and operation of larger wind power generation facilities (> 1 MW). In order to remove the barriers to the sustainable investment of wind power generation, the WHyPGen project (2012-2015) was initiated with funding support from the Global Environment Facility (GEF) and UNDP (United Nations Development Programme) and implemented by the Center for Energy Technology (B2TE) at the Agency for the Assessment and Application of Technology (BPPT).

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.

The project is comprised of several barrier-removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. It was designed to facilitate close coordination and consultation of the relevant stakeholders in each of the project activities. The activities include 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.

## Problems that the project seeks to address

The project is comprised of several barrier removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. The following table (Box 1) summarizes how the project’s main outputs/activities address the identified barriers and gaps.

Box 1 Summary of barriers and expected project outputs (taken from Project Document)

|  |  |
| --- | --- |
| **Barrier** | **Related outputs in the WhyPGen ProDoc** |
| * Lack of wind data and limited wind data assessments due to insufficient number of quality feasibility studies; wind energy availability is irregular/not stable; * Many examples of pilot/demos of wind power generation have failed in the past, because wind turbine selection has not been conducted with accurate wind potency survey and proper design * Economic and financial feasibility for WHyPGen application in Indonesia is unknown yet;; The perception is that The advantages to be gained from WHyPGen is not attractive for private parties * Lack of information on WHyPGen local suppliers | 1.1 Updated wind maps of areas with significant wind energy potentials;  1.2 Techno-economic feasibility assessments of potential wind power generation projects;  1.3 Completed feasibility assessments of the local manufacturing/production of WHyPGen system components |
| * Lack of demonstrable applications of WHyPGen, with current demonstrations limited only to low wattage power generation (both stand-alone and hybrid), and applications mainly for mechanical power (e.g. ground water pumping) | 2.1 Successfully implemented WHyPGen pilots/demos  2.2 Wind power generation project replications planned |
| * Fiscal and financial incentives are limited for technology applications like WHyPGen and not yet available for commercial applications * The payback period of WHyPGen financing might be too long under current Indonesian economic context * Lack of advanced project finance tools and business models for wind that investors, banks and financing institutions are more familiar with are not yet readily available in Indonesia;Difficult access to finance for private sector | 3.1 Completed trainings and promotions for banking/financial institutions in financing wind power generation projects;  3.2/3.3Designed & implemented financing schemes and/or loan guarantee schemes for small-scale wind power generation projects |
| * Existing policy regime that is not yet supportive of WHyPGen application, or not yet aligned to the interests of the development of WHyPGen system * Undefined pricing policy for power generation from renewable energy resources, especially wind energy (current feed-in tariff is based on mini-hydro and is deemed insufficient for wind energy | 4.1 Completed policy studies on wind hybrid energy systems;  4.2 Proposed & approved policy frameworks supportive of wind power generation projects |
| * Lack of information and low awareness for Engineers, Developers & Consumers on WHyPGen Application and its merits and benefits; | 5.1 Designed and implemented wind power generation promotional and advocacy program |
| * Lack or absence of campaigns and capacity building programs * Lack of local technical service providers for the installation, operation and maintenance of WHyPGen systems * Lack of technical knowhow in the design and engineering of WHyPGen systems * The idea of grid-connected WHyPGen has not yet been adopted by power utilities | 6.1 Completed 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;  6.2 Completed survey and evaluation of electricity demand areas served by wind power generation (including WHyPGen) facilities |

## Project strategy; project timing and milestones

The project is comprised of several barrier-removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. It was designed to facilitate close coordination and consultation of the relevant stakeholders in each of the project components:

1. WHyPGen Technology Application Assessments;

2. WHyPGen Technology Demonstration;

3. Financing of WHyPGen Initiatives;

4. Policy & Institutional Support for WHyPGen Initiatives;

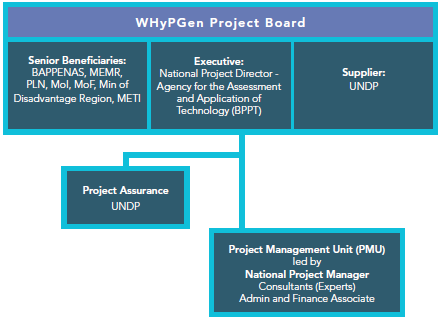
5. WHyPGen Promotion;

6. WHyPGen Market Development and Industry Support.

The project has been designed as a full-sized project with GEF financing of USD 2,156,200 (of which USD 170,000 for project management cost) and co-financing of USD 37,484,600, consisting of in-kind government and UNDP contribution of USD 1,484,600 and cash contribution by the private sector associated with investment in site preparation and wind farm construction (USD 36,000,000). Endorsed by GEF in February 2012 and planned for April 2012, the Project Document was only signed in August 2012. Implementation started with delay in October 2012 for a period up to Feb/March 2015.

## Project implementation arrangements

The above figure provides an overview of the project’s management arrangement, of which more details are given in Section 4.3.1 of this report.



The BPPT is the implementing partner of the project, the designated Implementing Partner for the project under the National Implementation Modality (NIM) of the UNDP. The UNDP, which provides support to the project on behalf of the GEF takes the role of the Senior Supplier.

## Main stakeholders: summary list

The following Box gives an overview of the main stakeholders:

Box 2 List of main stakeholders involved in the WHyPGen project

|  |  |
| --- | --- |
| **Stakeholder** | **Description** |
| **Government** |  |
| **BBPT** (*Badan Pengkajian dan Penerapan Teknologi*, Agency for the Assessment and Application of Technology)  **B2TE** (*Balai Besar Teknology Energi,* Energy Technology Center) | BBPT is a non-departmental government agency under the coordination of the Ministry of Research and Technology, which has the tasks of assessment and application of technology, acting as a technology clearinghouse and providing technology advisory services and audits for 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 (Kementerian Energi dan Sumber Daya Mineral)*  **DGNREEC** (Directorate General for New Energy, Renewable Energy and Energy Conservation – *DJEBTKE* (Direktorat Jenderal Energi Baru, Terbarukan, dan Konservasi Energi) | 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 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 Viron Energyto develop a wind facility at Sukabumi (10 MW) |
| **LAPAN** (National Institute of Aeronautics and Space) – *Lembaga Penerbangan dan Antariksa Nasional* | 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 Binatek Reka 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 and various wind projects are under negotiation with PLN (Samas, Bantul Regency, 50 MW) or entering the negotiation phase (Sidrap) |
| Viron Energy | Viron energy is a potential wind project developer that has planned develop a 10MW wind farm at Sukabumi and is now contemplating extension up to 50 MW |
| Medco Capital | Medco is a private company which main business is in petroleum oil. As project developer, Medco is collaborating 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 currently is developing a 62.5 MW wind project at Jeneponto. In collaboration with the WHyPGen Project, 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, *Lembaga Ilmu Pengetahuan Indonesia)* * Institute of Technology Bandung (ITB) * Universities, such as Gadjah Mada University (UGM), Sepuluh Nopember Institute of * Technology (ITS), Airlangga University (Unair), Indonesia university (UI), Sebelas Maret * University (UNS), University of Sumatra Utara (USU), Bogor Agriculture University (IPB), and * Diponegoro University | |

# Findings

This chapter presents an overview of the evaluation findings in three general areas, project results, project formulation and project implementation. The findings are based around the evaluation criteria and questions, (as given in Annex E) so that the reader can make a link with what was asked and what was found

## Project strategy

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * Does the Project’s purpose and objectives remain valid and relevant, or are there items or components in the project design that need to be reviewed and updated? * Is the project logical framework and design still relevant in the light of project experience to date? If not, suggest an approach to propose changes from the project implementation perspective than propose changes to log frame in achieving the anticipated outputs. * Whether the performance measurement indicators and targets used in the project monitoring system are specific, measurable, achievable, reasonable and time-bounded (SMART) to achieve desired project outcomes? |

### Project design

Annex D provides usueful background information on government policy and regulations regarding renewable energy. The WHyPgen project fits squarely into government strategy on energy and sustainable energy development. The Government has set the target of around 250 MW of commercial wind power to be added to the grid by 2025 (see Annex D.2). Wind energy has in the past been considered as not really feasible in countries that are situated in the equatorial belt (such as Indonesia) that are generally characterized by low average wind speeds. However, although the average may be low, wind speeds are available constantly throughout the country. Wind machines are not likely to suffer from strong winds or storms. As fewer favourable high-wind speed sites are available worldwide, interest in exploiting regions with lower wind speeds is growing. In order to optimise results at these locations, wind technology is evolving internationally, and equipment is being developed to target this market, basically by increasing the rotor-swept area and putting the turbine on a higher tower, or a combination of the two. Thus, project developers are getting more interested in commercially setting up wind farms.

There are two main issues in the WHyPGen project design, which should be mentioned. First, is that the focus in the project document seems to be on small-medium institutional and/or commercial project developers (< 10 MW), as indicated by the main target consisting of 3 demonstration wind projects totalling 9.4 MW. That seems to result from the desire to support demo projects of the Nusa Penida type (0.735 MW wind).

Second, originally the project document has been written in mind to receive co-financing from the KPDT (Ministry of Disadvantaged Regions) with another focus on rural electrification projects. This focus implies on small facilities (0.1-0.5/1 MW facilities on remote islands with a typical hybrid setup in which wind complements solar and/or diesel gensets. For example, the project document mentions the case of a village grid system of 240 kW system consisting of 120 kW wind, 72 kW solar and 48 kW diesel.

Reality has been that KPDT dropped out; their co-financing was replaced by a co-financing from a commercial project developer, in this UPC Renewables-Binatek. This reflects the fact that in recent years commercial wind developers have become interested in Indonesia to invest in large wind farms (> 50 MW). This is a very encouraging development and the project has actively supported by providing info and advice a number of these commercial developer’s initiatives. This has been recommendable in terms of adaptive management (see Section 4.3.1). However, the original project’s outputs and progress indicators have been designed with another market cluster in mind, namely small and medium-sized projects (< 10 MW), while the most promising market clusters seems to be 10 MW and above. Different market clusters (also referred to as segments in this report) have different stakeholder with sometimes overlapping and sometimes different capacity building needs (see Box 3).

One of the evaluators of the Team has evaluated similar wind energy projects in other countries as well as other renewable energy projects. One common issue in these project evaluations is that the timeframe assumed is often very optimistic. The timeframe is set by budget constraints (allowing only projects of 3-5 year duration) and it assumes that all barriers are of equal importance and can be lowered (removed is often an over-statement) simultaneously within that 3-5 year timeframe.

Another issue is the nature of (commercial) wind project development. To develop a site, usually at least one year of measurements is needed. Wind energy is very site-specific and important because the energy harvested is proportional to wind speed cubed. Sometimes, more years of measurements are required. Then follows the period of feasibility analysis and site planning, PPA (power purchase agreement) negotiations, seeking permits and compliance with regulations. After financial closure, it will take time to acquire the hardware and organize the logistics, and start construction. Worse, as Nusa Penida has shown, system configuration, operation and maintenance issues can hamper proper functioning after a few years of operation. In short, developing even one site can take much longer than the typical duration of a UNDP-GEF project. Care should be taken with putting targets as ‘installed MW’ or ‘energy production (GWh/yr) therefore. We might end with the paradoxical situation in which a project, such as WhyPGen, has actually supported actively wind energy development, but with success no matched by functioning wind power, i.e. still no MW installed to showcase, as wind farms associated with the project are still in planning or under construction.

### Results framework and design

We have reviewed the targets and indicators, based on the results so far in the WHyPgen project. We noticed that in the 2014 PIR (UNDP/GEF Project Implementation Review) the list of indicators has been slightly changed. These changes are indicated in Box 4 in Section 4.2. Nonetheless based on the above design considerations and on the results reported (see Section 4.2), we think indicators can and should be fine-tuned even more. In particular, indicators planned and realized wind energy production should be re-organized to reflect more the various stages of wind site and project development. Other indicators, in particular those related to capacity building and promotion in Components 5 and 6 might benefit from streamlining and condensing them or shifting these to the Components where they are more logically placed. In Section 5.2, we will provide a table with our suggestions for progress indicators per outcome (Box 13)

### Ratings

The UNDP Midterm Review Guide (2014) does not mention that a rating to be given on project design, but if asked to do so we would provide a rating as marginally unsatisfactory.

This has less to do with BPPT and UNDP’s efforts of not putting enough details in the project documentation, but more to do with the lack of market focus, i.e. the project does not seem to distinguish between various market segments, large wind farms (> 20 MW), medium wind farms (1-20 MW) and small wind facilities (grid-connected and for small island grids) and between the various types of beneficiaries (state-owned utilities, local governments, large investors, large and smaller developers) in these various segments that may face quite different barriers. Hence, the barrier removal activities look like ‘one size fits all’, while in reality the various players encounter different barriers in the different market segments in different level of importance and activities should have been more tailored to that end.

Box 3 Wind power market clusters/segments

The market for wind power is not uniform and sizes, application, ownership and developers can vary widely. We can distinguish the following market clusters:

* Off-grid applications, either as stand-alone system (e.g. water pumping or small-scale power generation up to 10 kW with battery banks) or in a hybrid small grid system, possibly combined with other renewable energy sources such as photovoltaics (PV), with diesel generating sets as back-up;
* Village-scale mini-grids can be 1-10 MW in size. Owners of such a system is likely to be PLN, which still has a de facto monopoly on power distribution, as well as local government as financier or future owner, as well as villager’s cooperatives.
* Grid interconnection systems, in which the wind system can connected to the grid or parallel into local power production systems. We distinguish in this MTR report between small-medium systems (1-10 MW), medium-size systems (10-50 MW) and large wind farms (50 MW and above). Owners of the system can be a company or consortium, selling power to PLN; while also PLN (together with MEMR or a local government) may develop a medium-sized wind facility. Profiting from economic of scale, the first commercial wind farms in Indonesia are likely to be large (> 50 MW and above), but once successfully demonstrated, investors/developers of medium-sized wind farms would be attracted, especially if offered an attractive feed-in tariff and favourable loan facilities by financial institutions.

Various players are involved in the wind power business, including the government (MEMR and the state-owned utility PLN), local governments, banks, investors, project developers, consultants and service providers, equipment providers as well as individual experts, operators and engineers.

## Progress towards results

The results of the project include outcomes and outputs. Changes between the planned and actual results are described and explained as well as factors that may have affected the achievement of the intended results.

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * Is the Project making satisfactory progress in achieving project outputs vis-à-vis the targets and related delivery of inputs and activities? * How does overall implementation of the project activities contribute to the achievement of the targeted outputs and outcomes of WHyPGen? * How does overall implementation of the project activities contribute to the achievement of the targeted outputs and outcomes of WHyPGen? |

### Description of planned results and achievements; ratings

Box 3 provides an overview of results (outcomes and outputs) against a set of indicators as reported in the 2014 PIR (Project Implementation Review) report. The formulation of outputs, indicators and activity results is taken from the latest 2014 PIR (Project Implementation Review)[[8]](#footnote-8) that was given to the MTR team. The ‘results reported’ are taken from the 2014 PIR, supplemented by other progress reporting and info from discussions with the project team and stakeholders during the MTR mission. The PIR does not give a numbering of indicators; we have added numbering (i.e. 1., 2., etc.) for more easy reference in future. An overview of ratings of progress towards results for each component is given in Box 12 in Section 5.1.

Box 4 Framework of project outcomes, outputs, indicators and resulted reported (at 30 June 2014)

| **Planned output (**numbered according to ProDoc’s logfram**e) and Outcomes (**as mentioned in CEO AR and given numbers x.y as in the PIR**)**  **Indicators (**numbered 1, 2, …**) per outcome and per output as given in 2014 PIR,** indicating *baseline* level and end-of-project targe**t** | **Results reported (presented per Indicator)** |
| --- | --- |
| **Project objective:**  Facilitation of commercial on-grid WhyPGen systems for environmentally sustainable electricity supply | |
| 1. Installed capacity of WHyPGen facilities (*0,* 9.4 MW)  2. Total electricity generation from installed WHyPGen facilities (*1.35*; 19.27 GWh/yr)  3. Total WHyPGen capacity planned (*0,* 100 MW) | 1. Installed 9 wind turbine units (3x85 kW; 6x80 kW) and 2 PV units (30 KW and 32 kW) at Nusa Penida, but currently not in operation  2. Nil  3. See Indicator 11. |
| ***Component 1 WhyPGen Technology Application Assessments***  GEF budget: USD 282,830. Co-fin: USD 746,200 | |
| *Outcome 1.1: Enhanced knowledge of potential WhyPGen application* | |
| 1.1 Updated wind maps of areas with significant wind energy potentials   1. Provinces covered by the new & updated wind maps (*0*, 9) 2. Number of assessed locations with wind power potentials (*0*, 25)   6. Number of identified locations with wind resources that are feasible for wind-power based power generation (*0*,15) | *Output 1.1:*  4. 13 provinces covered, including 1) East Nusa Tenggara (NTT), 2) Banten, 3) West Java, 4) Bali, 5) Yogyakarta, 6) Central Java, 7) South Sulawesi, 8) North Sulawesi, 9) West Kalimantan, 10) Aceh, 11) Papua, 12) Bangka Belitung, 13) West Nusa Tenggara (NTB), in which wind data were provided for several sites in the DANIDA-financed Environment Support Program (ESP3) program in the development of meso-scale wind map for 3 big Islands: Java, Sumatera and South[[9]](#footnote-9)  5. Over 19 locations assessed for wind energy potential, of which the results of the assessment will contribute to the creation of national wind maps, namely:  (1) Oelbubuk, TTS  (2) Muara Binuangeun , Lebak  (3) Ciemas , Sukabumi  (4) Nusa Penida, Klungkung  (5) Baron, Gunung Kidul  (6) Pandan Simo, bantul  (7) Harjo winangun . Purworejo  (8) Cikelet , Garut  (9) Pamatata, Selayar  (10) Sidrap, Sidrap  (11) Jeneponto, Jeneponto  (12) Bitung, Minahasa Utara  (13) Karimata Islands, Kayong Utara  (14) Laipori, Sumba Timur  (15) Aceh, Aceh Besar  (16) Kaimana, Kaimana  (17) Kupang, Kupang  (18) Belitung , Belitung  (19) Tembere, Lombok Timur  *Output 1.2:*  6. Location with feasible wind energy resources:  1. South East Timor (TTS) Regency (Oelbubuk)  2. Lebak Regency (100 MW)  3. Sukabumi Regency (100 MW)  4. Klungkung Regency (Nusa Penida)  5. Gunung Kidul Regency (Baron; 15 MW)  6. Bantul Regency (Pandan Simo; 50 MW)  7. Purworejo Regency (67 MW)  8. Garut Regency (150 MW)  9. Selayar Regency (10 MW)  10. Sidrap Regency (100 MW)  11. Jeneponto Regency (180 MW)  12. Bitung Regency  13. East Sumba Regency (Laipori; 15 MW)  14. Aceh Besar Regency  15. Kupang Regency  16. Belitung Regency |
| *Outcome 1.2 Improved knowledge of WhyPGen systems, benefits and costs* | |
| 1.2 Techno-economic feasibility assessments of potential wind power generation projects[[10]](#footnote-10)  7. Number of evaluated wind energy system (*0*, 11)  8. Number of completed wind power generation project feasibility studies (*0,* 10) | 7. Number of evaluated systems:  1. Gunung Kidul Regency (Baron)  2. Bantul Regency (Pandan Simo)  3. Klungkung Regency (Nusa Penida)  4. Selayar Regency (Apatanah)  5. Selayar Regency (Pamatata)  6. Rote-Ndao Regency  7. Belu Regency  8. North Central Timor (TTU) Wini  8. Feasibility studies of wind energy projects:  1. South East Timor (TTS) Regency (oelbubuk)  2. Lebak Regency ( Muara Binuangeun)  3. North Kayong Regency (Karimata Islands)  4. Purworejo Regency (Harjowinangun)  5. Aceh Regency (Pekan Bada)  6. Gunung Kidul Regency (Baron  7. Garut Regency ( Cikelet)  8. Sukabumi Regency (Ciemas)  9. East Sumba Regency (Laipori)  10. Belitung Regency (Tanah Tinggi) |
| *Outcome 1.3 Enhanced interest in investing in WhyPGen system projects* | |
| 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 components (*0*,14);  10. Number of local equipment manufacturers that are ready to produce wind energy components (*0*,15) | *Output 1.3:*  9. and 10. Number of assessed local equipment manufacturers that can potentially produce:  1. *PT LEN*  2. *PT INTI*  3. *PT DI*  4. *PT PINDAD*  5. *PT Alpen Steel*  6. *PT Korindo Heavy Industry*  7. *PT Indonesia Composite Teknologi*  8. *PT Mekanikal Elektrikal Egra*  9. *PT Guna Elektro*  10. PT Cast Metal Indonesia  11. *PT Carita Boat*  12. PT Barata Indonesia  13. PT Boma Bisma Indra  14. *PT Cerah Sempurna*  15. PT Baja Kurnia  Companies that are ready to produce are highlighted in italics |
| ***Component 2 WhyPGen Technology Demonstration***  GEF: USD 576,570. Co-fin: USD 34,068,600 | |
| *Outcome 2.1 Increased number of WhyPGen projects planned and implemented* | |
| 2.1 Successfully implemented WHyPGen pilots/demos*[[11]](#footnote-11)*  12. Number of WhypGen projects implemented (*0,* 16)  2.2 Wind power generation project replications planned  11. Number of planned WhyPgen replication projects (*0*, 10) | *Outputs 2.1 and 2.2:*  12. One project is under construction/rehabilitation (explanation in the main text) at Nusa Penida (Bali)  11. Planned projects (452.5 MW)  1. Samas – UPC  2. Sukabumi – Viron  3. Lebak – Viron  4. Oelbubuk – AGC  5. Jeneponto - AGC  6. Garut – Medco  7. Sidrap – UPC |
| *Outcome 2.2 Increased share of wind energy in national power generation* | |
| 13. % contribution of WHyPgen in electricity supply in Indonesia (*0*, 0.0062) | 13. Nil |
| ***Component 3 Financing of WHyPGen Initiatives***  GEF: USD 301,600. Co-fin: USD 302,500 | |
| *Outcome 3.1 Increased investments on wind power generation (including WhyPGen) projects[[12]](#footnote-12)* | |
| 3.1 Completed trainings and promotions for banking/financial institutions in financing wind power generation projects  14. Number of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable proposals by year 3 (0, 6)  15. Number of local services providers[[13]](#footnote-13) and power project developers trained on the development of business plans and utilization of financial models for preparing bankable proposals (0, 28)  16. Number of banks/FIs that provide affordable financing schemes for WhyPGen projects (*0,* 3) | *Output 3.1*  14. Two trainings: the project has conducted training on wind project business plan writing for the potential project developers and training for the local manufacturers; In collaboration with PT. Sarana Multi Infrastruktur (SMI), the project will conduct training on formulating bankable project proposals  15. Number of companies trained (10):   * PT Sewatama, PT Bakrie Power, PT LEN, PT Energi Angin Indonesia, PT Odira Persada, PT Medco Power Indonesia, Capital Energy Indonesia/Capital Turbine Indonesia, PT Pertamina, PT Viron Energy, BIE;   16. See Indicator 17. |
| *Outcome 3.2 Local banks/ financing institutions providing loans for wind power generation (including WhyPGen)* | |
| 3.2 Designed financing scheme for WhyPGen projects[[14]](#footnote-14)  17. Number of financing schemes designed and approved for wind energy projects as well as for WhyPGen component manufacturing (*0,* 3)  18. Number of wind energy projects implemented with financial support through the approved financing scheme (*0,* 2)  19. Volume of financing (in USD million) provided to implemented wind energy projects through the approved financing schemes (*0*, 16 million) | *Output 3.2:*  17. Loans and financing schemes:   * The financing schemes can be different kind (loan guarantee, mezzanine loan, etc.). A first financing facility available for wind projects was planned to be set up, for which purpose WHyPGen project through UNDP Indonesia had signed an agreement with PT. SMI in initiating a financing program for wind power project in Indonesia, in which WHyPGen had allocated USD 300,000 as grant facility to support the bankability of the wind power projects. PT. SMI should leverage the amount up to 10 times, but this has not been realized yet and the concept is under discussion. * SMI will help Viron Energy to structure the financing for wind power project at Sukabumi (10MW) as the first pilot project. Review and assessment on the financial aspects and project finance structuring is now under process.   18. Nil  19. Nil |
| ***Component 4 Policy & Institutional Support for WHyPGen Initiatives***  GEF: USD 108,850. Co-fin: 517,200 | |
| *Outcome 4.1 Approved and enforced policies supportive of wind generation projects[[15]](#footnote-15)* | |
| 4.1 Completed policy study on WHyPGen system  20. Number of formulated policies (fiscal, market, regulatory, institutional) that are supportive of wind power generation (*0*, 6)    4.2 Proposed & approved policy frameworks supportive of wind power generation projects  21. Number of approved and enforced policies (fiscal, market, regulatory, institutional) that are supportive of wind power generation (*0,* 3)  22. Number of local companies actively engaged in the wind power generation (including WHyPGen) business (*0,*15)[[16]](#footnote-16) | *Output 4.1:*  20 and 21. Two (2) policies/regulations formulated:   * Policy on Feed-in Tariff (FIT) – fiscal * Policy on *Rancangan Standar Nasional* Indonesia (National Draft Standard of Indonesia) – regulatory :   + *Persyaratan Rancangan Turbin Angin Skala Kecil* – IEC-61400-2 (Design requirements for small wind turbines);   + *Pengukuran unjuk kerja daya lisrik yang dihasilkan oleh turbin angin* – IEC-61400-12-1 (Power Performance measurements of electricity producing wind turbines);   + *Pengukuran dan pengkajian karakteristik kualitas daya pada koneksi ke grid turbin angin* – IEC -61400   (Measurement and assessment of Power quality characteristic of connected wind turbines);  22. Local companies currently involved/interested:  1. PT Korindo Heavy Industry  2. PT Viron Energy  3. PT Binatek Reka Energi  4. PT Sewatama  5. PT Pertamina  6. PT Energi Angin Indonesia  7. PT Medco Power Indonesia  8. PT Sarana Multi Infrastruktur  9. PT Bakrie Power  10. PT PLN (persero)  11. PT Alpen Steel  12. PT Guna Elektro  13. PT Indonesia Composite Teknologi  14. PT PINDAD  15. PT Cerah Sempurna |
| ***Component 5 WHyPGen Promotion***  GEF: USD 336,775. Co-fin: 436,900 | |
| *Outcome 5.1: Enhance awareness of the benefits WHyPGen* | |
| 5.1 Designed and implemented Wind power generation promotional and advocacy program  23. Number of completed promotional materials on wind energy in general and WhyPGen in particular (*0,* 15)  24. An operational and widely used central database system on wind energy by yr2 (*0*, year2);  25. Number of engineering schools that offer courses on wind energy technologies in their engineering curricula (*0,* 3)[[17]](#footnote-17)  26. Average number of coordination activities of IWA (Indonesia Wind Association) each year starting yr 2 (*0,* 4) | *Output 5.1:*  23. Number (15) and type (11) of promotional materials completed:  Poster Presentations (3); Flyer on Lebak’s wind potency (1); WISE bulletin (1); Hybrid System Brochure (1); WHyPGen Brochure (1); Calendar (1); Block Note (1); Goody Bag (1); Ballpoint (1); Agenda (2); Banner (3)  24. Functioning website, users (counter) and central infobase with wind data:   * Website established as infobase for wind energy in Feb 2013; 2900 visitors in 2014-Q1 (with 877 out of 890 expressing satisfaction) ; * Several articles on the website; Data (reports, pre-feasibility study, presentations, etc.) that related to wind energy in Indonesia and WHyPGen Project activities had been gathered and collected   25. Number of engineering schools that offer courses on wind energy:  The project has identified five engineering schools that apply RE (and wind) curricula. Engineering schools curricula on WHyPGen are assessed and reviewed by the project to better prepare future engineers for wind (e.g. *Politeknik Bandung*; Technology Education and Devpt. Center)[[18]](#footnote-18). The curricula need to be strengthened on wind power. The WHyPGen Project also in the process of collaboration with Technical Education and Development Center (mechanical, electrical and industrial) known as P4TKBMTI. It is an educational institution owned by the Ministry for Education and Culture. It provides training for vocational school teachers in order to improve their knowledge and skill. P4TKBMTI also has a role in developing and improving the curricula for engineering schools and senior high schools  26. Number and type of promotional events organised (with IWA) and level of participation:   * WHyPGen Project had initiated the establishment of Indonesia Wind Association (IWA) that launched through declaration at the EBTKE (MEMR) Connex on 4-6 June 2014[[19]](#footnote-19). For the next step, the project will facilitate and support the legal aspects of the IWA establishment; * Thereafter, the project will collaborate with IWA to conduct the related activities in promoting the wind energy in the country, including in advocating the required policies to the MEMR and other related government agencies; * Two national workshops with key WHyPGen stakeholders, including about 45 national media, were held to enhance nationwide awareness of the benefits of WHyPGen and that way, contribute to wider dissemination of information about wind energy on TV, newspaper, radio, magazine * The project had attended several meetings with the potential wind project developers which purposely aimed to establish the wind energy association in Indonesia. |
| ***Component 6 WHyPGen Market Development and Industry Support***  GEF: USD 379,575. Co-fin: USD 733,700 | |
| *Outcome 6.1 Improved local wind energy system (including WhyPGen) capacity* | |
| 6.1 Completed 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  27. A fully established and operational wind energy clearinghouse by yr 2 (*0*, year2)  28. Number of project developers, investors, technical service and local equipment manufacturers that make use of the clearing house each year (*0*, 8) | *Output 6.1:*  27. Clearinghouse to be established by MEMR with Danish support (Environmental Support Programme, ESP3)[[20]](#footnote-20). The project has provided to DJEBKTE in developing the RE clearinghouse (in particular wind data)  28. Nil |
| *Outcome 6.2 Ensured availability of local service providers for wind generation facilities[[21]](#footnote-21)* | |
| 29. Cumulative number of local equipment manufacturers trained under capacity development programs (*0,* 15)  30. Number of wind energy projects (including WhyPGen) that are designed and engineered by local technical service providers (*0,* 4)  31. Number of wind power (incl. WhyPGen) projects facilitated through WESMA (*0,* 2) | Indicators 29-31: Nil |
| *Outcome 6.3 Availability of quality components of wind energy systems that are locally made[[22]](#footnote-22)* | |
| 32. % of all trainees of the capacity development programmes that are actively engaged in the Indonesia wind market (*0*, 60) | 32. Nil |
| *Outcome 6.3 Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia* | |
| 6.2 Completed survey and evaluation of electricity demand areas served by wind power generation facilities  33. Number of areas with completed electricity demand analysis and forecasts (*0*, 25)  34. Number of power project develeopers and technical service providers that make use of the electricity demand analyses and forecasts (*0,* 8) | 33. Nil. A meeting proposed with PLN P3B (Distribution and Load Control Center; *Penyaluran dan PusatPengatur Beban*).  34. Nil |
| ***Project management cost:* USD 170,000; co-fin: 679,500**  *TOTAL: USD 2,156,200. Co-fin: 37,484,600* | |

### Additional info on achievements and issues in achieving the project objective

**Wind measurements and assessments**

The wind data in Indonesia are obtained from various wind measurement such as from the National Meteorological Agency (BMKG) and by in-situ measurement done by National Institute of Aeronautics and Space (LAPAN), Winrock International USA, Wind Guard Germany in cooperation with the Local Governments), Soluziona in cooperation with the MEMR, NipSA Spain, and NL Agency (Energy and Climate Change) as well as other relevant institutions at several areas in Indonesia. Based on the data collected, about 166 sites in Indonesia had been measured for the wind energy potential[[23]](#footnote-23). Out of these, around 35 sites have good potential wind energy with an average annual wind speed above 6 meters per second (m/s) and an additional 34 sites also have sufficient wind energy to be developed; with the average of annual wind speed is ranging between 4-5 m/s.

The assessed wind energy locations will be promoted to both government and private sector to inform them on the wind power potential in Indonesia that can economically be tapped. This should lower their reluctance to invest in grid-connected wind power development. Wind mapping and assessment will be expanded to cover other identified locations. Many locations have not yet been assessed because of their remoteness and due to financial constraints. For data quality improvement, the WhyPGen project has extended support to a number of measurements by using more reliable equipment and direct measurement at selected locations. Normally, such measurements should take at least a full year or more to cover seasonal variations in wind and to generate data valid enough for a bankable proposal.

**Wind project development**

The table in the previous Section 4.2.1 gives an overview of the status of the development of wind farms (output 1.2 in the project document, ProDoc). The 50 MW Samas Project, developed by UPC Renewables-Binatek Reka Energy, is likely to become the first commercial wind farm. UPC-Binatek have been conducting assessment and measurements at the location for more than 3 years. The first measurement was conducted at 60m height, while a second measurement has been running for more than 1 year at 80m height at two sites. The developer has completed the process of getting permits from the local government, including land acquisition. At the moment, the PPA is under negotiation between the developers and PLN. This will lead the Samas project into the next financial closure phase after which hardware procurement and construction could be initiated. The WHyPGen project has been providing support as an ‘independent’ advisor in providing provide support and guidance to PLN in reviewing and evaluating the project, including facilitating the discussion and negotiation with the developer as needed. The project would be very strategic as the (first!) success story of a commercial wind power project in the country. It is expected that the PPA for Samas Project can be signed in the 3rd quarter 2014. Currently there are three other projects in line to start PPA negotiations, namely Jeneponto (with AGC), Sukabumi (with Viron Energy) and Sidrap (with UPC-Binatek).

**Financial aspects and feed-in tariff**

The lack of financial support is related to the non-availability of electricity price that specially generated by a wind power generation. The electricity price was based on the existing regulation from the MEMR no. 31/2009 on the standard price for the utility PLN in purchasing the electricity generated by renewable energy (RE) and excess power (in projects less than 10 MW). According to the 2009 regulation, the electricity price generated from wind energy is only INR 625/kWh. This price would too low to make any investments in wind energy attractive for the investor. Thus, one of major WHyPGen project activities has been to advocating a suitable feed in tariff (FiT) for wind energy. A policy proposal has been submitted to the MEMR, which currently is under discussion. The WHyPGen Project will continue to provide support and advocacy on the policy making process. The existing of a FiT for wind energy is very crucial as it will become the reference for PLN and small-medium developers in the negotiation process; one suggestion has been to extend the tariff to projects up to 50 MW to cover medium-sized projects as well.

Regarding the longer-term sustainability, operating the FiT system should not be loss-making for PLN, hence it will adversely affect its financial health and/or create resistance within the utility’s management against renewable energy. It is not entirely clear to the MTR evaluators if in the end the premium part of the FiT will be paid for by the public treasury or transferred to the power consumer by means of higher tariffs.

Box 5 Summary of wind farm project status

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Wind Farm Project** | **Project Developer/partner** | **WHyPGen support** | **Status** |
| 1 | 10 MW Ciemas – Sukabumi axtend to 50MW | Viron Energy | * Technical feasibility study, for 10 MW and will extend to 50 MW | * Established PPA, but as the tariff is considered too low, currently under negotiation. Also, re-design of lay- out and configuration of new wind turbine (Sinovel type). * Improvement on the existing feasibility study |
| 2 | 50 MW Samas | UPC Renewable and Binatek | * Advice to PLN staff * AEP wind farm simulation | * 3 met masts[[24]](#footnote-24) have been installed since 2012, with 60 m height (1 mast) and 80m height (2 masts) * PPA Negotiation and apparently close to conclusion |
| 3 | 62.5 MW Jeneponto 1 | AGC and Energi Angin Indonesia |  | * 3 met masts had been installed since 2009, with 80 m height * Feasibility study is completed and currently in the preparation process for PPA negotiation |
| 4 | 70 MW Sidrap | UPC Renewable | * Expert support on wind measurement and environmental study | * 3 met mast has already installed since 2013, with 60 m height * Feasibility study to be completed to prepare for the PPA negotiation |
| 5 | 20 MW TTS | AGC and PT. BAS | * Initial feasibility study with existing wind data | * The initial feasibility study had already done with the existing wind data. |
| 6 | 150 MW Garut | Medco Energi | * Technical and economic feasibility study * Wind data validation with installed wind measurement (plan) | * Gather data from site survey and wind resources assessment (WRA) with satellite data * Wind measurement installation plan * Initial study for possibility wind farm development at site |
| 7 | 50 MW Lebak | Viron Energy | * Technical and economic feasibility study * Wind data validation with installed wind measurement | * Measurement program start on October 2013 and will finish on October 2014 * Completed initial Feasibility Study using the existing wind data. |
| 8 | 500 KW pilot grid connectin | EBTKE-ESDM | * Provide wind data * Selected feasible site for demo * Feasibility study | * Feasibility study on progress and the target should be finished November 2014. * The project will deploy at 2015. |

Box 6 Example of a feasibility study, Oelbubuk, TTS (Timor Tengah Selatan)

One output of the WhyPGen project is the facilitation of techno-economic studies of the utilization of wind power systems in locations that have been selected as having a good wind resource potential (see Indicator 8 in Box 4). This text box provides an example of one of these studies, namely the techno-economic study for Oelbubuk, located in the regency (district) of Timor Tengah Selation (TTS) in the province of East Nusa Tenggara (NTT).

The study has the following contents:

|  |  |
| --- | --- |
| **Section** | **Description** |
| Site description and conditions | The area has been selected due to its low electrification rate (29%) and its high wind potential with wind speeds higher than 6 m/s. Diesel generation plants with a combined capacity of 4.66 MW are located in the capital Soe and other sites in TTS. There are plans to construct a hydropower facility (3 MW) and wind farm. The chapter describes site characteristics, ground and soil conditions at Oelbubuk as well as the need for access roads (some need to be built) and availability of cranes (can be hired in Kupang, capital of NTT and transported by boat). It further describes environmental and legal aspects and seismic risks. |
| Wind resource assessment | Wind speed and direction data are available for 1998, measured at 30 m height. Wind energy potential has been calculated using WASP and WindPro software, showing average wind speed of 6.6 m/s (lowest in February at 2.6 m/s and highest during July-September at 9.2 m/s). Taking into account surface topography, results obtained are wind speed at 6.74 m/s and wind power density of 372 W/m2 |
| Technical layout | This chapter describes the possible configuration comparing with four types of wind turbines (0.27-0.34 kW each) of various brands (Vestas, Enercon, Vergnet) as well as the possible wind farm layout (with installed capacity of 10.7-13.1 MW |
| Energy production estimates | Simulations are made using WindPro and WASP software with the four types of wind turbine to make estimates of the wind production (in kWh/yr) with capacity factors of 37.8-39.2% |
| Cabling and grid connection | Two sections describe internal cabling concept and the integration with power network of the area, including transmission lines and substation needed |
| Cost-benefit estimates | The last chapter gives an estimates of the cost of the wind farms and its financial indicators (such as NPV and IRR). These calculations are done for two turbines (the Enercon E33 330 kW and Vergnet GV 275 kW). The table below summarizes the results for the Enercon turbine: |

The project has engaged PT. Sarana Multi Infrastruktur (SMI) to support the wind energy project financing in the country. SMI was established in 2009 (fully owned by the Government) with the aim of accelerating the provision of funding for national infrastructure through partnership with private and/or multilateral financial institutions with a catalytic for infrastructure investment through financing and advisory activities. The WHyPGen Project has allocated USD 300,000 as grant facility to support the bankability of the wind power projects with the idea of leveraging up to 10 times for financing of the grant as the potential wind project.

The issue with such a grant facility appears that it is too small to make an impact in terms of facilitating a credit line to support commercial wind power development. It has been mooted to use the grant facility to organise the finance package for the proposed 10 MW wind farm at Sukabumi to be developed by PT. Viron Energy. This would also nicely fit with the target in the project’s objective of supporting 9 MW of demo activities. However, we were informed that Viron Energy is already contemplating upscaling the Sukabumi project to 50 MW or more and loan financing does not seem to be a critical issue anymore with equity available from other investors. The future of the USD 300,000 is now under discussion at SMI and they are now considering using the funds to provide financial engineering and advisory services.

**Promotion and capacity strengthening**

The WHyPGen Project has supported the promotion of grid-connected wind and the wind potential in Indonesia by conducting seminars, workshop, participating in exhibition and one-on-one meetings with some of the relevant stakeholders. The main challenge in promoting wind energy in Indonesia is the lack of confidence on the wind energy potential itself. Based on the studies conducted in 19 locations spread over 13 provinces in Indonesia, it is estimated that wind energy can generate electricity up to 900MW. These studies have been presented and promoted to the public, and WHyPGen will collaborate with potential developers, MEMR and PLN to have further feasibility assessments based on the studies.

There is lack of a success story on wind power generation in Indonesia, and WHyPGen is in the process of supporting the rehabilitation of the Nusa Penida wind hybrid power facility. Nusa Penida is part of Bali islands. There are 9 units of wind power generation with total capacity installed is 735kW which are hybridized with 62kW solar power and the original diesel units with a capacity of 5.79 MW. The hybrid power plants are owned by the MEMR and PLN. The wind hybrid power generation was installed during 2005-2007, but sadly all the units are not working anymore due to various reasons (see Box 7 for details). WHyPGen Project has conducted an assessment to support the refurbishment process. It has been suggested that the project could provide for the automated control system for grid integration, while MEMR/PLN should finance the necessary turbine repairs (see Box 14). The Nusa Penida experience may relate to the lack of qualified operators and engineers in the wind power sector and the issue of ownership and responsibility for operation and maintenance.

### Global environmental impacts

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * How about achieving a total capacity of 9.4 MW WHyPGen demonstration projects implemented and operational by end of the project? * How about achieving a total capacity of 100 MW of planned installation of WHyPGen after the end of the project? * A commentary is required on the “Expected Situation at the end of the Project” as envisioned at the MTR and recommendations, if any required, for accelerating the pace of work; |

Box 7 Status of the wind hybrid system installed at Nusa Penida

Issues with wind power generation at Nusa Penida

Nusa Penida, an island of 9,500 inhabitants, has s hybrid system installed, consisting of 9 units of wind power with installed capacity of 735kW and a 62kW solar power facility that supplement the original diesel units (with a capacity of 5.79 MW). The six 80 kW (WES80) wind energy systems were supported by MEMR (of which 5 were procured from Wind Energy Solutions BV (WES) and one from ALTO) and three systems of 85 kW by PLN. All these systems were installed between 2005 and 2007. Operation and maintenance of solar PV and wind energy systems has been handed over to a local cooperative, but have been operating for 3-4 years only. The island of Nusa Penida is connected to Bali grid through a submarine cable. Because of rocky topography of sea bed, there is often grounding of the cable, causing malfunctioning.

Currently, the wind energy systems are not functioning, due to hardware failure and breakdown of individual control systems. The warranty period has expired and, anyhow, the local distributor who supplied these systems closed its operation in Indonesia. The existing Solar PV installation (1x30 + 1x 32 = 62 kW) has problems with the inverter and/or transformer.

The UNDP-GEF WhyPGen project is trying to bring back the renewable energy system and ensure it becomes a ‘smart’ hybrid grid system where the individual power systems have enough safeguards as needed. Discussions are under progress with PT. PLN Bali and MEMR to invest their own funds for repair to have these wind turbine installations into operation soon. PLN is trying to restore one of their 85 kW turbine (Tower 5) first as it seems to costs less than the others (estimated to be USD 100,000). For the other two PLN towers, tower 3 and 4 will cost USD 180,000 each, mainly for cabling system modification and changes in the invertor hardware (to be subcontracted to Siemens)

The WHyPGen project has provided the following support:

* Conducted an assessment of all the 9 wind turbines;
* Installed wind measuring mast at Tower 8 to check on wind production data;
* Conducted training for the operation and maintenance staff. This training was especially designed to improve their knowledge and skill of day-to-day operational basis of a wind power generation, simple maintenance and troubleshooting.
* Assessed cost for restoration of all the renewable energy systems including solar PV. This also included the cost of monitoring equipment installation, so that information (data on electricity generation and status of functioning) can be sent to PLN offices both in Bali and Jakarta. It was also estimated that the project will support needed maintenance devices such as a lifting crane.

A number of possible next steps and proposed WHyPGen interventions are discussed further in Box 14.

Lessons learned regarding failure of the systems

* When these systems were handed over to local cooperative, there was no clarity on who takes the action if there is a breakdown and/or hardware failure in the system. The local cooperative was not sufficiently trained on the operation and maintenance of the hardware including wind turbines. This brings up the issues related to ownership and point of responsibility for proper operation and maintenance of the renewable energy systems in small grid systems;
* Since wind turbines and solar PV systems were added over a period of time, there was no integrated approach towards having proper control systems and it turned out that the Nusa Penida hybrid system did not have sufficient safety, equipment protection, and system controls. PLN has preferred to do a manual synchronization of renewables grid at its substation with the island grid, which is a rare practice for grid capacities over 100 kW. Manual synchronization requires skilled operators and a major challenge exists to connect dedicated supply from renewables safely to the grid at the correct frequency and phase, and disconnect quickly and safely from the grid when a disturbance is detected. Furthermore, with the island system connected to the submarine cable, it is all the more important to have protective devices to switch automatically while transitioning between island-only and grid-connected modes. Controllers such as protective relays, reclosers, power factor correcting capacitor banks are in a required automatic synchronization system (at substation) with electronic load controller (ELC).

Note: the text is mainly based on the BTOR report by UNDP Regional Technical Specialist, B. Gadde (2014)

It is proposed to detail the indicators on installed and planned capacity on a more sliding scale, differentiating between various development stages, i.e. installed and operational, under constructing, under negotiation to undergoing a site feasibility analysis. This will provide a fuller picture of the status of wind project development. After refurbishment, Nusa Penida should become operational again in 2015. One commercial wind farm project is being close to PPA, and others are entering the PPA negotiation stage. However, achieving construction and commissioning will take time; for example, the first UPC-Binatek wind farms at Samas and Sidrap would only be operational by 2016. Being able to cover this construction period, is one reason to propose extend the project in a budget-neutral way up to mid-2016 (see Section 5.2 on recommendations).

Box 8 provides an overview of the expected installed and planned capacities of wind power by 2016 and associated wind energy production and greenhouse gas emission reduction estimates.

Box 8 Overview of expected direct and indirect emission reduction by mid-2016



Note: the emission factor used is 0.722 tCO2/MWh, taken from *Electricity-specific emission factors for grid electricity*,

Econometrica (2011)

In the above Box, the following definitions are used:

* Direct emissions: from installed capacity, i.e. wind farms operating or close to commissioning
* Post-project direct emissions: wind farms near financial closure or with advanced PPA negotiations;
* Indirect emissions (bottom-up): from wind farms with complete feasibility studies that have aroused attention from prospective investors or developers who are preparing for PPA negotiations.

The original target of 9.4 MW is a bit off the mark. By mid-2016, the likely situation is that a) no capacity has been added still (implying that both the Nusa Penida rehabilitation and the Samas wind farm construction have met delays); b) 0.7 MW is rehabilitated and operating (Nusa Penida) or c) 50.7 MW at Samas is installed (or close to commissioning) and Nusa Penida operating. If all the wind farms mentioned in Box 4 (Indicator 11) could be realized in the near future and would become operational, this would imply an installed capacity of around 450 MW. This would be substantially more than the target of 250 MW of wind power set by MEMR for the year 2025.

The following table gives the assumptions used in the energy production and GHG emission reduction to calculate the figures of Box 8. It should be noted that data on investment and operation and maintenance (O&M) are for illustrative purposes only. These do not refer to the cost of specific proposed wind farms (such as Samas) but are based on data provided in international literature[[25]](#footnote-25). The wind production assumes a capacity factor of wind farm of 25%. Greenhouse gas emissions are calculated for medium-sized wind facilities, assuming these are hybrid with diesel generators in local grid systems (thus replacing diesel fuel) and for big wind farms, assuming these are connected to the main grid systems (this replacing the fuel mix typical for the grid, and the average emission grid factor for Indonesia’s grid system[[26]](#footnote-26) has been applied).

Box 9 Model calculation of energy production and GHG emission reduction for a 1 MW and 50 MW wind farm

Please note that the cost analysis does not include financing cost

## Project implementation and adaptive management

### Management, work planning, monitoring & evaluation, reporting and communications

**Mid-term review questions (see Annex E)**

|  |
| --- |
| Adaptive management framework:   * + - How effectively is the project managed at all levels? Is it results-based and innovative?     - Asses how project partners, stakeholders and co-financing institutions are involved in the Project’s adaptive management framework?     - How about the changes made to project implementation arrangement during the project implementation, if applicable? Have they impacted the project in a positive way?     - Assess the use of the project logical framework and work plans as management tools and in meeting with UNDP-GEF requirements in planning and reporting.     - How does the APR/PIR process helped in monitoring and evaluating the project implementation and achievement of results? |

The implementation arrangements are described in Section 3.4. BPPT is the implementing partner of the project, the designated Implementing Partner for the project under the National Implementation Modality (NIM) of the UNDP. UNDP, which provides support to the project on behalf of the GEF takes the role of the Senior Supplier.

At the management level, a Project Management Unit (PMU) is responsible for the overall operational and financial management and reporting in accordance with the rules and regulations of the Government of Indonesia and UNDP and manages day-to-day operations of the project, including operational and financial activities, developing the Annual Work Plans (AWPs), quarterly progress reports, monitoring and evaluation, preparation of ToRs of consultants and contracted services, and inform the Project Board on any issues, problems and possible options to address these.

Key staff are:

* National Project Manager (Mr. Soeripno Martosaputro)
* Technical experts[[27]](#footnote-27)
* Finance, administrative and office support

The Project Board (PB; often referred to as ‘project steering committee’) is responsible for making decisions for the project when guidance is required by the Project Management Unit (PMU), including recommendations for approval of project plans and revisions. Members include representatives from National Development Planning Agency (BAPPENAS), BPPT-Planning Bureau, BPPT-B2TE (Energy Technology Centre); Ministry of Energy and Mineral Resources (MEMR); LAPAN (National Institute of Aeronautics and Space); Ministry of Energy & Mineral Resources (MEMR); Ministry of Trade & Industry (MTI); Ministry of Finance; National Electricity Company (PLN), UNDP, while also Alpen Steel and Viron Energy have participated in PB meetings as important co-financiers. The BPPT and UNDP representatives act as Chairs of the Project Board.

BPPT has appointed a National Project Director (NPD), Mr. Soni Wirawan, The NPD is responsible for the achievement of project objectives as per the approved Project Document and trusted with the responsibility to authorize the use of project fund and resources to effectively deliver project outputs and responsible for the timely submission of progress report, and dully signed financial reports. The NPD is assisted by two Deputy NPDs[[28]](#footnote-28).

The Project Team has performed certain adaptive management tasks, in the sense that it has been re-focussing activities to market clusters that seem to be furthest in establishing wind farms, namely developers of large wind farms (> 50 MW) and their negotiations with PLN, although this market segment is not really the focus of the original Project Document. To properly monitor this change in focus, we feel requires some changes in the project logical framework and its set of progress indicators with targets that can be reported (see Sections 4.1.1 and 5.2).

### GEF budget and co-financing

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * + How is the committed co-financing for the project being used by PMU and BPPT? Report the co-financing details in the format as suggested in Annex 1 in the ToR; “Table A1: Financial Planning Co-financing”; |

A summary of the performance of the project in terms of actual expenditures per main project component and budget category is given in the Box below.

Box 10 Budget overview (until June 2014) of the GEF-funded components



It should be noted that detailed financial management or disbursement issues are not the subject of this MTR as such, as the project has a separate financial auditing process. This section analyses the progress of expenditures in relation with the progress of outputs and results. Box 11 on the next page provides an overview of committed and realized co-financing.

The following can be observed:

* + The disbursement rate has been 47% only (USD 1,008,222 of the GEF budget of USD 2,156,200) compared to 81% of the project period passed (April 2012-June 2014).
  + The realized co-financing is quite low (11%), mainly consisting of the in-kind contribution of the government entities involved (BPPT; plus the involvement of local government) and of the project and site development preparation activities of some of the project developers (Binatek/UPC, Bakrie Power, Medco). This is understandable, because most co-financing consists of cash associated with the investment in the preparation and construction of wind farm, which is still pending.

Not surprisingly, most expenditures have been realized in Component 1, in which the project results have advanced the most (wind resources assessments and feasibility studies). Expenditures in Component 6 have been the lowest (only 23%), reflecting the relative lack of progress in the organization of technical training and capacity building. With the capital grant placed in the care of PT SMI raised from the original USD 200,000 to USD 300,000 this automatically implies that the financial Component 3 has spent more than 100%. However, this does not reflect progress in results, but merely the fact that the USD 300,000 has been transferred by UNDP to PT SMI.

**Box 11 Committed and realized co-financing**



*Note:* the realized co-financing of the private investors (USD 3,321,000) is related to site and project preparation and can be considered ‘*grant/cash*’, while the UNDP and government contribution (USD 958,000) up to now have been ‘*in-kind*’.

Regarding budget categories it can be observed that the budget category of equipment has been underutilized. It has been suggested that these funds could be used as (limited) project support to the refurbishment of the Nusa Penida wind facility. A suggestion (see recommendations in Section 5.2) is to finance a state-of-the-art automated grid connection control system.

## Sustainability

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * Validate whether the risks originally identified in the project document and, currently in the APR/PIRs are reasonable? And their risk rating in terms of most critical is reasonable? * Describe additional risks identified during the review, if any, and suggest risk ratings and possible risk management strategies to be adopted. * Is the project implementation and achievement of results proceeding well and according to plan, or are there any outstanding issues, obstacles, bottlenecks, etc. on the implementation of demonstration projects, government or private sector or the captive power industry as a whole affecting the successful implementation and achievement of project results? |

Showcasing grid-connected wind power in Indonesia: lack of success stories so far

The lack of success stories on wind power generation in Indonesia is a critical risk, not only for wind power in Indonesia in general, but for the project in achieving its objective in particular, i.e. the installation of 9 MW of wind power. Until recently, the lack of confidence by government entities (PLN and MEMR) and commercial wind power developers led to the potential of wind for power generation being ignored. A successful pilot project is required to convince both government and private stakeholders. The wind-solar-diesel hybrid facility at Nusa Penida (with 0.73 MW of wind, built during 2005-2007, was meant to be such a showcase demo project, but damage and other reasons to turbines have caused the wind farm to be out of production (see Box 7). The WHyPGen project is currently encouraging the rehabilitation of this facility by means of an assessment of the repair and maintenance issues. Second, the project has been assisting PLN by providing technical assistance in the review and evaluation process of a 50MW commercial scale wind farm at Samas. Hopefully, this project can become the first success story of commercial wind project in Indonesia, now that PPA negotiations are getting close to successful conclusion.

Both projects are very critical for wind power development in the country. The Nusa Penida facility will demonstrate that government (or utility)-supported wind power development is possible. The 50 MW Samas wind farm will be the first reference of a commercial activity. Failure of any of these project will strongly strengthen the negative perceptions on wind power generation development in Indonesia, while success of these ‘early birds’ projects will encourage other project developers or investors to have wind power business in Indonesia.

Regulatory-strategy: lack of wind power pricing policies

After the first experiences in wind power development in Indonesia, it will then depend on how private investors take wind power as a cost-effective and profit-making venture. The big investors (> 50 MW) will negotiate PPA as business-to-business deals with PLN, including the agreed tariff. Investors in small-medium and medium-sized farms (1-50 MW) will face higher installed cost and will benefit from a reasonable and competitive price for wind.

Presently, there has no specific regulation been available for energy pricing for grid-connected wind power generation, unlike other renewable sources of energy. A reasonable and competitive feed-in tariff (FiT) for wind energy is very strategic for the development of wind power generation in Indonesia. It demonstrates the real interest shown by the Government and will serve as a guarantee for the medium-sized investors/project developers to invest on the wind power generation. WHypGen has assisted PLN-MEMR in formulating a draft FiT for wind energy, which is currently under discussion.

Given the above-sketched development and the favourable wind energy potential in (as shown by wind resource and site feasibility assessments by the WhyPGen project), the sustainability of the wind technology (WHyPGen) can be considered ‘moderately likely (ML)’.

# Conclusions and recommendations

## Conclusions

The following table provides a summary of the ratings for a) progress towards results, b) project implementation and adaptive management and c) sustainability. Although not strictly required, a rating for ‘design and relevance’ has been added

Box 12 Mid-term review ratings and achievements summary table

|  |  |  |
| --- | --- | --- |
| Main criteria | Rating | Explanation |
| Progress towards results | MS | The project has been most successful in carrying out wind resource assessments, site assessments and feasibility analyses. These studies have been presented and promoted to the public, and WHyPGen has been successfully cooperating with potential developers, MEMR and PLN. A feed-in tariff proposal had been submitted to the MEMR. The existing of FIT for wind energy is very crucial as it will become the reference for PLN and medium-sized project developers in the negotiation process  Significant shortcomings include the lack of progress so far in the Component 3 (Finance) and Component 6 (training and capacity building). This may have to do with the lack of focus on a particular market cluster (large, medium; commercial or PLN; small grids) and identification of actors as beneficiaries of the project’s activities. |
| - Component 1  - Component 2  - Component 3  - Component 4  - Component 5  - Component 6 | - HS  - S  - U  - S  - S  - MU |
| Design and relevance | MU | Major shortcomings are that the project documents tries to lower a range of barriers in a timeframe which seems way too short and serving a range of beneficiaries market clusters (large developers, medium developers; institutional developers, rural electrification) without properly identifying their different capacity strengthening needs. Second, the indicators needs to be improved and the MTR Team is suggesting a revised list of indicators (see Box 13 in Section 5.2) |
| Implementation and adaptive management | S | The project started only after substantial delay in Oct 2012, but nonetheless the Project Team has some significant results, notably in the first Components as well as in Component 4 (feed-in tariffs). In terms of adaptive management, the Team rightly has shifted focus on market clusters that are most crucial in getting the first wind farms in Indonesia operational, i.e. large commercial (> 50 MW scale). More details are given in Section 4.3. |
| - Management  - M&E; reporting, communications  - Stakeholder involvement  - Budget and co-finance | S  S  S  S |
| Sustainability | ML | The lack of success stories on the wind power generation in Indonesia is a critical risk for the project in achieving its objective. With the first experiences in wind power development in Indonesia, it will depend on how private investors take wind power as cost-effective and a profit-making venture. Given the interest already shown by developers and the promising number of sites assessed on feasibility by the WhyPGen project, the sustainability of the wind technology (WHyPGen) is rated as ‘moderately likely’ |
| Overall rating | MS |  |

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * Progress towards achievement of results   + Given the level of achievement of outputs and related inputs and activities to date, is the Project likely to achieve its Immediate Purpose and Development Objectives?   + Are there critical issues relating to achievement of project results that have been pending as on date and need immediate attention immediately after MTR? |

In conclusion, the WHyPGen Project has been instrumental in bringing the wind power agenda forward by providing reliable wind resource data, providing independent advice in PPA negotiations between PLN and commercial developers as well as promotion wind energy amongst the community of companies that are or would potentially be involved in wind power development (equipment providers, project developers). The realization of the target of 9.4 MW is a third-party investment decision, not directly made by the Project, but it seems likely that at one point in the near future the medium-sized Nusa Penida (0.735 MW) wind farm will be operational (by 2015), while the first commercial wind farm (50 MW, Samas) might be operational by 2016.

## Recommendations

There are a number of issues are discussed in this Section with numbered recommendations on how to address these issues.

**Mid-term review questions (see Annex E)**

|  |
| --- |
| Factors beyond the Project’s immediate control or project-design factors that influence outcomes and results:   * Is the project implementation and achievement of results proceeding well and according to plan, or are there any outstanding issues, obstacles, bottlenecks, etc. on the consumer, government or private sector or the wind energy industry as a whole that are affecting the successful implementation and achievement of project results? * With regards to WHyPGen technology, is the existing technology provider in the country strengthened enough to support the project? Is the capacity building and skill enhancement of the technical personnel sufficient to support the project implementation? Are there issues with the WHyPGen adoption, operation and maintenance? * To what extent does the broader policy environment remain conducive to achieving expected project results, including existing and planned legislations, rules, regulations, policy guidelines and government priorities? * What are the other barriers/problems being encountered?   + If possible, identify the causes for the same?   + How the PMU and BPPT have addressed those? If not addressed, explain why?   + Recommendations from the MTR Team of how to address those during rest of the project implementation period. |

|  |
| --- |
| * Proposals for future directions underlining main objectives:   + Do the Project’s purpose and objectives remain valid and relevant, or are there items or components in the project design that need to be reviewed and update   + Corrective actions for the design, implementation, monitoring and evaluation of the project; including Specific recommendations on how to expediently mobilize and facilitate the planned activities not completed as on date and activities to be completed during rest of the project implementation period |

**Corrective actions for the design implementation, M&E of the project; Future directions for Components 5 and 6**

1. *Adjusted list of indicators with baseline and end-of-project targets*

The following Box summarizes an alternative List of Indicator, based on the 2014 PIR, but further adjusted by the MTR team, for future progress reporting of the WhyPGen project with quantitative targets:

Box 13 Proposed revised progress indicators

| **Indicators (**as in PIR; see Box 2 with *baseline situation,* end-of-project targetsand **mid-term status)** | **Alternative list of indicators** | **Baseline (mid 2011)** | **EoP target (mid 2016)** | **Status**  **(mid 2014)** |
| --- | --- | --- | --- | --- |
| **Project objective** | **Project objective** |  |  |  |
| 1. Installed capacity of WHyPGen facilities (*0,* 9.4 MW, **0.735 MW**)  2. Total electricity generation from installed WHyPGen facilities (*1.35*; 19.27 GWh/yr, **0**)  3. Total WHyPGen capacity planned (*0,* 100 MW, **452.2 MW**) | 1. Installed wind power  * Number of projects (based on Indicators 11 and 12) * Capacity (MW) * Electricity generation (GWh/yr) * Direct emission reduction (ktCO2/yr) | Installed/under construction:   * 1 * 0.734 MW * 1.6 * 3.0 | Installed/under construction   * 2 * 50.7 MW * 111.1 * 82.0 | Installed/under construction:   * 1 * 0.734 MW * 1.6 * 3.0 |
| 1. Short-term planned wind power  * Number of projects (see Indicator 13) * Capacity (MW) * Electricity generation (GWh/yr) * Post-project emission reduction (ktCO2/yr) | Negotiation   * 0 | Negotiation   * 3 * 162.5 MW * 355.9 * 256.9 | Negotiation:   * 1 * 50 MW * 111.1 * 82.0 |
| 1. Longer-term planned wind power  * Number of feasible projects * Capacity (MW) * Electricity generation * Indirect emission reduction | * 0 | * 4 * 220.5 MW * 373.4 * 270.8 | * 7 * 333 MW * 619.8 * 448.7 |
| **Component 1 WhyPGen Technology Application Assessments** | | | | |
| *Outcome 1.1: Enhanced knowledge of potential WhyPGen application* | | | | |
| 4. Provinces covered by the new & updated wind maps (*0*, 9, **13**)  5. Number of assessed locations with wind power potentials (*0*, 25, **19**)  6. Number of identified locations with wind resources that are feasible for wind-power based power generation (*0*,15, **16**) | 1. Provinces covered by the new & updated wind maps 2. Number of assessed locations with wind power potentials 3. Number of identified locations with feasible wind resources | 0  0  0 | 13  25  20 | 13  19  16 |
| *Outcome 1.2 Improved knowledge of WhyPGen systems, benefits and costs* | | | | |
| 7. Number of evaluated wind energy system (*0*, 11, **8**)  8. Number of completed wind power generation project feasibility studies (*0,* 10, **10**) | 1. Number of evaluated wind energy system 2. Number of completed wind power feasibility studies | 0  0 | 11  10 | 8  10 |
| *Outcome 1.3 Enhanced interest in investing in WhyPGen system projects* | | | | |
| 9. Number of local equipment manufacturers that can potentially produce wind energy components (*0*,14, **15**);  10. Number of local equipment manufacturers that are ready to produce wind energy components (*0*, 7, **10**) | 1. Number of assessed local equipment manufacturers that can:  * potentially produce and * are ready to produce  1. Number of local equipment manufacturers that can potentially produce wind energy components | 0  0  0 | 15  10  15 | 15  10  15 |
| **Component 2 WhyPGen Technology Demonstration** | | | | |
| *Outcome 2.1 Increased number of WhyPGen projects planned and implemented* | | | | |
| 11. Number of planned WhyPgen replication projects (*0*, 10, **7**)  12. Number of WhypGen projects implemented (*0*, 6, **1)** | 1. Number of projects under operation/construction/rehabilitation[[29]](#footnote-29) 2. Number of projects under negotiation (PPA, finance) | 1  0 | 5  3 | 1  1 |
| *Outcome 2.2 Increased share of wind energy in national power generation* | | | | |
| 13. % contribution of WHyPgen in electricity supply in Indonesia (*0*, 0.0062, **0**) | Propose to delete this outcome and the indicator, because it is more at impact (project objective) than at outcome level. Moreover, with only few wind farms getting on-grid, the % will still be very low; the indicator is not giving any useful insight. |  |  |  |
| **Component 3 Financing of WHyPGen Initiatives** | | | | |
| *Outcome 3.1 Increased investments on wind power generation (including WhyPGen) projects* | | | | |
| 14. Number of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable proposals by year 3 (*0*, 6, **2**)  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 proposals (*0*, 28, **10**)  16. Number of banks/FIs that provide affordable financing schemes for WhyPGen projects *(0*, 3, **1**) | 1. Number of local services providers and power project developers trained on the development of business plans and utilization of financial models for preparing bankable proposals by year 3 | 0 | 25 | 10 |
| *Outcome 3.2 Local banks/ financing institutions providing loans for wind power generation (including WhyPGen)* | |  |  |  |
| 17. Number of financing schemes designed and approved for wind energy projects as well as for WhyPGen component manufacturing (*0*, 3, **0**)  18. Number of wind energy projects implemented with financial support through the approved financing scheme (*0*, 2, **0**)  19. Volume of financing (in USD million) provided to implemented wind energy projects through the approved financing schemes (*0*, 16 million, **0**) | 1. Volume of finance offered by local banks as part of financing schemes (loans, guarantees, other) for wind power *(see also Recommendation 4c)* 2. Total volume of project-linked finance invested by implemented wind projects 3. Completed study on sources of funding and issues and options in financing commercial wind power with recommendations for one or more financing schemes *(new indicator, see Recommendation 4b)* | 0  0  0 | $ 3 million  $ 16 million  1 | 0  0  0 |
| **Component 4 Policy & Institutional Support for WHyPGen Initiatives** | | | | |
| *Outcome 4.1 Increased investments on wind power generation (including WhyPGen) project* | | | | |
| 20. Number of formulated policies (fiscal, market, regulatory, institutional) that are supportive of wind power generation (*0*, 6, **4**)  21. Number of approved and enforced policies (fiscal, market, regulatory, institutional) that are supportive of wind power generation (*0,* 3, **0**)  22. Number of local companies actively engaged in the wind power generation (including WHyPGen) business (*0,*14, **15**)[[30]](#footnote-30) | 1. Completed review of existing policies and regulations (tax incentives, regulations, tariffs) and applicability for wind energy development (big, medium, small) *(new indicator; see explanation given in Recommendation 4d)* 2. Status of and number of policy regulations on feed-in tariff and facilitating market access  * Proposed * Approved | 0  0  0 | 2  1  2 | 1  1  1 |
| **Component 5 WHyPGen promotion** | | | | |
| *Outcome 5.1 Enhance awareness of the benefits WHyPGen* | | | | |
| 1. Number of completed promotional materials on wind energy in general and WhyPGen in particular (*0*, 15**, 15**) 2. An operational and widely used central database system on wind energy by yr2 (*0*, year2, **2014**); 3. Number of engineering schools that offer courses on wind energy technologies in their engineering curricula (*0*, 3, **5**)[[31]](#footnote-31) 4. Average number of coordination activities of IWA (Indonesia Wind Association) each year starting yr 2 (*0*, 4, **0**) | 1. Number of promotional materials completed 2. Functioning website, users (counter) and central infobase with wind data with number of visitors 3. Number and type of promotional events organised with WHyPgen project support (with IWA and others) *(see Recommendation 4f)* 4. Guide for investors in wind energy *(see Recommendation 4e)* 5. Clearinghouse operational and (number of users, such as developers, investors, service/equipment providers that make use of the facility) *(see Recommendation 4g)* | 0  0  0  0  0 | 15  1  (9000)  Events:   * Annual forum (3) * Workshops   1  1  (10) | 15  1  (2900)  Events:   * 0 * 1   0  0  (10) |
| **Component 6 WHyPGen Market Development and Industry Support** | | | | |
| *Outcome 6.1 Improved local wind energy system (including WhyPGen) capacity* | | | | |
| 27. A fully established and operational wind energy clearinghouse by yr 2 (*0*, year2, **2014-15**)[[32]](#footnote-32)  28. Number of project developers, investors, technical service and local equipment manufacturers that make use of the clearing house each year (*0*, 8**, 0**) | 1. Completed report containing an assessment of (technical) capacity building and training needs and plan for project-supported activities per market cluster *(see Recommendation 4h)* 2. Number of engineering schools that offer wind power subjects in their engineering curricula 3. Number of vocational training institutes that including wind power operation and maintenance | 0  3  0 | 1  5  3 | 0  5  1 |
| *Outcome 6.2 Ensured availability of local service providers for wind generation facilities[[33]](#footnote-33)* | | | | |
| 29. Cumulative number of local equipment manufacturers trained under capacity development programs (*0,* 15, **0**)  30. Number of wind energy projects (including WhyPGen) that are designed and engineered by local technical service providers (*0,* 4, **0**)  31. Number of wind power (incl. WhyPGen) projects facilitated through WESMA (*0,* 2, **0**) | 1. Number of (technical) trainings and staff trained (engineers and operators[[34]](#footnote-34); service/consultancy providers) on wind energy topics | 0 | 100 | 0 |
| *Outcome 6.3 Better understanding of the availability and potentials for wind energy for ensuring environmentally sustainable power supply in Indonesia* | | | | |
| 33. Number of areas with completed electricity demand analysis and forecasts (*0*, 25, **0**)  34. Number of power project develeopers and technical service providers that make use of the electricity demand analyses and forecasts (*0,* 8, **0**) | Study on grid-related issues (ability of grids to absorb intermittent production, grid stability, dispatching rules, charges, etc.) *(see Recommendation 4j)* | 0 | 1 | 0 |

*Specific notes on indicators:*

* We deleted in the indicators formulations such as “wind generation (including WHypGen)”. Given the broad interpretation of hybrid system (any wind power generation connected to the main grid, island grid or village grid) and the fact that stand-alone power or mechanical applications are not to focus of this project, indicators can either refer to wind power generation or WHyPGen;
* The terms “service providers” is not really defined in the Project Document. We wonder what is really meant here, consultants, ESCOs? The market consists of government agencies, developers and investors, equipment providers and finance providers. We do not see a role for ESCOs in this market yet. Outcome 6.2 can be deleted because its Indicators are likely to have ‘nil’ as end-of-project achievement and duplicate other training indicators. They add little value to the project’s progress measurement.
* In the 2014 PIR already a number of the original Indicators (as mentioned in the Project Document) had been deleted, leaving only one Indicator (number 32 “% of all trainees..”) that as actually not a good indicator of the outcome 6.3

A *general motivation* for these proposed changes is given below:

a) *Duplication*

The indicators are sometimes a mix of real output and more outcome or impact-level indicators and sometimes have been found duplicating. For example, the indicators on energy production and emission reduction of output 2.2 is actually an indicator at impact level associated with the project objective. Another example is Output 5.2 (which is proposed to be cancelled) as it duplicates Outputs 2.1 and 2.2. In other cases, the list of indicators has been condensed a bit and re-organised with sub-indicators. For example, the indicator ‘financial mechanism’ can have as sub-indicators ‘size’ and ‘loans applied for and provided’. The indicator ‘loans applied for’ will cover both loans of the mechanism as well as other loans and thus not provide an indication of the success of the financial mechanism. Apart from the ‘financial mechanism’ indicator we do need an indicator ‘other loans applied for’ to keep track of the financial packages being engineered outside the project-supported ‘financial mechanism’. In this way, we tried to bring more logic in the list of indicators, but trying to avoid at the same time to create a confusingly long ‘shopping list’ of minor indicators.

b) *Components 1 and 2*

It is suggested that some indicators on wind project planning and implementation more closely reflect the various stages of development rather than just the two categories ‘installed’ and ‘planned’, namely 1) Identification, assessment of sites, 2) Feasibility of a wind power installation, 3) Negotiation (PPA), legal issues and permits, and financial closure, 4) Hardware acquisition, construction and commissioning and 5) Operation. For example, the end-of-project situation with three wind parks still under construction and 10 in the pipeline, may be a more desirable outcome than 1 demo project in operation and the rest on paper only, although the old set of indicators in the ProDoc would (have to) rate the first situation as more satisfactory.

*Component 3*

It was suggested during the mission by some of the stakeholders interviewed, that the WHyPGen project could do an analysis of various sources of (international/national) funding (sustainable energy, climate finance, green funding) that might be tapped into for wind energy development in Indonesia. An indicator (no. 17) has been added for this purpose.

*Component 6*

We think that Component 5 could actually have been merged with Component 6 (both seem to be a hotchpotch of 3 types of activities; a) promotion and info sharing; b) technical training and capacity building and c) rural electrification. We have left the original division in Components 5 and 6, but propose Component 5 to focus on awareness raising and promotions (website, info, workshops, and clearinghouse) and Component 6 to have a stronger focus on technical training and capacity building only. The Output 6.2 has been deleted. It was included to a) reflect the participation of one of the co-financiers, Ministry of Disadvantage Region (KPDT) and b) the focus on isolated mini-grid systems. However, as KPDT did pull out and more commercial wind project developer have come on board, the focus has shifted as well towards large-sized installations (connected to Java’s main grid mainly). PLN usually compiles power demand and supply data and projections on provincial basis. Based on these data, a small grid wind-powered system would have to include a more fine-tuned analysis of power demand as part of the feasibility study anyhow.

1. *Extension of project period until June 2016*

The MTR team recommends extending the project’s closing date to June 2016 without any budget increase. The reasons for this recommendation are:

* The project’s operations started only in October 2012, half a year after the envisaged start (April 2012); Half of the GEF budget is still unspent and, if used wisely, can sustain project activities until mid-2016;
* The timeframe of the project (3 years) is not sufficient to lower all the barriers (informational, policy-regulatory, capacity and financial) in a substantial manner;
* For the demo projects, associated with WHyPGen, the development and preparation period can be lengthy; the time needed from site assessment, feasibility analysis, negotiation, financial closure and construction and commissioning can easily take 3-4 years or more. The project duration should be re-defined such that it fully covers the preparation cycle of at least one commercial wind farm to be able to show results in terms of installed capacity. Apart from the Nuda Penida rehabilitation, it should be noted that the first commercial wind farm (Samas, 50 MW) is not likely to be operational until the end of 2015 and its commissioning should fall within the period of the WhyPgen project to be able to showcase the results;
* Other projects are still in planning stage. The project is supporting measurements at some sites. It will take minimum 1 year to have a valid data to develop a commercial wind power project and another year for feasibility analysis and starting PPA negotiations. In this regard, it can be argued to extend the project to be able to monitor the process from measurement to bankable proposal formulation;

1. *Suggested actions for the monitoring and adaptive management:*

*3a. Develop a strategic plan to cover barrier-removal activities*

A budgeted strategic plan 2014-2016 would serve to fine-tune the various outputs and activities to the needs of the actors in the various market clusters groups (see Box 12), particularly in the Components that so far has shown less results, i.e. the Components 3 (financial) and 6 (technical training and capacity building). It should include a description of the project exit strategy (e.g. transfer of information and database after the project’s end). The strategic plan should also reveal how the focus on market clusters will develop over time. For example, we can imagine the year 2014 continuing with a focus on information provision to PLN and large investors and developers, with the focus shifting in the succeeding year 2015 towards the needs of smaller developers (5-20 MW) on financial mechanisms and technical capacity building, while 2016 could (if budget still allows) see added a renewed attention to the issues and options of small island or village power grids (the latter could even produce a spin-off project proposal for rural & island grid electrification for UNDP/GEF).

*3b. End-of-project status report on wind power development*

Towards the end of the project, it might be worthwhile to undertake a qualitative stocktaking on remaining barriers and issues and suggestions for BPPT, MEMR and other stakeholder on actions needed to address these gaps.

**Actions to follow up or reinforce initial benefits**

*4) Activities needed to strengthen project impacts*

Component 2

*4a. Support to rehabilitation of Nusa Penida.*

The biggest capacity installed of wind turbine in Indonesia currently is in Nusa Penida with the total capacity of 735kW.While PLN and MEMR should take responsibilities for the repairs needed on the wind turbines, we concur the suggestions made (see Box 14) that the Project make available some funds from to provide a state-of-the-art control system for connection to the local grid and connection to the larger main grid system. This could come out of the budget line ‘equipment’ (in which about USD 260,000 is still left, see Box 10). The WHyPgen project should formulate a detailed plan, assessing the interventions needed with a clear timeline, so that the island hybrid power grid can be brought back as a smart system.

Box 14 Recommendations for the rehabilitation of the Nusa Penida wind hybrid system

The WHyPGen project is undertaking a task of assisting in refurbishing the existing wind hybrid system at Nusa Penida (see Box 7). Nusa Penida has had a manual synchronization of renewables grid at its substation with the Island grid and does not appear to have had the required safety, equipment protection, and system controls. It is important to upgrade to an automatic synchronization system. Furthermore, when connected via the submarine cable to Bali to the wider grid system, it is important to have protective devices to switch automatically when transitioning between Islanded and grid-connected mode.

WHyPgen can support Nusa Penida rehabilitation with the following interventions:

* Reassessment and proposal for upgrading of the control systems. Such upgrading is a must, and all the more necessary when connected to the submarine cable. It is suggested to hire (on an expedited basis) a consulting firm to properly assess the total system including individual controls that existing at renewable energy systems, mini-grid and substation.
* The project can formulate a proposal for a long-term operation and maintenance plan in coordination with the key stakeholders i.e. PLN, PLN Bali, MEMR and the local cooperative to ensure PLN and MEMR invest the needed funds to bring these systems back in operation. The plan should include issues as ownership, responsibility and funds availability in case of future system breakdown. It is further suggested for an agency to be selected that would establish an office at Nusa Penida to support operation and maintenance.
* In terms of GEF, grant assistance, the recommendations is to support the installation of a new upgraded control systems, with PLN or MEMR taking care of repairs on existing electro-mechanical equipment

Note: Based on the BTOR report by the UNDP RTA, B. Gadde (2014)

Component 3

*4b. Study on green funding and financing sources available for wind in Indonesia*

A new activity is proposed which would map the need for financial support and instruments per various wind power market cluster (large investors/developers), analyse readiness of banks and institutions to provide loans for medium-scale wind power generation and the availability and applicability of international and local source of green funding. To avoid duplication and save on budget, it is suggested to be undertaken jointly with the Danish-funded ESP3 project as part of support to the MEMR Clearinghouse on sustainable energy.

*4c. Discussion on SMI financing scheme*

The project had successfully engaged one financial institution, PT. SMI, to deliver the micro-capital grant that is part of its budget. Initially planned at USD 200,000, the amount was raised up to USD 300,000 by re-allocating some of the budget of Component 2. The grant was meant as a seed fund for wind energy project financing. PT. SMI would leverage the grant up to 10 times to finance a wind power project. However, given the size of wind power investments, the amount could possible only be used in one project. The project has been supporting SMI and Viron Energy to have a 10 MW project at Sukabumi. Apparently, finance does not seem to be a big barrier for Viron Energy anymore, and is in fact planning to upscale Sukabumi to 50 MW or more. Rather than using the USD 300,000 as seed money for a fund which by the nature of its size would be too small, it is being mooted now by SMI to use the amount for providing financial and project preparation services, which we feel should be discussed further.

Component 4

*4d*. *Review on the impact of policies and regulations*

Hopefully, the WHyPGen-supported feed-in tariff proposal will be accepted by MEMR by the end of 2014. It might be useful in 2016 to review impact of the feed-in tariff policy in terms attracting investors as well as to assess the impact of policy, regulations and incentives (tax policy, grid-related issues, permitting and licensing) on wind energy development in the various market clusters (large, medium, small wind farms).

Component 5

*4e. Guide for investors in grid-connected wind power development*

This guide would provide information on wind resources, potential sites and potential, linked with data available on the WhyPGen website, relevant policies and regulations, case studies, investment opportunities. It could be elaborated jointly with the ESP3 project as part of support to the MEMR Clearinghouse on sustainable energy.

*4f. Annual wind energy promotional event*

One suggestion made by one of the stakeholders interviewed is to organize a ‘wind energy’ forum and exhibition on an annual basis, in cooperation with MEMR and the wind energy associations (IWES, IWA) among wind power investors, developers, support providers and project implementers.

Component 6

*4g. Cooperation with ESP3 on strengthening RE and EE Clearinghouse at MEMR*

The project has been exchanging data on wind resources with the Danish-funded ESP3 project at MEMR (that has supported the development of a meso-scale wind map for Central Java). Apart from data and info exchange, the two projects could work together for examples in jointly commissioning the review studies on policy and regulations (recommendation 4d), guide for investors in wind energy (recommendation 4e) and grid connection impact study (recommendation 4j). As part of the project’s exit strategy (recommendation 3b), it should also be looked into with BPPT and MEMR how the Clearinghouse could be a depository of information, database, reports and documents after the proposed end of the project in 2016.

*4h. Assessment of (technical) capacity building and training needs and plan for project-supported capacity strengthening and training activities*

The MTR Team proposes this as a sub-study of the before-mentioned strategic plan (2014-2016) focussing on assessment of the technical capacity building needs (in additional to the financial capacity strengthening of Outcome 3) of various types of beneficiaries (government and utility staff, large developers, investors and financiers, small developers, equipment providers, individual engineers and maintenance experts and subsequently presenting a plan of capacity strengthening (courses, workshops, seminars) within the budget availability of the WHyPgen project. The assessment should build on existing expertise (such as the curricula of existing engineering and vocational training institutes; incorporate the results of the local equipment manufacturers’ capacity assessment and needs (output 1.3; Indictor 9 and 10). It should distinguish between the three main capacity needs areas (noting that business and financial planning training is covered in Outcome 3.1)

* Local manufacturing of wind power generation system components (building on Outcome 1.3);
* Design & engineering of wind power generation projects; and
* Installation, operation and maintenance of wind power generation facilities

*4j. Study on grid-related issues*

This assessment would deal with wind power transmission and grid connection issues, develop technical parameters and modelling for the grid connected wind farms to check grid stability and reliability of power supplies. Often grid stability risks are overestimated by utilities and the potential contribution of intermittent sources of power underestimated. As the study concerns other sources of renewable energy too, the study could be jointly undertaken with the before-mentioned Danish-funded ESP3 project.

## Lessons learned

**Mid-term review questions (see Annex E)**

|  |
| --- |
| * Lessons learned, if any, in addressing issues relating to relevance, performance and success |

**Project-specific lessons learned**

Despite being considered as having low wind speeds, nonetheless commercial wind project developers are getting interested in Indonesia for the following reasons:

* Internationally there is trend towards exploring lower-speed wind areas for wind farms, as fewer higher-speed wind areas are available, while wind technology is being developed to target this market;
* Indonesia is a vast country with a large enough wind energy potential in selected areas;
* New policies have been introduced over the past decade that encourage wind power developers and investors, including a commitment by policy makers (by means of national wind power target), experience with dealing with IPPs (independent power producers) and regulations that allow offering long-term contracts with secure payment mechanisms and an acceptable rate of return. Feed-in tariffs are one example, but the design and adequacy to local conditions and regular revisions will be critical to their success.

The project has been most successful in its Component 1 in terms of site identification, wind power potential assessment and feasibility analysis. Commercial wind power is at crucial point right now following two tracks, smaller government-supported wind facility, such as the first demonstration wind hybrid at Nusa Penida (0.75 MW wind) and larger commercial wind farms (50 MW or above), such as the first wind farms currently under negotiation by UPC- with PLN. Many potential developers are looking at these first project to be successfully installed and in operation to take away their doubts that wind power development may not be economic in Indonesia. For this reason it has been important that Nusa Penida gets rehabilitated again soon and that the PPA negotiations of UPC with PLN will end with an agreement. Although these specific wind power project have not explicitly been mentioned in the Project Document, WHyPgen has taken the laudable initiative to support these activities with advice and data.

Some lessons learned from the WhyPGen project are:

* The project implementation period has been overly optimistic, only 3 years; not enough to cover the lengthy preparation time to bring a typical wind power facility from identification, concept, feasibility to negotiation, financial closure and construction;
* Not all barriers are equally important and may need different timeframe to be lowered, while removal of one barrier may be a precondition for other barriers to be removed or lowered. For example, wind resource assessments (info barriers) and education & training (capacity barrier) will not lead to effective wind farms, if there is no conducive supportive wind energy policy (policy barrier) and a profitable economic model for developers (financial barrier);
* Different beneficiaries (the above-mentioned market clusters) face different barrier or in different magnitude. For example, large project developers will be able to mobilise their own finance and negotiate a PPA as business-to-business with PLN. Smaller developers will face less economic s of scale resulting in higher production price in terms of USD/kWh. This market segment will need a favourable feed-in tariff (as is under discussion in Indonesia). With banks typically interested in the large projects (> 50 MW), this market segment may face barriers in organising the right financial package of equity and loans. A financial mechanism may help banks in lowering their demand for a large share of equity that this market segment may be unable or unwilling to risk;
* The project has shifted focus in terms of target beneficiaries. Going from conceptualization, project document formulation to the current implementation, WHyPGen’s attention has moved from small and small-medium projects to the developers of large and medium-sized wind power projects. There has been good reasons for this shift in focus, but should have been accompanied by a thorough re-assessment of barriers that the various market clusters face and of their need of WHyPGen-supported activities;
* Ownership, operation and maintenance in particular becomes an issue when the project is transferred during its course (e.g. by developer in a BOOT setup to the utility; or a government-supported wind facility that is transferred to a local authority or organization) and it should be clear how O&M as well as major overhaul will financed and who will bear responsibility;
* Rural electrification (in Indonesia often remote island electrification) is another segment who faces a set of barriers that are quite different from commercial project development and we think should be dealt with in separate projects. We noticed during the MTR mission in discussion with some smaller developers that they might be interested in not only building hybrid island grid systems, but also in owning and operating it. However, until recently regulations only allowed PLN to distribute power in villages over 50 households and a clear legal-regulatory framework is still lacking. The interest show by Indonesian private sector shows there is scope for IPPs also on rural electrification. However, financial barrier are of a different nature. Investment cost of small grid system are often prohibitive, requiring a large grant portion in the finance mix that could come from central government, local government, private sector or donors. When in operation, it is again important that ownership, responsibility and finance availability is clearly settled to ensure a long-term operation, maintenance, administration and possible need for overhaul.

**General lessons learned in wind power project design**

Annex D.4 provides a number of lessons learned from UNDP-GED supported wind power projects in other countries. WHyPGen is an example of a UNDP/GEF (on-grid) wind power development project that tries to tackle a number of barriers (policy, institutional-regulatory, economic-financial and informational-technology-capacity) and aiming at capacity strengthening of a range of actors, from utilities, large project developers and investors, developers of medium-sized projects, NGOs, in various market clusters (large wind farms, small and medium-size wind developments, national grids and local grids). This has the danger of lumping barrier removal activities into a ‘one size fits all’, while in reality the various players encounter different barriers in the different market segments and activities should have been more tailored to that end. Also, removal of some barriers is dependent on lower major barriers first.

The timeframe in the projects is often optimistic. Also, in the Indonesia WhyPgen the project duration has been really short, 3 years only, not even enough to cover the time needed to fully develop a demonstration project (from site identification, feasibility assessment, design, procurement and installation to commissioning, to develop a wind farm). A larger timeframe could be more fruitful, for example by employing a phased structure, in which the most important barriers are lowered as a pre-condition for committing more resources to financing investment of other barrier-removal activities. However, spreading projects over a larger timeframe would obviously generate higher administrative cost, so a balance would need to be found.

1. Terms of reference

**I. BACKGROUND**

The country’s 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. Prevailing wind direction is from the east at 90o. The ASEAN Center for Energy estimates this at 480 MW for 3 – 5 m/s wind speeds. In 2008, the total installed power generation capacity in the grid systems of PLN that are located in the wind rich areas of East Nusa Tenggara, South and West Sulawesi, Maluku and Papua, was 285.7 MW. During the same year, the net effective power generation capacity (net dependable capacity) was 246.0 MW; total power generation was 936.1 GWh; average peak demand was 182.2 MW; and average load factor was 54.6% of installed capacity. This situation shows there is still a lot of unexplored wind potential in Indonesia for power generation.

In order to remove the barriers to the sustainable investment of wind power generation, the WHyPGen project (2012-2015) wass initiated with funding support from the Global Environment Facility (GEF) and UNDP; and implemented by the Center for Energy Technology (B2TE) at the Agency for the Assessment and Application of Technology (BPPT). The 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.

The project is on the promotion, development, application and facilitation of the commercialization of a cost-effective system of utilizing Indonesia’s wind energy resource. It focuses on cost-effective and potentially commercially viable grid-connected wind-diesel hybrid power generation. The project is comprised of several barrier removal activities which would substantially reduce any risk in the adoption of WHyPGen technology. It is designed to facilitate close coordination and consultation of the relevant stakeholders in each of the project activities. The activities include 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. During the implementation, in addition to GEF fund and UNDP fund; the project will be supported by in-kind contribution from the government implementing partner (BPPT) and parallel funding from private sector.

In accordance with UNDP/GEF monitoring and evaluation

(M&E) policies and procedures, all regular projects supported by the GEF should undergo a mid-term review (MTR) and final evaluation (FE). MTR is an important activity, given the current context of WHyPGen project, to get an update of the project relevance, performance, early signs of potential impacts and sustainability of results, including contribution to the capacity development and achievement of global environmental goals. MTR will also identify and document lessons learnt and provide recommendations that might improve implementation of this project to achieve project objective, outcomes and outputs as stated in the WHyPGen log frame. The review team will comprise of an international and a local consultant.

The objectives of the MTR are as follows:

a. Promote accountability for the achievement of GEF objectives through the assessment of results, effectiveness, processes and performance of the partners involved in GEF activities. GEF results will be monitored and evaluated for their contribution to global environmental benefits;

b. Promote learning, feedback and knowledge sharing on results and lessons learned among the GEF and its partners, as basis for decision-making on policies, strategies, program management, and projects and to improve knowledge and performance.

c. Identify problems that have been encountered as on date of the project implementation period, and provide recommendations of how to address these problems to ensure project is on track during rest of the project implementation period or as per adjusted schedule as applicable.

As defined in the GEF Monitoring and Evaluation (M&E) Policy, an evaluation is a systematic and impartial assessment of an activity, project, program, strategy, policy, sector, focal area or other topics. It aims at determining the relevance, impact, effectiveness, efficiency and sustainability of the interventions and contributions of the involved partners. An evaluation should provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons into the decision- making processes**.**

**II. SCOPE OF WORK, RESPONSIBILITIES AND DESCRIPTION OF THE PROPOSED ANALYTICAL WORK**

1. **Scope of Review**

The scope of the MTR covers the entire UNDP/GEF-funded project and its components as well as the co-financed components of the project.

The MTR will assess the Project implementation taking into account the status of the project activities and outputs and the resource disbursements made up to December 31, 2013.

The review will involve analysis at two levels: component level and project level.

**Component level:** progress against each outcome, output, activity (including sub-activities) and impact indicators listed in the project document along with the following shall be assessed:

Whether there is an effective relationship and communication between/among components so that data, information, lessons learned, best practices and outputs are shared efficiently, including cross-cutting issues?

* How about achieving a total capacity of 9.4 MW WHyPGen demonstration projects implemented and operational by end of the project?
* How about achieving a total capacity of 100 MW of planned installation of WHyPGen at the end of the project?
* Whether the performance measurement indicators and targets used in the project monitoring system are specific, measurable, achievable, reasonable and time-bounded to achieve desired project outcomes?
* Whether the use of consultants has been successful in achieving component outputs?
* The review will include such aspects appropriateness and relevance with work plan, compliance with the work and financial plan with budget allocation, timeliness of disbursements, procurement, coordination among project team members and committees, and the UNDP country office support. Any issue or factor that has impeded or accelerated the implementation of the project or any of its components, including actions taken and resolutions made should be highlighted.
* **Project level:** it will assess the project performance in terms of: (a) Progress towards achievement of results, (b) Factors affecting successful implementation and achievement of results, (c) Project Management framework, and (d) Strategic partnerships.
* *Progress towards achievement of results* (internal and within project’s control)
* With regards to WHyPGen technology, is the existing technology provider in the country strengthened enough to support the project? Is the capacity building and skill enhancement of the technical personnel sufficient to support the project implementation?
* Are there issues with the WHyPGen adoption, operation and maintenance?
* So far, how effective is this project in helping or facilitating towards the following:
  + introduction and promotion of WHyPGen investment
  + establishment of financing mechanism for WHyPGen
  + strengthening local capabilities in the design and implementation of WHyPGen technology, specifically in terms of:
    - production of components locally in terms of part/module can be substituted from its origin supplier
    - what is the best way for the project to address this issue during rest of the project implementation period?
  + development and approval of policies and regulatory frameworks that are supportive of WhyPGen applications in the country
* As part of wind hybrid power project financing, is there any issue with the financial support from banks, financial institutions, and private investments?
* How does overall implementation of the project activities contribute to the achievement of the targeted outputs and outcomes of WHyPGen?
* Is the Project making satisfactory progress in achieving project outputs vis-à-vis the targets and related delivery of inputs and activities?
* Are the direct partners and project consultants able to provide necessary inputs or achieve results?
* Given the level of achievement of outputs and related inputs and activities to date, is the Project likely to achieve its Immediate Purpose and Development Objectives?
* Are there critical issues relating to achievement of project results that have been pending as on date and need immediate attention immediately after MTR?
* A commentary is required on the “Expected Situation at the end of the Project” as envisioned at the MTR and recommendations, if any required, for accelerating the pace of work.

*(b) Factors affecting successful implementation and achievement of results* (beyond the Project’s immediate control or project-design factors that influence outcomes and results)

* To what extent does the broader policy environment remain conducive to achieving expected project results, including existing and planned legislations, rules, regulations, policy guidelines and government priorities?
* Is the project well-placed and integrated within the national government development strategies, such as promotion of low carbon technologies, decentralized power generation using relatively clean energy resource such as natural gas resources etc., and related global development programs to which the project implementation should align?
* Does the Project’s purpose and objectives remain valid and relevant, or are there items or components in the project design that need to be reviewed and updated?
* Is the project logical framework and design still relevant in the light of project experience to date? If not, suggest an approach to propose changes from the project implementation perspective than propose changes to log frame in achieving the anticipated outputs.
* Is the project implementation and achievement of results proceeding well and according to plan, or are there any outstanding issues, obstacles, bottlenecks, etc. on the implementation of demonstration projects, government or private sector or the captive power industry as a whole affecting the successful implementation and achievement of project results?
* Do the demonstration projects have secured sustainable fuel supply i.e. natural gas as anticipated in ProDoc? Has this issue been addressed well by the Project? If the availability of natural gas for these demonstrations is an issue, what are the plans for using alternative fuels and securing enough fuel for sustained operation of MCT demonstrations?

1. Project management *(adaptive management framework)*

* Are the project management arrangements adequate and appropriate?
* How effectively is the project managed at all levels? Is it results-based and innovative?
* How about the changes made to project implementation arrangement during the project implementation, if applicable? Have they impacted the project in a positive way?
* How does the Project Management Unit (PMU) and BPPT work with its partners especially stakeholders in the country? If there were problems:
  + identify those along with their causes
  + how do those affect the performance of activities at the national level against the delivery of target outputs?
  + what are the plans of the PMU in stimulating the interest and cooperation of its target partners?
  + recommendations from the MTR Team of how to address those during rest of project implementation period.
* Is technical assistance and support received from project partners and stakeholders appropriate, adequate and timely?
* How is the committed co-financing for the project being used by PMU and BPPT? Report the co-financing details in the format as suggested in Annex 1 “Table A1: Financial Planning Co-financing”.
* What are the problems encountered in using or accessing the committed co-financing? If there were problems,
  + how do those affect the delivery of the target outputs?
  + what are the measure taken by BPPT and PMU to make use of the committed co-financing or leverage additional co-financing from the co-financers?
* Validate whether the risks originally identified in the project document and, currently in the APR/PIRs are reasonable? And their risk rating in terms of most critical is reasonable?
  + Describe additional risks identified during the review, if any, and suggest risk ratings and possible risk management strategies to be adopted.
  + What are the other barriers/problems being encountered?
    - if possible, identify the causes for the same?
    - how the PMU and BPPT have addressed those? If not addressed, explain why?
    - recommendations from the MTR Team of how to address those during rest of the project implementation period.
  + Assess the use of the project logical framework and work plans as management tools and in meeting with UNDP-GEF requirements in planning and reporting.
  + How does the APR/PIR process helped in monitoring and evaluating the project implementation and achievement of results?
  + How does the project management systems, including progress reporting, administrative and financial systems and monitoring and evaluation system, operating as effective management tools, aid in effective implementation and provide sufficient basis for evaluating performance and decision making?
  + Assess the use of electronic information and communication technologies in the implementation and management of the project.

1. *Strategic partnerships* (project positioning and leveraging)
   * Asses how project partners, stakeholders and co-financing institutions are involved in the Project’s adaptive management framework.
   * Identify opportunities for stronger collaboration and substantive partnerships to enhance the project’s achievement of results and outcomes.
   * Are the project information and progress of activities disseminated to project partners and stakeholders? Are there areas to improve in the collaboration and partnership mechanisms?
2. In summary, the MTR Team must include the following points in their final report.

* Conclusions on the findings, observations and results of MTR
* Lessons learnt and best practices that can be developed from these conclusions
* Recommendations based on the conclusions on how to improve the implementation of the WHyPGen activities during rest of the project implementation period
* Specific recommendations on how to expediently mobilize and facilitate the planned activities not completed as on date and activities to be completed during rest of the project implementation period.

1. **Review Methodology**

The international consultant will be the team leader and coordinate the consultancy to ensure quality of the report and timely submission. The local consultant will provide supportive roles both in terms of professional back up, translation etc. The MTR Team is expected to become well versed as to the project objectives, historical developments, institutional and management mechanisms, activities and status of accomplishments. Information will be gathered through document review, group and individual interviews and site visits.

The review team will conduct an opening meeting with the National Project Director (NPD), Deputy NPD-I, Deputy NPD-II, National Project Manager, Lead Consultant and, experts to be followed by an “exit” interview to discuss the findings of the assessment prior to the submission of the draft Final Report.

Prior to engagement and visiting the Project Management Office, the MTR Team shall receive all the relevant documents including at least:

WhyPGen Project Document

* Inception Report
* Annual Work and Financial Plans
* Annual Project Report/Project Implementation Review (API/PIR) for 2012 and Quarterly Reports
* Minutes of project board meetings
* Back-to-Office Reports of UNDP staff and PMU staff (if any)

To provide more details, as may be needed, the following will be made available for access by the MTR Team:

* Executive summary of all quarterly reports
* Internal monitoring results
* Terms of Reference for past consultants’ assignments and summary of the results
* Past audit reports

The MTR Team should at least interview the following people, but not limited to:

* National Project Director
* Deputy NPD-I, and Deputy NPD-II
* National Project Manager (NPM)
* Project Administrative Officer
* Project Financial Officer
* Board Members
* Relevant project stakeholders, and personnel of;
  + DG-NREEC, Ministry of Energy and Mineral Resources
  + BBTE - Balai Besar Teknologi Energi (Energy Technology Center)
  + BPPT- Badan Pengkajian dan Penerapan Teknologi (Agency for the Assessment and Application of Technology)
  + PLN - Perusahaan Listrik Negara, state-owned electric company
  + National Development Planning Agency (BAPPENAS)
* Research institutions and Experts in the country, where applicable
* Relevant personnel at UNDP Country Office in Indonesia and in-charge of the WHyPGen Project
* Private sector entities that are potential developers and co-financers of WHyPGen project
* Other financial institutions such as IFC and donor agencies like USAID and DANIDA, where applicable

**3. Review Team**

The MTR Team will be composed of one International Lead Consultant and one National Consultant. With the aim of having an objective and independent project review, the MTR Team is expected to conduct the project review according to international criteria and professional norms and standards as adopted by the UN Evaluation Group. The individual experts in the Team needs to have good technical knowledge of the renewable energy (RE) and climate change projects and national context of RE project and program implementation in Indonesia, must be independent with no conflict of interest (i.e. not involved in the development or management of the project), possess good evaluation experience, and writing skills to carry out the assignment. The allocation of tasks in the execution of this TOR shall be decided mutually between the International and National consultants.

At the minimum, the International and National Consultants of the MTR Team shall have the following professional background and responsibilities:

***International Lead Consultant***

**Profile**

* Post-Graduate in Engineering, Management or Business
* Minimum of ten years accumulated and recognized experience in renewable energy and climate change projects
* At least 3 years technical experience in power generation and/or engineering or operations.
* Technical experience in the application of wind power generation is advantageous
* Minimum of five years of project evaluation and/or implementation experience in the result-based management framework, adaptive management and UNDP or GEF Monitoring and Evaluation Policy
* Demonstrated ability to assess complex situations, succinctly, distils critical issues, and draw forward-looking conclusions and recommendations.
* Ability and experience to lead multidisciplinary and national teams, and deliver quality reports within the given time.
* Familiar with developing countries context or regional situations relevant to that of Indonesia
* Experience with multilateral and bilateral supported on RE and climate change projects
* Comprehensive knowledge of international RE industry best practices
* Very good report writing skills in English

**Responsibilities**

* Documentation of the review
* Leading the MTR Team in planning, conducting and reporting on the review
* Deciding on division of labor within the Team and ensuring timeliness of reports
* Use of best practice review and evaluation methodologies in conducting the evaluation
* Leading presentation of the draft review findings and recommendations in-country
* Conducting the debriefing for the UNDP Country Office in Jakarta and WHyPGen Project Management
* Leading the drafting and finalization of the MTR Report
* Validate and complete appropriate sections in tracking tool for mid-term review of climate change mitigation projects

The members of the Team must be independent from both the policy-making process and the delivery and management of the UNDP/GEF assistance. Therefore, candidates who had any direct involvement with the implementation of the WHyPGen Project will not be considered.

***National Consultant***

**Profile**

* Bachelor degree (Post graduate is preferred) in engineering, management, business, or environmental science.
* A minimum of five years of project management experience in renewable energy/related climate change projects and community development.
* Renewable energy/related climate change or training and technical experience on wind power generation.
* Knowledge on wind power generation technology.
* Familiarity with the implementation of Indonesia development policies, programs and projects
* Very good report writing skills in English

**Responsibilities**

* Documentation of the review and data gathering
* Contributing to the development of the review plan and methodology
* Conducting those elements of the review determined by the International Lead Consultant
* Contributing to presentation of the review findings and recommendations at the evaluation wrap-up meeting
* Contributing to the drafting and finalization of the review report.
* Participate in debriefing for the UNDP Country Office in Jakarta and WHyPGen Project Management
* Support the international consultant to validate and complete appropriate sections in tracking tool for mid-term review of climate change mitigation projects.

**IV. EXPECTED RESULTS**

**MTR Schedule and Deliverables**

A review report will be produced after 25 working days, but not later than 15 May 2014. The report shall highlight important observations, analysis of information and key conclusions including its recommendations as mentioned earlier. Based on the scope of the MTR described above, the review report will include, among others:

* Findings on the project implementation achievements, challenges, and difficulties to date;
* Assessments of the progress made towards the attainment of outcomes;
* Recommendations for modifications and the future course of action;
* Lessons learned from the project structure, coordination between different agencies, experience of the implementation, and output/outcome and,

The report will be initially shared with the National Project Director and National Project Manager to solicit comments or clarifications and will be presented to the UNDP Country Office (CO) in Jakarta for further deliberations.

**There will be two main deliverables:**

* Based on agreed MTR work plan, the consultant should provide Mid-Term Review report, including an executive summary, fulfilling the review requirements set out in this Terms of Reference (TOR). The final report is to be cleared and accepted by UNDP CO in Jakarta before final payment. The final report (including executive summary, and annexes) should not exceed 50 pages.

The review report outline should be structured along the following lines:

* 1. Executive summary
  2. Introduction
  3. The project and its development context
  4. Findings and Conclusions
     1. Project formulation
     2. Implementation
     3. Results
  5. Completed tracking tool
  6. Conclusions on the findings, observations and results of MTR
  7. Lessons learned
  8. Recommendations
  9. Annexes

More guidance on the GEF project review criteria and explanation of terminology provided in the Annex 1.

* A power-point presentation of the findings of the review. Depending upon the complexity of the review findings, UNDP CO in Jakarta may consider organizing a half- day stakeholders meeting at which to make a presentation to the partners and stakeholders.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Deliverables/ Outputs** | **Target Due Dates** | **Payment** |  |
| **1.** Upon acceptance of consultant’s proposed MTR work plan by WHyPGen and UNDP | **1st April 2014** | **30%** |
| **2.** Upon acceptance of Final Mid- Term Review report by UNDP. | **10th May 2014** | **70%** |

**ANNEX 1 - Guidance on the GEF Project review criteria and explanation of terminology provided in the GEF Guidelines to Evaluations**

This Annex providing more detailed guidance on the GEF Project review criteria and explanation of terminology provided in the GEF Guidelines to Evaluations is an integral part of this TOR.

**I Project Review Criteria**

Please note that some of the categories in the findings and conclusions need to be rated in conformity with the GEF guidelines for final evaluations.

1. **Executive summary**
   * Brief description of project
   * Context and purpose of the review/evaluation
   * Main conclusions, ratings, recommendations and lessons learned
2. **Introduction**
   * Purpose of the review/evaluation
   * Key issues addressed
   * Methodology of the review/evaluation
   * Structure of the review/evaluation
3. **The project(s) and its development context**
   * Project start and its duration
   * Problems that the project seek to address
   * Immediate and development objectives of the project
   * Main stakeholders
   * Results expected
4. **Findings and Conclusions**

In addition to a descriptive assessment, all **criteria marked with (R) should be rated** using the following divisions: Highly Satisfactory, Satisfactory, Marginally Satisfactory, Unsatisfactory.

* 1. **Project Formulation**
     + Conceptualization/Design (R). This should assess the approach used in design and an appreciation of the appropriateness of problem conceptualization and whether the selected intervention strategy addressed the root causes and principal threats in the project area. It should also include an assessment of the logical framework and whether the different project components and activities proposed to achieve the objective were appropriate, viable and responded to contextual institutional, legal and regulatory settings of the project. It should also assess the indicators defined for guiding implementation and measurement of achievement and whether lessons from other relevant projects (e.g., same focal area) were incorporated into project design.
     + Country-ownership/Driveness. Assess the extent to which the project idea/conceptualization had its origin within national, sectoral and development plans and focuses on national environment and development interests.
     + Stakeholder participation (R). Assess information dissemination, consultation, and “stakeholder” participation in design stages.
     + Replication approach. Determine the ways in which lessons and experiences coming out of the project were/are to be replicated or scaled up in the design and implementation of other projects (this also related to actual practices undertaken during implementation).
     + Other aspects. To assess in the review of Project formulation approaches would be UNDP comparative advantage as IA for this project; the consideration of linkages between projects and other interventions within the sector and the definition of clear and appropriate management arrangements at the design stage.
  2. **Project Implementation**
     + Implementation Approach (R). This should include assessments of the following aspects:

1. The use of the logical framework as a management tool during implementation and any changes made to this as a response to changing conditions and/or feedback from monitoring and evaluation (M&E) activities if required.
2. Other elements that indicate adaptive management such as comprehensive and realistic work plans routinely developed that reflect adaptive management and/or; changes in management arrangements to enhance implementation.
3. The project's use/establishment of electronic information technologies to support implementation, participation and monitoring, as well as other project activities.
4. The general operational relationships between the institutions involved and others and how these relationships have contributed to effective implementation and achievement of project objectives.
5. Technical capacities associated with the project and their role in project development, management and achievements.
   * + Monitoring and evaluation (R). Including an assessment as to whether there has been adequate periodic oversight of activities during implementation to establish the extent to which inputs, work schedules, other required actions and outputs are proceeding according to plan; whether formal review/evaluations have been held and whether action has been taken on the results of this monitoring oversight and review/evaluation reports where applicable.
     + Stakeholder participation (R). This should include assessments of the mechanisms for information dissemination in project implementation and the extent of stakeholder participation in management, emphasizing the following:
6. The production and dissemination of information generated by the project.
7. Local resource users and NGOs participation in project implementation and decision making and an analysis of the strengths and weaknesses of the approach adopted by the project in this arena.
8. The establishment of partnerships and collaborative relationships developed by the project with local, national and international entities and the effects they have had on project implementation.
9. Involvement of governmental institutions in project implementation, the extent of governmental support of the project.
   * + Financial Planning: Including an assessment of:
10. The actual project cost by objectives, outputs, activities
11. The cost-effectiveness of achievements
12. Financial management (including disbursement issues)
13. Co-financing 1
    * + Sustainability. Extent to which the benefits of the project will continue, within or outside the project domain, after it has come to an end. Relevant factors include for example: development of a sustainability strategy, establishment of financial, environmental and economic instruments and mechanisms, mainstreaming project objectives into the economy or community production activities.
      + Execution and implementation modalities. This should consider the effectiveness of the UNDP counterpart and Project Co-ordination Unit participation in selection, recruitment, assignment of experts, consultants and national counterpart staff members and in the definition of tasks and responsibilities; quantity, quality and timeliness of inputs for the project with respect to execution responsibilities, enactment of necessary legislation and budgetary provisions and extent to which these may have affected implementation and sustainability of the Project; quality and timeliness of inputs by parties responsible for providing inputs to the project, and the extent to which this may have affected the smooth implementation of the project.
    1. **Results**
       * Attainment of Outcomes/ Achievement of objectives (R*):* Including a description *and rating* of the extent to which the project's objectives (environmental and developmental) were achieved using Highly Satisfactory, Satisfactory, Marginally Satisfactory, and Unsatisfactory ratings. If the project did not establish a baseline (initial conditions), the reviewers/evaluators should seek to determine it through the use of special methodologies so that achievements, results and impacts can be properly established.
       * This section should also include reviews of the following:
         + Sustainability*:* Including an appreciation of the extent to which benefits continue, within or outside the project domain after GEF assistance/external assistance in this phase has come to an end.
         + Contribution to upgrading skills of the national staff.
         + The positive and negative results, and foreseen and unforeseen, changes to and effects produced by a development intervention. In GEF terms, results include direct project outputs, short-to-medium term outcomes, and longer-term impact, including global environmental benefits, replication effects and other, local effects.
14. **Recommendations**

* Corrective actions for the design, implementation, monitoring and review/evaluation of the project
  + Actions to follow up or reinforce initial benefits from the project
  + Proposals for future directions underlining main objectives

1. **Lessons learned**

This should highlight the best and worst practices in addressing issues relating to relevance, performance and success.

1. **Review/Evaluation report Annexes**

* Review/Evaluation TORs
* Itinerary
* List of persons interviewed
* Summary of field visits
* List of documents reviewed
* Questionnaire used and summary of results
* Comments by stakeholders (only in case of discrepancies with evaluation findings and conclusions)

**II Explanation of Terminology Provided in the GEF Guidelines to Reviews/Evaluations**

**Implementation Approach** includes an analysis of the project’s logical framework, adaptation to changing conditions (adaptive management), partnerships in implementation arrangements, changes in project design, and overall project management.

Some elements of an effective implementation approach may include:

* The logical framework used during implementation as a management and M&E tool
* Effective partnerships arrangements established for implementation of the project with relevant stakeholders involved in the country/region
* Lessons from other relevant projects (e.g., same focal area) incorporated into project implementation
* Feedback from M&E activities used for adaptive management

**Country Ownership/Driveness** is the relevance of the project to national development and environmental agendas, recipient country commitment, and regional and international agreements where applicable. Project Concept has its origin within the national sectoral and development plans.

Some elements of effective country ownership/driveness may include:

* Project Concept has its origin within the national sectoral and development plans
* Outcomes (or potential outcomes) from the project have been incorporated into the national sectoral and development plans
* Relevant country representatives (e.g., governmental official, civil society, etc.) are actively involved in project identification, planning and/or implementation
* The recipient government has maintained financial commitment to the project
* The government has approved policies and/or modified regulatory frameworks in line with the project’s objectives

For projects whose main focus and actors are in the private-sector rather than public-sector (e.g., IFC projects), elements of effective country ownership/driveness that demonstrate the interest and commitment of the local private sector to the project may include:

* The number of companies that participated in the project by: receiving technical assistance, applying for financing, attending dissemination events, adopting environmental standards promoted by the project, etc.
* Amount contributed by participating companies to achieve the environmental benefits promoted by the project, including: equity invested, guarantees provided, co-funding of project activities, in-kind contributions, etc.
* Project’s collaboration with industry associations

**Stakeholder Participation/Public Involvement** consists of three related and often overlapping processes: information dissemination, consultation, and “stakeholder” participation. Stakeholders are the individuals, groups, institutions, or other bodies that have an interest or stake in the outcome of the GEF-financed project. The term also applies to those potentially adversely affected by a project.

Examples of effective public involvement include: Information dissemination

* Implementation of appropriate outreach/public awareness campaigns. Consultation and stakeholder participation
* Consulting and making use of the skills, experiences and knowledge of NGOs, community and local groups, the private and public sectors, and academic institutions in the design, implementation, and review/evaluation of project activities.

Stakeholder participation

* Project institutional networks well placed within the overall national or community organizational structures, for example, by building on the local decision making structures, incorporating local knowledge, and devolving project management responsibilities to the local organizations or communities as the project approaches closure
* Building partnerships among different project stakeholders
* Fulfillment of commitments to local stakeholders and stakeholders considered to be adequately involved

**Sustainability** measures the extent to which benefits continue, within or outside the project domain, from a particular project or program after GEF assistance/external assistance has come to an end. Relevant factors to improve the sustainability of project outcomes include:

* Development and implementation of a sustainability strategy
* Establishment of the financial and economic instruments and mechanisms to ensure the ongoing flow of benefits once the GEF assistance ends (from the public and private sectors, income generating activities, and market transformations to promote the project’s objectives)
* Development of suitable organizational arrangements by public and/or private sector
* Development of policy and regulatory frameworks that further the project objectives
* Incorporation of environmental and ecological factors affecting future flow of benefits
* Development of appropriate institutional capacity (systems, structures, staff, expertise, etc.)
* Identification and involvement of champions (i.e. individuals in government and civil society who can promote sustainability of project outcomes)
* Achieving social sustainability, for example, by mainstreaming project activities into the economy or community production activities
* Achieving stakeholders consensus regarding courses of action on project activities

**Replication approach**, in the context of GEF projects, is defined as lessons and experiences coming out of the project that are replicated or scaled up in the design and implementation of other projects. Replication can have two aspects, replication proper (lessons and experiences

re replicated in different geographic area) or scaling up (lessons and experiences are replicated within the same geographic area but funded by other sources). Examples of replication approaches include:

* Knowledge transfer (i.e., dissemination of lessons through project result documents, training workshops, information exchange, a national and regional forum, etc)
* Expansion of demonstration projects
* Capacity building and training of individuals, and institutions to expand the project’s achievements in the country or other regions
* Use of project-trained individuals, institutions or companies to replicate the project’s outcomes in other regions

**Financial Planning** includes actual project cost by activity, financial management (including disbursement issues), and co-financing.

Effective financial plans include:

* Identification of potential sources of co-financing as well as leveraged and associated financing*2*.
* Strong financial controls, including reporting, and planning that allow the project management to make informed decisions regarding the budget at any time, allows for a proper and timely flow of funds, and for the payment of satisfactory project deliverables
* Due diligence in the management of funds and financial audits

*Co-financing includes:* Grants, Loans/Concessional (compared to market rate), Credits, Equity investments, In-kind support, Other contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector and beneficiaries. Please refer to GEF Council documents on co-financing for definitions, such as GEF/C.20/6.

*Leveraged resources* are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO’s, foundations, governments, communities or the private sector. Please briefly describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project’s ultimate objective.

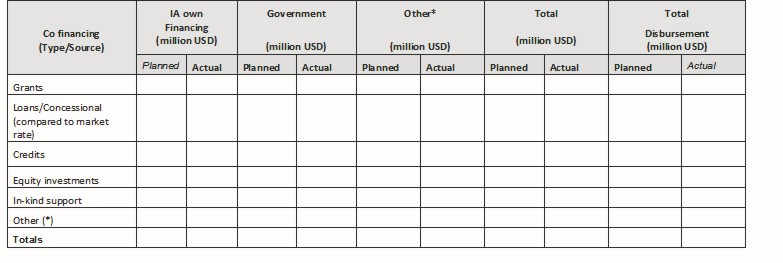
**Cost-effectiveness** assesses the achievement of the environmental and developmental objectives as well as the project’s outputs in relation to the inputs, costs, and implementing time. It also examines the project’s compliance with the application of the incremental cost concept. Cost-effective factors include:

* Compliance with the incremental cost criteria (e.g. GEF funds are used to finance a component of a project that would not have taken place without GEF funding) and securing co-funding and associated funding
* The project completed the planned activities and met or exceeded the expected outcomes in terms of achievement of Global Environmental and Development Objectives according to schedule, and as cost-effective as initially planned
* The project used either a benchmark approach or a comparison approach (did not exceed the costs levels of similar projects in similar contexts)
* **Monitoring, Review & Evaluation**.

Monitoring is the periodic oversight of a process, or the implementation of an activity, which seeks to establish the extent to which inputs, work schedules, other required actions and outputs are proceeding according to plan, so that timely action can be taken to correct the deficiencies detected. Evaluation is a process by which program inputs, activities and results are analyzed and judged explicitly against benchmarks or baseline conditions using performance indicators. This will allow project managers and planners to make decisions based on the evidence of information on the project implementation stage, performance indicators, level of funding still available, etc, building on the project’s logical framework.

Monitoring, Review and Evaluation includes activities to measure the project’s achievements such as identification of performance indicators, measurement procedures, and determination of baseline conditions. Projects are required to implement plans for monitoring and evaluation with adequate funding and appropriate staff and include activities such as description of data sources and methods for data collection, collection of baseline data, and stakeholder participation. Given the long-term nature of many GEF projects, projects are also encouraged to include long-term monitoring plans that are sustainable after project completion.

**Table A1: Financial Planning Co-financing**



1. mission agenda and itinerary

|  |  |
| --- | --- |
| **Date** | **Schedule** |
| August 8 | Briefing and Discussion with Butchaiah Gadde (Regional Technical Adviser) and Verania Andria (UNDP-Indonesia) at UNDP Jakarta Office. |
| August 11 | * Opening meeting with National Project Board and Project Management Unit * Discussion with National Project Board * Interview and Discussion with National Project Manager and Consultants |
| August 12 | * Interview and Discussion with PT UPC Renewables Indonesia   Person interviewed: Chris Caffyn (Senior Vice President)  Contact: email : [chris.caffyn@upcrenewables.co.id](mailto:chris.caffyn@upcrenewables.co.id)  Tel/Fax: +62 21 7279 6016 /+62 21 7279 0155 |
| August 13 | * Interview and Discussion with ALPEN STEEL   Person interviewed : Paul Sutanto (Director)  Contact: Email : [alpen.costumer@gmail.com](mailto:alpen.costumer@gmail.com)  Tel/Fax : +62 22 872 44 888/ +62 22 872 44 777 |
| August 14 | * Interview and Discussion with DG-NREEC, Ministry of Energy and Mineral Resources   Person interviewed: Abdi Dharma Saragih (Deputy Director for Investment & Cooperation)  Contact: Email: [adsaragih2004@yahoo.com](mailto:adsaragih2004@yahoo.com)  Tel : +62 213 192 4588   * Interview with ESP3 DANIDA   Person interviewed: Rene Treumer Andersen (Senior Technical Advisor at MEMR)  Contact: Email: [andersen@esp3.org](mailto:andersen@esp3.org)  Tel/Fax : +62 21 5224483/ +62 21 5279340 |
| August 15 | * Interview and Discussion with PT SMI   People Interviewed: 1. Darwin T Trisna Djajawinata (Director)  2. Suparno (Advisory Division)  Contact: Email : [suparno@ptsmi.co.id](mailto:suparno@ptsmi.co.id)  Tel/Fax : +62 21 5785 1499 / +62 21 5785 4298 |
| August 18 | * Interview and Discussion with PLN   People interviewed : 1. Jefri Rosiadi (Senior Manager For Planning of IPP Procurement)  2. Hernadi Buhron (Head of IPP Procurement Division)  Contact: email : [hernadi.buhron@pln.ac.id](mailto:hernadi.buhron@pln.ac.id)  Tel/Fax : +62 21 722 7049 / +62 21 725 1511   * Interview and Discussion with PT. Viron Energy   Person interviewed: Daud Mustopa  Contact Email: [daudguns@yahoo.com](mailto:daudguns@yahoo.com)  Tel: +628129482724 |
| August 19 | * Present the findings for the UNDP Country Office in Jakarta and WHyPGen Project Management |
| August 20 | * MTR Team Discussion |
| August 21 | * Further Interview and Discussion WHyPGen Consultants |

1. Documents reviewed

Project documents and reports

* UNDP Project Document (August 2012)
* Draft Project Implementation Report (PIR)
* Annual Work Plans (2012, 2013, 2014)
* Quarterly Monitoring Reports (2012: Q4; 2013: Q1, Q2, Q3, Q4; 2014: Q1)
* Minutes of Meetings, Project Board (Dec 2012, Dec 2013)

Project-supported technical reports and UNDP-related documents

* *Techno-economic Assessment of Wind Power Generation at Oelbubuk Vllage, Timor Tengah Selatan District, Esat Nusa Tenggara,* WHyPGen Project, BPPT, UNDP (2013)
* *WISE, Wind for Indonesia, a more Sustainable Energy,* WHyPGen Project, BPPT, UNDP (2013)
* *Back-to-Office Report (BTOR),* by B. Gadde (UNDP Regional Technical Specialist), August 2014

Other publications and documents

* ADB (2013)

*Energy Outlook for Asia and the Pacifc,* Asian Development Bank (Oct 2013)

* APCTT-UNESCAP

*Indonesia, Renewable Energy Report*

* APEC (2013)

*Peer Review on Low-Carbon Energies in Indonesia,* Asia-Pacific Economic Cooperation (Nov 2013)

* AWS True Power (2010)

*Wind Resource Maps of Eastern Indonesia,* AWS True Power; NL Energy and Climate Change (2010)

* DNREEC (2012)

*Development of New and Renewable Energy and Energy Conservation in Indoneisa,* paper presented by DNREEC at “Global Workshop on Clean Energy Development, Washington DC (Dec 2012)

* EBTKE-CONEX 2013

*Blowing the Wind in Indonesia,* paper presented at Conference and Exhibition Indonesia Renewable Energy & Energy Conservation (20130, by S. Martosaputro and N. Murti, available at [www.sciencedirect.com](http://www.sciencedirect.com)

* ECN (2013)

*Small-scale IPPs in Indonesia,* by M. Hekkenberg and L. Cameron, Netherlands Energy Research Centre

* IEA (2008)

*Energy Policy Review of Indonesia,* International Energy Agency, OECD, Paris (2008)

* EIA (2014)

*US Energy Information,* Dept. of Energy, USA

* PLN (2012)

*PLN Statistics 2012,* PT PLN (Persero)

* REN21 (2014)

*Renewables Interactive Map, Indonesia,* REN21, Renewable Energy Network for the 21st Century (August 2014)

* UPC (2014)

*Project Development Progress Report,* PT UPC Reneweables Indonesia – Binetek Energi, PowerPoint presentation (July 2014)

1. Background info on wind energy
   1. Power sector in Indonesia

Energy sector overview

Since 2000, Indonesia transitioned from a robust energy exporter to an importing nation that, for the first time, is concerned with growing domestic demand, rising production costs and inadequate infrastructure, energy subsidies and a complex regulatory framework as well as local and global environmental concerns.

Indonesia's total primary energy consumption grew by 44% between 2002 and 2012. The petroleum share, although decreasing, continues to account for the highest portion of Indonesia's energy mix at 36% in 2012. In the past decade, coal consumption nearly tripled and surpassed natural gas as the second most consumed fuel (20% and 17% of primary energy consumption in 2012). Indonesia is also a significant consumer of traditional biomass and waste in its residential sector, particularly in the more remote areas that lack connection to the country's energy transmission networks.

Indonesia ranked as the 24th-largest crude oil producer in the world in 2013, although the country both imports and exports crude oil. Growing internal demand for energy, declining production (most notably in mature fields), and limited investment to increase capacity has led to a situation in which Indonesia currently imports crude oil and refined products to meet demand. Indonesia remains the world's largest exporter of coal by weight and exports about 75% of its production (standing at 452 million tons in 2012). Indonesia was the fourth-largest LNG (liquefied natural gas) exporter in 2012, about 870 billion ft3, while domestic consumption of gas was 1,329 billion ft3 in 2012.

Fuel subsidies have cost the government between 7% and 25% of its annual public expenditures between 2005 and 2013. To curb oil imports and reduce pressure on the government budget, Indonesia reduced government fuel subsidies in June 2013 for the first time since 2008[[35]](#footnote-35).

Electricity supply and demand

PLN[[36]](#footnote-36) is the most significant company in the electric power sector. It owned and operated about 85% of the country's generating capacity through its subsidiaries as of 2012 and maintains an effective monopoly over distribution activities. Although the most recent 2009 Electricity Law ends PLN's distribution monopoly and allows setting up other entities[[37]](#footnote-37), there is a lack of sufficient regulations to enforce this law, there have been legal issues and up to now PLN retains an effective monopoly in distribution. The previous Electricity Law had a uniform electricity tariff regime and applied cross-subsidies between regions. The 2009 Electricity Law allows cross-border electricity trading between business areas as well as electricity tariffs to be differentiated by region. Nonetheless, up to now PLN has not been implementing tariff differentiation. In fact, consumer electricity prices are set below market levels, forcing PLN to accept losses. To ameliorate the effect of this policy on the state's vertically integrated utility, Indonesia raised prices on a quarterly basis in 2013. This move was also intended to reduce government subsidies to PLN, surpassing USD 9 billion in 2013. The government has sought also to raise tariffs in the power sector to provide price security to PLN and attract private investors.

Indonesia had an estimated 44 gigawatts (GW) of installed capacity in 2012 and generated 200 billion kilowatt-hours (kWh), according to BPS-Statistics and IHS EDIN. In 2011, roughly 88% of the power generation came from fossil fuel sources, with the rest coming from hydroelectric (7%) and geothermal (5%). Coal accounted for just over half of the power generated from fossil fuels. Oil-fired generation capacity has declined along with Indonesia's oil production. Total electricity sales by PLN grew to about 174 billion kWh in 2012, increasing 10% from the 2011 level. Average annual growth rates have been 7% since 2002.

Although Indonesia's electricity generating capacity has increased by more than 25% in the past decade, the country has a low electrification ratio compared to countries with similar income levels. In 2012, about 73% of Indonesia's population had access to electricity, according to state electric utility *Perusahaan Listrik Negara* (PLN). The Indonesian government has set the national goal that 90% of households will have electricity by 2020.

Box 15 Power demand projections, Indonesia



Source: Project document

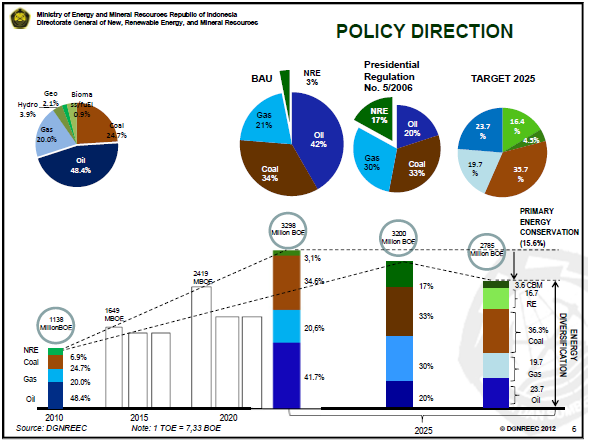
The policy makers embarked on a plan in 2006, designed to add 20 GW to the grid. Phase one of this plan includes 10 GW of new coal-based generation by 2015; the second phase prioritizes 10 GW of capacity additions that burn cleaner energy sources such as natural gas, geothermal, and other renewables. MEMR has set the target to increase the use of renewable energy to over 15% of the electricity portfolio by 2025, basically geothermal energy as well as hydropower, biomass, solar and wind energy. This includes 250 MW (megawatt) electricity from wind energy on grid and 5 MW off grid in the year 2025.

* 1. Wind energy

The average wind speeds in Indonesia range between 1.3 to 6.3 meters per second (m/s). The main wind energy potential areas are located in East and West Nusa Tenggara (eastern and western portion of the Lesser Sunda islands) as well as in certain other areas of Indonesia, such as the south coastal areas of South Sulawesi), which have average wind speeds of more than 5 m/s. Other 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 wind power density of 300 – 1,000 W/m2 at 30 m altitude. Prevailing wind direction is from the east at 90o. A database with wind energy potential of each region is available from the National Institute of Aeronautics and Space (LAPAN) and also other organizations have done wind mapping.

The implementation of wind energy technology in Indonesia is still low. The total wind power generation installed in Indonesia is around 1.6 MW in non-commercial scales. The implementation of isolated wind energy systems typically in remote area/location or islands, and they are frequently installed as part of development or research projects. The biggest capacity of wind turbine unit installed in Indonesia at the moment are:

**Box 16 Policy goals in renewable energy**



* 100kW turbine, installed by the Ministry of Energy and Mineral Resources (MEMR) at Sukabumi (West Java) and Selayar (South Sulawesi) and a grid-connected 240 kW system at Sangihe (North Sulawesi)
* The largest wind power generation facility is installed at Nusa Penida-Bali, with the total capacity of 734 kW. The facility consists of 9 turbines, of which 3 owned by PLN and 6 by the MEMR.

Box 17 Wind power units in Indonesia

Left: installation of a 2.5 kW wind power unit (Sukabumi area, West Java)

Right: 80 kW system at Nusa Penida (Bali). Sources: <http://daus.tral.la/2007/12/nusa-penida>; APCTT

Box 18 Wind speed map of Indonesia



Source: www.3tier.com

The WES80 wind turbines are installed on the small island Nusa Penida. The grid on the island is powered by a series of diesel generators with a peak load of 1.2 MW.  The five hybrid turbines are installed in the diesel grid to reduce the consumption of diesel fuel.  The average wind speed at the island is less than 5 m/s, but because the WES turbines have a low start up wind speed of 3.0 m/s each turbine still generates an average of 135,000 kWh a year.  Each turbine can reduce the diesel fuel consumption of the island by approximately 43.000 liters a year. The lattice towers and turbines were installed without the use of a crane. A special hoisting rig with a hoisting boom and a winch have been used to lift the nacelle to the top of the lattice tower. The lattice towers were fabricated in Indonesia. Unfortunately, this ‘showcase’ project has met problems in operation and maintenance and some turbines were damaged.

The approximate wind power potential in Indonesia is estimated at around 9 500 MW and the ASEAN Center for Energy (ACE) estimates a potential of 480 MW in the areas with best wind conditions such as in the and Nusa Tenggara. However, Indonesia is lagging much behind these potentials, with an installed capacity of around 1.2 to 2 MW with wind power projects ranging from 0.05-100 kW. Most of it is still for research or demonstration purposes and concentrates on stand-alone electricity production in rural and remote areas. In addition, wind power is also used for water pumping for agriculture purposes and for battery charging. Up to recent, no grid-connected medium or large-scale applications have been realized in Indonesia. This situation shows there is still a lot of unexplored wind potential in Indonesia for power generation.

* 1. Regulations on RE development

To support and drive effort and program in developing renewable energy, the government has introduced several policies and regulations. In 2006, through Presidential Regulation no 5/2006, the national energy policy and target energy mix in 2025 was announced. It was stated that the main objective of the country energy policies is to diversify energy sources and for 2015 the targeted the role of renewable energy is 15% of total energy (see Section 2.1),

The engineering, procurement and construction (EPC) of the generation plant and connection to the grid requires initial financing. This generally comes from a mixture of investors (equity) and banks (debt). IPPs sell the electricity they produce to the state utility (PLN) through power purchase agreements (PPAs) that describe delivery and payment conditions. In recent years, the government has implemented a feed-in-tariff (FiT) scheme for several renewable energy technologies, which makes profitable operation for IPPs possible, such as:

* MEMR Regulation Number 04 Year 2012 Electricity Power Purchased Price from Renewable Generations (small and medium scale) and Excess Power;
* Ministerial Regulation of MEMR No. 22/2012 on geothermal price structure; MEMR Regulation 17/2013 on solar PV, and 19/2013 on waste-to-energy
* Ministry Of Finance Regulation Number 130/PMK.011/2011 Concerning on Provision of Exemption Facilities or Reduction of Income Tax;
* Ministry of Finance Regulation No. 21/PMK.011/2010 Concerning on Tax and Custom Facilities for Renewable Energy Utilization.

For electricity from most small-scale renewable sources a feed-in-tariff (FiT) is set by the Ministry of Energy and Mineral Resources (ESDM) that pays a premium rate for electricity and makes the project feasible; i.e. creates the business case. The FIT is differentiated per technology and per region and in general are for projects up to 10 MW. Projects above 10 MW would need to negotiate the tariff in business-to-business negotiations. Feed-in tariffs exist for renewable energy or are under discussion. For geothermal energy there is feed-in tariff of USD 0.10-0.185 / kWh, USD 0.25 for solar PV, for hydropower USD 0.068-0.103[[38]](#footnote-38) and for biomass:

* Biomass and biogas (non-municipal solid waste): IDR 975 / kWh \* F
* Municipal solid waste (zero waste-landfill): IDR 850-1050 /kWh \*F[[39]](#footnote-39)

Provincial Governments the right and responsibility to issue concessions, and operating licenses for renewable energy and energy efficiency projects. The main actors which provide permits and support to the project developers are PLN and Ministry of Energy & Mineral Resources (MEMR-DGEEU).

However, the FiT is only part of the picture. Investors and banks will only risk their money if they are confident that their investment will actually pay off. Finance; the majority of IPPs have difficulties getting the necessary loans from banks. This is due to a number of reasons: i) banks report that project proposals often have inadequate feasibility studies, ii) there is a lack of good practice cases for business models, which makes banks reluctant to loan, and iii) banks ask for prohibitively high collateral from IPPs due to the perceived risks (double size, i.e. 40% equity instead of 20%), or reject the proposal altogether. IPPs and banks would both profit from the availability of professional technical support that could improve feasibility studies and reduce risks. Additionally, a financial mechanism to encourage banks to give loans, or provide support directly to IPPs, could help to bring down risk premiums and therefore project costs.

Box 19 Feed-in Tariff (FIT) as an instrument to push wind power generation in Indonesia

One of the instrument may be useful to push the commercialization of wind power is the FIT scheme. In this text box, a calculation is presented of the FIT for wind power as carried out by the WhyPGen project. The assumptions are as follows:

* IRR is categorized acceptable if higher than 14%
* Interest rate is 7%/year
* Currency 1 USD = IDR 10,000
* Residual value of the project at the end ( 20years) is 0
* Unit price of Wind Turbine is USD 1,350/kW or USD 1,750/kW (Installed price)
* Construction period is 18 month
* Inflation rate 2% /year
* Equity 30%
* Capacity of each turbine is 330 kW/unit for 1 MW installed capacity and it is 750 kW/unit for 5 MW installed capacity.

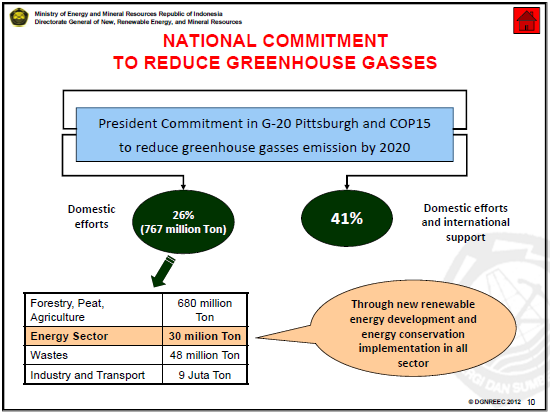
The simulation reveals that with a capacity factor (CF) of 25%, IRR of 14% which means the project is acceptable, can be reached if the power price is USD 0.174/kWh. Thus, the FIT for wind power is suggested at USD 0.174/kWh.

Renewable energy projects often cross multiple government authorities, both in level (national, provincial and district) and area (e.g. energy, water and forestry). A lack of coordination between government officials and having so many authorities involved often leads to delays. Insufficient technical understanding of issues related to RE projects at the permitting authority is also reported to lead to barriers in permitting[[40]](#footnote-40).

* 1. Greenhouse gas emission reduction

The following Box describes Indonesia’s national commitment to reduce greenhouse gases in a short and informative way (taken from a 2012 presentation by DGNREEC).

Box 20 Greenhouse gas emission reduction targets



Regarding the energy sector, the National Action Plan on Greenhouse Gas Emission Reduction, mentions the following main groups of action:

* Energy management and implementation of programs on energy efficiency
* Use of cleaner fuels (e.g. natural in public transportation)
* New and renewable energy.

Regarding the latter category, in indication of emission reduction during 2010-2020 is 4.40 million tCO2 out of the 30 million tons mentioned in the graph, of which 60,000 tons for wind. The reader may note that the target reduction of 17,000 tCO2 from 9 MW is mentioned in the project document (ProDoc) of WHyPGen.

* 1. Promotion of wind energy: Some lessons learned from UNDP-GEF projects

This 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). Most country are characterized by good wind resources, but with electricity prices varying from very low in Kazakhstan and Iran (USD 0.025-0.035) to vary high (USD 0.35 or higher in Pakistan). This Box summarizes this publication, although the findings are spiced with the experience of the international Evaluators, who has been involved in the evaluation of wind power projects in Kazakhstan (mid-term and final) and Pakistan (mid-term) as well as in many other UNDP/GEF project evaluations. Therefore, this Box reflects the Evaluator’s opinions, not UNDP’s or the above-mentioned publication.

Most of the 11 projects have the following elements:

1. Public policies, emphasising political commitments (long-term renewable energy targets; removal of fossil fuel subsidies) and giving access to the market (feed-in tariffs, quotas, public tenders) as well as other regulatory issues (permitting and licensing and grid connection);

2. Providing public economic (incentives, such as direct subsidies, tax facilities) and financial support (low interest loans and guarantee schemes), sometimes linking with climate finance (CDM, JI);

3. Improving technology and information dissemination, such as wind resources assessments and (pre)-feasibility studies; awareness creation and communication; technical training and capacity building;

4. Demonstration program, usually centring around one pilot wind farm.

Some lessons learned, to our opinion, are:

* These four components address the main groups of barriers (policy, institutional-regulatory, economic-financial and informational-technology-capacity). However, countries differ also in market conditions and policy-regulatory environment as well as in their experience with independent power producers (IPPs). Consequently, some barriers are not fully addressed or underestimated. For example, in Kazakhstan there was not even a clear renewable energy policy, let alone regulations. This major barrier was not discussed in the project document and sought subvention for one pilot project from the state-owned utility. With the unbundling of power utilities after the project document (ProDoc)’s design, the project team rightly supported the development of a renewable energy law and feed-in tariff regulations first, as a means to attract investors in a now commercial market;
* Only few ProDocs mention grid-related issues, such as connection charges and ability of the grid to absorb intermittent production a. This is surprising as utilities often are slow to accept wind power, if fearing grid stability and/or when wind has a relatively high proportion of power supply in small grids. In Pakistan as well as Ukraine it was planned to procure computer hard- or software to undertake grid simulation impact studies;
* Most project documents gloss over the fact that wind power markets are quite different; on hand are wind applications for off-grid and small local-connected applications (1 MW or below), medium-sized (5-50 MW) and, third, larger one (20-50 MW or more), while also the market players are different (state-owned utility, government entities as well as commercially oriented utilities, large (foreign and local) investors and smaller investors). These market clusters have different players and wind installed capacity objectives and do face the above-mentioned barriers, but often in different importance and intensity.
* Typically, the demo component consists of one or more project of a few MW size. The choice for size of wind farm seems to reflect the need for co-financing and ability to get confirmed co-financing letters. With GEF asking co-financing typically to be 4-5 times more than the GEF contribution (around 2-5 million in the above-mentioned projects), a 5-10 MW farm (costing USD 2500 per MW) can nicely provide the co-financing leveraging. However, if government funded, projects have often encountered lower than expected participation from the government (e.g. Kazakhstan);
* Developing a wind farm takes time. Site measurements can take one year or more; negotiation with government entities on PPA and feed-in tariffs can also be time-consuming, especially in the case of ‘greenfield’ projects. After successful negotiation and financial closure, a period of construction follows that can also take a year or more. In other words, developing a (first) wind farm, pilot or commercial, can take longer than the typical 3-4 year duration of a UNDP-GEF project;
* Hence, some projects have introduced two-phase projects; a first one focussing on lowering main barriers (e.g., by formulating wind targets, feed-in tariff discussions; wind resource assessment; local capacity strengthening) to be followed by a more investment-oriented second phase which can then be associated with larger wind farms. Examples are (e.g. Mexico, 45 MW, South Africa 45 MW, and Tunisia: 100 MW). Unfortunately, splitting projects in two phases has often been an excuse to cut budget due to GEF funding shortages (e.g. Mexico).

1. Mid-term review critera and questions

Before undertaking the mid-term review (MTR), an *Inception Report* was presented, including the proposed of 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.

Box 21 Evaluation criteria and questions, as suggested in the Inception report of the MTR

| **Contents** | **Evaluation scope (based on the ToR): items and main questions** |
| --- | --- |
| Title page  Executive Summary  Table of Contents |  |
| 1. **Introduction**  * Problems the projects seeks to address * Short description of the project (objectives, project participants, objectives and outcomes, duration)   Purpose and approach of the mid-term review; structure of the evaluation report | |
| 1. **Context**  * Power and renewable energy in Indonesia; policies and plans; institutions   UNDP programme in Indonesia | |
| 3. **Findings:** Design and formulation   * + Appropriateness and relevance   + Quality of design and project formulation (document, logical framework) | * Does the Project’s purpose and objectives remain valid and relevant, or are there items or components in the project design that need to be reviewed and updated? * Is the project logical framework and design still relevant in the light of project experience to date? If not, suggest an approach to propose changes from the project implementation perspective than propose changes to log frame in achieving the anticipated outputs. * Whether the performance measurement indicators and targets used in the project monitoring system are specific, measurable, achievable, reasonable and time-bounded to achieve desired project outcomes; |
| **Findings**: *Progress towards Results*[[41]](#footnote-41),   * Outputs   Progress against each outcome, output, activity (including sub-activities) and impact indicators listed in the project document;   * Component 1: WHyPGen technology application assessments;   + - Component 2: WHyPGen technology demonstration     - Component 3: *Financing* WHyPGen initiatives     - Component 4: Policy and institutional support for WHyPGen in initiatives     - Component 5: WHyPGen Promotion     - Component 6: WHyPGen market development and industry support * GHG reduction and longer-term impacts   + Energy savings and GHG emission reduction; number of identified and assessed locations; number of completed feasibility studies; * Project effectiveness   + - Attainment and quality of results;     - Factors affecting successful implementation and achievement of results | * + Component level:     - How about achieving a total capacity of 9.4 MW WHyPGen demonstration projects implemented and operational by end of the project?     - How about achieving a total capacity of 100 MW of planned installation of WHyPGen after the end of the project? * Project level:   + Is the Project making satisfactory progress in achieving project outputs vis-à-vis the targets and related delivery of inputs and activities?   + With regards to WHyPGen technology, is the existing technology provider in the country strengthened enough to support the project? Is the capacity building and skill enhancement of the technical personnel sufficient to support the project implementation?   + Are there issues with the WHyPGen adoption, operation and maintenance?   + So far, how effective is this project in helping or facilitating towards the following:     - introduction and promotion of WHyPGen investment     - establishment of financing mechanism for WHyPGen     - strengthening local capabilities in the design and implementation of WHyPGen technology, specifically in terms of production of components locally in terms of part/module can be substituted from its origin supplier; what is the best way for the project to address this issue during rest of the project implementation period?     - development and approval of policies and regulatory frameworks that are supportive of WhyPGen applications in the country   + As part of wind hybrid power project financing, is there any issue with the financial support from banks, financial institutions, and private investments?   + How does overall implementation of the project activities contribute to the achievement of the targeted outputs and outcomes of WHyPGen? * Factors beyond the Project’s immediate control or project-design factors that influence outcomes and results:   + Is the project implementation and achievement of results proceeding well and according to plan, or are there any outstanding issues, obstacles, bottlenecks, etc. on the consumer, government or private sector or the wind energy industry as a whole that are affecting the successful implementation and achievement of project results?   + To what extent does the broader policy environment remain conducive to achieving expected project results, including existing and planned legislations, rules, regulations, policy guidelines and government priorities?   + What are the other barriers/problems being encountered?   + If possible, identify the causes for the same?   + How the PMU and BPPT have addressed those? If not addressed, explain why?   + Recommendations from the MTR Team of how to address those during rest of the project implementation period. |
| **Findings:** *implementation and adaptive management* | * + Adaptive management framework:     - Are the project management arrangements adequate? |
| * Implementation and efficiency:   + Project *management arrangements*   + Strategic partnerships and *stakeholder engagement*   + *Work planning*   + *Reporting*   + *Communications*   + Financial plan with budget allocation, timeliness of disbursements, procurement; table of planned and realized GEF *finance and co-financing*; | * + - How effectively is the project managed at all levels? Is it results-based and innovative?     - How about the changes made to project implementation arrangement during the project implementation, if applicable? Have they impacted the project in a positive way?     - How does the Project Management Unit (PMU) and BPPT work with its partners especially stakeholders in the country? If there were problems:       * identify those along with their causes       * how do those affect the performance of activities at the national level against the delivery of target outputs?       * What are the plans of the PMU in stimulating the interest and cooperation of its target partners?     - Recommendations from the MTR Team of how to address those during rest of project implementation period.     - Is technical assistance and support received from project partners and stakeholders appropriate, adequate and timely?     - How is the committed co-financing for the project being used by PMU and BPPT? Report the co-financing details in the format as suggested in Annex 1 in the ToR; “Table A1: Financial Planning Co-financing”;     - Whether the use of consultants has been successful in achieving component outputs     - Assess the use of the project logical framework and work plans as management tools and in meeting with UNDP-GEF requirements in planning and reporting.     - How does the APR/PIR process helped in monitoring and evaluating the project implementation and achievement of results?     - How does the project management systems, including progress reporting, administrative and financial systems and monitoring and evaluation system, operating as effective management tools, aid in effective implementation and provide sufficient basis for evaluating performance and decision making?     - Assess the use of electronic information and communication technologies in the implementation and management of the project. * Project positioning and leveraging: * Asses how project partners, stakeholders and co-financing institutions are involved in the Project’s adaptive management framework. * Identify opportunities for stronger collaboration and substantive partnerships to enhance the project’s achievement of results and outcomes. * Are the project information and progress of activities disseminated to project partners and stakeholders? Are there areas to improve in the collaboration and partnership mechanisms? |
| * **Findings:** *Sustainability*   + Financial risks   + Socio-economic risks   + Institutional and governance   + Environmental | * Validate whether the risks originally identified in the project document and, currently in the APR/PIRs are reasonable? And their risk rating in terms of most critical is reasonable? * Describe additional risks identified during the review, if any, and suggest risk ratings and possible risk management strategies to be adopted. * Is the project implementation and achievement of results proceeding well and according to plan, or are there any outstanding issues, obstacles, bottlenecks, etc. on the implementation of demonstration projects, government or private sector or the captive power industry as a whole affecting the successful implementation and achievement of project results? |
| 1. **Conclusions**  * Conclusions   + Progress towards achievement of the objective   + Overall results and ratings * Lessons learned | * Progress towards achievement of results   + Given the level of achievement of outputs and related inputs and activities to date, is the Project likely to achieve its Immediate Purpose and Development Objectives?   + Are there critical issues relating to achievement of project results that have been pending as on date and need immediate attention immediately after MTR?   + A commentary is required on the “Expected Situation at the end of the Project” as envisioned at the MTR and recommendations, if any required, for accelerating the pace of work; * Lessons learned, if any, in addressing issues relating to relevance, performance and success |
| 1. **Recommendations**  * Strategic recommendations to achieve the result’s target * Actions for follow-up | * Proposals for future directions underlining main objectives:   + Do the Project’s purpose and objectives remain valid and relevant, or are there items or components in the project design that need to be reviewed and updated * Corrective actions for the design, implementation, monitoring and evaluation of the project; including Specific recommendations on how to expediently mobilize and facilitate the planned activities not completed as on date and activities to be completed during rest of the project implementation period |

1. About the evaluatorS

**Mr. Jan van den Akker** is a technology management scientist with a Master's degree from Eindhoven University of Technology (Netherlands), specializing in international development cooperation. He is an expert on sustainable energy policy and technologies. Mr. Van den Akker specializes in studies and analytical work, project design and development, project coordination and implementation, project monitoring and evaluation, knowledge management, capacity strengthening and public-private partnerships in the field of sustainable energy strategies, energy efficiency, energy technologies and supply, climate change and the Clean Development Mechanism. He has lived and worked abroad for over 7 years in Zambia, Mexico and Thailand. In addition, has undertaken numerous short missions to about 45 countries in Africa, Latin America and Asia & the Pacific.

In 2003/2004 he founded ASCENDIS, as an independent office, and has been providing consultancy on sustainable energy and climate change, specializing in development issues. ASCENDIS is based in Westerhoven, Netherlands, but offers services in Africa, Asia and the Pacific, Europe and Latin America & the Caribbean, often by associating itself with local freelance experts, professionals and organizations. As a long-term expert with the United Nations system, Mr. Van den Akker has provided advice to governments and organizations on the design of investment and capacity building programs for UNEP, UNDP and UNIDO, mostly in GEF-funded activities, UNFCCC and for NGOs/consultancy companies (e.g., Practical Action Consulting, Winrock) in the area of renewable energy, energy efficiency and sustainable transportation.

**Mr. Himsar Ambarita** is a researcher also an independent consultant with specializing in sustainable energy policy and technologies. He is an Indonesian and gets Doctor of Engineering degree from Muroran Institute of Technology, Japan. As a researcher his specialities are: Green Houese Gases, Global Warming, Sustainable Energy Technologies and Policies, Heat Transfer, Energy Efficiency, Renewable Energy (Solar, Wind, Hidropower, Bioenergy), Pump as a Turbine, Optimization of Thermal System, Adsorption Cycle, Organic Rankine Cylce, Refrigeration, and Drying Technology.

As an independent cosultant he has some experiences working with foreign agencies and the Government of Indonesia on capacity building and to formulate regulations related to sustainable energy. Some of his experiences are: (1) National Consultant for Mitigation Momentum to develop NAMAs proposal, a project by Energy Centre for the Netherlands (ECN), (2) Expert for BAPPEDA (Agency for Regional Development) of Sumatera Utara province to support development of RPJMD(Mid-Term Regional Development Plan) 2014-2018, responsible for energy sector, (3) National Consultant for JICA (Japan International Cooperation Agency) to support development of RAD-GRK(Regional Action Plan for Reducing Emissions of Green Houses Gases) Sumatera Utara province. Energy base sectors: transportation and industry, and (4) Expert for CASINDOProject (Capacity development and strengthening for energy policy formulation and implementation of sustainable energy projects in Indonesia). It is part of a bilateral energy co-operation between Indonesia and Netherlands.

1. consultant code of conduct form

**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, minimize 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 wrongdoing 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: J.H.A. VAN DEN AKKER (Team Leader, on behalf of the Team) Name of Consultancy Organization (where relevant): I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.



Signed at Westerhoven, Netherlands

Signature:

1. 1) Highly Satisfactory (HS), project has no shortcomings in terms of effectiveness, relevance of efficiency, 2) Satisfactory (S), minor shortcomings, 3) Marginally Satisfactory (MS), 4) Marginally Unsatisfactory (MU), the project has significant shortcomings, 5) Unsatisfactory (U), major shortcomings, 6) Highly Unsatisfactory (HU), severe shortcomings. to highly satisfactory [↑](#footnote-ref-1)
2. As mentioned in the Terms of Reference (ToR) of this evaluation (see Annex A) [↑](#footnote-ref-2)
3. The general scope of questions/themes is given in Section 3. Specific questions for each interviewee will be formulated during the mission itself as certain issues become more clear during the various interviews and based on analysis of background information [↑](#footnote-ref-3)
4. See Back-to-Office Report (BTOR) by B. Gadde (August 2014) [↑](#footnote-ref-4)
5. The Inception report mentions the use of a pre-determined questionnaire as an option. However, this was not deemed necessary in the end, as in the Evaluator’s view the open-style interviews and documents reviewed provided sufficient and valid information. [↑](#footnote-ref-5)
6. *Project-Level Monitoring: Guidance for Conducting Mid-term Reviews of UNDP-supported, GEF-financed projects* (UNDP, 2014)*,* [↑](#footnote-ref-6)
7. *Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed projects* (UNDP, 2012) [↑](#footnote-ref-7)
8. Version, dated 05 August 2014 [↑](#footnote-ref-8)
9. A meso-scale map is also available for Eastern Indonesia. See the reference AWS True Power (2010) in Annex C. [↑](#footnote-ref-9)
10. The ProDoc mentions as indicator “Number of seminar-workshops on wind energy (including WHyPGen) applications and promotion of potential wind power projects by EOP”, but apparently this indicators has been removed in the PIR, although no explanation is given. [↑](#footnote-ref-10)
11. The following indicators mentioned in the Project Document have been removed in the PIR, namely “Cumulative electricity production from successfully implemented 2MW WHyPGen pilots/demos by EOP, GWh” and “Cumulative CO2 emission reductions from successfully implemented 2MW WHyPGen pilots/demos by EOP, MT CO2”. This is logical to our opinion, as these indicators duplicate the first set of three objective indicators. The corresponding description in outcome 2.1 “GHG emission reductions from WHyPGen demo projects” has been eliminated and the part “Increased number of wind generation power has remained”. [↑](#footnote-ref-11)
12. [↑](#footnote-ref-12)
13. This indicator seems to partly duplicate number [↑](#footnote-ref-13)
14. The output mentioned in the CEO ER “Designed and established loan and guarantee scheme for small-scale projects” does not appear anymore in the PIR. A number of indicators given in the ProDoc have disappeared as well “No. of completed capacity building programs for banks/FI”; “No. of completed capacity building programs for project developers”; “No. local service providers and power project developers trained on [↑](#footnote-ref-14)
15. The original 5 indicators in the ProDoc “No. existing WHyPGen-related policies evaluated”, “Number of policy recommendations proposed for facilitating, promoting and supporting wind power generation (including WHyPGen) investments”, “Supporting policies for wind power generation including WHyPGen formulated”; “Supporting policies for wind power generation including WHyPGen endorsed by the government” and “Number of local companies actively engaged in the wind power generation (including WHyPGen) business”. Indeed, to our opinion the latter indicator [↑](#footnote-ref-15)
16. We recommend this Indicator to be moved to Component 1, as it supplements Indicators 9. to 12. The number of involved companies is not only dependent on policies formulated. [↑](#footnote-ref-16)
17. We wonder if this Indicator should actually not be included with the training-relevant indicators of Component 6 [↑](#footnote-ref-17)
18. Five engineering schools have RE included, namely STT, PLN, UNDIP, UGM, UI, UNSADA [↑](#footnote-ref-18)
19. EBTKE Connex is an annual event of seminar and exhibition that held by the Directorate General of New Energy, Renewables and Energy Conservation (DJEBTKE), [↑](#footnote-ref-19)
20. Component 2 targets energy management. This includes efforts to make the Energy Efficiency and Conservation Clearing House (EECCH), set up in the predecessor ESP2 phase, sustainable, and assist in establishing a new combined Clearing House including renewable energy and support MEMR’s capability to promote a more efficient use of traditional and renewable energy. National level activities are closely related to provincial activities, and feedback from the implemented pilot activities in Central java is an important element also of the national level activities. ESP3 will be operational during 2013-17. [↑](#footnote-ref-20)
21. The indicator no. 29 “Number of local equipment manufacturers trained under the capacity development programme” has been labelled as “repetitive” in the 2014 PIR However, training under Component 3 would be on financial-economic issues only, so a type of indicator, re-formulated, might be necessary in our opinion to capture technical training. [↑](#footnote-ref-21)
22. In fact, a number of Indicators as mentioned in the ProDoc’s logframe are omitted in the PIR, notably “Number of trained local equipment manufacturers that are manufacturing quality wind energy system equipment & components”, “Number of local technical service providers trained under the capacity development program”, “Number of trained local technical service providers that are actively engaged in the servicing (installation & maintenance) of wind energy systems (including WHyPGen)”, “Number of trained local technical service providers that are actively engaged in the servicing (design & engineering) of wind energy systems” and “Number of power generation engineers and operators certified to operate and maintain wind power generation (including WHyPGen) systems” [↑](#footnote-ref-22)
23. See *Blowing the Wind in Indonesia,* paper presented at “Indonesia EBTKE CONEX 2013” Conference, by. S. Martosaputro and N. Murti, available at www.sciencedirect.com [↑](#footnote-ref-23)
24. Meteorology masts, also referred to as measurement masts or towers [↑](#footnote-ref-24)
25. *Renewable Energy Technologies: Cost Analysis Setries; Volume 1: Power Sector, Issue 5, Wind Power,* International Renewable Energy Agency (IRENA), 2012, available at www.irena.org [↑](#footnote-ref-25)
26. *Electricity-specific emission factors for grid electricity,* Econometrica (2011), emissionfactors.com. In the Project Document, an emission factor of 0.886 has been used to calculate emission reduction, based on diesel oil-based generation. This would be correct for island grid systems where wind would replace diesel of diesel generators, but not when connected to the main grid systems in which power is generated by a mix of energy conversion technologies and sources. [↑](#footnote-ref-26)
27. Current staff is Budi Prasetyo (technical electrical), Malik Ibrochim (technology assessment and demo), Royhan Setiawan (capacity building), NIla Murti (promotion and market development), Didik Karyawanto (finance), Roofi Mulyana (admin assist) and Joko Wardoyo (office support). Note that Budi and Royhan are staff that recently joined the project team [↑](#footnote-ref-27)
28. Gatot Dwianto and Edi Hilmawan [↑](#footnote-ref-28)
29. This indicator would cover also the support given by the WHyPGen project to refurbish the wind hybrid power facility at Nusa Penida *(see Recommendation 4a*) [↑](#footnote-ref-29)
30. This indicator (22) has been shifted to Component 1 as Indicator 10 in the alternative list [↑](#footnote-ref-30)
31. Proposed to be moved to Component 6 to show the linkage with training activities of this Component [↑](#footnote-ref-31)
32. We propose to merge Indicators 27 and 28 and move to Component 5 (as Indicator 25 in the alternative list) together with other promotional and info dissemination activities, with Component 6 focussing on technical training and support. [↑](#footnote-ref-32)
33. We propose Outcome 6.2 and 6,3 to be deleted as these are not relevant (yet) for the nascent wind power development in Indonesia (Outcome 6,2) or have overlap with other activities (Outcome 6.3; availability of quality components is already covered by the Indicators 9 and 10 of Outcome 1.3 [↑](#footnote-ref-33)
34. The case of Nusa Penida (see Box 7) may highlight the need for qualified engineers and wind (hybrid) system operators [↑](#footnote-ref-34)
35. Information in Section 2.1 has been compiled from eia.gov.doe, en.wikipedia.org and ADB (2013) [↑](#footnote-ref-35)
36. *Perusahaan Listrik Negara,* State Electricity Company [↑](#footnote-ref-36)
37. Called PKUK, *Pemegang Kuasa Usaha Ketenagalistrikan,* Holder of Electricity Business Authority [↑](#footnote-ref-37)
38. *Renewables Interactive Map, Indonesia,* REN21 (August 2014), taken from ACE, *Country Profile Indonesia* (2013) and MEMR website on Ministerial Regulations [↑](#footnote-ref-38)
39. F: regional incentive factor; Java, Bali, Sumatera, F=1; Kalimantan, Sulawesi, NTB and NTT regions, F=1.2 and Maluku and Papua regions: F=1.3. Taken from *Development of New and Renewable Energy and Energy Conservation,* Presented at Global Workshop on Clean Energy Development by DGNREEC; Washington DC, USA (Dec. 2012) [↑](#footnote-ref-39)
40. See ECN (2013) [↑](#footnote-ref-40)
41. The underlined items in this table refer to the UNDP evaluation **criteria** of Relevance, Effectiveness, Efficiency, Results, Sustainability; The items in *italics* refer to the main areas of focus, as mentioned in the UNDP (2014) mid-term evaluation guide,. [↑](#footnote-ref-41)