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Validation Report

Sindicatum Carbon Capital Ltd

VALIDATION OF THE CDM-PROJECT:

WAYANG WINDU PHASE 2 GEOTHERMAL POWER PROJECT

REPORT NO. 1283892

02 December 2010

TÜV SÜD Industrie Service GmbH

Carbon Management Service
Westendstr. 199 - 80686 Munich – GERMANY

Report No.	Date of first issue	Revision No.	Date of this revision	Certificate No.
1283892	19-01-2009	10*	02-12-2010	-

* Revision carried out in accordance with EB58, para 61(g)

Subject: Validation of a CDM Project

Accredited TÜV SÜD Unit:	**TÜV SÜD Contract Partner:**
TÜV SÜD Industrie Service GmbH Certification Body "climate and energy" Westendstr. 199 80686 Munich Germany	TÜV SÜD Industrie Service GmbH Carbon Management Service Westendstr. 199 80686 Munich Germany
Project Participants: **Client:** Sindicatum Carbon Capital Ltd 33 Duke Street London W1U 1JY UK **Other Project Participants:** Star Energy Geothermal (Wayang Windu) Limited Jl. Let. Jend. S. Parman Kav 62-63, 8th - 11th floor Wisma Barito Pacific, Star Energy Tower Jakarta, 12710, Indonesia	**Project Site(s):** Republic of Indonesia West Java Kecamatan Pangalengan, 40km south of Bandung 7.20744° S, 107.62892° E

Project Title: Wayang Windu Phase 2 Geothermal Power Project

Applied Methodology / Version: ACM0002 / Version 09	**Scope:** 1 **Technical area:** 1.3

First PDD Version:		**Final PDD version:**	
Date of issuance:	09-01-2009	Date of issuance:	02-12-2010
Version No.:	01	Version No.:	3
Starting Date of GSP	21-01-2009		

Estimated Annual Emission Reduction: 794,832 tCO_2e

Assessment Team Leader:	**Technical reviewers:**
Thomas Kleiser	Robert Scharpenberg, Javier Castro
Further Assessment Team Members:	**Certification Body responsible:**
Madhuri Nanda, Ivan Hernandez, Sandeep Kanda	Cuiyun (Rachel) Zhang

Summary of the Validation Opinion:

☒ The review of the project design documentation and the subsequent follow-up interviews have provided TÜV SÜD with sufficient evidence to determine the fulfilment of all stated criteria. In our opinion, the project meets all relevant UNFCCC requirements for the CDM. Hence TÜV SÜD will recommend the project for registration by the CDM Executive Board in case letters of approval of all Parties involved will be available before the expiring date of the applied methodology(ies) or the applied methodology version respectively.

☐ The review of the project design documentation and the subsequent follow-up interviews have not provided TÜV SÜD with sufficient evidence to determine the fulfilment of all stated criteria. Hence TÜV SÜD will not recommend the project for registration by the CDM Executive Board and will inform the project participants and the CDM Executive Board on this decision.

Abbreviations

ACM	Approved Consolidated Methodology
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CR / CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	GreenHouse Gas(es)
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
IRR	Internal Rate of Return
KP	Kyoto Protocol
MP	Monitoring Plan
NGO	Non Governmental Organisation
OM	Operational Margin
PDD	Project Design Document
PP	Project Participant
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

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1 INTRODUCTION

1.1 Objective

The validation objective is an independent assessment by a Third Party (Designated Operational Entity = DOE) of a proposed project activity against all defined criteria set for the registration under the Clean Development Mechanism (CDM). Validation is part of the CDM project cycle and will finally result in a conclusion by the executing DOE whether a project activity is valid and should be submitted for registration to the CDM Executive Board (CDM-EB). The ultimate decision on the registration of a proposed project activity rests at the CDM-EB and the Parties involved.

The project activity discussed by this validation report has been submitted under the project title:

Wayang Windu Phase 2 Geothermal Power Project

1.2 Scope

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities. In the case of CDM project activities the scope is set by:

- The Kyoto Protocol, in particular § 12 and modalities and procedures for the CDM
- Decision 2/CMP1 and Decision 3/CMP.1 (Marrakech Accords)
- Further COP/MOP decisions with reference to the CDM (e.g. decisions 4 – 8/CMP.1)
- Decisions and specific guidance by the EB published under http://cdm.unfccc.int
- Guidelines for Completing the Project Design Document (CDM-PDD), and the Proposed New Baseline and Monitoring Methodology (CDM-NM)
- Baselines and monitoring methodologies (including GHG inventories)
- Management systems and auditing methods
- Environmental issues relevant to the sectoral scope applied for
- Applicable environmental and social impacts and aspects of CDM project activity
- Sector specific technologies and their applications
- Current technical and operational knowledge of the specific sectoral scope and information on best practice

The validation is not meant to provide any consulting towards the project participant (PP). However, stated requests for clarifications, corrective actions and/or forwards actions may provide input for improvement of the project design.

Once TÜV SÜD receives a first PDD version, it is made publicly available at the UNFCCC webpage and at TÜV SÜD's webpage for starting a 30 day global stakeholder consultation process (GSP). In case of any request a PDD might be revised (under certain conditions the GSP could be repeated) and the final PDD will form the basis for the final evaluation as presented in this report. Information on the first and the final PDD version is presented on page 1.

The only purpose of a validation is its use during the registration process as part of the CDM project cycle. Hence, TÜV SÜD cannot be held liable by any party for decisions made or not made based on the validation opinion, which will go beyond that purpose.

2 METHODOLOGY

The project assessment applies standard auditing techniques to assess the correctness of the information provided by the project participants. The assessment is based on the "Clean Development Mechanism Validation and Verification Manual" version 01. The work starts with appointment of team covering the technical scope(s), sectoral scope(s) and relevant host country experience for evaluating the CDM project activity. Once the project is made available for the stakeholder consultation process, members of the team carry out the desk review, follow-up actions, resolution of issues identified and finally preparation of the validation report. The prepared validation report and other supporting documents then undergo an internal quality control by the CB "climate and energy" before submission to the CDM-EB.

In order to ensure transparency, assumptions are clear and explicitly stated; the background material is clearly referenced. TÜV SÜD developed methodology-specific protocol customised for the project. The protocol shows, in a transparent manner, criteria (requirements), the discussion of each criterion by the assessment team and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- Ensures a transparent validation process where the validator will document how a particular requirement has been validated;
- The result of the validation; and
- Any adjustment made to the project design.

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol is enclosed in Annex 1 to this report.

Validation Protocol Table 1: Conformity of Project activity and PDD				
Checklist Topic / Question	**Reference**	**Comments**	**PDD in GSP**	**Final PDD**
The checklist is organised in sections following the arrangement of the applied PDD version. Each section is then further sub-divided. The lowest level constitutes a checklist question / criterion.	*Gives reference to documents where the answer to the checklist question or item is found in case the comment refers to documents other than the PDD.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached. In some cases sub-checklist are applied indicating yes/no decisions on the compliance with the stated criterion. Any **Request** has to be substantiated within this column*	*Conclusions are presented based on the assessment of the first PDD version. This is either acceptable based on evidence provided (☑), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question (See below). **Clarification Request (CR)** is used when the validation team has identified a need for further clarification. **Forward action request** to highlight issues related to project implementation that require review during the first verification.*	*Conclusions are presented in the same manner based on the assessment of the final PDD version and further documents including assumptions presented in the documentation.*

Validation Protocol Table 2: Resolution of Corrective Action and Clarification Requests			
Clarifications and corrective action requests	**Ref. to table 1**	**Summary of project owner response**	**Validation team conclusion**
If the conclusions from table 1 are either a Corrective Action, a Clarification or a Forward action Request, these should be listed in this section.	*Reference to the checklist question number in Table 1 where the issue is explained.*	*The responses given by the client or other project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the discussion on and revision to project documentation together with the validation team's responses and final conclusions. The conclusions should be reflected in Table 1, under "Final PDD".*

In case of a denial of the project activity more detailed information on this decision will be presented in table 3.

Validation Protocol Table 3: Unresolved Corrective Action and Clarification Requests		
Clarifications and corrective action requests	**Id. of CAR/CR**	**Explanation of the Conclusion for Denial**
If the final conclusions from table 2 results in a denial the referenced request should be listed in this section.	*Identifier of the Request.*	*This section should present a detail explanation, why the project is finally considered not to be in compliance with a criterion with a clear reference to the requirement which is not complied with.*

2.1 Appointment of the Assessment Team

According to the technical scopes and experiences in the sectoral or national business environment TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body "climate and energy". The composition of an assessment team has to be approved by the Certification Body (CB) ensuring that the required skills are covered by the team. The CB TÜV SÜD operates four qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL)
- Greenhouse Gas Auditor (GHG-A)
- Greenhouse Gas Auditor Trainee (T)
- Experts (E)

It is required that the sectoral scope linked to the methodology has to be covered by the assessment team.

Name	Qualification	Coverage of Sectoral Scope	Coverage of technical area	Host country experience
Thomas Kleiser	**ATL**	☑	☑	☑
Madhuri Nanda	GHG-A	-	-	☑
Ivan Hernandez*	GHG-A	-	-	☑
Sandeep Kanda	GHG-A	☑	☑	☑

* Appointed auditor at the time of the on-site audit

Thomas Kleiser is head of certification body at TÜV SÜD Industrie Service GmbH. In this position he is responsible for validation, verification and certifications processes for GHG mitigation projects as well as trainings for internal auditors. As assessment team leader he already conducted numerous validations and verifications of CDM and JI projects. Before entering this department he worked as expert on air quality measurements and emissions inventories as well as on environmental auditing within the environmental branch of the company. Reflecting on earlier projects he is familiar with political, economical and technical random conditions in host country

Madhuri Nanda is auditor at TÜV SÜD Industrie Service GmbH, Germany. She holds a M.Sc. degree in Environment Management and has gathered experience in climate change policy, sustainability reporting, environmental compliances and environmental impact assessment studies before joining TÜV SÜD. She is a also a lead auditor for SA 8000 and has worked on management systems (ISO 9001, ISO 14001, OHSAS 18001).

Ivan Hernandez was a GHG lead auditor. He has an academic background in industrial engineering and industrial maintenance. He has received extensive training in the CDM Validation and Verification processes and participated already in several CDM project assessments as auditor in SE Asia. In particular, Mr. Hernandez brings with him prior experience of working on several geothermal projects.

Sandeep Kanda is a GHG auditor for CDM/JI projects and energy and environment field expert at TÜV SÜD Industrie Service GmbH. He holds a master degree in energy systems engineering and also industrial safety and environmental management. Before joining the TÜV SÜD Industrie Service GmbH he has worked extensively on projects in energy sector, manufacturing industries, chemical industries and metal production. He has carried out energy audits and worked on development of CDM projects and methodologies in the aforementioned sectors.

2.2 Review of Documents

A first version of the PDD was submitted to the DOE in January 2009. The first PDD version submitted by the PP and additional background documents related to the project design and baseline were reviewed to verify the correctness, credibility and interpretation of the presented information, furthermore a cross check between information provided and information from other sources (if available) have been done as initial step of the validation process. A complete list of all documents and proofs reviewed is attached as annex 2 to this report.

2.3 Follow-up Interviews

On 27th to 30th January 2009 TÜV SÜD performed interviews, telephone conferences and physical site inspection with project stakeholders to confirm relevant information and to resolve issues identified in the first document review. The table below provides a list of all persons interviewed in this context.

Name	Organisation
Hendra Tan	Star Energy – Chief Financial Officer (CFO)
Alex Smillie	Star Energy – Vice President Operations (VP-OP)
Yuliana Sutjitro	Star Energy - Manager
Meizani Irmandhiany	Star Energy - Coordinator
Johanes	Star Energy - Analyst

Name	Organisation
Daniel Bussin	Sindicatum Carbon Capital (SCC) – Climate Change
Melanie Tantri	SCC – Associate
Steven Oentoro	SCC – Associate
Suryantoro Prakoso	SCC - VP
Werner Betzenbichler	SCC - SVP CC
H. Dwyudha	Field Manager
Zerry Antro	Star Energy Geothermal (Wayang Windu) Limited (MNL) – Engineer
Huri Kustino	MNL- SHE
Yoyo Sunarya	MNL – Laboratory
Dian	MNL – Laboratory
Faiq Kaustak	MNL – SHE
Achmad Navual	MNL – Community development
Yuyun Wahyu	Teacher from school built by MNL
Atik Sumarni	Teacher from school built by MNL

2.4 Further cross-check

During the validation process, the team makes reference to available information related to similar projects or technologies as the CDM project activity. The documentation has also been reviewed against the approved methodology applied to confirm the appropriateness of formulae and correctness of calculations.

2.5 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve the requests for corrective actions and clarifications and any other outstanding issues which needed to be clarified for TÜV SÜD`s conclusion on the project design. The CARs and CRs raised by TÜV SÜD were resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the validation process, the concerns raised and responses that have been given are documented in more detail in the validation protocol in annex 1.

The final PDD version submitted in December 2010 serves as the basis for final assessment presented herewith. Changes are not considered to be significant with respect to the qualification of the project as a CDM project based on the two main objectives of the CDM, i.e. to achieve a reduction of anthropogenic GHG emissions and to contribute to a sustainable development.

2.6 Internal Quality Control

As final step of a validation the final documentation including the validation report and the protocol have to undergo an internal quality control by the CB “climate and energy”, i.e. each report has to be finally approved either by the head of the CB or the deputy. In case one of these two persons is part of the assessment team approval can only be given by the other one.

After confirmation of the PP the validation opinion and relevant documents are submitted to the EB through the UNFCCC web-platform.

3 SUMMARY

The assessment work and the main results are described below in accordance with the VVM reporting requirements. The reference documents indicated in this section and Annex 1 are stated in Annex 2.

3.1 Approval

The project participants are Star Energy Geothermal (Wayang Windu) Limited (MNL) of Indonesia and Sindicatum Carbon Capital Ltd of United Kingdom of Great Britain and Northern Ireland. The host Party Indonesia and further Annex I Party United Kingdom of Great Britain and Northern Ireland meet the requirements to participate in the CDM.

The Designated National Authority (DNA) of the United Kingdom has issued a LoA on 8th June 2009 authorizing Sindicatum Carbon Capital Ltd as a project participant [87]. The DNA of Indonesia has also issued a LoA on 8th May 2009 authorizing Star Energy Geothermal (Wayang Windu) Limited (MNL) as a project participant [86]. TÜV SÜD received these letters from the project participants directly and considers the provided letters as authentic.

Furthermore, after checking the provided LoAs, TÜV SÜD confirms that both letters refer to the precise proposed CDM project activity title in line with the title in the PDD “Wayang Windu Phase 2 Geothermal Power Project”.

Both letters also indicate that each participating Party is a Party to the Kyoto Protocol, and that the participation in the Wayang Windu Phase 2 Geothermal Power Project is voluntary. The Indonesian LoA also confirms that the proposed CDM project activity contributes to the sustainable development of Indonesia (host country). Based on the information given in these letters, TÜV SÜD considers the approval as unconditional with respect to these items.

Both LoAs have been issued by the respective Party’s DNA Indonesia and United Kingdom, Global Carbon Markets, Department of Energy and Climate Change, respectively.

TÜV SÜD considers the requirements of the VVM (§§ 45-48) to be complied with.

The LoAs do not specify a version number of the PDD or validation report. The corresponding references included to LoAs, PDD and validation report are consistent.

3.2 Participation

The participants of the project activity have been approved by the corresponding Parties, which is confirmed by the issued LoAs.

The means of validation were equivalent to those described in section 3.1 in regard to the approval process of the project activity.

3.3 Project design document

The PDD is compliant with relevant form and guidance as provided by UNFCCC.

The most recent version of the PDD form was used.

TÜV SÜD considers that the guidelines for the completion of the PDD in their most recent version have been followed. Relevant information has provided by the participants in the applying PDD sections. Completeness was assessed through the checklist included as Annex 1 to this report.

3.4 Project description

The project involves the construction and operation of a geothermal power station with a capacity of 117 MW, which is an additional power unit at an existing power plant (Wayang Windu Unit I) that results in the increase of the installed power generation capacity of the electricity system. The location of Wayang Windu Phase 2 geothermal power generation project is Wayang Windu allotment at 40 km south Bandung in West Java, Indonesia. Star Energy Geothermal (Wayang Windu) Limited ("MNL") is the operator of the new unit, the same that operates Wayang Windu Phase 1.

The information presented in the PDD on the technical design is consistent with the actual planning and implementation of the project activity as confirmed by:

- Review of data and information (see annex 2).
- An on-site visit has been performed and relevant stakeholder and personnel with knowledge of the project were interviewed, in case of doubt further cross checks through additional interviews have been done.
- Finally information related to similar projects or technologies as the CDM project activity have been used if available to confirm the accuracy and completeness of the project description.

In light of the above, TÜV SÜD confirms that the project description as included to the PDD is sufficiently accurate and complete in order to comply with the requirements of the CDM.

3.5 Baseline and monitoring methodology

3.5.1 Applicability of the selected methodology

Compliance with each applicability condition as listed in the chosen baseline and monitoring methodology ACM0002 Version 09 has been demonstrated.

The assessment was carried out for each applicability criteria and included among others the compliance check of the local project setting with the applicability conditions in regard to baseline setting and eligible project measures. This assessment also included the review of secondary sources which sustain that applicability conditions are complied with.

The Methodology specific protocol included to the Annex 1 documents the assessment process, including the steps taken. The results on the compliance check as well as the relevant evidence are explicitly presented in annex 1. TÜV SÜD confirms that the chosen baseline and monitoring methodology is applicable to the project activity.

Emission sources which are not addressed by the applied methodology and which are expected to contribute more than 1% of the overall expected average annual emissions reduction have not been identified.

3.5.2 Project boundary

The project boundary was assessed in the context of physical site inspection, interviews and based on the secondary evidence received on the design of the project.

- The Project boundary includes the physical and geographical site of the all power plants connected physically to the Jamali grid. The project boundary is as per the methodology and the same has been validated based on the document review and on-site visit

The most relevant documents assessed in order to confirm the project boundary are as follows:

- WW Joint Operation Contract between Pertamina and MNL signed in 1994, amended on 21st November 2006 [21]; and
- Energy Sales Contract between PLN and MNL and Pertamina, Original and amendments dated 21st November 2006 [22].

The same have been validated during the validation process using standard audit techniques, further details of any observation are transparently presented in the annex 1.

Hence TÜV SÜD confirms that the identified boundary and the selected sources and gases as documented in the PDD are justified for the project activity.

3.5.3 Baseline identification

The project involves the construction and installation of the additional steam turbine and peripheral equipment with a capacity of 117 MW to generate electricity from new production wells in the Wayang Windu reservoir. The Wayang Windu geothermal field is not exclusively linked to unit 1, but covers the whole geological formation in an area of dozens of square kilometers, which offers the possibility of exploiting hot steam for power generation by a renewable energy source. The field itself is not related to any development phase while so-called well-fields (drilling several wells within a small area in order to exploit the steam field) are usually attributed to a development phase.

The project activity would produce and supply electricity to the JAMALI grid, and hence add to the electricity capacity of the existing Wayang Windu unit 1, which has been delivering power with a capacity of 110 MW since June 2000. In light of the fact observed during the on-site audit that there are interconnections for steam flows of unit 1 and unit 2 and joint infrastructure (e.g. power house), the project activity has been considered as a capacity addition project.

As noted above, the project activity also involves the drilling of additional production wells with the steam pipelines that are interconnected to Unit 2 steam turbine. Further, as Wayang Windu Unit 1 and Wayang Windu Unit 2 (project activity) both are operated by Star Energy Geothermal (Wayang Windu) Limited (or Magma Nusantara Limited) therefore to allow operational flexibility these new steam pipelines are interconnected to the existing steam pipelines (of unit 1), i.e. the steam from the newly developed part of the steam field could also be used in the operation of unit 1. The interconnection allows the steam to flow from the existing production wells of Wayang Windu Unit 1 to steam turbine of Wayang Windu Unit 2, and vice versa, but overall the Unit 1 production wells feed the Unit 1 turbine, and the Unit 2 production wells feed the Unit 2 turbine, and steam flows are monitored to control this.

Therefore TUV SUD confirms that the project activity is a capacity addition and in accordance with the applied methodology ACM0002 v9, the baseline scenario defined in the PDD is as follows:

- In the absence of the CDM project activity, the existing facility would continue to provide electricity to the grid ($EG_{baseline}$, in MWh/year) at historical average levels ($EG_{historical}$, in MWh/year), until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production ($EG_{baseline}$) is assumed to equal project electricity production (EG_y , in MWh/year), and no emission reductions are assumed to occur.

As the project activity is the installation of an additional power unit, the installation of new well-fields and their interconnection with the original steam supply system at an existing grid-connected geothermal power plant, it is considered as the modification/retrofit of an existing grid-connected renewable power plant/unit, and the baseline scenario in line with baseline methodology procedure of ACM0002 v9 would be the existing facility continuing to provide electricity to the grid ($EG_{baseline}$, in MWh/year) at historical average levels ($EG_{historical}$, in MWh/year), while the additional power produced by the project would have been delivered by the Jamali grid. This will be valid until the time at which the original generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production (EGbaseline) is assumed to equal project electricity production (EG_y, in MWh/year), and no emission reductions are assumed to occur.

The average of historical electricity delivered by the existing facility to the grid (MWh) has been included in the final PDD. The value of $EG_{baseline}$ stated as 912,476 MWh/year could be validated from

the invoices of net electricity sales to the grid operator [112]. The technical lifetime of the existing facility has been taken as 30 years and as Wayang Windu unit 1 started operation in June 2000, hence the $DATE_{BaselineRetrofit}$ is taken as 01 June 2030. This is deemed acceptable.

Therefore, TUV SUD confirms that the baseline scenario identified in the PDD is suitable and appropriate.

The information presented in the PDD has been validated by a first document review of all the data, further confirmation based on the on-site visit and a final step by cross checking the information with similar relevant projects and/or technologies. The sources referenced in the PDD have been quoted correctly. The information was cross-checked based on verifiable and credible sources, such as:

- CR 5 - EF from Indonesian Env Ministry (Letter from Environmental Ministry of Indonesia, Latest information of baseline emission factor for CDM projects at Sumatra and JAMALI grid, 0.891 tCO_2/MWh) dated 19th January 2009 [45];
- CR 5 - EF from Indonesian Authority (Letter from Department of Energy and Mineral Resources of Indonesia Baseline Emission Factor for Sumatra Grid and Updating Baseline Emission Factor of JAMALI Grid, 0.891 tCO_2/MWh), dated 13th February 2009 [44];

  Both the above letters issued in 2009 confirm that the latest data available for JAMALI grid is only till 2006; and
- CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL, Jamali grid system data (2002 to 2006): unit, power generated, per fuel type, net electricity production, fuel consumption, Average OM, and BM [46].

TÜV SÜD has determined that no reasonable alternative scenario has been excluded.

TÜV SÜD confirms that all relevant CDM requirements, including relevant and / or sectoral policies and circumstances, have been identified correctly taken into account in the definition of the baseline scenario. A verifiable description of the baseline scenario has been included to the PDD.

In regard to item 86 of VVM, TÜV SÜD confirms that:

1. All the assumptions and data used by the project participants are listed in the PDD, including their references and sources;
2. All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD;
3. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
4. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD;
5. The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

3.5.4 Algorithm and/or formulae used to determine emission reductions

TÜV SÜD has assessed the calculations of project emissions, baseline emissions and leakage and emission reductions. Corresponding calculations were carried out based on calculation spreadsheets. The parameters and equations presented in the PDD and further documentation have been compared with the information and requirements presented in the methodology and respective tools. The equation comparison has been made explicitly following all the formulae presented in the calculation files.

The assumptions and data used to determine the emission reductions are listed in the PDD and all the sources have been checked and confirmed. Based on the information reviewed it can be confirmed that the sources used are correctly quoted and interpreted in the PDD. The values presented

in the PDD are considered reasonable based on the documentation reviewed, further references and the result of the interviews. The baseline methodology has been correctly applied following the requirements. The estimated of the baseline emissions can be confirmed as the same have been replicated by the audit team using the information provided.

Detailed information on the verification of the parameters used in the equations can be found in the annex 1. The algorithms for the determination of the baseline, project and leakage are discussed in the following sections.

3.5.4.1 Baseline Emissions

The calculation of the baseline emissions followed the procedures described in the methodology ACM0002 Version 09. The Jamali Grid is considered to be the project boundary.

In the GSP-PDD the data for grid emission factor was obtained from the following sources:

- PDD of Registered Project 1313: MEN-Tangerang 13.6MW Natural Gas Co-generation Project;

- PT PLN P3B (Persero).

This was subsequently revised. The final PDD uses the primary data as reported by the National Authorities leading to lower emission factor, as follows:

- CR 5 - EF from Indonesian Env Ministry (Letter from Environmental Ministry of Indonesia, Latest information of baseline emission factor for CDM projects at Sumatra and JAMALI grid, 0.891 tCO_2/MWh) dated 19th January 2009 [45]; and
- CR 5 - EF from Indonesian Authority (Letter from Department of Energy and Mineral Resources of Indonesia Baseline Emission Factor for Sumatra Grid and Updating Baseline Emission Factor of JAMALI Grid, 0.891 tCO_2/MWh), dated 13th February 2009 [44];

Both the above letters issued in 2009 confirm that the latest data available for JAMALI grid is only till 2006.

For the calculation of the Baseline Emission Factor, option (a) – A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system is chosen. The Jamali Grid has been considered as the baseline. The Operating Margin (OM) and the Build Margin (BM) Emission Factor (EF) has been calculated by Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization and endorsed by Indonesian DNA [44, 45].

In line with the methodology, the combined margin emission factor for the Jamali Grid of Indonesia has been calculated to be 0.891 tCO_2/MWh consisting of 50% operating margin and 50% build margin approach and is fixed ex-ante. The operating margin has been determined to be 0.844 tCO_2/MWh and the build margin to be 0.937 tCO_2/MWh. The OM is calculated based on the Average OM approach using Option A: fuel consumption and net electricity generation of each power plant over a three year period of 2004, 2005 and 2006. The BM is calculated ex-ante based on the 20% most recent capacity additions in the grid based on net generation for the year 2006.

The calculation of the grid emission factor has been checked and can be confirmed [46]. The Emission Factor used in the project is acceptable

3.5.5 Project emissions

The project emissions considered for this project and according the methodology are:

- Fugitive CH_4 and CO_2 in the non-condensable gases of the produced steam; and
- CO_2 emission resulting from combustion of fossil fuel related to the operation of the power plant.

3.5.6 Leakage

The methodology used (ACM0002 version 9) does not consider the emission due to power plant construction and fuel handlings, no leakage is considered ($L_y = 0$).

3.5.7 Emission Reductions

In summary, the calculation of the baseline emissions; project emissions, and the emission reductions, respectively, can be considered as correct.

3.6 Additionality

The additionality of the project has been presented in the PDD using following approach: the latest version of "Tool for the demonstration and assessment of additionality" (version 05.2).

The additionality of the project has been presented in the PDD using the approach depicted in the "Tool for the Demonstration and Assessment of Additionality (Version 05.2)"

The approach used in the PDD has been assessed initially through document review followed by on-site audit and further sources. On site the additionality has been discussed principally with Alex Smillie (Star Energy – VP OP), Hendra Tan (Star Energy – CFO), and Yuliana Sutjitro (Star Energy – Manager). The documents that have been reviewed are listed in Annex 2. Finally, the data, rationales, assumptions, justifications, and documentation provided have been verified using local knowledge as well as sectoral and financial expertise.

Based on this validation steps we can confirm that the documentation assessed is appropriate for this project.

3.6.1 Prior consideration of the clean development mechanism

Based on the latest Glossary of CDM terms, starting date of a CDM Project activity is defined as the earliest date at which either the implementation or construction or real action of a project activity begins. In accordance with the same, the starting date of the project activity is determined by Contract for Engineering, Procurement, and Construction of the project that was signed on 30th January 2007. The start date has been assessed as follows:

The GSP-PDD indicated the purchase contract for tubular components for geothermal drilling, dated 11th July 2005 as the start date. During the course of validation it was realized that as this is an expansion project and part of construction for Wayang Unit 2 was also done during Unit 1 construction, which raised concern on the project starting date. Therefore, detailed contracts were reviewed from 1997 onwards till 2007 to confirm that only some basic common infrastructure work was accomplished in 2000 for unit 2, whereas no further significant activity was initiated for Unit 2 until 2007, when a fresh contract was awarded. The purchase contract for tubular components for geothermal drilling does not necessarily represent the project developer's firm intent or commitment to implement the project, given that the purchase of the tubular component for drilling would not have created any losses in case the project activity would not have been realized. Under such a situation these wells could have been used as make-up wells (as 2 new wells are needed to replace depleted wells every 3 years) for Wayang Windu unit 1. Also, it amounts to only around 4% of the total investment costs, which occured since that point in time. Hence ordering the drilling of this set of wells is not considered as a firm commitment to the proposed CDM activity.

The earliest date at which the implementation, construction, and real action of the project activity began was on 30th January 2007, when the contract for the Engineering, Procurement, and Construction of the project was signed, which is USD 118.56 million or 65% of the total investment cost from the starting date of the project activity of 181.38 USD million. Thus representing the first major commitment of funds, and as such is appropriate as a valid starting date of the project activity as per the CDM Glossary of terms.

As the starting date of the project activity is determined to be 30th January 2007 which is before 02nd August 2008 and also before the GSP, therefore to demonstrate prior consideration of CDM, the PPs have presented to the assessment team documentation depicting the key activities related to the project activity. In order to confirm that the PPs have taken real actions to continue the activity as CDM, following timeline has been reviewed against the respective documents presented in the table below:

Activity	Document	Auditor conclusion
First approach to obtain Carbon Revenues for project implementation	Letter of interest of CERUPT Wayang Windu project, dated 29th January 2002 [9]	This document demonstrates the effort put to meet the requirement of the CERUPT program, consequently the early consideration of Carbon Revenues at this stage of the project.
Submission of CER offer	Acknowledgement receipt expression of interest for CERUPT, from Senter to Magma, dated 6th February 2002 [11]	The CER value is viewed as the key to overcome the barriers.
Correspondence with Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources	Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources letter (topics of communication: CDM Baseline study, DNA Approval pending), dated 22nd August 2002 [10]	Even a baseline study was carried out by Indonesian Ministry of Environment that GOI approval could not be issued yet as Indonesia has not yet ratified the Kyoto Protocol. Evidence of interest to participate in mechanism of Emissions Reduction.
Preliminary Validation	Preliminary Validation of Wayang Windu 2 as a CDM project from URS, dated 09th September 2002 [13]	Effort for accomplishment of CDM requirement and overcome barriers. Subsequently, the company faced economical problems and was sold, after which they re-considered the construction of unit 2 only in late 2006
Withdrawal of CERUPT offer	Withdrawal of CERUPT from Senter to Magma, dated 16th December 2003 [12]	The agreement on the contents of the contract cannot be reached, in the main for economic change in electricity tariff.
Signing of Joint Operation Contract	WW Joint Operation Contract (JOC) between Pertamina and MNL signed in 1994, amended on 21st November 2006 [21]	The agreement and amendments of JOC demonstrate the high exigency levels for the usages of geothermal resources in Indonesia.
Singing the Energy Sales Contract	Energy Sales Contract (ESC) between PLN and MNL and Pertamina, and amendments dated 21st November 2006 [22]	The ESC demonstrates the high risk and exigency levels to provide electricity to the Jamali grid.
Starting date of project activity	Engineering and Procure and Construction (EPC) Agreement for the Steamfield above Ground System and Power Plant Project.	This evidences the earliest date when the construction or real of project activity begins.

Activity	Document	Auditor conclusion
	30th January 2007 [23]	
Asking for a commercial loan	Accounts Agreement part 1 and part 2 (Loan from Standard Chartered Bank to MNL, dated 3rd May 2007 [14]	The loan is given considering the CERs as fundamental part of project income. It supports the additionality of the project.
Correspondences for CDM project development	Letter from Ecosecurities with offer to develop the project as CDM dated 31st May 2007 [93]	The letter is made available to the audit team and has been verified.
Utilization request Credit Facility Agreement,	Confirmation letter where MNL proceed with utilization of loan portion which has to be applied towards project cost, dated 7th August 2007 [92]	The project can overcome the barriers with the commercial loan which fundamentally is conditioned to CERs income since the agreement with PLN about electricity tariff was not favorable for the project.
Draft letter of Exclusivity from Climate Change Capital	Draft letter of Exclusivity from Climate Change Capital dated 8th August 2007 [94]	The draft letter is made available to the audit team and has been verified.
Discussion with various potential CDM partners for the project	Correspondences verified by the audit team for a period from November 2007 to October 2008 [96 - 103]	All the correspondences have been submitted to the audit team under confidentiality and the same have been verified by the team.
Start of validation	Start of GSP at UNFCCC website on 21st January 2009	-

The original documents presented have been reviewed and verified based on on-site interviews. Therefore the documents can be considered appropriate to confirm the prior consideration of CDM. This confirms that the project complies with the requirements to demonstrate the prior consideration of the CDM.

3.6.2 Identifications of alternatives

The output of the project is electricity supply to Jamali Grid, Indonesia.

As per the ACM0002 ver. 9, the baseline is clearly defined. For the project activity, which involves the retrofit of existing grid-connected renewable power plant, in this case Wayang Windu I, the baseline scenario is providing electricity to the grid at historic levels until the time when the existing facility is likely to be replaced or retrofitted, i.e. electricity will continue to be generated by existing generation mix operating in the Jamali grid, with capacity additions as planned. This has been clearly described in the PDD.

Since, the retrofit is only expected in June 2030, the baseline scenario for this project would continue to be the historic generation of the existing facility.

3.6.3 Investment analysis

The PP uses the investment analysis to demonstrate the additionality. Benchmark analysis has been opted as the most suitable method for carrying out the investment analysis and the same has been found to be the appropriate analysis method.

The investment analysis is in accordance to the investment analysis study prior to the investment date, except for some positions where adjustments have been requested along this validation process, e.g. deletion of costs prior to the starting date [140]. The source of the input values were based on the evidence collected and estimates based on the experience from Wayang Windu 1 prior to the start date of the project activity.

The financial input parameters that have been the basis of the decision to proceed with the investment of the project is close enough to the investment decision date, and therefore TUV SUD confirms that it is unlikely in the context of the underlying project activity that the input values would have materially changed.

It has been demonstrated that the financial returns of the proposed project are insufficient to justify the investment. The project IRR without CDM revenues is **17.62%** which is below the market benchmark required rate of return of **18.96%.** The project IRR with CDM revenues is **20.48%.**

It is to be noted that the benchmark in the GSP-PDD was stated 17.18% (based on 2005 data) which was subsequently revised owing to the revision in the start date of the project activity from 11th July 2005 to 30th January 2007. The revised start date gives a different benchmark, as it is based on the 2007 values for risk free rate, beta and country risk premium, and thus the benchmark appropriate to that is given, i.e. 18.96%. As further consequence of changing the starting date costs which occurred during these dates have been taken out of the financial analysis. Thus, not only the benchmark but also the IRR changed from 15.73 % to 17.62 %. Thus financial additionality has been proven under both economical conditions. This revision is deemed appropriate and acceptable.

Following the guidance on the assessment of investment analysis, the input values for the benchmark analysis have been validated as follows:

Benchmark

The benchmark is based on the weighted average cost of capital (WACC). As per EB 51, Annex 58 Guidelines on the Assessment of Investment Analysis (version 03) paragraph 12, Weighted Average Costs of Capital (WACC) is an appropriate benchmark for a project IRR. The benchmark (WACC) has been derived based on the publicly data sources which have been clearly validated by TUV SUD.

The cost of equity for the WACC has been derived based on the Capital Asset Pricing Model (CAPM), which is in line with the method explained in the “Investment Valuation” book by A. Damodaran. The approach was also validated earlier in the registered Project 2346: Kabil II 11.4 MW Gas Fired Project (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1229687540.39/view).

Although the project activity is a capacity addition, and therefore can only be implemented by Star Energy Geothermal (Wayang Windu) Limited (or Magma Nusantara Limited), the company internal benchmark (WACC of the project company) is not used in this project. This is because there were no project activities under similar conditions developed by the project owner by the investment decision period. Thus, no company-specific benchmark can be applied.

The assumptions used in the benchmark calculation have been validated as follows:

Debt to equity ratio (60:40) – In accordance with the additionality tool, the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Thus, the debt to equity ratio considered as 60:40 which is also standard debt to equity ratio in developing countries is deemed to be appropriate for the project activity. This has also been verified with the debt to equity ratio of the other energy companies in Indonesia [136,137].

Cost of debt (11.5%) – The cost of debt has been derived with the Bank Indonesia (BI) rate in January 2007 of 9.5% (http://www.bi.go.id/web/id/Moneter/BI+Rate/Data+BI+Rate/) increased by 2% (200 basis points) corresponding to the margin charged by the commercial banks. Thus the cost of debt taken as 11.5% is deemed to be appropriate for the project activity.

Cost of equity – The cost of equity has been determined using the Capital Asset Pricing Model (CAPM). The CAPM approach to risk analysis calculates the risk premium associated with the specific risk involved in a particular project. The riskiness is calculated by means of the beta and this beta measures the relative riskiness of the proposed project activity. The CAPM assesses risks at a market level and not by looking at an individual's risk preferences and therefore is sufficient to analyze the appropriate rate of return necessary to compensate investors for the risk faced in the proposed project activity. The assumptions used in this model to arrive at the cost of equity have been validated as follows:

Risk free rate (4.84%) – The risk-free rate has been taken as the average of the 30 years US Treasury bond rates for January 2007 corresponding to the start date and the expected lifetime of the proposed project activity. The PP has provided the screenshot from Bloomberg for the 30 years US Treasury bond rates for January 2007 wherein the average value is stated as 4.8428% [58]. Further, these values have also been cross-checked and confirmed from other sources (http://www.treas.gov/offices/domestic-finance/debt-management/interest-rate/yield_historical_2007.shtml).

Despite the fact that the proposed project activity is located in Indonesia, it has been validated through reference to the various citations made in the authoritative book by Prof. Aswath Damadoran "Investment Valuation, Second Edition ("Damodaran" [IRL 145][*]) that the risk free rate (4.84%) derived from the United States is suitable for the project activity.

While the proposed project activity is based in Indonesia, the US risk free rate is deemed appropriate because the project activity is almost exclusively exposed to US Dollar ("USD") transactions; both for its costs and revenues, and the forecasted cash flows used in the computation are also in nominal USD terms.

The exposure of the project cash flows to USD have been confirmed through the following documents:

- The final offer from Sumitomo Corporation to the Bid Committee of Magma Nusantara Limited for Wayang Windu Unit 2 Geothermal Power Project Engineer, Procure and Construct (EPC) for Unit 2 Steamfield Above Ground System (SAGS) and Power Plant Works dated 6 September 2006 [IRL 141];
- The actual cost from the EPC Agreement for the SAGS and Power Plant Project by and between Star Energy Holdings Pte Ltd and Sumitomo Corporation dated 30 January 2007 clause 4.6.1 [IRL 23];
- Wells Drilling, Total Infrastructure, and Other costs from the Information Memorandum for Refinancing of Wayang Windu Geothermal Project (unit 1) and Financing of the Wayang Windu Geothermal Expansion Project dated December 2007 [IRL 126];
- 3-year overhaul costs budget for Wayang Windu 1 in year 2003 and 2006 [IRL 124];
- The completion report of the work over program/well repair in 2003 for Wayang Windu 1 [IRL 123];
- The Amendment to JOC Clause 4 for the Reimbursement to Pertamina [IRL 21]; and

[*] http://books.google.co.in/books?id=sLQhYjndgwEC&dq=Investment+Valuation,+A.+Damodaran+Second+Edition&printsec=frontcover&source=bn&hl=en&ei=yBarTKyePIzpOfHNvIYH&sa=X&oi=book_result&ct=result&resnum=4&ved=0CCYQ6AEwAw

- Amendment to the Wayang Windu Geothermal Energy Sales Contract Section 5 for the projected tariff [IRL 22].

The approach of using a USD denominated risk free rate is consistent with the citation in Damodaran.

Page 156 of Damodaran states that *"The risk-free rate used to come up with expected returns should be measured consistently with how the cash flows are measured. Thus, if cash flows are estimated in nominal US dollar terms, the risk-free rate will be the US Treasury bond rate. This also implies that it is not where a firm is domiciled that determines the choice of a risk-free rate, but the currency in which the cash flows on the firm are estimated."*

The quoted source in this matter is the most relevant, considering that several other components of the calculations used are derived from Damodaran's books and research.

Furthermore, when calculating the cost of equity in the proposed project activity, the country risk premium is already included in the applicable equity risk premium and therefore US Treasury Bond rate would be the most appropriate figure to be applied in this context. Using the Indonesian government bond rate, which also includes the country risk, would lead to double counting of the country risk. This concept is further explained in Damodaran on Page 167.

Equity Risk premium (4.79%) and *Country risk premium* (4.5%) – The equity risk premium and the country risk premium for Indonesia have been sourced from A. Damodaran, New York University http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem07.xls reference Index subtitle - Discount Rate Estimation, Risk Premiums for Other markets for year 2007 [60]. The quoted source in this matter is the most relevant, considering that formula derived was quoted from A. Damodaran's books and research. These have been used to form the basis of the total risk premium (9.29%). The risk premium value is referenced from the year 2007 (instead of the published 2006 data in Jan 2007) as it has a lower value than the risk premium in year 2006 of 10.16% (http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem06.xls). Therefore the used data is more conservative. The risk premium value can be disaggregated into 2 separate elements:

1. Global Equity Risk Premium of 4.79% which is conservative to the 5% that is commonly used by financial practitioners
2. Specific Country Risk Premium of 4.5% which is appropriate to Indonesia.

This total Equity Risk Premium is considered reasonable as it measures the rate of return investors seek to compensate them for investing in higher risk equity based assets rather than risk free securities. This is deemed appropriate and acceptable.

Beta (1.69) – The beta value has been taken as 1.69 (un-levered) for the US power sector referring to the values provided by Damodaran Online http://www.stern.nyu.edu/~adamodar/pc/archives/betas07.xls reference Index for year 2007 [59]. The quoted source in this matter is the most relevant, considering that formula derived was quoted from his books and research. The beta value is referenced from the year 2007 (instead of the published 2006 data in Jan 2007); it could be noted that the value selected is lower than the beta value in year 2006 of 2.05 (http://www.stern.nyu.edu/~adamodar/pc/archives/betas06.xls). Therefore it is considered a conservative approach. The unlevered betas are derived from levered betas using the average market debt/equity ratios by industrial sector.

Despite the fact that the proposed project activity is located in Indonesia, it has been validated through reference to the various citations made in the authoritative book by Prof. Aswath Damado-

ran “Investment Valuation, Second Edition ("Damodaran" [IRL 145][*]) that the beta value (1.69) derived from the United States is suitable for the project activity.

The information on page 189 of Damodaran confirms the appropriateness of using the US beta rather than using any emerging market specific beta based on following reasoning:

1. When liquidity is limited, as it often is in many stocks in emerging markets, the betas estimated using short return intervals tend to be more biased. Indonesia is considered to be an emerging market[†]. The liquidity of the Indonesian stock exchange (IDX) has also been checked from the fact books for the various years available at the Indonesian Stock Exchange website[‡].
2. In many emerging markets, both the companies being analyzed and the market itself change significantly over short periods of time. The variations in the JSX Composite Stock Price Index have been cross-checked with the data from the IDX fact book 2007[§].
3. Indexes that measure market returns tend to be dominated by a few large companies. The composition of the indices for the Indonesian stock exchange has been checked from the various yearly statistics, fact books and the stock lists available at the Indonesian Stock Exchange website[**]. Based on these checks it could be confirmed that the indexes are dominated by a few large companies.

This also explains the difference in value between the quoted US power sector beta and the emerging market specific beta. Furthermore, the US power sector beta has been taken as the most appropriate reference for the power sector beta in the cost of equity calculation as the US market offers the most robust data set available. It should also be noted that betas from the comparable companies in Indonesia are not available. It is also to be noted that the Jakarta Composite Index (JCI) and LQ45 (a stock market index for the Indonesian Stock Exchange)[††] have only a single energy company namely Perusahaan Gas Negara in their composition.

As cited on page 201 of Damodaran, it is appropriate to use US power sector beta for the power sector in small or emerging markets, such as Indonesia. This is because the country risk premium has been included in the applicable equity risk premium in the calculation, and therefore has been taken into account in the calculation of the cost of equity in Indonesia.

The usage of US beta instead of using local accounting betas by practitioners has also been cited in other financial books[‡‡] (page 129 of "Valuation of Companies in Emerging Markets: a Practical Approach" by Luis E. Pereiro).

It is also to be noted that the approach and input parameters are consistent with another CDM project in Indonesia ref. no 2346 (Kabil II 11.4 MW Gas Fired Project) which was registered following

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[*] http://books.google.co.in/books?id=sLQhYjndgwEC&dq=Investment+Valuation,+A.+Damodaran+Second+Edition&printsec=frontcover&source=bn&hl=en&ei=yBarTKyePIzpOfHNvIYH&sa=X&oi=book_result&ct=result&resnum=4&ved=0CCYQ6AEwAw

[†] http://en.wikipedia.org/wiki/Emerging_markets

[‡] http://www.idx.co.id/JSXStatistics/FACTBOOK/tabid/187/language/en-US/Default.aspx.

[§] http://www.idx.co.id/LinkClick.aspx?fileticket=ch%2bL1A0u6BI%3d&tabid=187&mid=613&language=en-US&forcedownload=true

[**] http://www.idx.co.id/

[††] The LQ 45 index consists of the top 45 companies in the Indonesia Stock Exchange.

[‡‡] http://books.google.co.in/books?id=pv9GE3178pAC&pg=PA247&lpg=PA247&dq=Valuation+of+companies+in+emerging+markets:+a+practical+approach+-By+Luis+E.+Pereiro&source=bl&ots=-Uk7RvrrFk&sig=IdpKYUvf572GPUxdpkLQs7WQqYA&hl=en&ei=qFysTMfnOo-WOpjFvYsH&sa=X&oi=book_result&ct=result&resnum=1&ved=0CBUQ6AEwAA#v=onepage&q&f=false

a request for review which included questions on the suitability of the WACC calculation. The project ref. no 2346 has the starting date of May 2007 and has used 4.87% for the risk free rate and 2.08 for the beta value*.

Further it can be noted that there are various approaches practiced depending on the economical circumstances and basis of investment decision for that particular project. Such approaches like the historical risk premium approach (e.g. used by UNFCCC ref. no 3028) can deliver appropriate results under specific business situations, which then would require different input parameters. However under the existing investment circumstances for this proposed project activity:

- With specific regard to the verified exposure of the proposed project activity to USD based cash flows as demonstrated above;
- And within an emerging economy market, like Indonesia, where the equity markets represent a small proportion of the overall economy;
- And where the annual stock returns have very large standard deviations;
- And where the historical returns in the market are available only for a short period;

It could be concluded that the usage of the beta value (1.69) issued for the United States has been found to be most suitable and hence has been accepted

Further the geared beta value has been calculated as 3.36 based on the debt to equity ratio and the applicable tax rate.

Tax rate (34%) – This is in line with the Indonesian Government Decree No. 49/1991 and Joint Operation Contract, Article 9.1 [21, 129].

In light of the above, it can be stated that the derived benchmark is suitable for the project type. Therefore TUV SUD confirms that the benchmark (WACC) that has been derived is suitable and conservative.

Investment analysis

In accordance with the guidance provided on the additionality tool, the input values used in the investment analysis have been found to be valid and applicable at the time of the investment decision taken by the project participant. The suitability of all the parameters and assumptions used in the calculation of the investment analysis has been validated as follows:

Production capacity (113.5 MW) – This value is the result of capacity (117 MW) minus the house load (3.5 MW), both verified from the turbine generator capacity stated in the EPC Contract of 117 MW and the historic data of the house load of Wayang Windu unit 1 [23, 112]. This is also in line with the deliverable capacity of 113.4 MW observed during the performance test conducted by the EPC contractor in February 2009 [110].

Capacity factor (93%) – This value is estimated based on the Wayang Windu 1 historical Net Capacity Factor [112]. This has also been cross-checked and found to be within the range of net capacity factor of other registered CDM geothermal projects in Indonesia (>88% for project no. 2876, 93.5% for project no. 673). Globally, geothermal power plants are reported to have capacity factors between 70-95% [113, 114]. Therefore the capacity factor assumed for this project activity is considered appropriate.

Shut down (2 weeks every 3 years) – This value is estimated based on the Wayang Windu 1 historical shut down due to plant overhaul and is confirmed based on the interview conducted with Wayang Windu VP Geothermal Operation (Alex Smillie) and Wayang Windu Field Manager (H Dwyudha) [1, 115].

* http://cdm.unfccc.int/Projects/DB/TUEV-SUED1229687540.39/view

*Tariff (*USD 8.2 cent/kWh average) – Projected Tariff is based on the Amendment to the Wayang Windu Geothermal Energy Sales Contract Section 5 which states that the tariff applicable to the Electricity delivered to PLN shall be based on an energy-only tariff of USD 0.0494 per kWh, which is made up of a fixed component of USD 0.0015, and a variable component of USD 0.0479 subject to escalation in accordance with the Energy Tariff Formula for 264 months from the Commercial Operating Date [22]. The escalation is calculated from Monetary Exchange Factor, Indonesian Consumer Price Index, United States Consumer Price Index and Oil Field Machinery Tools Index. The escalation for each index is estimated based on the historical growth rate of each index from 1985 to 2005 (OIL TOOLS INDEX WEB SITE (WPU 1191): http://www.economagic.com/em-cgi/data.exe/blswp/wpu1191, US PPI Index: http://data.bls.gov/cgi-bin/surveymost?wp, US CPI http://data.bls.gov/cgi-bin/surveymost?cu, INDONESIA CPI http://www.bps.go.id/sector/cpi/table3.shtml). The Monetary Exchange Factor is estimated from the historical average exchange rate of Indonesian Rupiah per Dollar during the year 2005 (www.bi.go.id). The supporting documents have been checked and the tariff is deemed to be appropriate. The 2005 data is the latest reported annual data available at time of the investment decision.

Operating expenses (USD 18.5 million/year average) – Projected Operating Expenses are estimated based on the historical Wayang Windu 1 General & Administration, Operating & Maintenance expenses, Routine Maintenance, and Insurance cost [116, 117]. The values were cross-checked with the operating expenses of other CDM geothermal projects (USD 22.7/MWh for project no 590 in Philippines (USD 3,180,000/year, 20 MW with 80% capacity factor)). At the same time, it is important to note that costs will vary considerably depending on the size, geography, etc., which makes it difficult for comparison. However it can be confirmed that the estimated operating expenses are consistent with actual operating expenses in 2008 and 2009, by comparing the cost for operating unit 1 only (2008) and operating both units based on the provisional balance sheets for year 2009 [141].

Number of wells needed to replace depleted well (2 wells every 3 years) – 2 wells are needed to replace the depleted wells every 3 years - were calculated based on the estimation of the steam needed for the power plant, electricity generation potential from each well, and the steam depletion rate. The calculation is confirmed based on the interview conducted with Wayang Windu VP Geothermal Operation (Alex Smillie) and is deemed appropriate [1].

Amount of steam needed for the power plant (120% of the generation capacity) – The estimation was confirmed through the Common Terms in the Loan Agreement for the project activity and is deemed to be appropriate [118].

Electricity generation per well (15 MW / well) – This is calculated based on the historical data of the steam of the Wayang Windu 1 and the guaranteed steam rate design of the turbine and was confirmed during the performance test [110, 119, 120]. Wayang Windu 2 wells are located at the same area, and therefore the assumption is deemed valid.

Steam depletion rate (5 %) – The value is based on the Wayang Windu well and resource performance analysis study conducted by Mauro Parini, advisor reservoir engineer for Unocal Geothermal [121]. The study was reviewed and the value is deemed to be valid. Also this estimation is considered conservative and appropriate because:

- The decline rates for Unit 2 wells indicated to range from 5.2% to 7.8% could be validated based on the report “Review of Wayang Windu Field Steam Decline - Wayang Windu Production Data Review” prepared by Sinclair Knight Merz (SKM) dated 24 Nov 2009 [148].
- More make-up wells would be required to make up for the loss of older wells when the required well repair is not successful.

Assuming a depletion rate of 5%, with no other factors being taken into account, the number of wells to be replaced annually would equal 0.45 (rounded to 0.5), and therefore 1 well to be replaced every

two years would be assumed. However, a higher replacement rate of 2 wells (rounding up from 1.36 in the last stage of the calculation) every 3 years has been assumed and confirmed as appropriate in the opinion of the DOE for the following reasons:

- As mentioned in the Wayang Windu well and resource performance analysis study conducted by Mauro Parini, the average decline rates of Wayang Windu 1 wells in 2004 were reported to be at 5.2% [IRL 121]. The report however also mentioned that the decline rate is somewhat uncertain, with one of the wells in Wayang Windu 1 reported with a decline rate of 45%.
- Based on the report "Review of Wayang Windu Field Steam Decline - Wayang Windu Production Data Review" prepared by Sinclair Knight Merz dated 24 Nov 2009 ("SKM") [IRL 148]. Page 1 of the report indicates that the overall depletion rate of all Unit 1 wells has increased to 8.1% and the average decline rate for Wayang Windu 2 wells are forecasted to be in the range of 5.2 to 7.8%. Also is to be considered is that the analysis of the report has been conducted with some uncertainty in the actual steam count and some assumption in the behavior of the wells due to the very short flow history of the Wayang Windu 2 wells (SKM page 21). Also has to be noted is that the reported average decline rate has been analyzed by excluding the wells with "abnormal" well behavior, i.e. well MBA-4 with wellbore problems in Wayang Windu 2 with a decline rate of 546.3% (SKM page 21). In reality, wells are bound to have problems during their lifetime which would increase the decline rate. Therefore the actual decline rate should be higher than reported when actual conditions are being taken into the analysis.
- The decline rate of both Wayang Windu 1 and 2 wells will be higher when Wayang Windu 3 is built. This is because of the additional mass extraction and the reinjection rate due to an additional power plant (SKM page 1).
- Furthermore make-up wells would be required when the required well repair is not successful which was evidenced by abandonment of one of the wells[*] which had already been repaired but the repair had been insufficient to resolve the issue.

Therefore the assumption of 2 new make-up wells every 3 years calculated with the above approach (a lower average decline rate of 5% and rounding up the figure in the final step of the calculation) is considered appropriate and conservative.

Also to be noted are the following points:

- Drilling of make-up wells requires mobilization and usage of a drilling rig, with the estimated cost of USD 1,500,000 to USD 2,000,000 on the rig mobilization, excluding the usage of the rig and the drilling cost [IRL 123]. Therefore it is more reasonable to drill 2 wells in 3 years instead of 1 well every 2 years, and the drilling costs estimated in the investment analysis is derived based on this assumption.
- Regardless of resource studies, it can take several years of production from a field before the reservoir performance can be gauged and there is always a risk of an unexpected decline in the capacity of the respective geothermal wells[†].
- Often after wells are drilled, geothermal steam production is not guaranteed. For example, for the Kamojang Geothermal project, 16 wells have been drilled, yet only 11 wells are useable in the production stage[‡] for Lahendong-I only 7 out of 9 wells drilled were productive[*]

[*] MBE-2 plug and abandon report dated 24 Aug 2009

[†] Refer to registered CDM geothermal project no. 2022: http://cdm.unfccc.int/Projects/DB/DNV-CUK1218173149.57/view

[‡] Refer to CDM geothermal project no. 3028: http://cdm.unfccc.int/Projects/DB/RWTUV1255101629.04/view

Based on the above substantiation, the assumption of 2 new make-up wells every 3 years is considered appropriate and conservative.

Further, it has also been checked that even if the assumption of 1 new make-up well every two years is applied the project IRR although increases from 17.62% to 17.96% still remains below the benchmark of 18.96% and the proposed project activity would still be additional.

Make-up well cost (USD 4.1 million) – Make-up wells are required to compensate for the natural decline in output from the wells. It is also to be noted that from accounting point of view, make-up wells are additional wells being drilled for the project, and therefore are taken along with the total investment cost in the IRR calculation spreadsheets.

The value was determined from the make-up well cost conducted in 2006 for Wayang Windu 1 of USD 3.7 million as also reported in the audited financial statement in 2007 [122]. Thereby, leading to an estimation of USD 4.1 million in 2009 with escalation of 3% based on the historical average of the US CPI index [149]. The estimated value which is based on the actual cost in 2006 and escalation is deemed appropriate.

Further, the make-up well costs for the project activity could be compared with other publicly available information as follows:

- The cost of drilling a geothermal well has been given to be in the range of USD 1 – 4 Million (http://www.repp.org/geothermal/geothermal_brief_geothermal_resources.html). Although these values are based on a 2002 report nevertheless taking into account the inflation the make-up well cost is clearly seen to be falling within the range.

Also, the estimated USD 4.2 million per make-up well cost in 2010 in the investment analysis is considered conservative as the current make-up cost for 2010 is budgeted at USD 7.9 million. This has been validated from the submitted authorization of expenditure of USD 7.9 million for the make-up well [150, 151].

Well repair (Work Over) (USD 1.7 million) – Well repair of existing wells is required due to corrosion or other damage. Geothermal fluids are corrosive, with the H_2S forming sulfuric acid, plus inflow of potentially acidic aquifers at depth (http://www.repp.org/geothermal/geothermal_brief_geothermal_resources.html). Hence, checks are made for corrosion in each well each year and repairs are conducted as required to avoid risk of a well blow-out which can be catastrophic. It is also to be noted that from accounting point of view, well repair costs are taken as the operating expenditure in the IRR calculation spreadsheets. The total repair well cost is based on the 'schedule repair wells' and the 'repair well cost per well'.

These parameters have been validated as follows:

Schedule repair wells: This is based on the previous experience from Wayang Windu unit 1 [124]. The investment analysis estimated that 3 wells are repaired every 3 years based on the estimation that each well will be repaired once every 10 years. This is considered appropriate considering that a few wells of Wayang Windu unit 1 had been repaired 2 to 3 times within the past 7-year period (MBE-2 in 2003, 2008, 2010; WWA-2 in 2003, 2010; WWP-1 in 2003, 2008); 2 wells were repaired in 2008 (MBE-2, WWP-1); and 4 wells were repaired in 2010 (MBE-2, WWA-2, WWQ-2, WWA-4). Further cross-checked with the information provided in other registered CDM geothermal project No. 2022: Amatitlan Geothermal Project (http://cdm.unfccc.int/Projects/DB/DNV-CUK1218173149.57/view).

* Refer to registered CDM geothermal project no. 2876: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1249404911.81/view

Repair well cost per well: The value for well repair cost was derived from the work over program to fix wells in 2003 for Wayang Windu unit 1 of USD 1.5 million [123]. Thereby, leading to an estimation of USD 1.7 million in 2009 with escalation of 3% based on the historical average of the US CPI index [149]. The value which is based on 2003 costs plus escalation is deemed to be appropriate.

The average well repair cost from 2003 to 2010 has also been checked. It has been found to be around USD 1 million [152]. Although, the estimation of the well repair cost in the investment analysis is slightly higher, nevertheless, it has been accepted based on the following justification:

The equipment used to repair a well will depend on the repair solution selected. If casing is to be replaced, it is essential to use a medium to large drilling rig. If the well is to be treated with acid injection, it may be possible to use a simple "coiled tubing unit" which is much less expensive than mobilizing a rig. Hence the cost of well repair will vary according to the solution selected. Typically, an operating company will not repair each well immediately as a problem occurs unless it results in the well being unsafe. Normally, a rig will be mobilized only when there are several jobs to be performed since the mobilization cost is a major component of the charges[*].

Since the cost of the drilling rig is directly related to the size of the rig, it is important to select the correct rig for the job. If a repair job is commenced with a small rig or coiled tubing unit, and it is found that the job actually requires a casing replacement, it will incur additional cost to mobilize a larger rig capable of handling the casing material.

With this background, it is to be noted that the value for well repair cost was based on 2003 costs of repairing wells of Wayang Windu unit 1 taking into account escalation. The reasons for accepting this approach instead of taking the average value was as follows:

- Well repairs in 2003 involved major work, setting new casing into several wells. Hence a relatively large drilling rig was used for this (approximately $50,000 per day costs for the rig). These repairs were successful and allowed operation to continue until the makeup wells were drilled during the 2006/07 drilling program which also drilled wells for the Unit 2 development.
- Well repairs in 2008 were relatively simple, requiring only injection of water and inspection of the wells, and a simple Coiled Tubing Unit (CTU) was mobilized (approximately $5000 per day costs for the CTU). These repairs were unsuccessful and resulted in the decision to abandon a well in the next program.
- Well repairs in 2010 required more capability than a coiled tubing unit but less than a full rig, so a Snubbing Unit was mobilized (approximately $10,000 per day costs for the Snubbing Unit), and this allowed the successful abandonment of one well (MBE2) and some other minor routine work-overs to increase steam supply.
- Star Energy Geothermal (Wayang Windu) Ltd ("SEG") as a prudent operator, budgets to undertake well repair on a regular basis as reflected in the investment analysis. The estimated cost which is used in the investment analysis is based on the cost to mobilize a small to medium drilling rig.

Further to be noted that budgeting in the investment analysis is expected for long term repair of wells and takes account of several factors:

- The number and complexity of well repairs will increase with the age of the wells.

[*] Refer to "Geothermal Well Design, Construction and Failures" paper by James N. A. Southon, SKM for Proceedings World Geothermal Congress 2005 and "Geothermal Well Operation and Maintenance" paper by Sverrir Thorhallsson for Geothermal Training Programme of the United Nations University, Sept 2003

- The basis of the estimate should allow for well abandonment of the deepest well since this is the safest solution, hence as a minimum a medium/large sized rig is required. Similar to that used in 2003.
- 1 million USD was found to be the average well repair cost for the Wayang Windu unit 1 from 2003-2010. This value is lower than that estimated for the proposed project activity because of the relative simplicity of the well repairs conducted in some of them, which led to some unsuccessful repairs and abandonment of a well. Therefore, the average well repair cost of WW1 during the period 2003-2010 are not a good reflection of the long term well repair costs for Wayang Windu 2.

The above arguments show that the assumption of average well repair cost of 1.7 million USD in 2009 is appropriate and conservative.

Further, it has also been checked that even if the assumption of average repair cost is revised to 1.0 million USD in 2009 the project IRR although increases from 17.62% to 17.86% still remains below the benchmark of 18.96% and the proposed project activity would still be additional.

Schedule plant overhaul (Every 3 years) – This is based on the previous experience from Wayang Windu 1, [124]. Further cross-checked with the information provided in other registered CDM geothermal project No. 2022: Amatitlan Geothermal Project (http://cdm.unfccc.int/Projects/DB/DNV-CUK1218173149.57/view).

3-year overhaul cost (USD 1.1 million) – This is based on the previous experience from the Wayang Windu 1 with the average overhaul cost of USD 1 million [124]. Thus, the estimation of USD 1.1 million in 2009 with escalation of 3% based on the historical average of the US CPI index [149]. The value is also validated based on the interview conducted with Wayang Windu VP Geothermal Operation (Alex Smillie) and Wayang Windu Field Manager (H Dwyudha) and is deemed to be appropriate [1].

Major (mid life) overhaul costs (USD 15.8 million in 2024) – This estimation was substantiated by the quotation from Fuji in 2007 of USD 9 million (970,000,000 Japan Yen with exchange rate of 1USD = 112 Japan Yen and allowance for manpower and other supporting costs) and escalation of 3% based on the historical average of the US CPI index [125, 149]. This value is deemed acceptable and is conservative due to prevailing exchange rate.

Total EPC (USD 118.56 million) – The value is based on the final offer from the EPC contractor, which was used as the basis of the final agreement with minor adjustments (e.g. import duties, taxes) [140]. This is confirmed based on the actual cost from the EPC Contract clause 4.6.1 and therefore is considered appropriate [23]. Also, the actual invoices have been checked and it has been found that the actual EPC cost incurred is USD 118.74 million as compared to the estimated EPC cost of USD 118.56 million [147].

Drilling, Total Infrastructure, and Other Costs (USD 62.8 million) – Drilling budget of USD 27 million from 2007 onwards (or USD 39.1 million inclusive of cost in 2006), infrastructure budget of USD 7.3million, VAT of USD 7.12 million from 2007 onwards (or USD 8.2 million inclusive of cost in 2006), Contingency of USD 14 million, and other costs of 7.4 million is based on the Wayang Windu 2 estimation budget, which was confirmed through the Information Memorandum for Refinancing of Wayang Windu Geothermal Project (unit 1) and Financing of the Wayang Windu Geothermal Expansion Project [126].

Total Investment Cost (Capex) (USD 181.38 million (equivalent to USD 1.55 million/MW)) – The estimated Total Investment Cost of USD 181.38 million consists of the EPC Cost, the Drilling, Total Infrastructure, and Other Costs estimated to occur after the starting date of the project activity. It is

also to be noted that total investment cost is revised reflecting the change in the start date. In accordance with the "Guidance on the Assessment of Investment Analysis", all the expenses that have been incurred prior to the start date have not been used in the investment analysis. The drilling and other costs incurred during the year 2006 i.e., before the start date of the project activity have been considered as sunk costs and therefore excluded in the IRR calculation.

The total investment cost is consistent with the Information Memorandum for Refinancing of Wayang Windu Geothermal Project (unit 1) and Financing of the Wayang Windu Geothermal Expansion Project [126]. The financing which has been agreed and approved by the Lenders has also been cross-checked with the Unit 2 Credit Facility Agreement dated 3 May 2007 [146]. The actual invoices of the major item, i.e. EPC contract representing around 65% of the total investment have also been checked and were found to be consistent. Based on the actual invoices it could be checked that the actual EPC cost incurred is USD 118.74 million as compared to the estimated EPC cost of USD 118.56 million [147]. Also it could be checked that the IRR of the project activity without CDM revenue is still below the market benchmark required when the total investment cost outside of the EPC cost is decreased by 20%. This is a deemed to be an unlikely scenario as the budget has been approved and received from the lenders, and therefore is considered as an appropriate estimation.

Further, the total investment cost for the project activity could be compared with other publicly available information as follows:

- The geothermal power direct capital costs for large plants (> 30 MW) have been given to be in the range of 1150 USD/KW to 1750 USD/KW for high quality resource and as 1350 USD/KW to 2200 USD/KW for medium quality resource (http://www.repp.org/geothermal/geothermal_brief_economics.html). Although these values are based on a 2002 report nevertheless the investment cost of the project activity estimated as 1550 USD/KW is clearly seen to be falling within the range.

- The investment cost reported in the other registered CDM projects has also been checked and found to be 2010 USD/KW for the registered project 590: 20 MW Nasulo Geothermal Project in Philippines (http://cdm.unfccc.int/Projects/DB/DNV-CUK1157642385.05/view), 2450 USD/KW for the 48 MW registered project 2975: 'Olkaria III Phase 2 Geothermal Expansion Project in Kenya' (http://cdm.unfccc.int/Projects/DB/RWTUV1252941041.99/view). Although the project activity is a capacity addition, the cost savings compared to new units are rather marginal (some infrastructure cost items) and therefore the comparison with these data delivers a good indication of the reliability of cost estimations.

Although it could be noted that costs will vary considerably depending on the size, geography, etc., nevertheless, the project investment cost could be assessed as plausible. In light of the above checks and cross-checks the total investment cost could be deemed acceptable.

VAT Reimburse (USD 8.2 million) – This value is based on the Unit 2 construction cost budget which is estimated to be paid by the company during the construction period of Unit 2 and can be reimbursed based on the Indonesian tax regulations. The Indonesian tax regulations have been cross-checked based on the Directorate General of Finance and Tax Decree number Kep-1288/LK/2000, Kep-68/PJ/2000 http://www.ortax.org/ortax/?id_jenis=6000&id_topik=&mod=aturan&tahun=2000&hlm=1&page=show&id=8882) [127]. The value is deemed to be in compliance.

Depreciation (12.5%) – This is based on the Joint Operation Contract, Appendix II no 5b which states that all capitalized costs for well-field and power plant assets (including capitalized interest) shall be depreciated using a 12.5% declining balance methodology [21]. The useful life of 16 years is based on Income Tax Law no. 36, year 2008; Section 11 which states the useful life for declining method depreciation of 12.5% rate is 16 years [128]. Depreciation is calculated on all Unit 2 construction cost except drilling cost as per the JOC Appendix II no. 3 which states drilling costs are ex-

penses. This has been verified as consistent with another registered CDM geothermal project no. 3028 in Indonesia.

Income tax (34%) – This is in accordance with the Joint Operation Contract, Article 9.1 and Appendix II and Indonesian Government Decree no 49/1991 [21, 129]. This has been verified with other CDM geothermal project no. 3028 in Indonesia and http://www.pajak.net/info/indonesian_tax_system.htm. The income tax calculates all loss to be forwarded and accumulated until the loss is totally covered, in accordance to the JOC, Appendix II no 9 and has been verified with the Indonesian Income Tax Law regulation no. 36 year 2008, Section 6 [128].

Reimbursement to Pertamina (USD 2.04 million) – US$2.04mn is in accordance to the Amendment to JOC Clause 4 [21].

Terminal Value (40%) – 40% is based on the market rate and is considered appropriate [130, 131].

Energy fee Pertamina (4%) – This is in accordance with the Joint Operation Contract (JOC) Article 9.4 [21].

The submitted referenced documents have been found to be relevant and consistent with the information provided in the PDD for the investment analysis. Based on the above, the input values have been found to be reasonable and correct.

The IRR of the project comes out to be 17.62% and is less than the 18.96% benchmark. The additional revenues from the sale of CERs increase the project's IRR to the required return for an average investor in this type of power project.

Sensitivity analysis – The sensitivity analysis is carried out for 10% variation of the following key parameters - total investment cost, operating expenses, electricity tariff, and terminal value of the project; and 2% variation for the capacity factor. The 10% variation for the total investment cost, operating expenses, electricity tariff, and terminal value is deemed to be appropriate.

The 10% variation of the above stated parameters results in the project IRR being still below the WACC benchmark except for the decrease in total investment cost. The best case scenario in sensitivity analysis generates project IRR of 19.081% when there is 10% decrease in total investment cost. However, this case is unlikely as the EPC cost which forms the major portion of the total investment cost was agreed at the time of investment as a result of a competitive bidding conducted by MNL and thus is unlikely to be lower. Thereby confirming that there is very low possibilty of occurrence of decrease in total investment cost from that assumed in the investment analysis. Hence the sensitivity analysis indicates that the benchmark is not crossed for the variation of the aforementioned parameters; thereby indicating that the economic un-attractiveness is robust to reasonable variations in the critical assumptions.

The choice of variables and range of variations in the sensitivity analysis meet the Guidance on the Assessment of Investment Analysis and TÜV SÜD confirms that the underlying assumptions are appropriate, the financial calculations are correct, and the IRR of the project remains commercially unattractive without the support of the CDM with reasonable variation in critical assumptions.

3.6.4 Barrier analysis

This step was not used.

3.6.5 Common practice analysis

The assessment team has reviewed the approach presented in the PDD and can confirm that relevant parameters such as location, infrastructure, economical situation, and development have been taken into account in order to define the region to be used for the common practice. The region for

the common practice analysis has been defined as Indonesia, where the project is located. Therefore, the presented region can be considered appropriate for the common practice analysis.

The assessment of common practice analysis in accordance with the additionality tool has been done as follows:

Sub-step 4a: Analysis of other activities similar to the proposed project activity – As the project activity is located in Indonesia therefore it has been considered as the relevant region. The complete list of all the geothermal power plants in Indonesia is provided in the Indonesia's Geothermal Development report by US Embassy in Indonesia [62]. This has also been confirmed with the article of "IndoRenergy, Positioning Geothermal" from Petrominer magazine no. 07/July 2009 [107]; and PLN's Electricity Provision Plan 2009-2018 [108]. The power plants data was also confirmed through an official letter dated 13th October 2009 from Department of Energy and Mineral Resources Republic of Indonesia [104]. The complete list of geothermal proven reserves and power plants construction status, in Indonesia, as validated from the referred sources is as follows:

Power Plant	Location	Development or Construction Date	Commencement Date	Capacity (MW)	Other Remarks
Kamojang Unit I, II, III	Jawa	1980s	Unit 1: 1982 Unit 2,3: 1988	140 MW	-
Kamojang Unit IV	Jawa	Feb 2006	Dec 2007	1 x 60 MW	CDM Project
Salak Phase 1	Jawa	-	1994 (2 units) and 1997 (1 unit)	3 x 60 MW	-
Salak Phase 2	Jawa	1994	1997	3 x 66.7 MW	-
Darajat Phase 1	Jawa	-	1994	55 MW	-
Darajat Phase 2	Jawa	1997	1999	90 MW	-
Darajat Phase 3	Jawa	-	2007	117 MW	CDM Project
Dieng Unit 1	Jawa	1994	July 1998	1 x 60 MW	-
Dieng Unit 2	Jawa	-	Expected 2012-2014	60 MW	Planning stage
Wayang Windu Phase 1	Jawa	1997	2000	1 x 110 MW	-
Patuha	Jawa	-	Expected 2013	180 MW	Planning stage
Karaha Bodas	Jawa	-	Expected 2012, 2014, 2018	1x30 MW, 1x110 MW, 1x110 MW	Planning stage
Cibuni	Jawa	-	Expected 2013	1 x 10 MW	Planning stage
Bedugul	Bali	-	Expected 2012	10 MW	Planning stage
Sibayak Unit 1	Sumatra	-	2000	2 MW	-
Sibayak Unit 2 & 3	Sumatra	Late 2005	2008	11.3 MW	CDM Project
Sarulla	Sumatra	-	Expected 2011	3 x 110 MW	Planning stage

Ulubelu	Sumatra	-	Expected 2011, 2012	1x55 MW, 1x55 MW	Planning stage
Kerinci	Sumatra	-	Expected 2011	20 MW	Planning stage
Lahendong Unit 1	Sulawesi	-	2001	20 MW	-
Lahendong Unit 2	Sulawesi	2005	2007	20 MW	CDM Project
Lahendong Unit 3	Sulawesi	-	2008	20 MW	Planning stage
Ulumbu	NTT / Flores	-	Expected 2011, 2012	2 x 3 MW	Planning stage

As per step 4(a) of the common practice analysis, an analysis of any other activities:

- That are operational and that are similar to the proposed project activity in the region;
- Rely on a broadly similar technologies, are of a similar scale; and
- Take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, and access to financing is to be provided.
- Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis.

In accordance with the same, the elimination criteria applied have been validated, as follows:

- Operational and similar project: As the common practice analysis should only cover the activities that are operational and similar to the proposed project activity all the projects which are not operational could be eliminated, i.e., all the projects in the planning stage - Dieng Unit 2, Patuha, Karaha Bodas, Cibuni, Bedugul, Sarulla; Ulubelu; Kerinci; Lahendong Unit 3; and Ulumbu. The status of these geothermal power plants indicated to have not started the construction in 2007 was confirmed through an official letter dated 13th October 2009 from Department of Energy and Mineral Resources Republic of Indonesia [104].
- Other CDM project activities: As other CDM project activities which are either registered project activities or project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process are not to be included in the common practice analysis, therefore the following projects could be eliminated –

  Darajat Phase 3 (Project 0673: http://cdm.unfccc.int/Projects/DB/KPMG1159285050.32/view),
  Lahendong Unit 2 (Project 2876: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1249404911.81/view),
  Kamojang Unit IV (Project 3028: http://cdm.unfccc.int/Projects/DB/RWTUV1255101629.04/view) and
  Sibayak Unit 2 & 3 (http://cdm.unfccc.int/Projects/Validation/DB/O2CE1RL2JNZWXYHS7BRF66PQXYNKJ0/view.html).

Thus the units remaining to be analyzed are as follows:

Power Plant	Devel-opment	Com-mence-	Capac-ity	Power plant op-erator	Steam field oper-ator	Other Remarks

	or Construction Date	ment Date	(MW)			
Kamojang Unit I, II, III	1980s	Unit 1: 1982 Unit 2,3: 1988	140 MW	PLN	Pertamina	Power plant operated by State owned company World Bank funding for Unit 2 & 3
Salak Phase 1	-	1994 (2 units) & 1997 (1 unit)	3 x 60 MW	PLN	Chevron / Pertamina	Power plant operated by State owned company
Salak Phase 2	1994	1997	3 x 66.7 MW	Chevron / Pertamina	Chevron / Pertamina	Tariff: 0.0846 USD/KWh
Darajat Phase 1	-	1994	55 MW	PLN	Chevron	Power plant operated by State owned company
Darajat Phase 2	1997	1999	90 MW	Chevron	Chevron	Tariff: 0.0695 USD/KWh
Dieng Unit 1	1994	July 1998	1 x 60 MW	PLN / Pertamina	Geo-Dipa	Power plant operated by State owned company
Wayang Windu Phase 1	1997	2000	1 x 110 MW	Star Energy	Star Energy	Tariff: 0.0839 USD/KWh
Sibayak Unit 1	-	2000	2 MW	Pertamina	Pertamina	Power plant operated by State owned company
Lahendong Unit 1	-	2001	20 MW	PLN	Pertamina	Funding under French Protocol Power plant operated by State owned company

The project participant has eliminated the above stated projects based on the non-comparable environment. This elimination criteria has been validated as follows:

- *Public sector vs Private sector:* Power plants that were developed by the state-owned companies are not comparable to projects developed by a private-owned operator with respect to the access to financing and to profitability requirements. It could be observed that no new units have been installed since 2000, with the exception of Lahendong unit 1 (http://www.geothermal.org/articles/worldpower05.pdf) [61]. The relatively little developement has been attributed to the Asian economic crises. The state operated power plants are not comparable to the private owned operators as the Government provides subsidies to PLN [62]. Further, it is to be observed that the state owned projects Kamojang Unit 2 & 3 has been financed by the World Bank [62]; and Lahendong unit 1 was built under the French Protocol and

associated support (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1249404911.81/view), indicating different access to financing. Thus based on the above justification the projects which have been developed and operated by the state owned companies could be eliminated, i.e., Kamojang Unit I, II, III, Salak Phase 1, Darajat Phase 1, Dieng Unit 1, Sibayak Unit 1 and Lahendong Unit 1.

- *Non-comparable environment with respect to the investment climate (tariff regime):* Power plants that were developed prior to the Asian and Indonesian economic crisis of 1998 and the subsequent economic downturn were considered having non-comparable environment with respect to the investment climate, particularly as the electricity prices prior to the financial crisis were between 0.069 USD/KWh and 0.085 USD/KWh and post to the financial crisis was only less than 0.05 USD/KWh. The stated electricity prices have been confirmed from the report produced for the United States Agency for International Development (USAID ASIA), Annex 3 Indonesia Country Report, From Ideas to Action: Clean Energy Solutions, For Asia to Address Climate Change, prepared by International Resources Group, dated June 2007 [72]. The contracted prices under the power purchase agreements of the various projects operated by the private sector i.e., Salak Phase 2, Darajat Phase 2 and Wayang Windu Phase 1 have been found to be higher than the base tariff of USD 0.0494 cents/KWh contracted for the project activity [22, 62].

Further, the essential distinction between the proposed project activity and the Wayang Windu Phase 1 project has been validated as follows:

Wayang Windu Phase 1 was developed by Mandala Magma Nusantara, B.V. (MNL) based on the Joint Operation Contract between Perusahaan Pertambangan Minyak dan Gas Bumi Negara (called “Pertamina”) and MNL and Energy Sales Contract among PT PLN (Persero), Pertambangan Minyak dan Gas Bumi Negara (called “Pertamina”) and MNL dated 2 Dec 1994 with the tariff comprising of energy payment and capacity payment arriving at around USD 0.084/KWh [22]. Investment decision was made based on the stipulated tariff and EPC contract for the project was signed in 1997.

In year 2000, due to the Asian Economic Crisis, the Government of Indonesia insisted on the renegotiation downwards of the electricity tariffs (with a tariff of US 0.035/KWh paid by PLN to MNL) [153]. The lower electricity tariff led the power plant to be handed over to bank creditors following its failure to repay loans [62]. Unocal then owned 50% of the power plant, and Credit Suisse First Boston (CSFB) and Deutsche Bank (DB) took over MNL as debt settlement in 2001. In Nov 2004, Star Energy acquired 100% of the ownership of MNL from CSFB, DB, and Unocal.

Wayang Windu Phase 2 was developed by Star Energy Geothermal (Wayang Windu) Limited (or Magma Nusantara Limited) after negotiating a new tariff before taking decision on the capacity addition. The finally contracted energy-only tariff was USD 0.0494/KWh as evidenced by the “Amendment to the Wayang Windu Energy Sales Contract” [22].

The essential distinction between Wayang Windu Phase 1 and Wayang Windu Phase 2 is that these two projects took place in a non-comparable environment, particularly with respect to the investment climate. Wayang Windu Phase 1 was started prior to the 1998 Asian Economic Crisis when the electricity tariff was considerably higher which made the project financially feasible. Wayang Windu Phase 2 was developed post to the Asian Economic Crisis when the electricity tariff is lower. The collapse of the original investment structure substantiates the statement that the post-crisis investment climate is less attractive.

Wayang Windu Phase 2 project was started in Jan 2007 (signing of the EPC contract for the power plant and the steam pipeline), after the consideration that the project is feasible with the CDM revenues [23].

On the basis of the analysis, it could be confirmed that there is no activity similar to the proposed project activity in the defined region.

Sub-step 4b: Discussion of any similar Options that are occurring: – Based on the above step it could be confirmed that there is no similar option that is occurring.

In light of the above, it can be confirmed that the proposed CDM activity is not a common practice in the defined region. This is further reinforced based on the fact that a relatively large coal based power plant is planned for the grid which is in line with the nationwide Fast Track Program implemented by the Indonesian Government in mid 2006 to move towards the low-cost coal-based power generation.

Thus the common practice analysis complements the investment analysis.

In light of the above investment analysis and common practice analysis, based on submitted documentation, argumentation and further cross checks from publicly available sources the project activity has been validated as an additional project.

3.7 Monitoring plan

The monitoring plan presented in the PDD complies with the requirement of the methodology. The assessment team has checked all the parameters presented in the monitoring plan against the requirements of the methodology; no deviations relevant for the project activity have been found in the plan.

The procedures have been revised by the assessment team through document review and interviews with the relevant personnel; this information together with a physical inspection allows the assessment team to confirm that the proposed monitoring plan is feasible within the project design. The major parameters to be monitored have been discussed with the PPs especially regarding the location of the meters, the data management and in general the quality assurance and quality control procedures to be implemented in the context of the project:

- Quantity of steam produced: The quantity of steam produced is recorded daily by using a Veturi flow meter (Msv) which is located at the upstream of unit-2 turbine (location corroborated during on site visit). The PP measures all the steam that enters unit 2, which is indifferent of any flow over the interconnections, and there is an Orifice plate meter (Mso) located at the 7 well-heads from unit 2. In order to be conservative, the primary data will be taken from the higher values from either upstream or downstream monitoring points adjusted with the brine losses. According to the technical design such flows over interconnections will only occur exceptionally. The conservative approach of considering this potential by monitoring input and output flows of the unit 2 steam pipe work ensures the delivery of data values according to the methodology.
- Average mass fraction of CO_2 and CH_4 in the steam produced: Non-condensable gases sampling will be carried out in production wells and at the entrance of unit 2 using ASTM Standard Practice E1675 for sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis. The sampling and analysis procedure of CO_2 and CH_4 consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. Hydrogen sulphide (H_2S) and carbon dioxide (CO_2) dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane. The non-condensable gases sampling and analysis should be performed at least every three months and more frequently, if necessary. With regards to the mass fractions of CO2 and CH4 in the steam produced, the primary data for each day when $M_{so} > M_{sv}$ will be taken from the analysis from the gas sampling carried out in the production wells. In the case when $M_{sv} > M_{so}$ the analysis result at the entrance of unit 2 will be used in emission reduction calculations.

- Net Electricity supplied to the grid (sum of the electricity supplied by the existing power generation unit and the additional capacity generation)
- Net electricity supplied by the existing power generation unit to the grid
- CO_2 emission from fossil fuel combustion in operation of power plant (emergency genset and diesel pump)

Hence it is expected that he PPs will be able to implement the monitoring plan and the emission reductions achieved can be reported ex-post and verified.

3.8 Sustainable development

The LoA of the Host country clearly present a statement that the project contributes to the sustainable development of the host Party.

3.9 Local stakeholder consultation

The relevant local stakeholders have been invited via local newspaper advertisement. The evidence of this invitation has been verified [82]. The assessment team has reviewed the documentation in order to validate the inclusion of relevant stakeholders and using the local expertise, it can be confirmed that the communication method used to invite the stakeholders can be considered appropriate. The summary of comments presented in the PDD has been cross checked with the documentation of the stakeholder consultation and it is found to be complete.

The relevant comments presented by the local stakeholders have been taken due account by the PP, the same has been cross check with the information obtained during the interviews.

Hence the local stakeholder consultation has been adequately performed according to the CDM requirements.

3.10 Environmental impacts

The project participants have undertaken an analysis of environmental impacts. The assessment team made a document review of the information presented. The Environmental Impact Study, which consists of ANDAL (Environmental Impact Analysis), RKL (Environmental Management Plan), and RPL (Environmental Monitoring Plan), confirms the correctness of the approach used by the PPs [41]. Hence the PPs followed the requirements of the host country regarding the environmental impacts.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

TÜV SÜD published the project documents on UNFCCC website by installing a link to TÜV SÜD's own website and invited comments by Parties, stakeholders and non-governmental organisations during a period of 30 days.

The following table presents all key information on this process:

<table>
<tr><td colspan="2">webpage:
http://cdm.unfccc.int/Projects/Validation/DB/J1EHEKAQRE7GW01YKXN9183Q00BEF8/view.html
http://www.netinform.net/KE/Wegweiser/Guide2_1.aspx?ID=5887&Ebene1_ID=26&Ebene2_ID=1856&mode=1</td></tr>
<tr><td colspan="2">Starting date of the global stakeholder consultation process:
21-01-2009</td></tr>
<tr><td>Comment submitted by:
None</td><td>Issues raised:
-</td></tr>
<tr><td colspan="2">Response by TÜV SÜD:
-</td></tr>
</table>

5 VALIDATION OPINION

TÜV SÜD has performed a validation of the following proposed CDM project activity:

Wayang Windu Phase 2 Geothermal Power Project

Standard auditing techniques have been used for the validation of the project. Methodology-specific customized checklists and protocol for the project have been prepared to carry out the audit in order to present the outcome in a transparent and comprehensive manner.

The review of the project design documentation, subsequent follow-up interviews and further verification of references have provided TÜV SÜD with sufficient evidence to determine the fulfilment of stated criteria in the protocol. In our opinion, the project meets all relevant UNFCCC requirements for the CDM. Therefore, TÜV SÜD will recommend the project for registration by the CDM Executive Board.

An analysis as provided by the applied methodology demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are additional to any that would occur in the absence of the project activity. Given that the project is implemented as designed, the project is likely to achieve the estimated amount of emission reductions as specified within the final PDD version.

The validation is based on the information made available to us, as well as the engagement conditions detailed in this report. The validation has been performed following the VVM requirements. The single purpose of this report is its use during the registration process as part of the CDM project cycle. TÜV SÜD can therefore not be held liable by any party for decisions made, or not made, based on the validation opinion beyond that purpose.

Munich, 02-12-2010

Cuiyun Zhang

Deputy Head

Certification Body “climate and energy”
TÜV SÜD Industrie Service GmbH

Munich, 02-12-2010

Thomas Kleiser

Assessment Team Leader

Annex 1: Validation Protocol

Table 1 Conformity of Project Activity and PDD

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
A. General description of project activity				
A.1. Title of the project activity				
A.1.1. Does the used project title clearly enable to identify the unique CDM activity?	3	Yes, the project title "Wayang Windu Phase 2 Geothermal Power Project" clearly enables the CDM project activity.	☑	☑
A.1.2. Are there any indication concerning the revision number and the date of the revision?	3	Yes, the revision number and date of the revision is indicated.	☑	☑
A.1.3. Is this consistent with the time line of the project's history?	9 - 25	Yes, the project is consistent with the timeline of the project's history and the CDM considerations have been reviewed. The documents submitted include among others: • Letter of interest of CERUPT Wayang Windu project, dated 29th January 2002. • Acknowledgement receipt expression of interest for CERUPT, from Senter to Magma, dated 6 February 2002 • Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources letter (topics of communication: CDM Baseline study, DNA Approval pending), dated 22 August 2002. • Preliminary Validation of Wayang Windu 2 as a CDM project from URS, dated 09 September 2002. • Withdrawal of CERUPT from Senter to Magma, dated 16 December 2003.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		• Purchase Contract for Tubular NO. WDA J.0225 11th July 2005. • Minutes of a Meeting of the boards of directors held at four season Hotel (The owner group of MNL discuss the implementation of project activity according financial conditions), Singapore on 28 February 2006. • WW Joint Operation Contract between Pertamina and MNL signed in 1994, amended 21st Nov. 2006. • Energy Sales Contract between PLN and MNL and Pertamina, and amendments • Accounts Agreement part 1 and part 2 (Loan from Standard Charter Bank to MNL, dated 3 May 2007. • "SCB Interest Rate Swap, Transaction Ref 3790055" Confirmation of the terms and conditions of the transaction entered into between Standard Charter Bank and MNL,dated 13 June 2007 • Utilization request Credit Facility Agreement, (Confirmation letter where MNL proceed with utilization of loan portion which has to be applied towards project cost), dated 7 August 2007. • Engineering and Procure and Construction Agreement for the Steamfield above Ground System and Power Plant Project. January 30th, 2007		
A.2. Description of the project activity				
A.2.1.Is the description delivering a transparent overview of the project activities?	3, 21 - 23,	Most of the information about the project is clearly defined in the PDD; it consists of construction and operation of a 117MW geothermal power station which would produce the electricity to the	CAR1	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		JAMALI grid. **Corrective Action Request No.1.** More information about Wayang Windu Unit 1 has to be included in the PDD. Give details about operation of Unit 1 and interaction with Unit 2 (steam connections). The information to be added should include how the project participant will ensure the proper measurement of steam produced from both units.		
A.2.2. What proofs are available demonstrating that the project description is in compliance with the actual situation or planning?	3, 21 - 23, 43	Several documents has been submitted (see A.1.3) where the characteristics and conditions of the project activity are consistent with the description delivered in the PDD (117MW geothermal power station which would produce the electricity and transfer to the JAMALI grid). **Clarification Request No.1.** A project schedule with the details about the project implementation should be submitted.	CR1	☑
A.2.3. Is the information provided by these proofs consistent with the information provided by the PDD?	3, 21 - 23, 43	See A.2.2.	Open	☑
A.2.4. Is all information presented consistent with details provided by further chapters of the PDD?	3	Yes, the information presented about the project description is consisted with further detail.	☑	☑
A.3. Project participants				
A.3.1. Is the form required for the indication of project participants correctly applied?	3	Yes, the tabular format has been used and has been correctly filled. See Table 1 in chapter A.3. of the PDD.	☑	☑
A.3.2. Is the participation of the listed entities or Parties confirmed by each one of them?	3, 21 - 23,	**Clarification Request No.2.** A confirmation letter (or similar document like contract) from each	CR2	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		entity involved in the project confirming their participation should be submitted to the validator.		
A.3.3. Is all information on participants / Parties provided in consistency with details provided by further chapters of the PDD (in particular annex 1)?	3, 21 - 23,	Yes, all information is complete and consistent.	☑	☑
A.4. Technical description of the project activity				
A.4.1. Location of the project activity				
A.4.1.1. Does the information provided on the location of the project activity allow for a clear identification of the site(s)?	3	Yes, there is a detailed description delivered in section A.4.1 in the PDD.	☑	☑
A.4.1.2. How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (ownership, licenses, contracts etc.)?	3, 14, 15, 21 - 23,	During the on site visit the validator had access to documentation like Joint Operation Contract (between Pertamina and MNL) where are specified the details for Geothermal Operation in Wayang Windu field, other relevant document is the Energy Sales Contract (between PLN and MNL) where all the details about energy provided by the project to the grid are detailed. Complementary the Accounts Agreements (between MNL and Standard Chartered Bank) clearly indicates the MNL ownership of the plant.	☑	☑
A.4.2. Category(ies) of project activity				
A.4.2.1. To which category(ies) does the project activity belonging to? Is the category correctly identified and indicated?	3,	Yes, the project activity is classified and identified correctly as “Renewable electricity generation for a grid (geothermal)” under sectoral scope number 1, Renewable Energy.	☑	☑
A.4.3. Technology to be employed by the project activity				
A.4.3.1. Does the technical design of the project activity reflect current good practices?	3, 83 - 85	Yes, the Project Design reflects good practice, the technology to be implemented and it is adequate for the energy production pro-	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		poses. The plant is certified under ISO14001:2004 Norm and OSHAS 18001:2007. Complementary during the on site visit were submitted: the installation approval form Director of mineral, coal and geothermal sources (Ministry of Energy), dated 14 November 2005 and Plant approval form General Director of Electricity (Ministry of Energy), dated 20 February 2006.		
A.4.3.2. Does the description of the technology to be applied provide sufficient and transparent input/ information to evaluate its impact on the greenhouse gas balance?	3, 4	Yes, the technology described in the PDD let know the relevant details to evaluate the impact and GHG balance.	☑	☑
A.4.3.3. Does the implementation of the project activity require any technology transfer from annex-I-countries to the host country(ies)?	3, 26, 27	**Clarification Request No.3.** Details about the purchase/source and source of the technical equipment/know-how should be given to corroborate if technology has been transferred from annex-I-countries to the host country.	CR3	☑
A.4.3.4. Is the technology implemented by the project activity environmentally safe?	3, 41, 83 - 85	Yes, the technology used in the project does not represent any environmental risk, the other geothermal plants have been installed in Indonesia (according PLN Statistics 2005, geothermal plants provide about 2.2% of national power capacity). The project activity complies with the Indonesian regulation (Law No. 4 of 1982, Government Regulation no 51 of 1993, Decree of Environmental Minister No. 17 of 2001.) which requires the development of an Environmental Impact Study, which consists of ANDAL (Environmental Impact Analysis), RKL (Environmental Management Plan), and RPL (Environmental Monitoring Plan). The Approval from Environmental local Authority, dated 27 March 2006, was submitted during the on site visit.	☑	☑
A.4.3.5. Is the information provided in compliance	3, 21	See A.2.2	Open	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	with actual situation or planning?	- 23, 43			
A.4.3.6.	Does the project use state of the art technology and / or does the technology result in a significantly better performance than any commonly used technologies in the host country?	3, 46, 47	The project proposes to use state of the art technology (similar to other plant installed in host country.	☑	☑
A.4.3.7.	Is the project technology likely to be substituted by other or more efficient technologies within the project period?	3, 21, 22	No, the technology selected is not likely to be substituted within the project period. Complementary, the Energy Sales Contract and Joint Operation Contracts describe a lifetime of 30 years.	☑	☑
A.4.3.8.	Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period?	3, 25 - 37	Yes, the project required extensive training and maintenance efforts, in section A.4.2 it is mention that contractor's company (Sumitomo Corporation) is on charge of these activities. The project participant has submitted all the evidences and information about training developed in the plant. Several evidences have been collected by the validator, for example: • Attendance list Steamfield Above Ground System training for topics: General Overview, Pressure and Control System, Combined System, Startup and Shutdown, dated 8, 9, 10 ,11 September 2008. • Attendant list, Training for Power Station, Heat Balance and Turbine and Condenser, dated 12 and 13 September 2008 • Attendant list, Training for Power Station, Generator and Electrical, dated 15 September 2008 • Attendant list, Training for Power Station, Electrical, dated 16 September 2008 • Attendant list, Training for Power Station, Gas Removal	CR4	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		System and Hot well Pump, dated 18 September 2008 • Attendant list, Training for Power Station, Control and Instrumentation, dated 19 September 2008 • Attendant list, Revenue Meter (electricity), dated 13 and 14 November 2008. • Attendant list, Training for Power Station, Discharge Monitoring, dated 20 and 21 November 2008 • Program of On-The-Job Training (Power Station) and attendant list, dated 18 December 2008. • Attendant list, Fire Fighting -Deluge Valves, dated 20 and 08 January 2009 **Clarification Request No.4.** In order to ensure the sensitivity for Emission Reduction Monitoring, the Project Participant should develop training sessions about CDM Requirements, conservativeness, monitoring reports, verification procedures, quality assurance, etc. In case that monitoring training is in early stage, a program detailing this consideration should be submitted.		
A.4.3.9. Is information available on the demand and requirements for training and maintenance?	3, 25 - 37	See A.3.8	Open	☑
A.4.3.10. Is a schedule available for the implementation of the project and are there any risks for delays?	3, 25 - 37	See A.3.8	Open	☑
A.4.4. Estimated amount of emission reductions over the chosen crediting period				
A.4.4.1. Is the form required for the indication of projected emission reductions correctly applied?	3, 49	Yes, the form indicates correctly the project emissions reductions.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
A.4.4.2. Are the figures provided consistent with other data presented in the PDD?	3, 49	Yes, the figures shown in section A.4.4 are consistent with other figures presented in the PDD.	☑	☑
A.4.5. Public funding of the project activity				
A.4.5.1. Is the information provided on public funding provided in compliance with the actual situation or planning as available by the project participants?	1, 3, 14, 15	Single statement in Section A.4.5 "There is no public funding for the Wayang Windu Phase 2 Geothermal Power Project". The project has been financed through a Loan agreement between project owner and Standard Chartered Bank. The documentation with financing details has been submitted (i.e. Credit Facility Agreement part 1 and part 2, dated 3 May 2007. and Financial closure with Standard Chartered Bank, "SCB Interest Rate Swap, Transaction Ref 3790055", dated 13 June 2007). **Corrective Action Request No.2.** The PDD should give details about project financing to let clearly know that no public funding funds has been used in the project.	CAR2	☑
A.4.5.2. Is all information provided consistent with the details given in remaining chapters of the PDD (in particular annex 2)?	1, 3, 14, 15	Yes, all the information found documents submitted about project financing is consistent with remaining chapters of the PDD. Annex 2 shows the same single statement: "There is no public funding for the Wayang Windu Phase 2 Geothermal Power Project". See conclusion in A.4.5.1	☑	☑
B. Application of a baseline and monitoring methodology				
B.1. Title and reference of the approved baseline and monitoring methodology				
B.1.1.Are reference number, version number, and title of the baseline and monitoring methodology clearly indicated?	3, 4, 44, 45	Yes, the methodology and version used is clearly identified in the PDD, it is the Version 08 of ACM0002: Approved consolidated baseline methodology for grid-connected electricity generation from renewable sources.	CR5	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Final PDD, however, has been updated with the most recent applicable version of methodology, version 09 of ACM0002 **Clarification Request No.5.** Please provide substantiating evidence to confirm that the data used to calculate the emission factor of the grid are the most recent data available.		
B.1.2. Is the applied version the most recent one and / or is this version still applicable?	3, 4	Yes, the version used is the most recent version applicable for the project.	☑	☑
B.1.3. Does the methodology refer to the following tools with its latest approved versions: - Tool to calculate the emission factor for an electricity system - Tool for the demonstration and assessment of additionality - Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion	3 - 8	Yes, the project also uses the tools (most recent version applicable) indicated by the methodology - Tool to calculate the emission factor for an electricity system, Version 1.1 - Tool for the demonstration and assessment of additionality, Version 5.2 - Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 02	☑	☑
B.2. Justification of the choice of the methodology and why it is applicable to the project activity				
B.2.1. Is the applied methodology considered the most appropriate one?	3, 4	Yes, the methodology used meets all the applicability criteria and satisfies the conditions required.	☑	☑
Fill in the required amount of sub checklists for applicability criteria as given by the methodology applied and comment at least every line answered with "No"				
B.2.2. Criterion 1: Type of electricity capacity addition by grid-connected renewable power generation The following types are possible: hydro	3, 4	Applicability checklist: Yes / No Criterion discussed in the PDD? Yes	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.		Compliance provable? Yes Evidences provided in the PDD? Yes Compliance verified? Yes The project activity is the installation of a geothermal power plant.		
B.2.3.Criterion 2 (in the case of hydro plants): -The project activity is implemented in an existing reservoir, with no change in the volume of reservoir or -The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is greater than 4 W/m2 or -The project activity results in new reservoirs and the power density of the power plant is greater than 4 W/m2.	3, 4	Not applicable	☑	☑
B.2.4.Criterion 3 (in the case of modification/retrofit in existing power plants): 5 years of historical data (or 3 years in the case of non hydro project activities) are available	3, 4	Although this was not explicitly stated in the GSP-PDD, the information has been clearly presented in the final PDD. The project activity is the installation of an additional power unit at an existing grid-connected geothermal power plant. The historical data has also been made available in the final PDD.	☑	☑
B.2.5.Criterion 4: Defined electricity grid boundaries	3, 4, 44, 45, 55	Applicability checklist: Yes / No Criterion discussed in the PDD? Yes	CR6	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Compliance provable? — Yes Evidences provided in the PDD? — Yes Compliance verified? — No **Clarification Request No.6.** In order to corroborate that the JAMALI grid has been clearly defined, please submit a confirmation from an official source (PLN) about the JAMALI grid identification (i.e. no connected to other systems, a map defining the area covered by the grid, etc.)		
B.2.6.Criterion 5: Approved inclusion in other methodologies (if applied only)	3, 4	Not applicable	☑	☑
B.2.7.Criterion 6: Exclusion of fuel switching activities	3, 4	Applicability checklist — Yes / No Criterion discussed in the PDD? — Yes Compliance provable? — Yes Evidences provided in the PDD? — Yes Compliance verified? — Yes	☑	☑
B.2.8.Criterion 7: Exclusion of biomass fired power plants	3, 4	Not applicable	☑	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.2.9.Criterion 8:
Exclusion of hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.</td><td>3, 4</td><td>Not applicable</td><td>☑</td><td>☑</td></tr>
<tr><td colspan="5">B.3. Description of the sources and gases included in the project boundary</td></tr>
<tr><td colspan="5">Integrate the required amount of sub-checklists for sources and gases as given by the methodology applied and comment on at least every line answered with “No”</td></tr>
<tr><td>B.3.1.Source:
Fugitive Emissions from non-condensable gases contained in geothermal steam (geothermal power plants only)
Gas(es): CO_2, CH_4
Type: Project Emissions</td><td>3, 4</td><td><table><tr><th>Boundary checklist</th><th>Yes / No</th></tr><tr><td>Source and gas(es) discussed by the PDD?</td><td>No</td></tr><tr><td>Inclusion / exclusion justified?</td><td>Yes</td></tr><tr><td>Explanation / Justification sufficient?</td><td>Yes</td></tr><tr><td>Consistency with monitoring plan?</td><td>Yes</td></tr></table><u>Corrective Action Request No.3.</u>
The operation of the steam pipelines includes an emergency procedure to release the steam in the rock muffler. The Fugitive Emissions from non-condensable gases contained in geothermal steam released in this stage should be taken in account for project emission. The project participant should define a procedure to measure this portion of steam released.
See B.7.1.10</td><td>CAR3</td><td>☑</td></tr>
<tr><td>B.3.2.Source:
Emissions from combustion of fossil fuels required to operate the geothermal power</td><td>3, 4, 52</td><td><table><tr><th>Boundary checklist</th><th>Yes / No</th></tr><tr><td>Source and gas(es) discussed by the PDD?</td><td>Yes</td></tr></table></td><td>CAR4</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
plant (geothermal power plants only) Gas(es): CO_2 Type: Project Emissions		Inclusion / exclusion justified? — Yes Explanation / Justification sufficient? — Yes Consistency with monitoring plan? — Yes **Corrective Action Request No.4.** The diesel consumption in the site comes from the backup generation set and fire pump, these equipments can operate for both Units (Unit1 plan previously installed and unit 2 the project activity proposed). The amount of diesel can be measured accurately but not the portion of diesel that corresponds to each unit. The project Participant should define a conservative approach to define the diesel consumption due the operation of unit 2, and calculate the project emission according.		
B.3.3.Source: Emissions from the reservoir (hydro power plants only) Gas(es): , CH_4 Type: Project Emissions	3, 4	Not applicable	☑	☑
B.3.4.Source: Emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity Gas(es): CO_2 Type: Baseline Emissions	3, 4, 46,	Boundary checklist — Yes / No Source and gas(es) discussed by the PDD? — Yes Inclusion / exclusion justified? — Yes Explanation / Justification sufficient? — No Consistency with monitoring plan? — Yes This source has been included in the PDD and the source used has been described in the PDD, but please see B.1.1, B.6.3.2, B.6.2.9, B.6.2.10, B.6.2.11, B.6.2.13 and B.6.2.14	☑	☑
B.3.5.Source:	3, 4,		☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
Emissions from electricity generation in fossil fuel fired power plants of any connected electricity system Gas(es): CO_2 Type: Baseline Emissions	46,	Boundary checklist: Yes / No Source and gas(es) discussed by the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes		
B.3.6.Source: Emissions from electricity generation in fossil fuel fired power plants of imported electricity (project electricity consumption) Gas(es): CO_2	3, 4, 46,	Boundary checklist: Yes / No Source and gas(es) discussed by the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.7.Do the spatial and technological boundaries as verified on-site comply with the discussion provided by the PDD?	1, 3, 4,	Yes, the spatial and technological boundary was verified during the onsite visit confirming that the description delivered in the PDD is correct. **Corrective Action Request No.5.** Complementary, in the figure 5 shown in section B.3, the rock muffler can be included since in this stage the potential project emission will happen.	CAR5	☑
B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario				
B.4.1.Is it clearly described that the baseline is represented by the combined margin of the grid the activity will be connected to?	3, 4, 44 - 47	Yes, the baseline is represented by the combined margin, it is clearly defined in the PDD.	☑	☑
B.4.2.In case of any modification or retrofit of exist-	3, 4	Although this was not explicitly stated in the GSP-PDD, the infor-	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
ing facilities: Is data available to determine the historic production level?		mation has been clearly presented in the final PDD. The project activity is the installation of an additional power unit at an existing grid-connected geothermal power plant. The historical data has also been made available in the final PDD.		
B.4.3. In case of any modification or retrofit of existing facilities: Have conservative assumptions been applied in order to estimate the point in time when the existing equipment needs to be replaced?	3, 4	Although this was not explicitly stated in the GSP-PDD, the information has been clearly presented in the final PDD. The project activity is the installation of an additional power unit at an existing grid-connected geothermal power plant. Conservative assumptions have been applied in order to estimate the point in time when the existing equipment needs to be replaced.	☑	☑
Changes required for methodology implementation in 2nd and 3rd crediting periods				
B.4.4. Has the continued validity of the baseline been correctly assessed?	3, 4	To be applied at renewable crediting period	☑	☑
B.4.5. Has the baseline been updated with new data?	3, 4	To be applied at renewable crediting period	☑	☑
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):				
B.5.1. Is evidence provided, that CDM has been considered seriously in the decision to proceed with the project activity (CDM decision before project start)?	3, 9 - 15	Yes, the validation team received evidence that indicate the participation of the project in the CERUPT tender and efforts put to meet the requirements of this program. The consideration of carbon revenues has been discussed over the table before the project starting. The validation team has reviewed different documents to corroborate the CDM consideration. • Letter of interest of CERUPT Wayang Windu project, dated 29th January 2002.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		• Acknowledgement receipt expression of interest of CE-RUPT, from Senter to Magma, dated 6 February 2002 • Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources letter (topics of communication: CDM Baseline study, DNA Approval pendant), dated 22 August 2002. • Preliminary Validation of Wayang Windu 2 as a CDM project from URS, dated 09 September 2002. • Credit Facility Agreement part 1 and part 2, dated 3 May		
B.5.2. Have realistic and credible alternatives been identified providing comparable outputs or services? (step 1a)	3, 21, 84, 85	Yes, the three alternatives listed provide comparable outputs. The alternatives given in this step are: • The proposed project activity implemented without CDM financing. • Construction of a thermal power plant with the same installed capacity or the same annual power output. • Continuation of the current situation, electricity generation by existing generation mix operating in the JAMALI grid. **Clarification Request No.7.** Please include documentation that support the plausibility of the alternatives listed in sub-step1a (i.e. make reference to investment analysis, submit the legal conformance of the company where being explained the type of power plants operated by the group, company polices, etc.	CR7	☑
B.5.3. Is the project activity without CDM included in these alternatives? (step 1a)	1, 3	Yes, this alternative has been included in the list of possible ways.	☑	☑
B.5.4. Is a discussion provided for all identified alter-	1, 3,	No, the sub-step 1 only includes the alternative “continuation of	CAR6	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
natives concerning the compliance with applicable laws and regulations? (step 1b)	21, 84, 85	the current situation, electricity generation by existing generation mix operating in the JAMALI grid." **Corrective Action Request No.6.** Please provide information regarding the compliance of laws and regulation for the other alternatives listed in step 1.		
B.5.5. In case the PDD argues that specific laws are not enforced in the country or region: Is evidence available concerning that statement? (step 1b)	3, 21, 84, 85	No, The PDD does not show this argument. Based on the DOE knowledge and experience in the host country, there are no laws or regulations that enforce to the installation of geothermal plants or push for the usage of renewable energy. In fact, even the large geothermal potential that Indonesia has (according The International Geothermal Energy Association. The programs implemented recently clearly show the national preference for coal as the primary energy resource *"Regulation No. 146/PMK.01/2006: coal fired power projects5 under the Government of Indonesia "Crash Program" to develop 10,000 MW of additional power generation capacity by 2010."*	☑	☑
B.5.6. In case of applying step 2 / investment analysis of the additionality tool: Is the analysis method identified appropriately (step 2a)?	3, 4, 6, 22, 23, 42,	Yes, the demonstration that the proposed CDM project activity is unlikely to be financially attractive applying sub-step 2b (Option III: Apply Benchmark Analysis) is appropriately identified.	☑	☑
B.5.7. In case of Option I (simple cost analysis): Is it demonstrated that the activity produces no economic benefits other than CDM income?	3, 6	NA.	☑	☑
B.5.8. In case of Option II (investment comparison analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)?	3, 6	NA.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
B.5.9. In case of Option III (benchmark analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)?	3, 4, 6, 42,	Yes, the project participant uses applied benchmark analysis through weighted average cost of capital ("WACC"), it is the minimum return that a company must earn on existing asset base to satisfy its creditors, owners, debts and other providers of capital.	☑	☑
B.5.10. In case of Option II or Option III: Is the calculation of financial figures for this indicator correctly done for all alternatives and the project activity?	3, 4, 6, 42,	Yes, the analysis includes the realization of the project with and without CDM revenues. Analysis not applicable for option of Continuation of the current situation, electricity generation by existing generation mix operating in the JAMALI grid.	☑	☑
B.5.11. In case of Option II or Option III: Is the analysis presented in a transparent manner including publicly available proofs for the utilized data?	3, 4, 6, 38 - 41, 58 - 71	The spreadsheet has been submitted during the on site visit. The information in the financial calculation has been reviewed and all the reference used has been submitted and reviewed, for example: • Country risk premium source used: http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem05.xls • risk-free rate source used: Bloomberg Finance L.P. • Unlevered Beta source used: http://faculty.insead.edu/peyer/FFE/Betas%20per%20industry%20based%20on%20US%20COMPANIES.doc • Total CAPEX based in the Accounts Agremment between MNL and Standard Charater Bank. • Energy fee Pertamina based in Joint Operation Contract • Energy Tariff base in Energy Sales Contract. • Inflation rate source used: OIL TOOLS INDEX	CR8, CR17	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		WEB SITE (WPU 1191), US PPI Index, US CPI and INDONESIA CPI. **Clarification Request No.8.** The project participant has to explain what capacity has been used for the financial analysis (110MW or 117MW, minus house load). Further please also refer CR17		
B.5.12. In case of applying step 3 (barrier analysis) of the additionality tool: Is a complete list of barriers developed that prevent the different alternatives to occur?	3, 6	NA.	☑	☑
B.5.13. In case of applying step 3 (barrier analysis): Is transparent and documented evidence provided on the existence and significance of these barriers?	3, 6	NA.	☑	☑
B.5.14. In case of applying step 3 (barrier analysis): Is it transparently shown that the execution of at least one of the alternatives is not prevented by the identified barriers?	3, 6	NA.	☑	☑
B.5.15. Have other activities in the host country / region similar to the project activity been identified and are these activities appropriately analyzed by the PDD (step 4a)?	3, 6, 57, 61	Yes, all the geothermal power plants in Indonesia are mentioned and analyzed. Geothermal power development is not the first of its kind in Indonesia, it only represent the 2.2% of national power capacity (source reviewed: World Geothermal Power Generation 2001-2005" by International Geothermal Development, accessed 20 Nov. 2008) Currently in Indonesia the geothermal energy source utilized represent the 4.5% of the potential (886.90 MW to the potential of	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		19,658 MW) source: CDM Country Guide for Indonesia edited by Institute of Global Environmental Strategies, 2nd edition, 2006.		
B.5.16. If similar activities are occurring: Is it demonstrated that in spite of these similarities the project activity would not be implemented without the CDM component (step 4b)?	1, 3, 72, 73, 74, 89, 90	The validator found that the plants developed without CDM coincides with their installation between 1982 and 2000, before the Asia and Indonesia economic crisis when the electricity price (between USD 0.069/kWh and USD 0.085/kWh) was better than 2005 until now (only under USD0.05/kWh). When the project activity started, the coal-based power plants were supported by the Fast Track Program that mandates the building of 40 coal-fired power plants started too, which means that in comparison with other energy sources, the coal-fired power get the government preferences, low cost of generation and easy availability.	☑	☑
B.5.17. Is it appropriately explained how the approval of the project activity will help to overcome the economic and financial hurdles or other identified barriers?	3	**Corrective Action Request No.7.** A more extensive conclusion about the impact of the CDM registration should be added.	CAR7	☑
B.6. Emissions reductions				
B.6.1. Explanation of methodological choices				
B.6.1.1. Is it explained how the procedures provided in the methodology are applied by the proposed project activity?	3, 6	Yes, the PDD mention the sources of the project emission and the procedure (following the methodology) to calculate it.	☑	☑
B.6.1.2. Is every selection of options offered by the methodology correctly justified and is this justification in line with the situation verified on-site?	3, 6	Yes, the PDD include the options indicated in the methodology according the type of project (a Geothermal plant)	☑	☑
B.6.1.3. Are the formulae required for the determination of project emissions correctly pre-	3, 6	Yes, the formulas are correctly determined identifying each para-	☑	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	sented, enabling a complete identification of parameter to be used and / or monitored?		meter to be monitored.		
B.6.1.4.	Are the formulae required for the determination of baseline emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	3, 6	Yes, the formulas are correctly determined identifying each parameter to be monitored.	☑	☑
B.6.1.5.	Is the choice of options to determine the emissions factor (OM, BM) justified in a suitable and transparent manner?	3, 6	Yes, the option selected are correct and justified, the source indicated	☑	☑
B.6.1.6.	Are the six steps as defined per the "Tool for calculation of emission factor for electrical systems" correctly applied by the project participants?	3, 6, 46, 47	Yes, the six steps defined in the tool are followed to calculate the emission factor of the grid. Data obtained from sources: - PDD for Registered Project 1313: MEN-Tangerang 13.6MW Natural Gas Co-generation Project - PT PLN P3B (Persero). This has been subsequently revised in the final PDD. The final PDD uses the primary data as reported by the National Authorities leading to lower emission factor.	☑	☑
B.6.1.7.	In case of alternative weighing factors for the Combined Margin: Is the quantification of the alternative weighing factor justified in a suitable and transparent manner?	3, 6	NA.	☑	☑
B.6.1.8.	In case of alternative weighing factors for the Combined Margin: Is the guidance for the PDD concerning the acceptability of alternative weights considered in the dis-	3, 6	NA.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
cussion?				
B.6.1.9. Are the formulae required for the determination of leakage emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	3, 6	Project participants do not need to consider these emission sources as leakage in applying this methodology.	☑	☑
Tool to calculate project or leakage CO2 emissions from fossil fuel combustion				
B.6.1.10. Is the formula required for the determination of CO2 project emissions from fossil fuel combustion correctly presented, enabling a complete identification of parameter to be used and / or monitored	3, 6, 7, 52	Yes, the formulas required by the tool are correctly presented. Values used will be reviewed during on site visit.	☑	☑
B.6.1.11. Is option A (preferred approach) or option B chosen for the determination of the CO2 emission coefficient COEFi,y and is COEFi,y correctly determined?	3, 6, 7, 52	Option B has been selected for the calculation of determination of the CO2 emission coefficient COEFi,y. The COEFi,y correctly determined	☑	☑
B.6.1.12. Are formulae required for the determination of emission reductions correctly presented?	3, 6, 7, 52	Yes, the formulas are correctly presented.	☑	☑
B.6.2. Data and parameters that are available at validation				
B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology?	3, 6	Yes, the list can be considered complete as far solve the CARs and CRs in this section	Open	☑
B.6.2.2. Is the choice of ex-ante or ex-post vintage of OM and BM factors clearly specified in the PDD?	3, 6, 8	For the BM calculated, the PDD specify that it will be calculated ex-post for the first crediting period. **Corrective Action Request No.8.**	CAR8	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>About the OM, the PDD does not specify the option selected (see step 2 of Tool to calculate the emission factor for an electricity system) ex-ante or ex-post option. The PDD should define it and clearly explain in the PDD.</td><td></td><td></td></tr>
<tr><td colspan="5">Fill in the required amount of sub checklists for monitoring parameter and comment any line answered with “No”</td></tr>
<tr><td>B.6.2.3. Parameter Title: GWP_{CH4} Global warming potential of methane valid for the relevant commitment period (tCO2/tCH4)</td><td>3, 6</td><td><table><tr><th>Data Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.4. Parameter Title: $EG_{historical}$ (only applicable to modification/retrofit of an existing grid-connected renewable power plant/unit)
Average of historical electricity delivered by the existing facility to the grid (MWh)</td><td>3, 6, 112</td><td>Please refer CR7 and CAR6.
The average of historical electricity delivered by the existing facility to the grid (MWh) has been included in the final PDD.</td><td>CR7, CAR6</td><td>☑</td></tr>
<tr><td>B.6.2.5. Parameter Title: $DATE_{BaselineRetrofit}$ (only applicable to modification/retrofit of an existing grid-connected renewable power plant/unit)</td><td>3, 6</td><td>Please refer CR7 and CAR6.
The point in time when the existing equipment would need to be replaced in the absence of the project activity has been indicated in the final PDD.</td><td>CR7, CAR6</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	Point in time when the existing equipment would need to be replaced in the absence of the project activity				
B.6.2.6.	Parameter Title: EF_{Res} (only applicable to hydro-power plants with reservoir) Default emission factor for emissions from reservoirs (kgCO2e/MWh)	3, 6	Not applicable	☑	☑
B.6.2.7.	Parameter Title: CAP_{BL} (W) (only applicable to modification/retrofit of an existing grid-connected renewable power plant/unit) Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.	3, 6	Not applicable	☑	☑
B.6.2.8.	Parameter Title: A_{BL} (only applicable to hydropower plant projects with reservoir) Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero (m^2).	3, 6	Not applicable	☑	☑
B.6.2.9.	Parameter Title: Emission factor of the grid (EF_{CM} in tCO_2/MWh)	3, 6	Data Checklist: Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes	Open	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Source clearly referenced? Yes Correct value provided? No Has this value been verified? No Choice of data correctly justified? Yes Measurement method correctly described? Yes See B.1.1, B.6.3.2, B.6.2.9, B.6.2.10, B.6.2.13 and B.6.2.14		
B.6.2.10. Parameter Title: Operating margin (EF_{OM} in tCO_2/MWh) emission factor of the grid	3, 6	Data Checklist: Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description? Yes Source clearly referenced? Yes Correct value provided? No Has this value been verified? No Choice of data correctly justified? Yes Measurement method correctly described? Yes See B.1.1, B.6.3.2, B.6.2.9, B.6.2.10, B.6.2.13 and B.6.2.14	Open	☑
B.6.2.11. Parameter Title: Build margin ($EF_{BM}intCO_2/MWh$) emission factor of the grid	3, 6	Data Checklist: Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description? Yes Source clearly referenced? Yes	Open	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Correct value provided? — No Has this value been verified? — No Choice of data correctly justified? — Yes Measurement method correctly described? — Yes See B.1.1, B.6.3.2, B.6.2.9, B.6.2.10, B.6.2.13 and B.6.2.14		
B.6.2.12. Parameter Title: $FC_{i,m,y,}$ $FC_{i,y}$, $FC_{i,j,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ and $FC_{i,n,h}$ Amount of fossil fuel type i consumed by power plant / unit m,j,k or n (or in the project electricity system in case of $FC_{i,y}$) in year y or hour h (mass or volume unit)	3, 6	Data Checklist — Yes / No Title in line with methodology? — Yes Data unit correctly expressed? — Yes Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided? — Yes Has this value been verified? — No Choice of data correctly justified? — Yes Measurement method correctly described? — Yes See B.1.1 no B.6.3.2	Open	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr>
<td>B.6.2.13. Parameter Title: $NCV_{i,y}$
Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)</td>
<td>3, 6, 91</td>
<td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>No</td></tr>
<tr><td>Has this value been verified?</td><td>No</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table>
<u>Corrective Action Request No.9.</u>
According the Tool to calculate the emission factor for an electricity system, the values that should be used for Emission Factor calculation are: the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
<u>Corrective Action Request No.10.</u>
The Net calorific value for Coal (21.34 TJ/kt) is not justified; the source used does not specify what kind of coal is used. According the CO_2 emission factor of fossil fuel type used for coal (96.1tCO_2/TJ) the DOE inferred that it is Sub-Bituminous Coal, but it should be clarified. In the case that Sub-Bituminous Coal is the fuel type use the correct value, see below.
Values used in calculation:
</td>
<td>CAR9
CAR10</td>
<td>☑</td>
</tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>HSD & Diesel Oil: 43.00 TJ/kt
MFO: 40.40 TJ/kt
Coal: 21.34 TJ/kt
Natural Gas: 48.00 TJ/kt
Values that should be used to calculate the Emission factor:
HSD & Diesel Oil: 41.40 TJ/kt
MFO: 39.80 TJ/kt
Coal: 11.50 TJ/kt
Natural Gas: 46.50 TJ/kt</td><td></td><td></td></tr>
<tr><td>B.6.2.14. Parameter Title: $EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$ CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)</td><td>3, 6, 91</td><td><table><tr><th>Data Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided?</td><td>No</td></tr><tr><td>Has this value been verified?</td><td>No</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table><u>Corrective Action Request No.11.</u>
According the Tool to calculate the emission factor for an electricity system, the values that should be used for Emission Factor calculation are: the IPCC default values at the lower limit of the un-</td><td>CAR11</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		certainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories Values used in calculation: HSD & Diesel Oil: 74.1 tCO2/TJ MFO: 77.4 tCO2/TJ Coal: 96.1 tCO2/TJ Natural Gas: 56.1 tCO2/TJ Values that should be used to calculate the Emission factor: HSD & Diesel Oil: 72.6 tCO2/TJ MFO: 75.5 tCO2/TJ Coal: 92.8 tCO2/TJ Natural Gas: 54.3 tCO2/TJ		
B.6.2.15. Parameter Title: $EG_{m,y}$, EG_y, $EG_{j,y}$, $EG_{k,y}$ and $EG_{n,h}$ Net electricity generated and delivered to the grid by power plant / unit m,j,k or n (or in the project electricity system in case of EGy) in year y or hour h (MWh)	3, 6, 91	Not applicable	☑	☑
B.6.2.16. Parameter Title: $EG_{PJ,h}$ Electricity displaced by the project activity in hour h of year y (in MWh) (only applicabe for the dispatch data OM)	3, 6	Not applicable	☑	☑
B.6.2.17. Parameter Title: $\eta_{m,y}$	3, 6	Not applicable	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
Average net energy conversion efficiency of power unit m in year y				
Parameter Title: A_{PJ} (only applicable to hydropower plant projects with reservoir)Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.	3, 6	Not applicable	☑	☑
B.6.2.18. Parameter Title: fraction of time with low costs /must run plant at the margin (for simple adjusted OM only)	3, 6	Not applicable	☑	☑
B.6.3. Ex-ante calculation of emission reductions				
B.6.3.1. Is the projection based on the same procedures as used for future monitoring?	3, 49	Yes, the project states correctly the emission reductions procedures.	☑	☑
B.6.3.2. Are the GHG calculations documented in a complete and transparent manner?	3, 49	**Clarification Request No.9.** Please submit the spreadsheet with the calculations in order to review the data used in the Emission Reductions calculations (including the Grid Emission Factor), and the correction about the Diesel figure of project emission.	CR9	☑
B.6.3.3. Is the calculation of the operating margin and build margin emission factors documented electronically in a spreadsheet with the relevant information as defined per the "Tool for calculation of emission factor for electrical systems"? Has this spreadsheet been submitted to the validation team?	3, 6, 8	See B.6.3.2	Open	☑
B.6.3.4. Is the data provided in this section	3, 6,	See B.6.3.2	Open	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	consistent with data as presented in other chapters of the PDD?	8			
B.6.4.	*Summary of the ex-ante estimation of emission reductions*				
B.6.4.1.	Will the project result in fewer GHG emissions than the baseline scenario?	3, 6	Yes, the project represents a fewer GHG emission that the base-line scenario.	☑	☑
B.6.4.2.	Is the form/table required for the indication of projected emission reductions correctly applied?	3, 6	Yes, the table indicates the emission reductions is correctly ap-plied	☑	☑
B.6.4.3.	Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period?	3, 21 - 23, 43	See A.2.2	Open	☑
B.6.4.4.	Is the data provided in this section in consistency with data as presented in other chapters of the PDD?	3, 6	Yes, the data about the emission reduction presented in this sec-tion is in consistency with other chapters of the PDD	☑	☑
B.7.	**Application of the monitoring methodology and description of the monitoring plan**				
B.7.1.	*Data and parameters monitored*				
B.7.1.1.	Is the list of parameters presented by chapter B.7.1 considered to be complete with regard to the requirements of the applied methodology?	3, 6	Yes the list is considered complete if CAR and CR are solved in this section.	Open	☑
Integrate the required amount of sub-checklists for monitoring parameter and comment on any line answered with "No"					
B.7.1.2.	Parameter Title: EGy Electricity supplied by the project activity to the grid (in MWh)	3, 6	Monitoring Checklist / Yes / No Title in line with methodology? / Yes Data unit correctly expressed? / Yes	CAR12	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided for estimation? — No Has this value been verified? — No Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes **Corrective Action Request No.12.** The figure shown in section B.7.1 of EGy is 886,293 MWh. Value used to calculate emission reductions and shown in other section is EGy = 924,661.8 MWh/yr. It should be corrected.		
B.7.1.3. Parameter Title: TEGy Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (in MWh).	3, 6	NA	☑	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.7.1.4. Parameter Title: $EF_{grid,CM,y}$
Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO2/MWh)</td><td>3, 6</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>No</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table>See B.6.2.13 and B.6.2.14</td><td>Open</td><td>☑</td></tr>
<tr><td>B.7.1.5. Parameter Title: PEFC,j,y
CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr). Calculated as per the latest version of the “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”</td><td>3, 6</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>No</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>Open</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes The amount of diesel consumption is base in the Installation and operation date report and Rating calculation record. See B.7.1.14 and B.7.15		
B.7.1.6. Parameter Title: Cap_{PJ} (only applicable to hydropower plant projects) Installed capacity of the hydro power plant after the implementation of the project activity (W).	3, 6	Not applicable	☑	☑
B.7.1.7. Parameter Title: A_{PJ} (only applicable to hydropower plant projects with reservoir) Area of the reservoir measured in the surface of the water, after the implemenation of the project activity, when the reservoir is full (m^2).	3, 6	Not applicable	☑	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.7.1.8. Parameter Title: $w_{Main,CO2}$
Average mass fraction of CO_2 in the produced steam tCO2/t steam
(for geothermal projects only)</td><td>3, 6, 50 54</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>No</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>
<u>Clarification Request No.10.</u>
Please submit the samplings and measurements done to determine the value used for $w_{Main,CO2}$ Average mass fraction of CO_2 in the produced steam tCO_2/t steam.
</td><td>CR10</td><td>☑</td></tr>
<tr><td>B.7.1.9. Parameter Title: $w_{Main,CH4}$
Average mass fraction of CH_4 in the produced steam (tCH4/t steam). for geothermal projects only)</td><td>3, 6, 50 54</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>Yes</td></tr>
</table>
</td><td>CR11</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Has this value been verified? — No Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes **Clarification Request No.11.** Please submit the samplings and measurements done to determine the value used for $w_{Main,CH4}$ Average mass fraction of CH_4 in the produced steam tCH_4/t steam.		
B.7.1.10. Parameter Title: $M_{S,y}$ Quantity of steam produced during the year y. (for geothermal projects only)	3, 6, 50 54	Monitoring Checklist — Yes / No Title in line with methodology? — Yes Data unit correctly expressed? — Yes Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided for estimation? — Yes Has this value been verified? — Yes Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes	CR12	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Clarification Request No.12. As was observed during the onsite visit, there is an interconnection between the steam pipes of Unit 1 (previously installed) and Unit 2 (project activity proposed) normally closed, due this connection the steam produced by unit 1 can be used in turbine 2 and vice versa. See below the approaches required: • The project participant should explain in detail the connection points. • A procedure should be defined to ensure that the steam from Unit 1 won't be used to produce energy in Unit 2. In case that it happens, a conservative approach should be used to deduct the electricity produced with steam from the other unit. • In case that Unit 2 supplies steam to Unit 1, first, a procedure should be defined to measure the stem produced in the plant and used in the other unit, also this balance can works to know the amount of steam released in the rock muffler. Second, to ensure that this steam will not be released to the atmosphere, and in this case how the balance done should help to determine in conservative manner the project emission due NCG. Any additional procedure defined for steam and electricity measurement, should be details as part of Annex4.		
B.7.1.11. Parameter Title: $EG_{existing,y}$ The actual, measured electricity supplied to the grid by existing units in year y (MWh).	3, 6, 52	Monitoring Checklist / Yes / No Title in line with methodology? — No Data unit correctly expressed? — No Appropriate description of parameter? — No Source clearly referenced? — No	CAR13	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Correct value provided for estimation? — No Has this value been verified? — No Measurement method correctly described? — No Correct reference to standards? — No Indication of accuracy provided? — No QA/QC procedures described? — No QA/QC procedures appropriate? — No **Corrective Action Request No.13.** This parameter ($EG_{existing,y}$) Should be added in the monitoring plan.		
Parameters related to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"				

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.7.1.12. Parameter Title:
Quantity of fuel type i combusted in process j during the year y
FCi,j,y</td><td>3, 6, 7, 52</td><td><table>
<tr><td>Monitoring Checklist</td><td>Yes / No</td></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>No</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>
<u>Clarification Request No.13.</u>
The Project Participant has to submit the Measurement & record of diesel fuel consumption for emergency genset.</td><td>CR13</td><td>☑</td></tr>
<tr><td>B.7.1.13. Parameter title:
Weighted average mass fraction of carbon in fuel type i in year y - $W_{C,I,y}$</td><td>3, 6, 7, 91</td><td>Not applicable</td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.14. Parameter title:
Weighted average density of fuel type i in year y - $\rho_{i,y}$</td><td>3, 6, 7, 91</td><td>Not applicable</td><td>☑</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.7.1.15. Parameter title:
Weighted average net calorific value of fuel type i in year y - NCVi,y</td><td>3, 6, 7, 91</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropria e description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>No</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>
<u>Corrective Action Request No.14.</u>
Value to be applied according Tool for NCVy should be 43.3 TJ/kt
IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
</td><td>CAR14</td><td>☑</td></tr>
<tr><td>B.7.1.16. Parameter title:
Weighted average CO2 emission factor of fuel type i in year y - $EF_{CO2,i,y}$</td><td>3, 6, 7, 91</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
</table>
</td><td>CAR15</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Source clearly referenced? — Yes Correct value provided for estimation? — No Has this value been verified? — Yes Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes **Corrective Action Request No.15.** The value to be applied for EFCO2f,y should be "Effective CO2 emission factor (kg/TJ)" not value in column A of table 1.4 of IPPC Value to be applied according Tool EFCO2f,y should be 74.8 tCO2/TJ IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.		
B.7.2. Description of the monitoring plan				
B.7.2.1. Is the operational and management structure clearly described and in compliance with the envisoned situation?	1, 3, 76	Yes, the structure is described in section B.8. the envisioned situation about monitoring task are included.	☑	☑
B.7.2.2. Are responsibilities and institutional arrangements for data collection and archiving clearly provided?	1, 3, 76	Yes, the CDM Project Manager is likely to be on a day to day basis responsible for the activities required to calculate the emission reductions	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
B.7.2.3. Does the monitoring plan provide current good monitoring practice?	1, 3, 76	Yes, the monitoring plan provide good practice if CARs and CR in section B.7 are solved.	Open	☑
B.7.2.4. If applicable: Does annex 4 provide useful information enabling a better understanding of the envisoned monitoring provisions?	1, 3, 76	No information provide in Annex 4	☑	☑
B.8. Date of completion of the application of the baseline study and monitoring methodology an the name of the responsible person(s)/entity(ies)				
B.8.1. Is there any indication of a date when the baseline was determined?	1, 3	Yes, in section B.8 the date of baseline determination is shown as 9 January 2009 Reviewed and released by SCC Technical Review Team headed by Gareth Phillips. This has been revised in the final PDD.	☑	☑
B.8.2. Is this consistent with the time line of the PDD history?	1, 3	Yes, the project history has been reviewed and it is consistent with the information shown in the PDD.	☑	☑
B.8.3. Is the information on the person(s) / entity(ies) responsible for the application of the baseline and monitoring methodology provided consistent with the actual situation?	1, 3	Yes, the information about the persons responsible for application of the baseline and monitoring methodology is state in the PDD and it is consistency with actual situation.	☑	☑
B.8.4. Is information provided whether this person / entity is also considered a project participant?	1, 3	Yes, Mr. Gareth Phillips from Sindicatum Carbon Capital Limited is listed in annex 1 like participant of project activity.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
C. Duration of the project activity / crediting period				
C.1. Duration of the project activity				
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	1, 3, 23,	**Corrective Action Request No.16.** In accordance with the "Glossary of CDM Terms" the starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. After check all the project time line and documentation relating the project implementation, the starting date of the project activity should be corrected, based in the document: "Engineering and Procure and Construction Agreement for the Steamfield above Ground System and Power Plant Project." Being the staring date 30th January 2007 (20/01/2007) The document mentioned is the agreement between MNL and Sumitomo Corporation to engineer, procure and construct the Steamfield Above Ground System which will transmit and process the geothermal fluids, steam, condensate and brine to supply steam to the plant and to engineer, procure and construct the plant that will convert thermal energy in the form of geothermal steam into electric power. The project participant should correct the date in the PDD using the format DD/MM/YYYY.	CAR16	☑
C.2. Choice of the crediting period and related information				
C.2.1. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max.	1, 3	Yes, the crediting period is defined as renewable period of 7 years, it is reasonable according equipment and technology characteristics	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
10 years)?				
D. Environmental impacts				
D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts				
D.1.1. Has the analysis of the environmental impacts of the project activity been sufficiently described?	1, 3, 41, 83 - 85	Yes, the laws applicable regarding the environmental assessment required for this kind of plants are mentioned. The information about the assessment done, include Air quality, noise intensity, job opportunities and water quality. The complete environmental study done for the project was reviewed during on site audit, corroboration the study comply the laws and regulation applicable.	☑	☑
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, has an EIA been approved?	1, 3, 41, 83 - 85	Yes the Indonesian authority requires to the project owner develop an Environmental Impact Study, which consists of ANDAL (Environmental Impact Analysis), RKL (Environmental Management Plan), and RPL (Environmental Monitoring Plan).	☑	☑
D.1.3. Will the project create any adverse environmental effects?	1, 3, 41, 83 - 85	No adverse environmental effect described or identified due to the project implementation. Environmental license issue by local authority	☑	☑
D.1.4. Were transboundary environmental impacts identified in the analysis?	1, 3, 41, 83 - 85	There were not trans-boundary environment impacts identified in the analysis. During the on site visit the validator corroborate the impact of the project activity. Complementary the environmental license issued implicates deliver a report quarterly with monitoring results of parameter like: noise level, air and water quality, etc. This report was reviewed, the site comply satisfactory with the environmental authority requirements.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party				
D.2.1. Have the identified environmental impacts been addressed in the project design sufficiently?	1, 3, 41, 83 - 85	Yes, the description delivered in the PDD summarizes correctly the information about Environmental Impact Study developed on site which includes: Environmental Impact Analysis, Environmental Management Plan, and Environmental Monitoring Plan. The key parameters in the study have been included in this section and they were corroborated through the revision of the documents mentions and license issued.	☑	☑
D.2.2. Does the project comply with environmental legislation in the host country?	1, 3, 41, 83 - 85	Yes, the project is in line with the legislation of the host country	☑	☑
E. Stakeholders' comments				
E.1. Brief description how comments by local stakeholders have been invited and compiled				
E.1.1. Have relevant stakeholders been consulted?	1, 3, 77 - 82	According the PDD the stakeholder consulted include among others: • Local residents • Local village representatives • Interested nongovernmental organizations • PT Pertamina Geothermal Energy • PT Perusahaan Listrik Negara During the site visit, the list of participants of the stakeholder meeting and minutes were not available.	CR14	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Clarification Request No.14. Please submit the complete list of attendants and minutes of the meeting realized.		
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	1, 3, 77 - 82	The PDD mentions that a public notice of the meeting was posted in the local newspaper. It is considered appropriate. However, on site the evidence for the same was not available. **Clarification Request No.15.** Please submit a copy of the advertisement published for the stakeholder meeting.	CR15	☑
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	1, 3, 77 - 82	No requirements form host country for stakeholder consultation.	☑	☑
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	1, 3, 77 - 82	Yes, the relevant details of the consultation have been included in the PDD. See E.1.1 and E.1.2.	Open	☑
E.2. Summary of the comments received				
E.2.1. Is a summary of the stakeholder comments received provided?	1, 3, 77 - 82	Yes, in the PDD there is delivered a summary of the comments received in the meeting. The same needs to be verified based on the evidences to be submitted. See E.1.1 and E.1.2.	Open	☑
E.3. Report on how due account was taken of any comments received				
E.3.1. Has due account been taken of any stakeholder comments received?	1, 3, 77 -	The answers to each comment and questions are summarized in the PDD, the comments don't require any specific actions from	open	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
	82	the project developer. See E.1.1 and E.1.2.		
F. Annexes 1 - 4				
Annex 1: Contact Information				
F.1.1. Is the information provided consistent with the one given under section A.3?	1, 3	Yes, the information is in consistency with the data shown in section A.3.	☑	☑
F.1.2. Is the information on all private participants and directly involved Parties presented?	1, 3	Yes, the data presented for each participant is clear and complete.	☑	☑
Annex 2: Information regarding public funding				
F.1.3. Is the information provided on the inclusion of public funding (if any) in consistency with the actual situation presented by the project participants?	1, 3, 14, 15	No information given in Annex 2. The Single statement appears in annex 2: "INFORMATION REGARDING PUBLIC FUNDING" **Corrective Action Request No.17.** The single statement "INFORMATION REGARDING PUBLIC FUNDING" is not enough. The project participant should include information regarding the project financing. In case that more details about this topic are described in other section in the PDD a reference should be added, including a summary of the financing details. The section cannot be left in blank.	CAR17	☑
F.1.4. If necessary: Is an affirmation available that any such funding from Annex-I-countries does not result in a diversion of ODA?	1, 3, 14, 15	See F.1.3	Open	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
Annex 3: Baseline information				
F.1.5. If additional background information on baseline data is provided: Is this information consistent with data presented by other sections of the PDD?	1, 3, 6, 44 - 47, 55	Most of the data used for the baseline determination is public and it is clearly referred in footnote in section B.6 The calculation of the grid emission factor refers to Registered Project 1313 : MEN-Tangerang 13.6MW Natural Gas Co-generation Project. This has been subsequently revised in the final PDD.	☑	☑
F.1.6. Is the data provided verifiable? Has sufficient evidence been provided to the validation team?	1, 3, 6, 44 - 47, 55	Yes, the data used has been reviewed; all the information provide is verifiable. See correction required in B.6.2.13 and B.6.2.14	Open	☑
F.1.7. Does the additional information substantiate / support statements given in other sections of the PDD?	1, 3, 6, 44 - 47, 55	Yes, the information used in other sections of the PDD also refers to Registered Project 1313: MEN-Tangerang 13.6MW Natural Gas Co-generation Project and PLN statistics. This has been subsequently revised in the final PDD.	☑	☑
Annex 4: Monitoring information				
F.1.8. If additional background information on monitoring is provided: Is this information consistent with data presented in other sections of the PDD?	1, 3, 51, 76	No information shown in annex 4. **Clarification Request No.16.** In case of more information about monitoring have been developed (draft monitoring manual, procedures, extensive organizational chart, etc.) the information should be submitted to the validation team. Additional information required in B.7.1.10 could be added in this annex.	CR16	☑
F.1.9. Is the information provided verifiable? Has sufficient evidence been provided to the vali-	1, 3, 51,	See F.1.8	Open	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	dation team?	76			
F.1.10.	Do the additional information and / or documented procedures substantiate / support statements given in other sections of the PDD?	1, 3, 51, 76	See F.1.8	Open	☑

Table 2 Resolution of Corrective Action and Clarification Requests

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Corrective Action Request No.1. More information about Wayang Windu Unit 1 has to be included in the PDD. Give details about operation of Unit 1 and interaction with Unit 2 (steam connections). The information to be added should include how the project participant will ensure the proper measurement of steam produce from both units.	A.2.1	Changes made in the PDD version 2 section A.2: The proposed project activity, Wayang Windu Phase 2 Geothermal Power Project, is the construction and operation of a 117MW geothermal power station, which is an additional power unit to an existing grid-connected renewable power plant. As the project activity is an electricity capacity addition to the existing capacity, the steam measurement will be taken at the Wayang Windu Phase 2 well heads and at upstream of Wayang Windu Phase 2 turbine. The higher value from both of the steam measurement will be taken in order to be conservative. For detailed monitoring and measurement, refer to: "WW2 Monitoring Plan" With regard to the fact that there are interconnections for steam flows of unit 1 and unit 2 we consider the project not any longer as an independent power project but as capacity addition to an existing renewable energy plant, a further applicable scenario under ACM0002. Thus we can avoid any deviation from the monitoring methodology as this will disable us (the PPs) from taking any advantage from steam flows between the two units. If unit 2 is shut down and steam would flow to unit 1 there is no additional power generation as the historic capacity of unit 1 will be discounted from the total amount of electricity	A clear and transparent description about the standard scenario (steam flowing from unit 1 and unit 2 going to respective generators) and possible exceptions of steam flow to alternative units has been described in the PDD. The monitoring plan clearly explains the procedure to follow for the monitoring of steam. Using a Veturi flow meter (Msv) which is located at the upstream of unit 2 turbine (location corroborated during on site visit) the PP measure all the steam that enter in the unit 2, it is indeferent of any flow over the interconnections, and there is a Orifice plates meter (Mso) located at the 7 wellheads from unit 2. In order to be conservative, the primary data will be taken from the higher values form either Msy or sum of Mso. With regard the mass fractions of CO2 and CH4 in the steam produced, the primary data for each hour when Mso > Msv will be taken from the analysis from the gas sampling carried out in the production wells. In the

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
		generated. On the other hand project emissions will be discounted by emissions of the steam which is monitored at the wells so the total ER will be negative. In case steam may flow from unit 1 to unit 2 when unit 1 is shut down there will be no additional ERs counted for as historic data will be discounted again, while the total amount of steam will be monitored by the venturi tube.	case when Msv > Mso the analysis result at the entrance of unit 2 has to be used in emission reduction calculations. ☑
Clarification Request No.1. A project schedule with the details about the project implementation should be submitted.	A.2.2 A.2.3 A.4.3.5 B.6.4.3	Refer to: "CR 1 - Project Schedule.doc"	The project schedule has been submitted, this document describe all the activities developed for the project implementation, from Signing of EPC Contract for power plant and steam pipeline (considered as the starting date of the project activity) to Expected Commercial Operation Date, the requirement has been covered. ☑
Clarification Request No.2. A confirmation letter (or similar document like contract) from each entity involved in the project confirming their participation should be submitted to the validator.	A.3.2	Modalities of Communication will be signed by the Project Participants and will be submitted separately	The Modalities of communication letter has been submitted to the validation confirming the participation of each entity mentioned in the PDD as project participant. ☑
Clarification Request No.3. Details about the purchase/source and source the technical equipment/know should be given to corroborate if technology has been transferred from annex-I-countries to the host country.	A.4.3.3	Changes made in the PDD version 2 section A.4: "Sumitomo Corporation, a Japanese corporation, is appointed to be the source of the technical equipment, responsible for the engineering, procurement and construction of the Project. Knowledge transfer is ensured through a comprehensive training for Magma Nusantara	Information regarding the technology used in the project has been included in the version 2 of the PDD. Complementary more details about equipment can be found in EPC contract and proof submitted about raining developed by the contractor.

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
		Limited, the Owner's operation and maintenance personnel. The training shall cover the configuration and maintenance of all Equipment and systems of the Project designed and supplied by the Contractor." Refer to folder "CR 3 – WW2 Training Proof" and EPC Contract, fire fighting and deluge valves,	☑
Clarification Request No.4. In order to ensure the sensitivity for Emission Reduction Monitoring, the Project Participant should develop training sessions about CDM Requirements, conservativeness, monitoring reports, verification procedures, quality assurance, etc. In case that monitoring training is in early stage, a program detailing this consideration should be submitted.	A.4.3.8	Refer to: "WW2 Monitoring Plan"	The document submitted has relevant information about measurement, reporting and quality assurance/quality control for all the parameters required to determine the Emission Reduction. The details given in the document submitted reflect sensitivity for Emission Reduction Monitoring according the CDM requirement. Issue closed. ☑
Corrective Action Request No.2. The PDD should give details about project financing to let clearly know that no public funding funds has been used in the project.	A.4.5.1	Changes made in the PDD version 2 section A.4.5: "The project financing portion comes from Standard Chartered Bank Singapore and the equity portion comes from the project owner's shareholders. Therefore the project activity is not using any public fund. Funding of the project will be disclosed to the DOE during validation."	The latest version of the PDD submitted to the validator reflects the information required, the statement given has been verified through the revision of Financial closure with Standard Chartered Bank. The project has been financed as it is explained in the project participant response as well in the PDD. ☑
Clarification Request No.5. The Project Participant has to confirm that the data used to calculate the emission fac-	B.1.1	The ex-ante grid emission factor of 0.891 tCO2/MWh is reported by the Department of Energy and Mineral Resources of Indonesia - Directorate	The documents submitted confirm the utilization of the most recent data available. Two letters from the Indo-

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
tor of the grid are the most recent data available. A letter (or similar communication) from PLN (National Electricity Company of Indonesia) confirming that will clarify the issue.		General of Electricity and Energy Utilization on 13 February 2009 and 24 December 2008 to the Indonesian DNA/Environmental Ministry, which then endorsed the data on 19 January 2009. The emission factor is calculated based on *tool to calculate the emission factor for an electricity system version 01.1* issued by CDM EB on 19 October 2007 based on the latest published data available, i.e. data from year 2004 to 2006. Refer to: "CR 5 - EF from Indonesian Authority.pdf", CR 5 - EF from Indonesian Env Ministry.pdf", "CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls"	nesian authorities confirm the correct value of the emission factor of Jamali grid, these letters published by Indonesian Authorities indicating the utilization of ACM0002 Methodology and Tool to calculate the emission factor for an electricity system version 01.1. Further, PP submitted the EF calculations based on publicly available data in line with the tool, which have been cross-checked by the audit team. ☑
Clarification Request No.6. Please provide substantiating evidence to confirm that the data used to calculate the emission factor of the grid are the most recent data available.	B.2.5	Jamali Grid has been clearly defined, as per official data received from the Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization on 13 February 2009 and 24 December 2008. Refer to: "CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls"	The documents submitted corroborate the Jamali Grid definition as was presented in the PDD. The Document mentioned as "CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls" shown the calculation of Build, Operating and Combined Margin of Jamali grid with all the information of list of plants, fuel consumption, energy generation. ☑
Corrective Action Request No.3. The operation of the steam pipelines includes an emergency procedure to release the steam in the rock muffler. The Fugitive Emissions from non-condensable gases contained in geothermal steam released in this stage should be taken in account for	B.3.1 B.7.1.10	The quantity of steam produced is recorded daily by means of a Venturi flow meter (M_{sv}) located at the upstream of the Wayang Windu Unit 2 turbine and Orifice Plates (M_{so}) located at the Wayang Windu Unit 2 well heads. In order to be conservative, the primary data will be taken from the higher values from either M_{sv} or sum	The approach used for the result in more conservative calculation of emission reduction. The procedure for monitoring of Quantity of steam produced is described in the WW2 Monitoring Plan and includes information like: Primary data source, Measurement equipment, calibration,

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
project emission. The project participant should define a procedure to measure this portion of steam released.		of M_{so} Emission from rock muffler no longer required to be monitored, as our approach is already more conservative. For detailed monitoring and measurement, refer to: "WW2 Monitoring Plan"	Maintenance, recording frequency data collection and transfer procedures, QA/QC, and fall back procedure. With the approach defined the measurement of steam rock muffler is not longer required. ☑
Corrective Action Request No.4. The diesel consumption in the site comes from the backup generation set and fire pump, these equipments can operate for both Units (Unit1 plan previously installed and unit 2 the project activity proposed). The amount of diesel can be measured accurately but not the portion of diesel that corresponds to each unit. The project Participant should define a procedure to deduct the emissions from combustion of fossil fuels due the operation of these devices.	B.3.2	To be conservative, all diesel consumption for back-up generation set and fire pump for both Wayang Windu Unit 1 and Unit 2 will be considered as the diesel consumption for the project activity. For detailed monitoring and measurement, refer to: "WW2 Monitoring Plan"	The approach used for the result in more conservative calculation of project emission. The procedure for monitoring of CO2 emissions from fossil fuel combustion in the operation of the power plant (diesel genset and fire pump) is described in the WW2 Monitoring Plan and includes information like: Primary data source, data collection transfer procedures and QA/QC. The calculation of this emission is inline with the tool requirements. ☑
Corrective Action Request No.5. Complementary, in the figure 5 shown in section B.3, the rock muffler can be included since in this stage the potential project emission will happened.	B.3.7	Rock muffler has been included in figure 5, however the emission from the rock muffler need not to be monitored. Refer to CAR No. 3	The rock muffler has been included in figure 5 as was required. The measurement of emission from the rock muffler is nor required since The quantity of steam produced is recorded daily by means of a Venturi flow meter (Msv) located at the upstream of the Wayang Windu Unit 2

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
			turbine and Orifice Plates (Mso) located at the Wayang Windu Unit 2 well heads, and the conservative approach takes as primary data the higher values from either Msv or sum of Mso. ☑
Clarification Request No.7. The project participant should include documentation that support the plausibility of the alternatives listed in sub-step1a (i.e. make reference to investment analysis, submit the legal conformance of the company where being explained the type of power plants operated by the group, company polices, etc.	B.5.2	The project owner is appointed by Pertamina Geothermal Energy to be the exclusive developer for the Wayang Windu geothermal area and does not have a business license to develop any other projects in Indonesia. Refer to Wayang Windu Joint Operation Contract (submitted to TUV SUD during validation)	As excerpt of the Joint Implementation Contract regarding this subject, it is stated that project owner desire to join and assist Pertamina in accelerating the exploration and development of the potential geothermal energy resources with in such area and the conversion of such geothermal energy resources to electricity and that the project owner is a corporation with technical competence and professional skill (specifically) to carry out the geothermal operation required by the project. This information clarify the issue. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Corrective Action Request No.6. Information regarding the compliance of laws and regulation for the other alternatives listed in step 1 should be given.	B.5.4	Changes made in the PDD version 2 section B.5: "The alternatives, i.e. construction of a new geothermal power plant connected to the local grid, construction of a thermal power plant and continuation of the current situation (electricity will continue to be generated by existing generation mix operating in the JAMALI grid, with capacity additions as planned) are in compliance with all mandatory applicable legal and regulatory requirements"	New statement can be read in the PDD in section B.5 about the compliance with the laws and regulation of alternative listed. The alternative of new geothermal power plant connected to the grid is in line with regulation and laws, proof of that are the contracts obtained by the project owner for Wayan Windu 2 unit: Joint Implementation Contract with Pertamina, Energy Sales Contra with PLN, Plant Approval form General Director of Electricity/energy Ministry, Installation approval from Director of mineral, coal and geothermal (part of Energy Ministry), approval from West java Provincial (environmental local authority). About the alternative to install a thermal power plant, there is obvious preference from the Indonesian government for this kind of plants particularly for coal as the primary energy resource, proof of that is the abundance of fossil fuel reserves in Indonesia that have been assessed against the Coal Fact, 2006 Edition, World Coal Institute (Indonesia is the 7th largest coal producer globally) and Regulation No. 146/PMK.01/2006

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Continuation of CAR6 conclusion.			"Crash Program" to develop 10,000 MW of additional power generation capacity by 2010. ☑
Clarification Request No.8. The project participant has to explain what capacity has been used for the financial analysis (110MW or 117MW, minus house load).	B.5.11	The capacity that has been used in the financial analysis = 117 MW minus house load of 3.5 MW. The capacity of 117 MW is based on the EPC Contract and the house load 3.5 MW is a typical house load, based on Wayang Windu 1. Refer to EPC Contract (as submitted earlier) and "CR 8 - House Load Usage 2004-2006 (Wayang Windu Unit 1).xls"	As it is explained in the project participant response, the financial analysis has been done using the capacity the 117MW minus the house load. The historic data from Wayang Windu Unit 1of transformer import MWH for 2004-2006 has been used to determine the house load used in financial analysis. ☑
Corrective Action Request No.7. A more extensive conclusion about the impact of the CDM registration should be added.	B.5.17	Changes made in the PDD version 2 Section B.5, sub-step 2c: The IRR of the project without CDM revenues is 16.62% which is below the market benchmark required rate of return of 19.21%. The IRR of the project with CDM revenues is 19.26%. The additional revenues from the sale of CERs increase the project's IRR to the required return for an average investor in this type of power project. The perception of the carbon market was that the carbon price will increase over the time, and hence this was considered to balance the remaining risks. In addition to the improvement to the project's IRR, the additional CER revenue gives a secondary stream of revenues in EURO or USD.	New statement can be read in the PDD in section B.5 about the impact of CDM registration. The information required has been added. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
		Therefore the project activity only becomes financially viable if the project activity generated additional revenue from the CDM through the sale of the emission reductions.	
Corrective Action Request No.8. About the OM, the PDD does not specify the option selected (see step 2 of Tool to calculate the emission factor for an electricity system) ex-ante or ex-post option. The PDD should define it and clearly explain in the PDD.	B.6.2.2	Changes made in the PDD version 2 section B.6: The data vintage chosen in this project is ex-ante option.	The PDD version 2 explains clearly that ex- ante option has been selected for calculations. Correction done and issue closed. ☑
Corrective Action Request No.9. According the Tool to calculate the emission factor for an electricity system, the values that should be used for Emission Factor calculation are: the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	B.6.2.13 B.6.2.10 B.6.2.11 B.7.1.4	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval may be used if the regional or national average default values are not available. In our PDD, we have used the data reported by the Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization on 13 February 2009 and 24 December 2008 to the Indonesian DNA/Environmental Ministry, which were endorsed by Indonesia DNA on 19 January 2009. Hence, no changes are required.	As primary data the Project Participant uses the data reported by the National Authorities. The data submitted has been reviewed by the validator “CR 5 - EF from Indonesian Authority.pdf”, CR 5 - EF from Indonesian Env Ministry.pdf” and“CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls” the Emission Factor used in the project is acceptable. ☑
Corrective Action Request No.10. The Net calorific value for Coal (21.34 TJ/kt) is not justified; the source used does not specify what kind of coal is used. According the CO_2 emission factor of fossil fuel type used for coal (96.1tCO_2/TJ) the DOE inferred that it is Sub-Bituminous Coal, but it should be clarified. In the case that Sub-	B.6.2.13 B.6.2.10 B.6.2.11 B.7.1.4 F.1.6	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval may be used if the regional or national average default values are not available/no reliable values are documented in regional or national energy statistics. In our PDD, we have used the data reported by the	As primary data the Project Participant uses the data reported by the National Authorities. The data submitted has been reviewed by the validator “CR 5 - EF from Indonesian Authority.pdf”, CR 5 - EF from Indonesian Env Ministry.pdf” and“CR 5 - GHG_JAWABALI_2006_DJLPE-

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Bituminous Coal is the fuel type use the correct value, see below. Values used in calculation: HSD & Diesel Oil: 43.00 TJ/kt MFO: 40.40 TJ/kt Coal: 21.34 TJ/kt Natural Gas: 48.00 TJ/kt Values that should be used to calculate the Emission factor: HSD & Diesel Oil: 41.40 TJ/kt MFO: 39.80 TJ/kt Coal: 11.50 TJ/kt Natural Gas: 46.50 TJ/kt		Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization on 13 February 2009 and 24 December 2008 to the Indonesian DNA/Environmental Ministry, which were endorsed by the Indonesia DNA on 19 January 2009. Hence, no changes are required.	FINAL.xls" the Emission Factor used in the project is acceptable. ☑
Corrective Action Request No.11. According the Tool to calculate the emission factor for an electricity system, the values that should be used for Emission Factor calculation are: the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories Values used in calculation: HSD & Diesel Oil: 74.1 tCO2/TJ	B.6.2.14 B.6.2.10 B.6.2.11 B.7.1.4 F.1.6	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval may be used if the regional or national average default values are not available/no reliable values are documented in regional or national energy statistics. In our PDD, we have used the data reported by the Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization on 13 February 2009 and 24 December 2008 to the Indonesian DNA/Environmental Ministry, which were endorsed by Indonesia DNA on 19 January 2009. Hence, no changes are required.	As primary data the Project Participant uses the data reported by the National Authorities. The data submitted has been reviewed by the validator "CR 5 - EF from Indonesian Authority.pdf", CR 5 - EF from Indonesian Env Ministry.pdf" and"CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls" the Emission Factor used in the project is acceptable. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
MFO: 77.4 tCO2/TJ Coal: 96.1 tCO2/TJ Natural Gas: 56.1 tCO2/TJ Values that should be used to calculate the Emission factor: HSD & Diesel Oil: 72.6 tCO2/TJ MFO: 75.5 tCO2/TJ Coal: 92.8 tCO2/TJ Natural Gas: 54.3 tCO2/TJ			
Clarification Request No.9. The project Participant has to submit the spreadsheet with the calculations in order to review the data used in the Emission Reductions calculations (including the Grid Emission Factor), and the correction about the Diesel figure of project emission.	B.6.3.2 B.6.3.3 B.6.3.4	Refer to "CR 9 - ER calculation.xls" and "CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL.xls" Regarding the diesel fuel consumption, as amended in the PDD version 2 section B.6: The consumption of diesel fuel and its characteristic will be recorded during the crediting period. To be conservative, for the calculation in this PDD, the amount of diesel fuel will be taken by doubling the volume of the diesel consumption in Wayang Windu 1.	The spreadsheet with the Emission Reduction calculation has been submitted as was required. The document is complete and correct. The approach used to calculate the project emission due fuel consumption is more conservative. The issue has been clarified satisfactorily. ☑
Corrective Action Request No.12. The figure shown in section B.7.1 of EGy is 886,293 MWh. Value used to calculated emission reductions and shown in other section is EGy = 924,661.8 MWh/yr. It should be corrected.	B.7.1.2	Changes made in the PDD version 2 section B.7	The Version 2 of the PDD reflects the correction. Issue solved. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Clarification Request No.10. The Project Participant has to submit the samplings and measurements done to determine the value used for $w_{Main,CO2}$ Average mass fraction of CO_2 in the produced steam tCO_2/t steam.	B.7.1.8	Refer to "CR 10 and CR 11 - mass fraction in steam.pdf"	The document required has been submitted. The result from external laboratory corroborate the value applied (4.1 * 10-3 tCO2/t steam). ☑
Clarification Request No.11. The Project Participant has to submit the samplings and measurements done to determine the value used for $w_{Main,CH4}$ Average mass fraction of CH_4 in the produced steam tCH_4/t steam.	B.7.1.9	Refer to "CR 10 and CR 11 - mass fraction in steam.pdf"	The document required has been submitted. The result from external laboratory corroborate the value applied (1.96 * 10-6 tCH4/t steam). ☑
Clarification Request No.12. As was observed during the onsite visit, there is an interconnection between the steam pipes of Unit 1 (previously installed) and Unit 2 (project activity proposed) normally closed, due this connection the steam produced by unit 1 can be used un turbine 2 and vice versa. See below the approaches required: The project participant should explain in detail the connection points. A procedure should be defined to ensure that the steam from Unit 1 won't be used to produce energy in Unit 2. In case that it happens, a conservative approach should be used to deduct the electricity produced with steam from the other unit. In case that Unit 2 supply steam to Unit 1,	B.7.1.10 F.1.8	Refer to CAR No 1. For detailed monitoring and measurement, refer to: "WW2 Monitoring Plan"	The change done in section A.2 reflects in better manner the project situation, installation of unit 2 as additional to the existing facility (unit 1). The project meets all the applicability criteria of the methodology. As it is explained in the project participant response, the higher value of steam measurement will be taken for conservativeness. The project infrastructure permits the measurement of stem at well heads and at upstream in the turbine, it was corroborating during the on site visit, it permits determine a reliable steam balance. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
first, a procedure should be define to measure the stem produced in the plant and used in the other unit, also this balance can works to know the amount of steam released in the rock muffler. Second, to ensure that this steam will not be released to the atmosphere, and in this case how the balance done should help to determine in conservative manner the project emission due NCG. Any additional procedure defined for steam and electricity measurement, should be details as part of Annex4.			
Corrective Action Request No.13. This parameter ($EG_{existing,y}$) Should be added in the monitoring plan.	B.7.1.11	Changes made in the PDD version 2 section B.7	This parameter has been included in the latest PDD. ☑
Clarification Request No.13. The Project Participant has to submit the Measurement & record of diesel fuel consumption for emergency genset.	B.7.1.12	Refer to folder: CR 13 - Diesel consumption, which contains the following files: CR13 - diesel consumption calculation.xls CR13 - Diesel Consumption Records for Unit 1 2003-2008.xls CR 13 - EDG1.JPG CR 13 - Fire pump2.JPG Comment by TÜV SÜD: The information required has been submitted. The diesel consumption has been calculated correctly and crosscheck with historical records of diesel consumption from unit 1 from year 2003 to 2008.	The correct amount of L/hr consumed in the fire pump has been used, the calculation of the project emission also reflect the correction done. Issue closed. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
		The information submitted includes relevant information like reference to define the Typical EDG consumption (75% load) 213 L/hr for Generation and fuel consumption from fire pump, the validator notice a mistake in the value taken for this equipment, it should be 53 L/hr instead 14 (this figure correspond to other units gal/ht). Please correct calculations according.	
Corrective Action Request No.14. Value to be applied according Tool for NCVy should be 43.3 TJ/kt IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	B.7.1.15	Changes made in the PDD version 2 section B.7	The latest version of the PDD reflects the correction required. The Weighted average net calorific value of diesel fuel used in the PDD is correct. ☑
Corrective Action Request No.15. The value to be applied for EFCO2f,y should be "Effective CO2 emission factor (kg/TJ)" not value in column A of table 1.4 of IPPC Value to be applied according Tool EF-CO2f,y should be 74.8 tCO2/TJ IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	B.7.1.16	Changes made in the PDD version 2 section B.7	The latest version of the PDD reflects the correction required. The Weighted average CO2 emission factor of diesel fuel used in the PDD is correct. ☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Corrective Action Request No.16. In accordance with the "Glossary of CDM Terms" the starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. After check all the project time line and documentation relating the project implementation, the starting date of the project activity should be corrected, based in the document: "Engineering and Procure and Construction Agreement for the Steamfield above Ground System and Power Plant Project." Being the staring date 30th January 2007 (20/01/2007) The document mentioned is the agreement between MNL and Sumitomo Corporation to engineer, procure and construct the Steamfield Above Ground System which will transmit and process the geothermal fluids, steam, condensate and brine to supply steam to the plant and to engineer, procure and construct the plant that will convert thermal energy in the form of geothermal steam into electric power. The project participant should correct the date in the PDD using the format DD/MM/YYYY.	C.1.1	Changes made in the PDD version 2 section B.7: "Based on the latest Glossary of CDM terms (Version 04), Starting date of a CDM Programme activity is the earliest date at which either the implementation or construction or real action of a programme activity begins. The Purchase contract for Tubular components for geothermal drilling has a total value of less than 5% of the overall CAPEX of the project. Hence based on the EB latest definition of the starting date of the project activity, the purchase of the tubular components is considered immaterial and the project is still reversible. The earliest date at which the implementation, construction, and real action of the programme activity began was on 30 January 2007, when the contract for the Engineering, Procurement, and Construction of the project was signed. This is taken as the starting date of the project activity." WACC has been updated based on the new starting date of the project activity. CAPEX has also been updated by excluding the IDC cost. Refer to "CAR 16 – WACC" "CAR 16 – Financial Model.xls"	The starting date of the project activity has been corrected in the latest version of the PDD. The section B.5 in the PDD also reflects the correction in WACC calculation, Therefore the project activity only becomes financially viable if the project activity generated additional revenue from the CDM through the sale of the emission reductions. ☑
Clarification Request No.14. The Project Participant has to submit the	E.1.1	Refer to "CR 14 - Attendants list during SHC.pdf",	The document required has been submitted. The Local Stakeholder meeting is described correctly in the

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
complete list of attendants and minutes of the meeting realized.		"CR 14 - Stakeholder minutes-5 Des 08- English.pdf", "CR 14 - Stakeholder minutes-5 Des 08- Bahasa.pdf"	PDD and completely documented. The information submitted solves the issue ☑
Clarification Request No.15. A copy of the advertisement published for the stakeholder meeting has to be submitted.	E.1.2	Refer to "CR 16 - WW2_Newspaper ad_28 Nov 08_2.pdf"	The document required has been submitted. The invitation to Local Stakeholder meeting is adequate. The information submitted solves the issue ☑
Corrective Action Request No.17. The single statement "INFORMATION REGARDING PUBLIC FUNDING" is not enough. The project participant should include information regarding the project financing. In case that more details about this topic are described in other section in the PDD a reference should be added, including a summary of the financing details. The sanction cannot be left in blank.	F.1.3 F.1.4	Added in the PDD: "The project financing portion comes from Standard Chartered Bank Singapore and the equity portion comes from the project owner's shareholders. Therefore the project activity is not using any public fund. Funding of the project will be disclosed to the DOE during validation."	The latest version of the PDD includes a statement which explains the project funding. The statement has been corroborated through the revision of Accounts Agreement part 1 and part 2 (Loan from Standard Charter Bank to MNL, dated 3 May 2007. ☑
Clarification Request No.16. In case of more information about monitoring have been developed (draft monitoring manual, procedures, extensive organizational chart, etc.) the information should be submitted to the validation.	F.1.8 F.1.9 F.1.10 B.7.1.10	Refer to: "WW2 Monitoring Plan"	The document submitted has relevant information about measurement, reporting and quality assurance/quality control for all the parameters required to determine the Emission Reduction. The details given in the document submitted reflect sensitivity for Emis-

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Additional information required in B.7.1.10 should be added in this annex.			sion Reduction Monitoirng according the CDM requirement. Issue closed. ☑
Clarification Request No.17. During the CB review of the project, a concern has been raised by the reviewer regarding the starting date of the project, considering that phase 1 of the project was initiated from 1997-2000. It has been confirmed through publicly available information, and further confirmed by the PP that the complete exploitation of the geothermal steam field up to a total capacity of 400 MW (part of which is Wayang Windu Phase 2) was concieved and rights have been secured way before 1997. It has also been confirmed that the work on phase 1 was completed in 1997-2000 during which the infrastructure and significant proportion of the preparation work for Phase 2 was also accomplished. The Website of AECOM, which is the service provider to Wayang Windu Phase 2, quotes 'A significant proportion of the preparation and infrastructure works for Unit 2 were completed as part of the Unit 1 development (1997 – 2000), but additional steam field development will be required to support the Unit 2 development.' Other published information also supports the above statement.	CB review	The development of Wayang Windu Unit 1 was undertaken on the basis of the development of Units 1 and 2 as an integrated Engineer, Procure and Construct (EPC) Contract with Sumitomo Corporation of Japan in 1997. The contract was structured in "phases" to allow financial commitment to the project to be confirmed in steps, as the geothermal steam was proven. First Plant (or Combined) Phase of the EPC contract included basic infrastructure for both Units 1 and 2; Second Plant (or Combined) Phase of the EPC contract included the Unit 1 turbine generator facilities; Third Plant (or Combined) Phase of the EPC contract included the Unit 2 turbine generator facilities. In practice Phases 1 and 2 were completed but Phase 3 was never awarded due to the impact of the Asian economic crisis of 1997/98/99. The basic infrastructure conducted for Unit 2 in the period of 2000 Unit includes the Unit 2 turbine-generator foundation work (14 meter depth), foundations for the Unit 2 Cooling Tower steel materials for the Unit 2 rotor and Condenser. These foundations were integral with the power house which was needed for the Unit 1 project, and did not imply any commitment to the development of a second Unit.	➢ It could be verified based on the original EPC contract awarded to Sumitomo in 1997 and final settlement contract for Unit 1 in 2000 that only *basic common infrastructure* was established for both unit 1 and 2 of Wayang Windu project during 1997 to 2000. Complete work was carried out only for Unit 1, which became operational in 2000. ➢ Subsequently, it could also be verified that there was no activity on the project, and it was only in 2007 (with new owners) that the project started its activity with CDM consideration with the award of EPC contract to Sumitomo for power plant and steam pipeline. ➢ The same could also be cross-checked with the project implementation schedule from 2007 to 2009 for Wayang Windu Unit 2, which was submitted to the validation team. Hence, it is accepted to consider the start date of the project activity to be 30th Jan. 2007.

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
In view of the above, please justify the start date of the project taken in the PDD as 30th Jan. 2007. Please provide a chronology of activities that were undertaken for WW2 before the (current) project start date, Jan. 2007. In other words, what preparation work and infrastructure was already created for WW2 project, while WW1 was implemented in 2000? Please note that CAR 16 of the protocol is not valid anymore with this new CR raised during CB review.		Unit 1 started operation as stand-alone power plant with an overdimensioned power-house and some few unused materials, a fact that increased costs without any return for the original owners. To reinforce this, in 1997 the Government of Indonesia formally advised all IPP developers to cease the development of new facilities due to the Asian Economic Crisis with the exception of Wayang Windu Unit 1 and Darajat Unit 2 . This also resulted in the Government insisting on the re-negotiation downwards of the electricity tariffs. Hence, when Star Energy took over the ownership of MNL in November 2004, the first activity which had to be undertaken was the formal renegotiation of the electricity tariff. Once completed, in November 2006, MNL was then in a position to make a decision about the economics of the development of Unit 2. It is shown within the financial analysis of the PDD that - although basic infrastructure was already in place – the remaining costs for completion of unit 2 would not have enabled a profitable operation of the project activity without the consideration of CDM. All costs for joint infrastructure and preparatory works have been excluded from this analysis therefore ensuring its conservativeness. Hence the project activity is considered as capacity addition to an existing power plant The earliest date at which the implementation, construction, and real action of the programme activity began was on 30 January 2007, when the contract	☑

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
		for the Engineering, Procurement, and Construction of the project was signed. This is taken as the starting date of the project activity. Financial closure of the project activity was even achieved in June 2007 only, after convincing Standard Charted Bank of the suitability of a concept including carbon revenues, and final notice to proceed to the EPC contractor was issued after the financial closure in June 2007. The chronology has been amended accordingly within a revised PDD version.	

Annex 2: Information Reference List

Ref. No.	Document or Type of Information
1	On-site interviews at the plant sites of the project conducted on January 27th to 30th, 2009 by auditing team of TÜV SÜD. **Validation team:** Ivan Hernandez GHG Auditor, TÜV SÜD **Interviewed persons:** Hendra Tan Star Energy - CFO Alex Smillie Star Energy – VP OP Yuliana Sutjitro Star Energy - Manager Meizani Irmandhiany Star Energy - Coordinator Johanes Star Energy - Analyst Daniel Bussin SCC – Climate Change Melanie Tantrie SCC – Associate Steven Oentoro SCC – Associate Suryantoro Praleoro SCC - VP Werner Betzenbichler SCC - SVP CC H. Dwyudha Field Manager Zerry Antro MNL – Engineer Huri Kustino MNL- SHE Yoyo Sunarya MNL – Laboratory Dian MNL – Laboratory Faiq Kaustak MNL – SHE Achmad Navual MNL – Community development Yuyun Wahyu Teacher from school built by MNL Atik Sumarni Teacher from school built by MNL
2	UNFCCC homepage http://www.unfccc.int
3	PDD, "Wayang Windu Phase 2 Geothermal Power Project " Version 2.1 dated 31st March, 2009.
4	ACM0002: Approved consolidated baseline methodology for grid-connected electricity generation from renewable sources, Version 08 and

Ref. No.	Document or Type of Information
	version 09
5	Tool for Demonstration of Additionality, version 3
6	Tool for the demonstration of additionality (Version 5.2)
7	Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02)
8	Tool to calculate the emission factor for an electricity system (Version 01.1)
9	Letter of interest of CERUPT Wayang Windu project, dated 29th January 2002.
10	Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources letter (topics of communication: CDM Base-line study, DNA Approval pendant), dated 22 August 2002
11	Acknowledgement receipt expression of interest of CERUPT, from Senter to Magma, dated 6 February 2002
12	Withdrawal of CERUPT from Senter to Magma, dated 16 December 2003.
13	Preliminary Validation of Wayang Windu 2 as a CDM project from URS, dated 09 September 2002.
14	Accounts Agreement part 1 and part 2, dated 3 May 2007.
15	Financial closure with Standard Chartered Bank, “SCB Interest Rate Swap, Transaction Ref 3790055”, dated 13 June 2007
16	Signed Consulting Services Agreement between Unocal Geothermal of Indonesia and ICF Resources to carry out the baseline study in order to meet the criteria for CDM project validation set forth by the UNFCCC. Dated 24-Jun-02
17	Signed Consulting Services Agreement between Unocal Geothermal of Indonesia and PT Dames & Moore Indonesia to provide Unocal with services as a UNFCCC accredited validator in order to meet the criteria for CDM project validation set forth by the UNFCCC. Dated 12-Jul-02
18	Indonesian Ministry of Environment and Indonesian Ministry of Energy and Mineral resources letter (topics of communication: CDM Base-line study, DNA Approval pendant), dated 22 August 2002.
19	Preliminary Validation of Wayang Windu 2 as a CDM project from URS, dated 09 September 2002.
20	Signed CDM Agreement between MNL and YBUL (CDM Developer), dated 01 October 2002
21	WW Joint Operation Contract between Pertamina and MNL signed in 1994, amended on 21st Nov. 2006
22	Energy Sales Contract between PLN and MNL and Pertamina, Original and amendments dated 21 Nov. 2006

Ref. No.	Document or Type of Information
23	Engineering and Procure and Construction Agreement for the Steamfield above Ground System and Power Plant Project. January 30th, 2007
24	Purchase Contract for Tubular NO. WDA J.0225 11th July 2005.
25	Minutes of a Meeting of the boards of directors held at four season Hotel (The owner group of MNL discuss the implementation of project activity according financial conditions), Singapore on 28 February 2006.
26	CR 3 WW 2 Training Proof (folder with proof of training of Sumitomo for power station, SAGS overview, SAGS pressure control system, combine system, SAGS Start Up and Shutdown, control and instrumentation, discharge monitoring, Generator and Electrical, ION8600 & ION Setup provided by Schneider)
27	Attendance list Steamfield Above Ground System training for topics: General Overview, Pressure and Control System, Combined System, Startup and Shutdown, dated 8, 9, 10 ,11 September 2008.CR3
28	Attendance list, Training for Power Station, Heat Balance and Turbine and Condenser, dated 12 and 13 September 2008
29	Program of On-The-Job Training (Power Station) and attendant list, dated 18 December 2008.
30	Attendance list, Training for Power Station, Control and Instrumentation, dated 19 September 2008
31	Attendance list, Training for Power Station, Discharge Monitoring, dated 20 and 21 November 2008
32	Attendance list, Training for Power Station, Electrical, dated 16 September 2008
33	Attendance list, Fire Fighting -Deluge Valves, dated 20 and 08 January 2009
34	Attendance list, Training for Power Station, Generator and Electrical, dated 15 September 2008
35	Attendance list, Training for Power Station, Gas Removal System and Hot well Pump, dated 18 September 2008
36	Attendance list, Revenue Meter (electricity), dated 13 and 14 November 2008.
37	WAYANG WINDU UNIT 2 GEOTHERMAL POWER PROJECT, dated 08September 2008.
38	Country risk premium source used in GSP PDD: http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem05.xls
39	Unlevered Beta source used in GSP PDD: http://faculty.insead.edu/peyer/FFE/Betas%20per%20industry%20based%20on%20US%20COMPANIES.doc
40	Inflation rate source used: OIL TOOLS INDEX WEB SITE (WPU 1191), US PPI Index, US CPI and INDONESIA CPI.

Ref. No.	Document or Type of Information
41	Environmental Impact Study, which consists of ANDAL (Environmental Impact Analysis), RKL (Environmental Management Plan), and RPL (Environmental Monitoring Plan).
42	CAR16 - Estimating Country Risk Premiums(Excel files: betas07ctryprem07, totalbeta07) and WACC calculation spreadsheet, file: WACC Jan 2007 and complete Financial Model
43	CR 1 - Project Schedule and Unit 2 Summary Schedule - Rev 7
44	CR 5 - EF from Indonesian Authority (Letter from Department of Energy and Mineral Resources of Indonesia Baseline Emission Factor for Sumatra Grid and Updating Baseline Emission Factor of JAMALI Grid, 0.891 tCO2/MWh) dated 13 Feb. 2009
45	CR 5 - EF from Indonesian Env Ministry (Letter from Environmental Ministry of indonesia, Latest information of baseline emission factor for CDM projects at Sumatra and JAMALI grid, 0.891 tCO2/MWh) dated 19 Jan. 2009
46	CR 5 - GHG_JAWABALI_2006_DJLPE-FINAL, Jamali grid system data (2002 to 2006): unit, power generated, per fuel type, net electricity production, fuel consumption, Average OM, and BM.
47	PDD for Registered Project 1313: MEN-Tangerang 13.6MW Natural Gas Co-generation Project (Footnotes 25, 26, 27)
48	CR 8 - House Load Usage 2004-2006 (Wayang Windu Unit 1)
49	CR 9 - ER calculation spreadsheet
50	CR 10 and CR 11 - mass fraction in steam, historic records
51	Standard Operating Procedure Maintenance of The Energy Transaction Metering System "2.1.2.2. SOP Metering Sytem Maintenance - MNL (final)" and Standard Operating Procedure of Metering System "0705. Metering System – WW"
52	CR13 - diesel consumption calculation, Diesel Consumption Records for Unit 1 2003-2008, fuel rating calculation record of emergency generator, and Fire pump: installation and operation data
53	Wayang Windu Unit 1 Production data: Electricity transaction records (PLN - Pertamina - MNL) Dec 2008, Energy Sales Invoice WW UNIT 1-2004 to 2008, MNL-Generation - invoice calculation years 2001 to 2006, and Unit-1 productionhistorical data from 1st June 2000 to 1st February 2009
54	CR11and12-mass fraction in steam
55	Map of Grid Connection in Indonesia, describes Jamali Grid
56	Source: http://dna-cdm.menlh.go.id/. Accessed on Jan 9th 2009.

Ref. No.	Document or Type of Information
57	CDM Country Guide for Indonesia, edited by the Institute for Global Environmental Strategies 2nd edition, 2006.
58	Risk free rate from Bloomberg - 30 years US Treasury Bonds rates for Jan 2007 in final PDD
59	Beta value for the power sector http://www.stern.nyu.edu/~adamodar/pc/archives/betas07.xls in final PDD
60	Total Risk Premium and Country Risk Premium Values for 2007 http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem07.xls
61	Article "World Geothermal Power Generation 2001-2005" by International Geothermal Development http://www.geothermal.org/articles/worldpower05.pdf
62	Article "Indonesia's Geothermal Development" http://jakarta.usembassy.gov/download/geo2002.pdf
63	Kamojang Geothermal PDD, version 01, dated 29 February 2008
64	Registered CDM Project: Darajat Unit III Geothermal Project PDD, version 3, dated 14 September 2006
65	Article "GeoDipa cancelled taking on the Sarulla Goethermal" dated 19 June 2006 by Hendi Suhendratio http://www.detikfinance.com/read/2006/06/19/120856/619063/4/geo-dipa-batal-garap-pltp-sarulla%20-%2032k accessed on 28 November 2008. Article mentioned some geothermal projects, including Patuha, Bedugul, and Karaha Bodas were postponed due to financial crisis in 1998
66	List of Geothermal developed by IPP currently at financing stage http://www.pln.co.id/InfoKorporat/IPPContractManagement/IPPProject/Pendanaan/tabid/231/Default.aspx accessed on 28 November 2008. The list has: Patuha, Bedugul, Patuha, and Cibuni at financing stage
67	Article "Bedugul Geothermal Project Still in Limbo" http://www.rasabali.com/bali-news/bedugul-geothermal-project-still-in-limbo-182.shtml accessed on 28 November 2008
68	Article "Consortium Signs Sarulla Geothermal Agreement" dated 20 August 2007 http://www.energycurrent.com/index.php?id=3&storyid=4605 accessed on 28 November 2008
69	Article "Ulumbu and Ulubelu Geothermal Power Plants will be Constructed" dated 29 March 2007 http://www.ntt-online.org/2006/10/30/tommy-bebasbersyarat-awal-pekan/?p=3435 accessed on 28 November 2008
70	http://www.vsi.esdm.go.id/gunungapiIndonesia/kerinci/umum.html accessed on 28 November 2008

Ref. No.	Document or Type of Information
71	Project data from PT PLN (Persero), dated October 2008
72	Report produced for the United States Agency for International Development (USAID ASIA) Annex 3 Indonesia Country Report, From Ideas to Action: Clean Energy Solutions, For Asia to Address Climate Change, prepared by International Resources Group, dated June 2007
73	"Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) year 2006-2015" by PT PLN (Persero) http://www.pln.co.id/ruptl/070219_perubahan_ruptl_06_10_web_.pdf accessed on 28 November 2008
74	In pursuant to Presidential regulation No. 71/2006
75	Footnote 25, 26, 27
76	WW2 Monitoring Plan V01 - 09 March 09 - for validation bb
77	Attendants list during SHC
78	Microsoft PowerPoint - Stakeholder Consultation - from MNL
79	Microsoft PowerPoint - Stakeholder consultation - from SCC
80	Microsoft Word - Stakeholder minutes-5 Des 08- English
81	Microsoft Word - Stakeholder minutes-bahasa-5 Des 08
82	WW2_Newspaper advertisement_28 Nov 08_2
83	Certificates ISO14001:2004 Norm (Approval Certificate No: JKT 0500379, certificate Expiry: 14 January 2010) and OSHAS 18001:2007 (Approval Certificate No: JKT 6002972, certificate Expiry: 16 January 2011)
84	Installation approval from Director of Mineral, Coal, and Geothermal, Ministry of Energy, dated 14 November 2005, valid until 4 may 2010.
85	Plant Approval from General Director of Electricity, Energy Ministry, dated 20 February, 2006 valid until 20 February, 2011.
86	Letter of Approval from Indonesia, Issued by Kementerian Negara Lingkungan Hidup, Republic of Indonesia on 8 May 2009
87	Letter of Approval from UK, Issued by Department of Energy and Climate Change, London on 08/06/2009
88	Geothermal Resources in Indonesia
89	Statistics and Analysis Indonesia Geothermal Development

Ref. No.	Document or Type of Information
90	US Embassy Jakarta, Indonesian's Geothermal Development, February 15th, 2002
91	Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
92	Confirmation letter where MNL proceed with utilization of loan portion which has to be applied towards project cost, dated 7 August 2007.
93	Letter from Ecosecurities with offer to develop the project as CDM dated 31 May 2007
94	Draft letter of Exclusivity from Climate Change Capital for Wayang Windu project dated 8 Aug. 2007
95	Final PDD ver. 2.3 dated 22 July 2009
96	CDM opportunity discussion with Ecosecurities in letter from Ecosecurities dated 29th Nov. 2007
97	Draft Emission Reduction Purchase Agreement from Standard Chartered and Sindicatum Carbon Capital dated 3rd Dec. 2007
98	Email correspondence with Ecosecurities dated 17th Jan. 2008 enclosing draft ERPA for the project
99	Email correspondence with World Bank dated 10th March 2008 discussing CDM opportunities for the project
100	Minutes of Meeting held with Sindicatum Carbon Capital local representatives in Indonesia dated 4th April 2008 for the project
101	Formal proposal from Sindicatum Carbon Capital to MNL dated 15th June 2008 for the project
102	Draft ERPA from Ecosecurities dated 30th July 2008 for the project
103	Proposal and agreement from South Pole dated Oct. 16, 2008 for the project
104	Official letter from the Department of Energy and Mineral Resource, Republic of Indonesia dated 13 October 2009 providing confirmation on Geothermal Power Plants Data
105	EPC contract with Sumitomo for Wayang Windu Unit 1 and 2 dated May 1997
106	Formal Deletion of the Third Combined Phase of the EPC Contract.Third Combined Phase includes Unit 2 equipment. Settlement agreement dated March 2000
107	Cover story "IndoRenergy, Positioning Geothermal" from Petrominer magazine No.07/July 20,2009
108	PLN's RUPTL (PLN's Electricity Provision Plan) 2009 – 2018 page 53-54
109	Sibayak Geothermal Power Plant PDD, version 01, dated 26 August 2008
110	Wayang Windu Phase 2 Geothermal Project - EPC Agreement - Test Report and Performance Test Report conducted in February 2009

Ref. No.	Document or Type of Information
111	Technical Data Sheets and Technical Information for Plant, Exhibit AD of the EPC Contract for power plant and steam pipeline for Unit 2 dated 30 Jan. 2007
112	Wayang Windu 1 historical Production Data
113	Information Report in Support of Submission: “Contribution of Geothermal Energy to the Sustainable Development” by International Geothermal Association dated 28 March 2001
114	Article "The Possibility of Large-Scale Geothermal Power Plants" dated April 13, 2010 http://www.perspectivesonglobalissues.com/current/geothermal/)
115	Wayang Windu 1 historical turbine outages data
116	Magma Nusantara Limited - Consolidated Financial Statements 31 December 2005
117	Magma Nusantara Limited - General Ledger for General & Administrative Expenses and Operation & Maintenance Expenses Jan - Dec 2005
118	Wayang Windu Geothermal Power Project Loan Agreement dated 3 May 2007
119	Wayang Windu 1 historical steam availability data
120	Calculation of the electricity generation per well based on the historical data of the steam of Wayang Windu 1 and the guaranteed steam rate design of the turbine
121	Wayang Windu well and resource performance analysis study conducted by Mauro Parini, advisor reservoir engineer for Unocal Geothermal November 2004
122	Notes to the consolidated financial statements December 31,2007 and 2006
123	Daily - drilling /Workover/ Completion Report of a fix well program
124	Overhaul cost for Wayang Windu 1
125	Fuji Electric System quotation for the turbine spare parts cost for the major overhaul cost estimation, 2007
126	Information Memorandum for Refinancing of Wayang Windu Geothermal Project (unit 1) and Financing of the Wayang Windu Geothermal Expansion Project, December 2007
127	The Directorate General of Finance and Tax Decree number Kep-1288/LK/2000, Kep-68/PJ/2000 - Keputusan Bersama Direktur Jenderal Lembaga Keuangan dan Direktur Jenderal Pajak Nomor Kep-1288/LK/2000

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128	Indonesian Income Tax Law no. 36 year 2008
129	Indonesian Government Decree no 49 year 1991
130	Technical Report on the Pre-feasibility Study for the Popa Falls Hydro Power Project based on 2004 data
131	Analysis for investment of Bentonite deposit at West Java Province
132	The cost of debt based on BI Rate for January 2007 (http://www.bi.go.id/web/id/Moneter/BI+Rate/Data+BI+Rate/)
133	Risk Premiums for Other markets for year 2007 from A. Damodaran, New York University (http://pages.stern.nyu.edu/~adamodar/New_Home_Page/)
134	Cost of Equity formula from Damodaran
135	The beta values provided by Damodaran Online (http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/totalbeta.html) reference Index for year 2007
136	"Proposed Loans Republic of Indonesia: PT Perusahaan Gas Negara (Persero) Tbk for the South Sumatra to West Java Phase II Gas Pipeline Project" by Asian Development Bank dated July 2006 http://www.adb.org/documents/rrps/ino/39928-ino-rrp.pdf
137	"Investment Opportunities" presentation by Perusahaan Listrik Negara dated July 2008
138	The Mortgage-Backed Securities Market in Indonesia" by Farid Harianto
139	Revised Financial Model
140	The updated estimation of the EPC price from the EPC Contractor for Wayang Windu 2 dated September 2006
141	The draft of the consolidated income statements for the years ended December 31,2009 and 2008 - Star Energy Geothermal (Wayang Windu) Limited
142	Performance improvement of the combined cycle power plant paper written by Department of Energy Technology, King Mongkut's University of Technology Thonburi, Thungkhru, Bangkok 10140, Thailand, and Department of Mechanical Engineering, College of Technology, 12000, Thailand
143	Star Energy Holdings Pte Ltd - Director's Resolutions dated 30 Jan 2007

Ref. No.	Document or Type of Information
144	Wayang Windu Phase 2 Geothermal Power Project version 2.7 dated 26 April 2010
145	Investment Valuation, A. Damodaran Second Edition
146	Unit 2 Credit Facility Agreement relating to Wayang Windu Geothermal Power Project dated 3 May 2007 among Magma Nusantara Limited, Standard Chartered Bank (Hong Kong) Limited, and The Financial Insitutions Listed in Schcedule 1 and 2
147	Actual invoices of the EPC contract by Sumitomo Corporation dated 3 June 2009
148	"Review of Wayang Windu Field Steam Decline - Wayang Windu Production Data Review" prepared by Sinclair Knight Merz (SKM) dated 24 Nov 2009
149	Inflation rate based on the historical average of the US CPI index sourced from http://data.bls.gov/cgi-bin/surveymost?cu US all item, Series Id: CUUR0000SA0
150	Wayang Windu Make Up Well program Phase 2, December 2009 indicating project budget estimation for 2010
151	Authorization of expenditure – Drilling and Workover
152	Well Repair (WORKOVER) Cost 2003 - 2008 – 2010
153	"Interim Agreement" between PLN & MNL dated 16 May 2000 and subsequent amendment and extensions till 14 September 2006
154	Final PDD incorporating corrections as per EB 58, para 61(g), "Wayang Windu Phase 2 Geothermal Power Project " Version 3, dated 02nd December, 2010