VALIDATION REPORT

USING OFF GAS COGENERATION PROJECT IN PT KPP

REPORT NO. 2012-110

KOREAN FOUNDATION FOR QUALITY

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VALIDATION REPORT

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Client: PT. Krakatau Poscopower		Client ref.: Mr. Young Lark CHOI

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Summary:

Project Title : Using off gas cogeneration project in PT KPP
Annex I Country : -
Host Country : Indonesia
Project Participants : PT. Krakatau Poscopower
Applied Methodology(ver) : ACM0012 (Version 04)
Sectoral Scope : 01- Energy industries (renewable - / non-renewable sources) (TA 1.1)
04- Manufacturing Industries (TA 4.3, Iron and steel)
Technology/Measure ~~to~~ be employed : Cogeneration(electricity and steam) using waste gas recovered from Integrated Steel Mill (ISM) process
Crediting Period : Fixed 10 years crediting period
Estimated ER : 809,138tCO_2e / year
Project Size : Large scale
Validation Report Status
☐ CAR/CL Requested
☐ Before DNA approval
☐ Resolution of Outstanding issues
■ Full approval and submission for registration

As the result of the validation, it can be confirmed that ***Using off gas cogeneration project in PT KPP*** as described in the revised PDD of 30 July 2013 (Ver. 06), meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the simplified baselines and monitoring methodology ACM0012 (Version 04). KFQ thus requests the registration of the project as a CDM project activity.

Work carried out by :	Work Verified by :
Nam Hoon KIM (Audit team leader, CDM auditor) Sung Han YOON (Audit team member, CDM auditor) Jong Hwan LEE (Technical Expert) Tae Seok JANG (Local expert)	Jong Mun PARK In Chan PARK

Abbreviations

BFG	Blast Furnace Gas
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CM	Combined Margin
COG	Coke Oven Gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide Equivalent
DNA	Designated National Authority
EF	Emission Factor
EIA	Environment Impact Assessment
FSR	Feasibility Study Report
GHG	Greenhouse gas(es)
ISM	Integrated Steel Mill
KFQ	Korean Foundation for Quality
LDG	Linze Donawitz Gas
LoA	Letter of Approval
MoV	Means of verification
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
PP	Project Participant
UNFCCC	United Nations Framework Convention for Climate Change

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1. INTRODUCTION

Korean Foundation for Quality (KFQ) has been engaged by PT. Krakatau Poscopower to perform a validation of the Using off gas cogeneration project in PT KPP in Indonesia. This validation report summarizes the findings of the validation of the project, performed on the basis of UNFCCC and host party's criteria for CDM project, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

All the validation team's conclusion and opinion on this project activity are made the PDD of Ver.05, 5 November 2012, as a basis. Revised PDD has followed the structure and guidance in the latest relevant PDD template (CDM-PDD, Ver.03.0) and the 'Guidelines for Completing the Project Design Document (CDM-PDD), and the Proposed New Baseline and Monitoring Methodologies (CDM-NM) (Ver. 07) for Large Scale CDM project.

The Project is classified with sectoral scope 01- Energy industries (renewable - / non-renewable sources) (TA 1.1) and sectoral scope 4- Manufacturing Industries (TA 4.3-KFQ internal scope for Iron and steel) and the main objective of the project is to utilize a waste off gas recovered from the Integrated Steel Mill(ISM) process and generate electricity and steam for supplying to steel manufacturing works.
The project activity will utilize a mix of waste off gases consisting of BFG (Blast Furnace Gas), COG (Coke Oven Gas) and LDG (Linze Donawitz Gas) for generating electricity and steam.
Thus, 284,190Nm^3/h of waste off gas came from the integrated steel works will be recovered and utilized as a fuel of the gas-fired boilers. As a result of cogeneration process, 1,037,334MWh/yr of electricity and 255,008 ton/year[1] of steam will be generated from the steam turbines and generators.
The electricity and steam generated by the project would displace the electricity imported from the regional grid which is dominated by fossil fuel-fired power plants and coal based steam boiler respectively.
Thereby, the project implementation would contribute to the emission reduction of GHG. The estimated GHG emission reduction is 809,138tCO_2e per year and 8,091,380 tCO_2e over 10 years crediting period.

[1] 32ton/hr x 7,969 hr/y = 255,008 ton/y = 53,950 MWh/yr

1.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host countries criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD), the project's baseline study, monitoring plan and other relevant documents. The information in these documents is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed on the Marrakech Accords and the relevant decisions by the CDM Executive Board including the approved baseline and monitoring methodology. KFQ has employed a risk-based approach to the validation that is based on the recommendation in the Validation and Verification Manual.

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

1.3 Validation Team

The validation team consisted as follows:

Nam Hoon KIM (Audit team Leader, GHG auditor)
Sung Han YOON (Audit team member, GHG auditor)
Jong Hwan LEE (Technical Expert)
Tae Seok JANG (Local expert)

Technical review was implemented by technical reviewers, Jong Mun PARK and In Chan PARK.

The qualification of each individual verification team member and a technical reviewer are detailed in Appendix B and Appendix C to this report.

2 METHODOLOGY

The validation consists of the following three phases:

I A desk review of the project design documents
II Follow-up interviews with project stakeholders
III The resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol for CDM project was customized for the project, according to the Validation and Verification Manual. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organizes details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of two tables. The different columns in these tables are described in Figure 1. The completed validation protocol is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfillment of validation protocol criteria or where a risk to the fulfillment of project objectives is identified. Corrective Action Requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) validation protocol requirements have not been met; or
iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification (CL) is issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

Validation Protocol Table 1: Requirements and Means of Validation for Clean Development Mechanism Project Activity				
Checklist Question	***Reference***	***Criteria***	***Comment***	***Draft and/or Final Conclusion***

The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in five different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	*Gives reference to criteria documents where the answer exists.*	*The requirement number in criteria document*	*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.* *N/A means not applicable.*	*This is either acceptable based on evidence provided* ***(OK),*** *or a* ***Corrective Action Request (CAR)*** *due to non-compliance with the checklist question (See below).* ***Clarification Request (CL)*** *is used when the validation team has identified a need for further clarification.*

The validation team has assessed the proposed CAR with a positive result and after the closure of these CARs and CLs the proponent has issued the final version of the PDD. On the basis of this the final validation report and opinion were issued.

Validation Protocol Table 2: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	***Ref. to checklist question in table 2***	***Summary of project owner response***	***Validation conclusion***
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request 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 validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation Protocol Tables

2.1 Desk review of the Documents

The Project Design Document (PDD) version 01 was submitted on 9 April 2012 and reviewed with additional background documents related to the project design including baseline and additionality of the project. A complete list of all documents and proofs reviewed is in section 6, Reference, to this report.

Main changes between the versions published for the 30 days stakeholders commenting period and the final version submitted for registration:

- Changes related to the CARs and CLs identified in the KFQ's validation report
- Update "Tool for demonstration and assessment of additionality", Version 06.0 to Version 07.0
- Update common practice as per "Guidelines on common practice", Version 01.0 to Version 02.0

- Update related to request for review raised from the EB

2.2 Follow-up Interviews with Project Stakeholders

Issues identified by KFQ during the subsequent stages of the validation have been clarified through continuous communication with the project participants. The project participants have also provided underlying documentation for review by KFQ, confirming selected information and resolving issues identified in the validation

In the period of 8 ~ 9 May 2012, KFQ performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
PT. Krakatau Poscopower - Akhmad Subagja - Eun Ju Shin	➢ *Project design* ➢ *Project technology, operation, maintenance* ➢ *Sustainable development issues* ➢ *Additionality* ➢ *Environmental impacts(incl. EIA approval)* ➢ *Stakeholder consultation process* ➢ *Monitoring plan*
RCC - Seung Jae Moon - Se Jin PARK - Hee Sung LEE CDM INDONESIA - Irhan POSCO - Ki Jong KIM	➢ *Applicability of selected methodology* ➢ *Baseline determination* ➢ *Additionality* ➢ *Emission reductions calculation* ➢ *Crediting Period* ➢ *Approval by the host country*
Representative of local stakeholder ▪ Local resident - Abdurohim - Tia Putriansyah ▪ Representative of Kubagzai village - TB. Vutwdt ▪ Representative of Ciwandan village - H. Suffenb	➢ *Environmental issues* ➢ *Stakeholder comments* ➢ *Sustainable development issues*
▪ KOTRA[1] Indonesia - So Wang LEE	➢ *Economic indicator* ➢ *Industrial status*

[1] Korea Trade-investment Promotion Agency

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve any outstanding issues which need to be clarified prior to KFQ's positive conclusion on the project design. In order to guarantee the transparency of the validation process, the concerns raised by KFQ and responses provided by project participant are documented in Table 2 of the validation protocol in Appendix A.

For this project, ten (10) Corrective Action Requests (CAR) and five (5) requests for Clarification (CL) were identified. These requests were presented to the project participant in a CAR/CL report on 21 May 2012. The additional information provided by the project participant to address these requests and revised PDD dated of 5 November 2012 (ver. 05) resolved the all Corrective Action Request and requests for Clarification to KFQ's entire satisfaction.

2.4 Internal Quality Control

According to KFQ's Procedure for deciding whether to proceeded request for registration, the final validation report and validation findings underwent a technical review before being submitted to the project participants for requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with KFQ's qualification scheme for CDM validation and verification.

3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

3.1 Participation Requirements

The project participant is PT. Krakatau Poscopower (hereinafter, PP or Project owner) as the project owner from the Host Party, Indonesia. The project is developed as a unilateral CDM project thus only host party has been involved in the project as project participant. The Host Party meets the requirements to participate in the CDM.

The Letter of Approval (LoA) from Indonesia was obtained on 27 August 2012 authorizing PT.

Krakatau Poscopower as project participant. The LoA also confirms that the project activity assists Indonesia in achieving sustainable development. The validation team checked detail information of the LoA of Indonesia such as address, signature & name on LoA and website of Indonesian DNA[1] as well. And we found the email correspondence between PP and Indonesian DNA for LoA issuance. Thus the validation team confirmed that there is no doubt on LoA of Indonesia provided from the PP.

The validation did not reveal any information indicating that the project can be seen as a diversion of official development assistance (ODA) funding towards Indonesia. The financing structure of the project activity is 30% from equity of project owner and 70% loan from Standard Chartered Bank Korea Limited on 4 June 2012.

Nevertheless, CAR 1 was raised in the course of the validation and was successfully closed (ref Annex: Validation Protocol- Table 3).

3.2 Project Design

The proposed project activity is the waste gas recovery project titled as "Using off gas cogeneration project in PT KPP". The project is located at Cilegon city, Banten province of Indonesia. The main objective of the project is to utilize a waste off gas recovered from the Integrated Steel Mill(ISM) process which is now under construction by PT KRAKATAU POSCO and generate electricity and steam for supplying to steel manufacturing works. The main equipment such as 2 sets of gas-fired boiler (2*45T/H, Natural circulation, Outdoor type), 2 sets of steam turbine (2*100MW, Reheat type condensing turbine indoor use) and 2 sets of generator (Horizontally mounted, rotating field, Air cooled, three phase Synchronous type) will be installed.
The project activity will utilize a mix of waste off gases consisting of BFG, COG and LDG. The gas-fired boiler will be fired by 90 % of BFG as main fuel and LDG and COG are as auxiliary fuel together with BFG. When BFG is firing, COG for the stabilized fuel will be fired by 10% heat capacity. And COG will be also used as ignition fuel and auxiliary fuel for flame stabilizer. 292,837 Nm^3/h of waste off gas came from the ISM will be recovered and utilized as a fuel of the gas-fired boilers.
As a result of cogeneration process, the expected annual net electricity and steam supplied to the steel work process is 1,037,334MWh/yr and 255,008 ton/h[2] respectively.

[1] http://www.dnpi.go.id/
[2] 53,950MWh/y

In the absence of the project implementation, the waste gas from the newly built ISM will be flared to the atmosphere after incineration. Thus, the heat would be supplied by newly built fossil fuel based steam boiler system and the electricity requirement of the steel works will be totally imported from regional grid (JAMALI grid) owned by PLN which is the National Power Company.
Thereby, the project implementation would contribute to the emission reduction of GHG. The estimated GHG emission reduction is 809,138tCO_2e per year. Moreover, the project will contribute to sustainable development by reducing the emission of GHGs and mitigate other environmental pollution, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates at the power plants when replacing the equivalent electricity from the grid. And the peoples shall have a direct bearing on improving their professional skills on waste energy recovery as well as the quality of their lives.
Furthermore, the project activity promotes economic development in the region and it will contribute to the local economic development through creation of new employment.

The starting date of the project has been validated by KFQ as 05 October 2011 which represents the date of contract of power plant installation (Offshore contract) between PP and POSCO Engineering & Construction Co., Ltd. KFQ confirmed that this starting date is the earliest date at which either the implementation or construction or real action of a project activity begins after reviewing the documents below.

To confirm this date, validation team examined following dates:

- Contract of power plant installation (Offshore contract) : 05 October 2011
- Onshore contract (include Steam turbines and Generators purchase) : 07 November 2011
- Operation start : expected to January 2014

Thus, KFQ regarded ‘Contract of power plant installation (Offshore contract)’ as an official implementation to proceed with the project activity and accepted it as the starting date because it is the earliest date at which either the implementation or construction or real action of a project activity begins.

The designed operational lifetime of the project is estimated as 15 years by FSR but PP applied operation lifetime as 20 years followed by Guidelines on the assessment of investment analysis (Ver. 05) and a fixed crediting period of 10 year is selected starting in 1 March 2014 or effective date of registration, whichever later.

The lifetime of main project equipment (gas-fired boiler, steam turbine and generator) are demonstrated through statement for Power Purchas Agreement (PPA) between PP and recipient

facility[1] dated on 1 October 2012. According to the PPA, the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years based on the equipment lifetime. In addition, we checked equipment lifetime by confirmation letter from the equipment supplier[2] dated on 16 August 2012 and confirmed the lifetime of all main equipment such as steam turbines, generators and boiler is 25 years. Furthermore, default value for technical lifetime according to Tool to determine the remaining lifetime of equipment (ver.01), these main equipment of the project activity over 25 years. Thus the verification team confirmed that this project lifetime (15 years)[3] is valid and the remaining lifetime of equipment covers the crediting period (10 years) of the project activity.

All the description of the project as contained in the PDD was identified through objective evidences such as Feasibility Study Report, Environment Impact Assessment, relevant contacts of this project activity and the Board meeting minute etc. as well as physical site visit. KFQ also confirms that the PDD is in compliance with relevant forms and guidances. Through above assessment, the validation team conclude that the PDD is complying with relevant forms and guidance and the project description is accurate and complete.

The process undertaken to validate the accuracy and completeness of the project description includes document review and cross-check with the relevant approvals. Complying with para.64/VVM version 01.2, KFQ hereby is able to confirm that the project description in PDD is accurate and complete in all respects.

Nevertheless, CAR 2, CAR 4 and CL 2 were raised in the course of the validation and was successfully closed (ref Annex: Validation Protocol- Table 3).

3.3 Baseline Determination

Project boundary

The project boundary was assessed through the physical site inspection, interviews and the evidence received on the design of the project.

The project boundary includes cogeneration facilities which are off gas fired boiler, steam turbine, electricity generator, combustion system, ignition system, main steam system, water

1 PT. KRAKATAU POSCO

2 POSCO E&C

3 Even though the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years according to the PPA which is reflected the lifetime of main equipment, PP applied 20 years as operational lifetime in the investment analysis for the proposed project that is in accordance with the maximum 20 years operation lifetime recommended in the Guidelines on the Assessment of Investment Analysis (Ver. 05).

supply system, condensation water system, power transmission system etc.. In the absence of the project activity, the project entity would have imported the electricity from the JAMALI grid and the steam would be supplied by fossil fuel based steam boiler. So, JAMALI grid should also be included in the project boundary.

The validation team checked board meeting minute which was based on the feasibility study established by the PT KPP on 15 October 2010 in order to confirm the project boundary and confirmed that the identified boundary and the selected sources and gases as documented in the PDD are justified for the project activity.

Applicability of the selected methodology to the project activity

All the applicability criteria listed by ACM0012 (Version 04) has been discussed in the PDD with corresponding evidences provided as below table and it has been validated that ACM0012 (Version 04) is applicable to the proposed project activity.

The realistic and credible alternatives are all considered to be in compliance with all mandatory applicable legal and regulatory requirements. Thus the validation team concludes that the baseline methodology ACM0012 (Version 04) has been correctly applied to the identification of alternatives to the project activity and the identification of alternatives are complete under relevant national and/or sectoral policies and circumstances.

The validation team confirmed applicability of ACM0012 as below [Table 1]

[Table 1] Applicability ACM0012 and validation result

Applicability	Validation result
1. The consolidated methodology is applicable to project activities implemented in an existing or Greenfield facility converting waste energy carried in identified WECM stream(s) into useful energy. The WECM stream may be an energy source for : • Generation of electricity; • Cogeneration; • Direct use as process heat source; • Generation of heat in element process; • Generation of mechanical energy; or • Supply of heat of reaction with or without process heating	The proposed project is a Greenfield project of cogeneration (electricity and steam) using waste gas recovered from Integrated Steel Mill(ISM) process newly. It is identified with FSR, plant design document, site visit and interview with staffs.

2. In the absence of the project activity, the WECM stream: a. Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility; or b. Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.	The proposed project is a Greenfield project which utilizes waste gas from ISM process for cogeneration. And in the absence of the project activity, the waste gas would be partially recovered in ISM plant, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the Greenfield project facility. It is identified with the waste gas generation and consumption from the gas balance in Feasibility Study by PT KPP in the absence of the proposed project and interview with the staffs.
3. Project activities improving the WECM recovery may (i) capture and utilize a larger quantity of WECM stream as compared to the historical situation in existing facility, or capture and utilize a larger quantity of WECM stream as compared to a "reference waste energy generating facility"; and/or (ii) apply more energy efficient equipment to replace/modify/expand waste energy recovery equipment, or implement a more energy efficient equipment than the "reference waste energy generating facility".	The proposed project applies to (i) capture and utilize a larger quantity of WECM stream as compared to a "reference waste energy generating facility". In the absence of the proposed project, the WECM stream would be flared, released to atmosphere and remains unutilized. Thus, there was no WECM recovery facility in the waste energy generation facility and the proposed project is newly installed in order to the WECM recovery. It is identified with the waste gas generation and consumption from the gas balance in Feasibility Study by PT KP in the absence of the proposed project and interview with the staffs. Refer to the below demonstration for extent of use of WECM and determination of baseline practice factor for CDM project activity implemented in Greenfield facility followed by Annex 1 of methodology.
4. For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable;	The project activity does not recover the waste pressure. The output of proposed project such as electricity and steam is from the waste gas. It is identified with the FSR, approval documents[1] for the project and interview with staffs.
5. Regulations do not require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity;	There is no regulation state that waste gas shall be recovered and utilized. Moreover In Indonesia, there is no regulation which constraint the industrial facility that generates waste energy from using the fossil fuels being used prior to the implementation of the project activity. It is identified with the FSR and interview with staffs and local officers.
6. The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added	The project activity is a Greenfield facility. The project is the waste gas recovery from the ISM which is now under construction and the project activity will implement in line with the ISM process operation. It is identified with the FSR and physical site inspection.

[1] TANDA TERIMA BERKAS PERMOHON IMB (construction approval), 04 August, 2011
IZIN PRINSIP PENANAMAN MODAL (business approval), 15 December 2011
TANDA DAFTAR PERUSAHAAN PERSEROAN TERBATAS (business license), 15 August 2011

production capacity must be treated as a Greenfield facility	
7. Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the project facility shall not be included in the emission reduction calculations.	No emission reduction will be claimed for the hours during the abnormal operation of the part of project facility which have impact on waste energy generation and recovery. The monitoring process during the abnormal operation is established in the monitoring plan of PDD.
8. If multiple waste gas streams are available in the project facility and can be used interchangeably for various applications as part of the energy sources in the facility, the recovery of any waste gas stream, which would be totally or partially recovered in the absence of the project activity, shall not be reduced due to the implementation of CDM project activity.	As for the proposed project, it is a Greenfield facility and there is no historical data available, so it is not possible to establish the energy balance for the demand and supply of energy base on the historical data. In order to establish the energy balance, the designed energy balance which was resulted by Feasibility Study was submitted to DOE as an established energy balance. PP provided waste gas generation and consumption from the designed energy balance in Feasibility Study conducted by PT. KP. As shown of energy balance above table 2, total waste gas generation in ISM plant is 637,539 Nm3/hr and the waste gas consumption at ISM plant is 344,702 Nm3/hr as process fuel and the waste gas which to be used for the project activity will be 292,837Nm3/hr. The FSR clearly cited the energy balance of ISM plant was designed utilizing the waste gas at the ISM plant as a process fuel firstly and then surplus waste gas will be recovered and used for cogeneration and thus this energy balance covers whole extended project boundary such as waste gas generation and consumption sources. Even though the energy balance for the project showed the waste gas to be used for the project activity will be 292,837Nm3/hr, the PP crosschecked extent of use of waste gas in other similar ISM plant in Korea such as Pohang ISM Plant and Gwangyang ISM Plant which have been operation during 30 years and found the amount of waste gas estimation to be used for the project activity is valid by demonstrating the conservativeness of waste gas production and its consumption in process as below. (1) Waste gas production The amount of waste gas production in ISM plant is derived from a calculation of multiply iron and steel production by its basic units (Nm3/Ton) of waste gas production in energy balance. We checked amount of iron and steel production in each process from energy balance is estimated as a condition of normal operation at ISM plant through the FSR and for the basic unit (Nm3/Ton), we crosschecked with the other

	similar ISM plant in Korea such as Pohang ISM Plant and Gwangyang ISM Plant[1]. We found the basic units of two type of waste gas (BFG, COG) in our energy balance are same or lower than similar two plants but the other type of waste gas (LDG) is higher than similar plants Therefore, in regard to the amount of waste gas production estimation from the ISM plant, we confirmed that the PP used values in energy balance for the project except basic units of LDG. PP selected basic unit of LDG as 66 Nm3/Ton from Pohang ISM Plant instead of 90 Nm3/Ton in a conservative manner[2]. (2) Waste gas consumption The amount of waste gas consumption in ISM plant is derived from a calculation of multiply production of each process by its basic units (Nm3/Ton) of waste gas consumption in energy balance. We checked amount of production in each process from energy balance is estimated as a condition of normal operation at ISM plant through the FSR. We found the basic unit (Nm3/Ton) of waste gas consumption is derived from the three years average (2006~2008) energy balance based on actual operation performance of the Pohang ISM Plant among these two similar ISM plants[3] because the basic units of three years average of Pohang ISM Plant is higher than the Gwangyang ISM Plant. Therefore, in regard to the amount of waste gas consumption estimation from the ISM plant, we confirmed that although PP designed energy balance for waste gas consumption in the ISM plant as a way of large quantity of waste gas usage in ISM processes in conservative application of waste gas consumption. To sum up, the ISM processes need such amount of waste gas described in the consumption part of energy balance (Table 2) compulsorily and the amount of waste gas usage in ISM processes is not be affected from the waste gas usage for cogeneration that is proposed project activity moreover, PP estimated the waste gas production as lower basic unit of LDG and waste gas consumption in ISM processes as higher experienced data from Pohang ISM plant in energy balance, moreover because a quantity of waste energy generated in the baseline ($Q_{WCM,BL)}$ has been capped with a low value estimation in a conservative manner, the validation team confirmed the use of waste gas in the absence of

1 Energy balance including the Basic unit of waste gas production Pohang ISM Plant and Gwangyang ISM Plant in the year 2008, Posco

2 However, PP selected basic unit of LDG as 90 Nm3/Ton from Pohang ISM Plant for the investment analysis in a conservative manner

3 Three years (2006~2008) Energy balance including basic unit of waste gas consumption in each process of Pohang ISM Plant and Gwangyang ISM Plant, Posco

project activity would not be reduced due to the implementation of project activity

In addition, multiple waste gas streams (BFG, COG, LDG) exist at the ISM in the baseline scenario that can be used interchangeably for various applications at ISM processes, thus the validation team checked the definition of extended boundary for the mixture of waste fuel gases from the energy balance.

< Definition of extended boundary for the mixture of waste fuel gases >

By-product gas		BFG	COG	LDG
Extended System Boundary	Sintering Plant	NO	YES	NO
	Coke oven plant	YES	YES	NO
	Coke By-product	NO	YES	NO
	Blast Furnace	YES	YES	NO
	Lime Calcining plant	NO	YES	NO
	Steel making Plant	NO	YES	NO
	Casting plant	NO	YES	NO
	Plate Mill	YES	YES	YES
	OLC maintenance	NO	YES	NO
	Incinerator	NO	YES	NO
	Loss	YES	YES	YES

Source : Feasibility Study by PT KP

As classified by extended boundary for mixture of waste fuel gases above Table, even though the use of waste gas in the absence of project activity would not be reduced due to the implementation of project activity, PP will monitor throughout the crediting period for each of the quantity of waste gases used in each ISM process in order to determine whether there is a decrease in the utilization of waste gas by other uses at the project facility during monitoring period and it will be verified during the site visit by verifying DOE. The monitoring parameters for each waste gas use in the ISM process were defined in PDD section B.7 and we confirmed the monitoring arrangements described in the monitoring plan are feasible and the means of implementation of the monitoring plan are sufficient to ensure verifiable emission reductions.

According to the methodology ACM 0012 ver.04 Annex 3, if there is a decrease in the energy recovery of WECM(s) in the extended boundary excluding the

	project activity WECM, a technical justification along with energy balance will be explained why the reduction in recover is not due to the CDM project. If this explanation is not satisfactory and there are possibilities of increase in emission due to the project activity within the extended project boundary, no CERs will be claimed for the rest of the monitoring period.
9. The methodology is not applicable to the cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	As explained above No. 8, 54.8% of the total waste gas consumed in the ISM process. The remaining 45.2% percent of surplus waste off gas is consumed by the project activity to produce electricity and steam. Thus all these surplus waste gas from the ISM plants which would be released to atmosphere in the absence of the project activity at the Greenfield facility, will be wholly utilized for the project activity. The validation team checked waste gas balance in Feasibility Study and Plant (ISM) layout design document issued by the PT KP and manufacturer's original design specifications. Thus, WECM stream would not be partially recovered in the absence of the CDM project activity to supply the heat of reaction.
10. This methodology is also not applicable to project activities where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, the projects recovering waste energy from single cycle and/or combined cycle power plants for the purpose of generation of heat only can apply this methodology.	The project activities do not utilize gas turbine or diesel generator to generate power. The waste gas will be recovered by gas fired boilers and generated steam from the boilers will operate steam turbines and generators. Thus, this project activity is not implemented in a single-cycle power plant and the waste energy recovery project is implemented in a combined cycle power plant by steam turbine. It is identified with FSR, specification information of equipment, and interview with staffs.

11. The emission reduction credits can be claimed up to the end of the lifetime of the waste energy generation equipment. The remaining lifetime of the equipment should be determined using the latest version of the "Tool to determine the remaining lifetime of equipment".	The lifetime of main project equipment (gas-fired boiler, steam turbine and generator) are demonstrated through statement for Power Purchas Agreement (PPA) between PP and recipient facility[1] dated on 01 October 2012. According to the PPA, the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years based on the equipment lifetime. In addition, we checked equipment lifetime by confirmation letter from the equipment supplier[2] dated on 16 August 2012 and confirmed the lifetime of all main equipment such as steam turbines, generators and boiler is 25 years. Furthermore, default value for technical lifetime according to Tool to determine the remaining lifetime of equipment (ver. 01), these main equipment of the project activity over 25 years. Thus the verification team concluded that this project lifetime (15 years) is valid and the remaining lifetime of equipment cover the crediting period (10 years) of the project activity.
12. The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1(for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology.	In order to determine the extent of use of waste energy from the waste energy generation facility in the absence of the project activity, Annex 1 from ACM0012 is applied. Please see the detail demonstration below.

PP investigated existing facilities in order to find the facilities which would be the use of waste energy from the source followed by required condition in methodology option 1. As a result of investigation through the "Conditions facing the steel industry of the free market AC-FTA, 2010", PP found there are 9 factories[3] related to manufacturing the steel product in Indonesia. However, these 9 factories are not the ISM but electric arc furnace steel factory. Because the electric arc furnace technology which is totally different from ISM[4], PP exclude these factories as applicable reference facility as required in methodology.

Thus PP researched other existing facility expanding the geographical area as worldwide. According to Steel Statistical Yearbook 2011 published by Korea Iron and Steel Association, the

1 PT. KRAKATAU POSCO

2 POSCO E&C

3 PT Krakatau Steel, PT Krakatau Wajatama, PT KHI Pipe industries, PT Cigading Habeam, PT Ispatindo, PT Gunung Garuda, PT Essar, PT Jakarta Cakra Tunggal, PT Budi Dharma steel

4 Electric arc furnace technology is significantly different with ISM technology for example Energy source (Electricity : Coal), source of output (scarp : iron ore, coal, coke) etc. Furthermore, Electric arc furnace factories are not generating a waste gas (COG, BFG, LDG) in the process.

number of facilities in accordance with the condition[1] in the option 1 of methodology Annex 1 is only 4 facilities. The list of facilities is shown below table 1.

[Table 1] World Ironworks implemented in the previous 10 year (3,420m^3~4,180m^3)

Country	Ironworks	No. of B.F.	Diameter of Hearth(m)	Volume in B. F. (m^3)	Year & Month of Firing
Austria	Voestalpine, Linz	No. 1	12	3,550	October 2004
China	Sandong, Iljo	-	-	3,800	September 2008
	Ansan, Younggu	No. 1	13.3	4,038	September 2008
		No. 2	13.3	4,038	April 2009

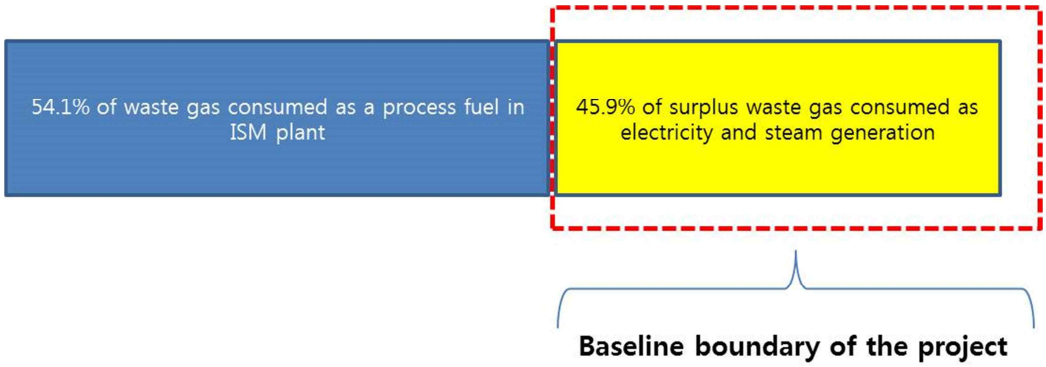
Consequently, the number of reference facilities which applicable to the condition in methodology does not reached 5 facilities thus, PP could not assess the extent of use of WECM and baseline practice factor through the method of option 1, thus PP used option 2 in Annex 1.

In order to analyse the extent of use of waste gas from the greenfield waste energy generation facility, PP used option 2 of Annex 1 in methodology. The number of reference facilities which applicable to the condition in methodology does not reached 5 facilities thus, PP could not assess the extent of use of waste gas through the method of option 1, thus PP used option 2 in Annex 1.

Before analysing the extent of use of waste gas, we would like to define a boundary for baseline emission such as a scope of waste gas use by waste energy generation facility of the project activity. A number of iron and steel production processes such as Blast Furnace, Coke Oven, Plant Plate Mill etc. must consume the waste gas as a process fuel in given priority and then surplus waste gas will be recovered and used for cogeneration such as project activity. Therefore, PP defined boundary for baseline emission as surplus waste gas that will be recovered and used for cogeneration.

<Figure 1. Boundary for baseline emission of the project >

[1] Blast Furnace implemented in the previous 10 years and +/-10% in terms of capacity of the facility as compared to the proposed facility (capacity of the BF of PT KP is 3,800m^3)



We analyzed extent of use of waste gas only for the surplus waste gas after using waste gas at iron and steel production processes. It was confirmed through energy balance in FSR and detail amount of waste gas production and consumption with the validity was explained below No. 3 of this report.

In accordance with the applied methodology option 2 of Annex 1 for assessment of extent of use of WECM and determination of baseline practice factor for CDM project activity implemented in Greenfield facilities, the methodology requires that the manufacturer of the project facility[1] should be invited to submit an alternative design including the usage of WECM that is recovered under project. Therefore, POSCO E&C, as the manufacture and provider of project facility such as gas-fired boiler, steam turbine and generator), was invited to submit the following alternative designs identified in the PDD as below:

√ Alternative designs 1 : The waste energy generation facility with surplus waste gas cogeneration (USE of waste gas)

√ Alternative designs 2 : The waste energy generation facility without surplus waste gas cogeneration and energy supplied from fossil fired power plant (NO USE of waste gas)

√ Alternative designs 3 : The waste energy generation facility without surplus waste gas cogeneration and energy supplied from the grid (NO USE of waste gas)

Three alternative designs submitted by the manufacture and provider of project facility and it has been assessed through investment analysis in accordance with the option 2 of Annex 1 in

[1] According to the Definition of the methodology, the waste energy is recovered by a third party in a separate facility, the .project facility will encompass both the waste energy generation facility and the waste energy recovery facility.

the applied methodology.

To figure levelized cost out for these selected alternative designs, PP assumed only electricity generation for the project activity instead of cogeneration because the proposed project activity will operate a condensing extraction turbine for generating steam that is only to be needed pipeline installation to generate steam in the electricity generation process. Therefore the construction of pipeline for steam comprises a negligible cost compared to total investment cost. Thus, it is reasonable to compare the proposed project with other power generation project using levelized cost analysis.

The financial indicator unit cost of service (i.e. levelized costs of electricity generation in MWh) has been applied for this investment analysis among the three alternative designs. The levelized cost is equivalent to the annualized costs divided by annual electricity generated. The input values involved in the calculation of levelized cost are investment, O&M cost, tariff, residual value rate and discount factor etc. When utilizing the levelized cost as the financial indicator in investment cost analysis, the alternative with the lowest costs is considered to be most economically attractive and most plausible alternative design.

As for the alternative design 1, the levelized cost for electricity generation using surplus waste gas is the proposed activity situation thus the input values are given from the FSR and PPA. Thus the levelized cost of alternative design 1 is calculated as 94.91 USD/MWh and we confirmed the calculation and this resulted value is correct. Please refer to IRR spreadsheet Ver. 9.

As for the alternative design 2, applicable fossil fuels are Heavy oil, Natural gas and Coal for electricity generation. Among them, heavy-oil is far expensive than other fuels[1] (refer to step 2 of baseline identification in the validation report) and the levelized cost for Natural gas also more expensive than Coal[2]. Thus coal fired power plant is selected as alternative design 2. PP

All the input values used in the alternative design 2 are derived from the Indonesian National Report publiched by National Nuclear Energy Agency(2010)3 which is using the ″mini G4Econs Model from IAEA″ (International Atomic Energy Agency) and input values used for levelized cost can be deemed as a reliable data source verified by the validation team. Also the applicability of input parameters adopted in the calculation of levelized cost has been validated as per the VVM 113(c). Therefore, validation team confirmed that the appropriateness of inputs values using in levelized cost calculation and found the. levelized cost of alternative design 2 is 59.66 USD/MWh.

[1] Fuel price per unit energy : Heavy oil : 18.96 USD/GJ, LNG : 7.38USD/GJ, Coal : 2.06 USD/GJ

[2] Levelized cost of Coal : 59.66 USD/MWh , Levelized cost of Natural gas : 61.52 USD/MWh

[3] PERBANDINGAN BIAYA PEMBANGKITAN LISTRIK NUKLIR DAN FOSIL DENGAN MEMPERTIMBNGKAN ASPEK LINGKUNGAN,

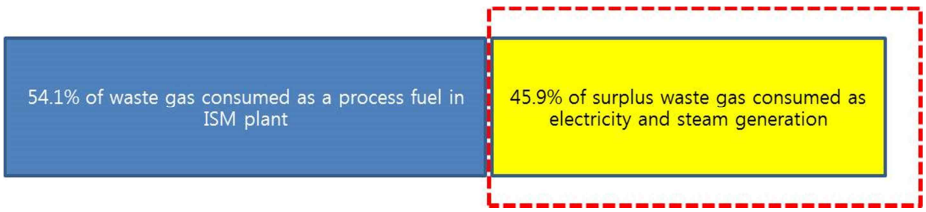
http://www.batan.go.id/ptrkn/file/tkpfn16/Makalah_peserta/Kel_E/47.M.Nasrullah,E348-352rev2.pdf

As for the alternative design 3, the unit cost of electricity production in JAMALI grid (71.97 USD/MWh)[1] is applied for levelized cost because the electricity tariff used input value for investment analysis in PDD (8.89 cent/KWh) is electricity sales price in JAMALI grid thus it is not applicable to the levelized cost comparison. We found the source and calculation of unit cost of electricity production in JAMALI grid is valid.

As a result of levelized cost above, it was demonstrated that alternative design 2, ″the waste energy generation facility without surplus waste gas cogeneration and energy supplied from fossil fired power plant (NO USE of waste gas)″, is the most financially attractive. Therefore the procedure carried out above concludes that the proposed greenfield facility would have wasted the energy in the absence of the project activity.

As a result of Annex I option 2 analysis (refer to No. 2 of the report), proposed greenfield facility would have wasted the energy in the absence of the project activity that means there is no electricity generation from the identified WECM stream at the Reference waste energy generating facility. Thus the remained surplus waste gas will be wasted and the $f_{practice}$ value should be 1 as shown in below Case 1, in doing so the validation team confirms that the formulas applied to calculate baseline emission including $EG_{i,j,y}$ calculation in PDD that is the condition of no recovery of waste gas in the absence of project activity is applicable to use of baseline emission calculation.

Case 1) baseline emission of proposed project considered as usage of surplus (partially) waste gas from the ISM plan t



√ $EG_{i,j,y} = \{(F_{j,y} \times (EG_{PJ,y} \times 45.9\%)\} \times 1$

In case baseline emission of proposed project considered as usage of surplus (partially) waste gas from the ISM plant, the capacity of cogeneration is 145.25MW (138.48MW for electricity + 6.77MW for steam). Thus $EG_{i,j,y}$ was calculated as *145.25MW * 1 * operation hour* from the Case 1 which is the proposed project′s baseline boundary.

1 PLN Statistics 2010, Page 38 : Average Generation Cost per kWh, Page 23 : Energy Production by Type of Power Plant (Gwh)

To make more concrete explanation, if the baseline emission of proposed project regarded as whole waste gas from the ISM plant (100% of waste gas generated from the ISM plant), the ISM plant will use waste gas partially in the absence of CDM project from the output of Annex 1 option 2 alternative design analysis. In this case the baseline emission will be calculated by using formulas in methodology section 1.2.2 as below Case 2.

Case 2) baseline emission of proposed project considering as usage in whole waste gas from the ISM plant

√ $EG_{i,j,y} = F_{j,y} \times EG_{PJ,y} \times 0.459$

In case baseline emission of proposed project considering as a usage in whole waste gas production from the ISM plant, the capacity of cogeneration is 316.44MW based on energy balance. However, according to the definition of fpractice, ″reference waste energy generating facility″ such as ISM process will use a part of waste gas, fpractice should be regarded as 0.459. In doing so, $EG_{i,j,y}$ was calculated as *316.44MW * 0.459 * operation hour* from the Case 2 which is same with Case 1 finally.

As shown above calculation, the validation team confirmed that the fpractice is closely linked with amount of use of waste gas in the absence of CDM project and we confirms that the $EG_{i,j,y}$ in baseline emission calculation is focusing on the boundary of waste gas use but the calculated value is same in each baseline emission boundary.

Identification of alternatives to the project activity consistent with current laws and regulations

According to the methodology ACM0012 (Version 04), the alternative baseline scenarios including the proposed project activity without CDM have been identified as follows.

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations.

Six alternatives scenarios for the use of waste energy, fourteen alternative scenarios for power generation and fourteen alternative scenarios for heat generation were identified. Mechanical energy alternatives are excluded since the project activity does not involve the heat generation and mechanical energy. The baseline candidates were considered for the following facilities:

- For the waste energy generation facility(ies) where the waste energy is generated; and
- For the recipient facility(ies) where the energy is consumed.

For the proposed project, the baseline candidates involve the coke production line (where waste energy is produced and the power will be consumed) and the power generation facility (where the power is produced).

For the use of waste energy, the realistic and credible alternatives are:

Option	Description	Validation result	Conclusion
W1	WECM is directly vented to the atmosphere without incineration;	According to the regulation,[1] direct venting of the waste gas to the atmosphere without incineration is restricted by the legal and regulatory requirements of Indonesia. Thus, it is not a credible alternative.	Exclude
W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized;	In the absence of the proposed project, the waste gas could be released to the atmosphere after incineration. And this is in accordance with the national regulation.	Include
W3	Waste gas/heat is sold as an energy source;	The validation team checked companies list[2] which are located near project activity and then there are no companies or industrial places which are needed waste gas such as the low heat caloric compared to fossil fuel and contains lots of dust so that cleaning facility needed. In addition there are no needs of waste gas from the project because it could be some restriction of continuous supply compare with other fossil fuel because waste gas is just generated at blowing time so that buffering facility essentially needed. Thus, it is not a credible alternative.	Exclude
W4	Waste energy is used for meeting energy demand at	This alternative is feasible from technical and legal perspectives. Utilizing the waste gas as	Include

[1] Decree of the state minister for environment/KEP.13/MENLH/3/1995, Indonesia
[2] http://www.kiec.co.id/index.php?page=content&cid=20

	the recipient facility(ies)	energy source to electricity and steam generation is included in the project activity.	
W5	A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilized;	The total energy (electricity and steam) required by ISM process which is recipient facility is much larger than the energy generated by the project activity. Thus all of the surplus waste gas for the proposed project activity from the ISM process will be used for generating the electricity and steam. The validation team confirmed waste gas generation and usage from the gas balance in Feasibility Study by PT KP. Thus, it is not a credible alternative.	Exclude
W6	All the waste energy produced at the facility is captured and used for export electricity generation or steam.	All electricity and steam generated from the surplus waste gas will be exported to PT. KP (ISM plant). According to the Joint Venture Agreement between PoscoPower and PT KDL, even though electricity generated in power plant could not export other entity directly and should be gone through the national power company such as PLN followed by the law in Indonesia, because PT KDL is branch company of national steel mill (PT Krakatau Steel), KDL has an authority for electricity trade in ISM pant of proposed project[1]. Thus the joint venture (PT KPP) received an authority of electricity trade in the proposed project site due to transferring the electricity trade authority from the PT KDL. Thus, the scenario is same as the proposed project. It is a credible alternative.	Include

For power generation, the realistic and credible alternatives are:

Option	Description	Validation result	Conclusion
P1	Project activity not undertaken as a CDM project activity	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
P2	On-site or off-site existing fossil fuel fired cogeneration plant	The validation team confirmed there is no on site existing fossil fuel fired cogeneration plant through the plant layout design and project location is a newly developed and the project activity as a first tenant. It was confirmed by interview with local officer and physical site inspection as well. Moreover although there is the off-site existing fossil fuel fired cogeneration plant, the electricity which is generated in power plant could not export other	Exclude

[1] http://www.kdl.co.id/?page=content&cid=15

		entity directly according to the law in Indonesia[1]. The electricity should be transmitted to PLN who is the national electricity company. Thus, P2 is not applicable.	
P3	On-site or off-site Greenfield fossil fuel fired cogeneration plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
P4	On-site or off-site existing renewable energy based cogeneration plant	It is not a credible alternative as same reason of P2.	Exclude
P5	On-site or off-site Greenfield renewable energy based cogeneration plant	There are no renewable energy sources such as wind[2], hydro[3], ocean energy[4] and biomass[5] in the region of the project and due to huge initial investment and low efficiency for supplying power for solar energy[6], these renewable energy based cogeneration plant is not possible. It was confirmed by the relevant references for each renewable energy source and physical site inspection as well. Thus, P5 is not applicable.	Exclude
P6	On-site or off-site existing fossil fuel based existing identified captive power plant	There is no on-site or off-site existing fossil fuel based existing identified captive power plant as the project activity is Greenfield project. Moreover, it could not be a credible alternative as same reason of P2 as well.	Exclude
P7	On-site or off-site existing identified renewable energy or other waste energy based captive power plant	There is no on-site or off-site existing identified renewable energy or other waste energy based captive power plant as the project activity is Greenfield project. Moreover, it could not be a credible alternative as same reason of P2 as well.	Exclude
P8	On-site or off-site Greenfield fossil fuel based captive plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
P9	On-site or off-site Greenfield renewable energy or other waste energy based captive plant	Regard to the on-site or off-site Greenfield renewable energy, it is not a credible alternative as same reason of P5. Regarding to using other waste energy, the validation team checked the proposed project just could use the waste off gas from the ISM through power purchase agreement (PPA) with PT KP and feasibility	Exclude

1 UNDANG-UNDANG REPUBLIK INDONESIANOMOR 30 TAHUN 2009

2 Renewable energy market assessment report: Indonesia (5page)_ Indonesia's potential for wind energy is limited.
http://ita.doc.gov/td/energy/Indonesia%20Renewable%20Energy%20Assessment%20(FINAL).pdf

3 Private participation on Hydropower Development(3page)_ As the project is located at seafront, it is lack of hydropower
http://energy-indonesia.com/03dge/Mochamad%20Sofyan.pdf

4 Ocean energy in Indonesia (14~15page) _ around the project site, ocean energy is limited.
http://wreeec2011bali.com/uploads/files/Presentation%20Prof%20Mukhtasor.pdf

5 Not only in the project site but also in Cilegon, there is no plantation. thus biomass is hard to get.
http://cilegonkota.bps.go.id/publikasi/CDA%202010.pdf _Cilegon in figure 2010(page11)

6 The Development of Photovoltaic System in Indonesia (9page) _ In the project area, the solar irradiation is not suitable.
https://circle.ubc.ca/bitstream/id/160590/Wirasaputra_Vincent_2012_EECE492_Final_Report.pdf

		study as well. And we confirms not any kind of waste energy which could be recovered and used for power generation exists in the process of ISM through ISM design document. Therefore PP could not use other waste energy from the ISM. P9 is not applicable.	
P10	Sourced from grid-connected power plants	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
P11	Existing captive electricity generation using waste energy. (if the project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency or lower recovery than the project activity)	There is no existing captive electricity generation using waste energy because the project activity is Greenfield project. It was confirmed by ISM design document and FSR. Thus, P11 is not applicable.	Exclude
P12	Existing cogeneration using waste energy. But at a lower efficiency or lower recovery	There is no existing power cogeneration using waste energy because the project activity is Greenfield project. Moreover, in the absence of the proposed project, the waste gas would directly be released to the atmosphere. Also, according to Regulations Minister of Energy and Mineral Resources of Indonesia No. 31/2005, using energy-efficient products and technologies are recommended to be applied. The lower efficiency of cogeneration is thus deemed to be not complying with the regulation. In addition, the scenario represents captive generation with lower efficiency than the project activity is impossible to find in the region. According to the FSR, there is no applicable technique with significant lower efficiency for the use of waste gas to cogeneration currently available. Meanwhile, the project owner chooses the appropriate technology with state of the art performance. Therefore, the lower efficiency of waste gas to cogeneration is not a business-as-usual choice. Thus, P12 is not applicable.	Exclude

For heat generation, the realistic and credible alternatives are:

Option	Description	Validation result	Conclusion
H1	The project activity is not undertaken as a CDM project activity	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
H2	On-site or off-site existing fossil fuel based cogeneration plant	It is not a credible alternative as same reason of P2.	Exclude

H3	On-site or off-site Greenfield fossil fuel based cogeneration plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
H4	On-site or off-site existing renewable energy based cogeneration plant	It is not a credible alternative as same reason of P4.	Exclude
H5	On-site or off-site Greenfield renewable energy based cogeneration plant	It is not a credible alternative as same reason of P5.	Exclude
H6	An existing fossil fuel based element process	There is no fossil fuel based element process because the project activity is Greenfield project. It was confirmed by ISM design document and FSR. Thus, H6 is not applicable.	Exclude
H7	A new fossil fuel based element process	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
H8	An existing renewable energy or other waste energy based element process to supply heat	There is no existing renewable energy or other waste energy based element process to supply heat because the project activity is Greenfield project. In addition, the validation team checked the proposed project just could use the waste gas from the ISM through power purchase agreement (PPA) with PT KP and feasibility study as well. And we confirms not any kind of waste energy which could be recovered and used for heat generation exists in the process of ISM through PPA and ISM design document. Therefore PP could not use other waste energy from the ISM. Thus, H8 is not applicable.	Exclude
H9	A new renewable energy or other waste energy based element process to supply heat	The steam from the project will be generated in a bypass steam generation way from the condensing extraction turbine that is collateral operation of the electricity generation using waste gas and the amount of steam supply from the project is very small part of the cogeneration (4.3%). Thus facilitating new other waste energy based independent element process to supply steam (e.g. waste gas fired boilers) is not financially attractive in a cogeneration project compare to operating collateral operation and not business-as-usual choice to the project owner. In regard to a new renewable energy process to supply heat, there are no renewable energy sources such as wind hydro, ocean energy and biomass in the region of the project and due to huge initial investment and low efficiency for supplying power for solar energy, these renewable energy for heat generation are not possible. It was confirmed by the relevant references for each renewable energy source	Exclude

		and physical site inspection as well. Therefore, alternative H9 is not a credible alternative.	
H10	Any other source such as district heat	There is no heat/steam exchange in Indonesia industry in doing so heat/steam is only to be generated and consumed within the captive plant. Consequently, there is no district heat facility is available in the project location. It was confirmed by interview with local officer and on-site inspection.	Exclude
H11	Other heat generation technologies (e.g. heat pumps or solar energy)	Using other generation technologies such as heat pump is not efficient and it is hard to make an output as much as project activity. Therefore, the validation team concludes it is not economically attractive to produce the amount of steam produced by the proposed project using heat pumps or solar energy. In addition, the project activity is only possible due to the utilizing the waste gas from the ISM plant thus other steam generation technologies such as heat pumps or solar energy cannot be the PP's business field. Thus, H11 is not applicable.	Exclude
H12	Steam/process heat generation from waste energy, but with lower efficiency or lower recovery	The validation team found a lower efficiency technology or lower recovery results less financial attraction in general. Therefore, it makes more serious barrier for the project. Moreover, in the absence of the proposed project, the waste gas would directly be released to the atmosphere. Also, according to Regulations Minister of Energy and Mineral Resources of Indonesia No. 31/2005, using energy-efficient products and technologies are recommended to be applied. The lower efficiency of steam generation is thus deemed to be not complying with the regulation. According to the FSR, there is no applicable technique with significant lower efficiency for the use of waste gas to steam generation currently available. Meanwhile, the project owner chooses the appropriate technology with state of the art performance. Therefore, the lower efficiency of waste gas to steam generation is not a business-as-usual choice. Thus, H12 is not applicable.	Exclude
H13	Cogeneration with waste energy, but at a lower efficiency or lower recovery	It is not a credible alternative as same reason of H12.	Exclude
H14	On-site fossil fuel consumption to supply heat	This alternative is in compliance with all applicable legal and regulatory requirements.	Include

For the use of waste energy, the possible baseline scenario is selected as below.

- Scenario W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized;
- Scenario W4: Waste energy is used for meeting energy demand at the recipient facility(ies)
- Scenario W6: All the waste energy produced at the facility is captured and used for export generation or steam.

For power generation, the possible baseline scenario is selected as below.

- Scenario P1: Project activity not undertaken as a CDM project activity
- Scenario P3: On-site or off-site Greenfield fossil fuel fired cogeneration plant
- Scenario P8: On-site or off-site Greenfield fossil fuel based captive plant
- Scenario P10: Sourced from grid-connected power plants

For heat generation, the possible baseline scenario is selected as below.

- Scenario H1: The project activity is not undertaken as a CDM project activity
- Scenario H3: On-site or off-site Greenfield fossil fuel based cogeneration plant
- Scenario H7: A new fossil fuel based element process
- Scenario H14: On-site fossil fuel consumption to supply heat

To sum up, the most plausible scenarios obtained from the combination of the alternatives are presented in the following table 2

< Table 2> Combination of baseline options and scenario

Combination	Baseline scenario	Description of Situation

1	W2	P3	H3	The waste gas is released to the atmosphere after incineration, a new on-site fossil fuel based cogeneration plant is constructed to provide ISM electricity and steam
2	W2	P8	H14	The waste gas is released to the atmosphere after incineration, Greenfield fossil fuel based captive plant is constructed to provide electricity, On-site fossil fuel is consumed to supply steam
3	W2	P10	H7	The waste gas is released to the atmosphere after incineration, the electricity is imported from JAMALI grid and the heat is supplied fossil fuel based steam boiler.
4	W4/ W6	P1	H1	The waste gas is used for generating the electricity and steam to satisfy the demand at the recipient facility, not undertaken as a CDM project activity

Thus, possible and reasonable combinations of each scenario are described as follows;

- Combination 1: W2 and P3 and H3
- Combination 2: W2 and P8 and H4
- Combination 3: W2 and P10 and H7
- Combination 4: W4/W6 and P1 and H1

Step 2: Step 2 and/or Step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenario by eliminating non-feasible option (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).

For the alternative combination 1;

In order to assess the validity of alternative combination 1, firstly PP investigated available fossil fuel for cogeneration that would have been used by the recipient all the fossil fuels available in the host country, including those which can be imported. As result of investigation, PP found the available fossil fuels are LNG, heavy oil and coal in Indonesia. Therefore, the possibility of alternative combination 1 was validated as divided into those fuels' possibility of use.

Firstly, according to the "Long term infrastructure development plan to meet domestic gas demand / ministry of energy and mineral resources, directorate general of oil and gas" from the 5th International Indonesian Gas Conference & Exhibition, Western Jawa region where is exact project site needs additional LNG supply because this area is not equipped gas supply

infrastructure. Therefore, PT PGN (Perusahaan Gas Negara)[1] limited the quantity of gas supplying for new customer LNG.[2] The validation team found it is not available of use of LNG due to lack of gas supply infrastructure in project area through the relevant document above, site inspection and interview with local officer as well.

Secondly, the price of heavy-oil[3] is far expensive than other fuels. PP investigate that the unit fuel price of each fossil fuel and found heavy oil (18.96USD/GJ) is much expensive than other fuels. Refer to the Table 3 below. Thus, for the large quantity of power plant for generating electricity and steam, the heavy-oil is not a credible scenario due to the cost of the fuel. In addition, we found the government got rid of the subsidy of oil through the "Indonesia's Fuel Subsidies: Action plan for reform" by Indonesian Institute for Energy Economics dated of March 2012.[4] Therefore, the price of oil is expected to expensive more than before.

< Table 3> Fuel price comparison per unit of energy

	Fuel price		Energy in joule		Price of fuel
					USD/GJ
LNG	7.79	USD/mm BTU	1.055	J/BTU	7.38
Heavy Oil	0.68	USD/ Lit	0.03586[5]	GJ/Lit	18.96
Coal	62.39	USD/tone	25.3	GJ/tone	2.60

Thirdly, a coal seems to be most probable fossil fuel for alternative of project activity considering the viewpoint of fuel cost. However, PP excluded coal as a fuel for selecting most plausible alternative. Because the installation of the coal based cogeneration power plant needs huge land requirement, it is essential prerequisite. In order to operate coal based cogeneration plant with 200MW capacity, it need almost same land requirement as the proposed project's site to store the coal. However the project activity is just a part of the ISM for supplying the electricity and steam and the ISM design was already planned and fixed by PT KP thus PP could not broaden their project site and also it need much construction cost to build coal based cogeneration plant off-site due to the coal feeding system installation. The validation team found a coal based cogeneration plant is not applicable for alternative scenario by checking the plant design layout of ISM plant and the reference for the size of coal based power plant in Indonesia.
To sum up the availability of alternative combination 1 above, the validation team confirmed the alternative combination 1 is not plausible baseline scenario.

[1] National Gas Company
[2] Handbook of energy and economic statistics of Indonesia 2011 which is published by Ministry of Energy and Mineral Resource
[3] http://ptmitraoilpertamina.indonetwork.co.id/2846356/harga-jual-kami-...1
[4] http://www.iisd.org/gsi/sites/default/files/ffs_actionplan_indonesia.pdf, http://www.businessweek.com/news/2012-03-26/indonesia-fuel-price-rise-needed-to-protect-growth-basri-says
[5] Volumetric energy density of Diesel oil (35.86 MJ/L)

For the alternative combination 2;

As assessed in the alternative combination 1, using fossil fuel such as LNG and Heavy oil for both electricity generation from a captive plant and on-site steam supply is not applicable because of financially unattractive and not equipped infrastructure. Thus only coal based electricity generation from a captive plant and on-site steam supply is applicable for this combination.

Even though this combination 2 assumed separated energy generation facility (electricity, steam), not cogeneration plant, only coal based captive power plant for electricity generation also needed huger land requirement because captive power plant for electricity generation charged much higher portion (94%) of total energy generation of proposed project. Thus only captive power plant for electricity generation is also impossible to build it at the project site as same reason in combination 1. Thus validation team confirmed the alternative combination 2 is not plausible baseline scenario in the context of alternative combination 1.

For the alternative combination 3;

In alternative combination 3, considered in these terms, the electricity would be from the Grid Company (JAMALI) and this is available in abundance. Also the electricity grid is dominated by coal-fired plants. Coal is the main fuel used in the JAMALI Grid to generate electricity as it is available in abundance in Indonesia and there is no supply constraint or any utilization limitation in Indonesia laws and regulations.

As for the steam supplied by fossil fuel based steam boiler, it is explained the fossil fuel[1] for cogeneration power plant is not applicable scenario in alternative combination 1. However the amount[2] of steam supply from the project is only small part of the cogeneration in the proposed project[3], so only steam boiler installation operated by fossil fuel based on and land requirement for fossil fuel storage is possible. And the selected fossil fuel for steam boiler is coal considering financially attraction from the unit fuel price of each fossil fuel and not equipped gas supply infrastructure which is investigated alternative combination 1 above. Thus the validation team confirmed the alternative combination 3 is plausible baseline scenario.

For the alternative combination 4;

In alternative combination 4, the project activity is not undertaken as a CDM project. It does not encounter any fuel supply constraints as the proposed project activity utilizes waste gas to generate electricity and steam. Thus the validation team confirmed the alternative combination 4 is plausible baseline scenario. However, the validation team verified by investment analysis according to the "Tool for the demonstration and assessment of additionality" and found it is not

[1] Applicable fossil fuel is coal by the reason of economical advantage than other fossil fuel and infrastructure possibility as explained in combination 1.

[2] Amount of steam generation : 32ton/hr

[3] The steam output charges only 6% of total energy output, FSR

feasible and should not be the baseline scenario of the project. More details in the section of 3.4 Additionality.
Consequently, the baseline scenario is concluded to be combination scenario 3 : "The waste gas is released to the atmosphere after incineration, the electricity is imported from JAMALI grid and the heat is supplied fossil fuel based steam boiler. The validation team confirmed that no reasonable alternative has been excluded.

Step 3: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the baseline scenario
Combination scenario 3 (W2/P10/H7) identified by the PDD is one of the scenarios described in methodology Table 2, where the proposed project falls (ACM0002 Ver.04). Therefore, the methodology is to be applicable to the proposed project.
We confirmed that all the assumptions and data used by the project participants are investigated including their references and sources and all documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD. And assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable.

Thus the validation team concludes that the ACM0012 (Ver. 04) and Tool for the demonstration and assessment of additionality (Ver. 07) have been correctly applied to the identification of alternatives to the project activity and the identification of alternatives are complete under relevant national and/or sectoral policies and circumstances, and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

Algorithms and/or formulae used to determine emission reductions

The validation team has assessed the calculations of project, baseline, leakage emissions as well as the emission reductions. Corresponding calculations were carried out based on calculation spread-sheets. The parameters and equations presented in the PDD and further documentation have been compared with the information and requirements presented in the methodologies and respective tools. The equation comparison has been made explicitly in regard of formulae presented in PDD and the emission reduction calculation spreadsheet.

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. And the values presented in the PDD are considered reasonable based on the documentation reviewed, further references and the result of the interviews.

Finally, the validation team has confirmed that the application, discussion and determination of the chosen baseline methodologies are transparent and reasonable and baseline for this project activity is reasonably determined by considering relevant national and/or sectoral policies and circumstances. Also validation team validated the key assumption, calculations and rationales used in the PDD by checking the documents and sources referred to in the PDD and methodologies.

(1) Baseline emission

According to ACM0012 (Ver. 04), the baseline emissions for the year y (BE_y) correspond to the combination scenario 2 (W2/P10/H7) and shall be determined as follows:

$$BE_y = BE_{En,y} + BE_{flst,y}$$

In the baseline scenario, the waste gas from the ISM plant was released directly to the atmosphere thus $BE_{flst,y}= 0$

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$$

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y})$$

$$BE_{Ther,y} = f_{cap} * \sum_j \left\{ \left(\sum_n f_{wcm,n,y} * HG_{n,j,y} \right) * EF_{heat,j,y} \right\}$$

The formulas required for the determination of baseline emissions for the project activity is correctly presented, enabling a complete identification of parameters to be used and/ or monitored. The validation on each baseline emission parameter and associated estimation for baseline emission are described in below Table 4 and Table 5.

[Table 4] Equation and parameters for baseline emission from electricity generation

Parameter Title	Final Value	Description	Means of Verification	Comment
$BE_{Elec,y}$	768,664 tCO_2e	Baseline emissions due to displacement of electricity during the year *y* in tons of CO_2	Calculated value $BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y})$	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
$EG_{i,j,y}$	1,037,334 MWh	The quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from i^{th} source (*i* can be either grid or identified source) during the year *y* in MWh	Calculated value $EG_{i,j,y} = EG_{GEN}, -EG_{PJtoPJ,y}$	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
EG_{GEN}	1,103,547 MWh	Annual evaluated power generated by the project in year y	Verified by calculating designed electricity generating capacity (138.48MW) multiplies annual operating hour (7969h). Designed electricity generating capacity (138.48) is calculated by total energy output such as both electricity and steam (145.25MW) which is estimated in FSR and Pohang ISM plan's energy balance in a conservative manner[1],	**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? Yes

[1] PP used values in energy balance for the project except basic units of LDG. PP selected basic unit of LDG as 66 Nm3/Ton from Pohang ISM Plant instead of 90 Nm3/Ton in a conservative manner in emission reduction.

			minus 35ton/hr (6.77M[1]) of steam generation. Total energy output (145.25MW) is estimated by the waste gas generation from ISM process to the proposed project activity. Waste gas balance in Feasibility Study shows that the waste gas which shall be used for the project activity is 284,190Nm^3/hr[2]. And this amount of waste gas was based on the actual experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM plants in Korea[3]. The validation team checked waste gas balance in Korean ISM Plants and confirmed waste gas availability of proposed project is valid. The annual operating hour (7969h, 90.9% of PLF) is derived from the maintenance & repair plan in FSR. Because PP set the maintenance and overhaul time during the whole operating period as scheduled in PPA, thus maintenance and overhaul time and the operation hour cannot be changed. In addition, POSCO who is one side of PT KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has many experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea over 30 years, in doing so they have much of expertise for operation planning and	Choice of data correctly justified? Yes Measurement method correctly described? Yes

[1] According to the enthalpy table from the Heat Balance Diagram made by 3rd party design institute, in order to generate 1 ton of process steam, 0.21MWh of electricity in needed. Thus 6.77MWh is needed for 32 tons of process steam. The validation team confirmed that the converting process from the steam amount to electricity amount is correct.

[2] Among whole waste gas from the ISM plant, operations associated with the steel mill consume 54.8% of the total waste gas and the remaining 45.2% percent of waste off gas(284,190Nm^3/hr) is consumed by the project activity to produce electricity and steam.

[3] Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

<table>
<tr><td></td><td></td><td></td><td>also we found the estimated annual operation hour of Gwangyang ISM Plant is 6941 hour [1] that is lower than the proposed project.</td><td></td></tr>
<tr><td>EG_{PJtoPJy}</td><td>66,213MWh</td><td>Electricity consumed by the project from the project in year y</td><td>The value of $EG_{PJtoPJ,y}$ (6% of electricity output (1,103,547MW)) applied based on installed capacity of the electricity consumption facility in the project such as pump, fan, air-compressor etc. The validation team checked the designed equipment electricity consumption capacity in Elec. Load List of project design. Total electricity consumption capacity of project activity is identified as 19.685MW in the Load List, however 6% of total energy output (9.9MW) was applied considering the rated output of each electricity equipment.
Meanwhile, validation team checked the available 4 similar projects for auxiliary electricity consumption. The average consumption rate of similar projects is 9.0% of gross electricity generation that is higher than the proposed project (6.0%). Even the smallest rate of auxiliary electricity consumption (3%) in similar projects, the IRR results shows below the benchmark rate (10.6%).
Thus, the validation team conclude the estimated captive power consumption (66,213MW[2]) is reasonable and valid.</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></tr>
</table>

[1] Estimated annual electricity generation during 2007 ~ 2008, Feasibility study of Gwangyang ISM Plant, #9 waste gas generation
[2] Captive power consumption from the electricity generation : 1,260,935 MWh * 0.06 = 75,656MWh

$EF_{Elec,i,j,y}$	0.741 tCO_2/MWh	The CO2 emission factor for the electricity source i (i=gr (grid) or i=is (identified source)), displaced due to the project activity, during the year y in tons CO_2/MWh	By means of checking the Indonesian DNA (Directorate General of Electricity, Ministry of Energy and Mineral Resources) website[1] and interview with the staff of Indonesian DNA[2], the validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was published on 27 March 2012 and found the most recent data was available on electricity generation and dispatch to JAMALI grid at the time of uploading the PDD for global stakeholders comment on UNFCCC website (14 April 2012). In the absence of the project activity, the same amount of electricity would have been produced in the grid, thus the baseline of the project activity are the emissions generated by generation of electricity in the JAMALI grid of Indonesia. The PDD has correctly identified the electricity system as Java-Madura-Bali (JAMALI) grid in accordance with applied tool in section B.4 and B.6.1. The project activity will be supplied the net electricity generated from JAMALI grid. Operating Margin (OM) and Build margin (BM) emission factors are correctly taken from the Emission Factor of JAMALI grid published by DNA of Indonesia on its official	

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?	Yes
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes

[1] http://pasarkarbon.dnpi.go.id/web/index.php/news/view/electricity-emission-factors-update-2011.html

[2] The local consultant Mr. Irhan (CDM Indonesia) interviewed with a staff of Indonesian DNA, Mr. A. Smyanugraha in 34 July 2013and found OM, BM, CM calculation procedure is correctly in accordance with the "Tool to calculate the emission factor for an electricity system" (version 02.2.1). The photos for the calculation procedure which were taken at interview has been provided to the DOE.

			website and is available on public domain is reliable data source available to PP. The validation team has reviewed the correctness of data used for the baseline determination by reviewing the information on emission factor of JAMALI grid on DNA website. In accordance with "Tool to calculate the emission factor for an electricity system", the emission factor can be calculated by one of the following options: a) Either by calculating combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM) Or b) By calculating weighted average emissions in the current generation mix. PP has calculated CM by opting the option (a) i.e. calculating 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' which is further calculate on the basis on operation margin (OM) and build margin (BM). The validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was the most recent data available on electricity generation and dispatch to JAMALI grid in Indonesia at the time of uploading the PDD for global stakeholders comment on UNFCCC website.	

			The simple OM emission factor was calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO2/MWh) of all generating power plants serving the system for year 2008, 2009 and 2010, as 0.769 tCO2e/MWh (fixed ex-ante). In calculating above low-cost/must-run power plants units were not included. The weighted average CO2 emission factor of build margin was calculated as the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The validation team checked by interviewing with the staff of Indonesian DNA and confirms that the selection of the options was correct. In validating this step, assessment team further confirms that: (i) the identified power capacity additions comprise 20% of the system generation for the year under consideration. (ii) none of the considered power capacity additions considered under (i) above have been built more than ten years earlier. The weighted average of build margin emission factor for year 2010 is calculated as 0.712 tCO2e/MWh (fixed ex-ante). This is in line with the guidance provided in the "Tool to calculate the emission factor for an electricity system" and we checked combined margin emission factor for the	

			JAMALI grid of Indonesia have been calculated to be 0.741 tCO2e/MWh by applying the weightage for OM and BM as 50:50 through ″Emission factor for the latest information on the CDM project eight interconnected power system in Indonesia″ issued by Executive director national council of climate change on 27 March 2012 which is based on ″Emission Factor Delivery for CDM project″ issued by Directorate General of Electricity on 08 February 2012. The combined margin emission factor is fixed ex ante for the entire crediting period. As result of applying the emission factor issued by Indonesian DNA (0.741 tCO_2/MWh), PP revised amount of emission reduction as 809,138 tonCO_2/y in PDD and ER spreadsheet and we confirmed the emission reduction calculation correct. The validation team checked that the applied emission factor of JAMALI grid in Indonesia issued by Indonesian DNA is published in order to apply CDM project and checked registered CDM projects developed in Indonesia used this published emission factor as well. Thus we confirmed applied emission factor (0.741 tCO_2/MWh) is valid to use	
f_{wcm}	1	Fraction of total electricity generated by the project activity using waste energy.	According to the methodology ACM0012 (version.04), the electricity generation is purely from use of waste energy, thus the fraction is 1.	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
f_{cap}	1	Energy that would have been produced in project year y using waste gas/heat generated in base year expressed as a fraction of total energy produced using waste gas in year *y*.	According to the methodology ACM0012 (version.04), the proposed project is a Greenfield facilities. Thus the fraction is 1	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes

[Table 4] Equation and parameters for baseline emission from thermal generation

Parameter Title	Final Value	Description	Means of Verification	Comment
$BE_{Ther,yy}$	40,474 tCO_2e	Baseline emissions from thermal energy (as steam) during the year *y* in tCO_2	Calculated value	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
$HG_{n,j,y}$	452.23 TJ	Net quantity of heat supplied to the unit process/element process/ reactor *n* in recipient facility *j* by the project activity during the year *y* (TJ).	Net quantity of heat supplied (process steam) is calculated from the difference of both enthalpy of steam supply to facilities (2,837.1KJ/Kg at 260°C, 12.75bar) and enthalpy of feed water to	**Data Checklist** **Yes/No** Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate Description of parameter? Yes

<table>
<tr><th>Parameter Title</th><th>Final Value</th><th>Description</th><th>Means of Verification</th><th>Comment</th></tr>
<tr><td></td><td></td><td></td><td>the boiler (1,063.7KJ/Kg at 245.3°C, 0bar). These enthalpies are derived from the Heat Balance Diagram made by 3rd party design institute, FUJI Electric systems on 9 November 2010.
Annual steam output has been calculated by Steam Balance Study of the project and the outcome of the study applied to the FSR. According to the Steam Balance Study, the steam generation and consumption in the ISM process in the absence of project activity, the shortage of steam generation expected to 32ton/h thus 32ton/h steam will be generated from the two boilers with the capacity of 45ton/h.
Therefore, net quantity of heat supplied is
(2,837.1 KJ/Kg - 1,063.7 KJ/Kg) * 32ton/h * 7,969h / 10^6 = 452.23 TJ
The validation team checked the calculation equation and source data used for the calculation and confirmed calculated steam output is correct.</td><td><table><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></tr>
<tr><td>$EF_{heat,j,y}$</td><td>89.5
tCO_2/TJ</td><td>The CO_2 emission factor per unit of energy of coal used in boiler used by recipient facility j during year y in absence of the project activity</td><td>Calculated value
$EF_{heat,j,y} = \sum_i ws_{i,j} \frac{EF_{CO2,i,j}}{\eta_{EP,i,j}}$</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></tr>
</table>

Parameter Title	Final Value	Description	Means of Verification	Comment
$EF_{CO2,i,j}$	89.5 tCO_2/TJ	The CO_2 emission factor per unit of energy of the baseline fuel used in i^{th} element process used by recipient j, in tCO_2e/TJ, in absence of the project activity	The lower limit of the uncertainty at a 95% confidence interval value of the baseline fuel (coal) applied from IPCC 2006 Guidelines for National Greenhouse Gas Inventories.	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
$\eta_{EP,i,j}$	1	Efficiency of the i^{th} element process that has or would have supplied heat to j^{th} recipient in the absence of the project activity	According to the methodology ACM00012, because the recipient facility is a Greenfield facility and its baseline source of heat is an element process, the efficient of the element process assumed as 100% based on the net calorific value as a conservative approach.	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
$ws_{i,j}$	1	Fraction of total heat that is used by the recipient j in the project that in absence of the project activity would have been supplied by the i^{th} element process	In the site of the project, there are no other existing or newly build boiler for steam generation except project activity, therefore, $ws_{i,j}$ is assumed as 1.	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes
$f_{wcm,n,y}$	1	Fraction of total heat generated in the unit process/ element process/reactor n by the project activity using waste energy.	According to the methodology ACM0012 (version.04), the steam generation is purely from use of waste energy, thus the fraction is 1.	**Data Checklist** / **Yes/No** Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate Description of Yes

Parameter Title	Final Value	Description	Means of Verification	Comment
				parameter?
				Source clearly referenced? Yes
				Correct value provided Yes
				Has this value been verified? Yes
				Choice of data correctly justified? Yes
				Measurement method correctly described? Yes
f_{cap}	1	Factor that determines the energy that would have been produced in project year *y* using waste energy generated at a historical level expressed as a fraction of total energy produced using waste source in year *y*.	According to the methodology ACM0012 (version.04), the proposed project is a Greenfield facilities. Thus the fraction is 1	**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? Yes Choice of data correctly justified? Yes Measurement method correctly described? Yes

KFQ validated through the checked with the methodology ACM0012(version 04), FSR, and other related references, that the PDD had been correctly calculated based on the methodology using appropriate data, and of which result was also correctly applied to the BE_y calculation.

Thus, the validation team confirmed that the application, discussion and determination of the chosen baseline methodology are transparent and reasonable. The baseline for this project activity is reasonably determined by validating the key assumption, calculations and rationales used in the PDD by checking the documents and sources referred to in the PDD.

(2) Project emission

Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas($PE_{AF,y}$) and electricity emissions due to consumption of electricity for cleaning of gas before being used for generation electricity($PE_{El,y}$).

Thus according to ACM0012 (Ver. 04), the project emissions for the year y (*PEy*) shall be determined as follows:

$PE_y = PE_{AF,y} + PE_{EL,y}$

Where:

PE_y = Project emissions due to project activity;

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason;

$PE_{EL,y}$ = Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption (as per Summary of gases and sources included in the project boundary on PDD B.3.)

Regards to the $PE_{AF,y}$, fossil fuel (heavy oil) will be consumed in the emergency case. The value zero correspond the condition heavy oil use only at emergencies and no one is foreseen at the validation but this figure will be monitored. Carbon dioxide emission factor of heavy oil per unit of energy ($EF_{CO2,i}$) as 78.8 tCO2 / TJ and Net Calorific Value (NCV_i) of heavy oil as 41.7 TJ/Gg will be applied from 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 according to the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (ver. 02)".

The electricity for gas cleaning equipment would be consumed in baseline and project emissions. Thus electricity consumption for gas cleaning is ignored according to the methodology. Additionally, all electricity consumed for the project activity will be supplied from electricity

generated by the project activity. The electricity consumed for the project activity will be deducted from total electricity generated by the project activity. Thus, the electricity consumed for the project activity is also ignored and the ex-ante project emission is zero.
However, in case of the emergency situation or the start-up of project activity, the electricity will be supplied from the JAMALI grid. Thus it will be monitored and considered as the project emission.

In conclusion, it is valid that the project emission of the proposed project is zero according to the methodology.

(3) Leakage
According to the methodology, no leakage emissions have been applied for the Project.

(4) Conclusion
The validation team concluded that the GHG calculation is transparent and the amount of estimated baseline emission, project emission and leakage is reasonable. Also validation team confirmed that all the assumptions and data used by PP are considered reasonable and the methodology has been applied correctly to calculate baseline emission and emission reduction.

Further to this, all estimates of the baseline emissions, project emissions and accordingly emission reductions can be replicated using data and parameter values provided in the PDD.

Nevertheless CAR 3, CAR 5, CAR 6, CAR 9 and CL 3 were raised in the course of the validation and were successfully closed (ref Annex: Validation Protocol- Table 3).

3.4 Additionality

The additionality of the project has been established in the PDD using the "Tool for the demonstration and assessment of additionality" (Version 7.0).

Through our thorough investigation and analysis, we can state that the identification of alternatives to the project activity is complete under relevant national and/or sectoral policies and circumstances and the "Tool for the demonstration and assessment of additionality" (Version 7.0) is correctly applied. And, the validation team concludes the proposed project activity is additional as it would not have happened in the absence of CDM.

Prior consideration and continued action to secure CDM status

As starting date of the project activity is 05 October 2011 (the date of contract of power plant installation), which is after 2 August 2008. Validation team had assessed the evidence that the

project participants informs the Indonesia DNA and the UNFCCC secretariat in writing of the commencement of the project activity according to the "Guidelines on the demonstration and assessment of prior consideration of the CDM, version 04" (EB 62, Annex 13)
The validation team checked that the PP informed their intention to seek CDM status for the proposed project activity to the Indonesia DNA on 10 November 2011 (accepted on 11 November 2011) and PP inform the notification to the UNFCCC secretariat on 08 November 2011*, (accepted on 10 November 2011) respectively.

Even though PP noticed their project to the Indonesia DNA and to the UNFCCC Secretariat by e-mail, the validation team have assessed the evidence that an incentive from the CDM was seriously considered in the decision to proceed with the project activity and the project owner at that time was aware of CDM development in Indonesia and decided to carry out project with CDM. The consideration of CDM benefits prior to the starting date of the project activity has been found in the board meeting minute held on 21 December 2010.

In order to proceed with the application, the project owner signed the CDM consultancy agreement with CDM consulting company (RCC Co., Ltd.) on 01 November 2011. After that, DOE contract for CDM validation was made on 08 February 2012 and the PP received the LoA of Indonesia on 27 August 2012 from the National Council on Climate Change. (Dewan Nasional Perubahan Iklim)

The validation team was able to verify all the relevant documents which demonstrate that benefits from CDM had been seriously considered before the starting of the project activity and its CDM continuation was coherent and reliable through evidences and official documents.

Thus, KFQ confirmed that the project owner was aware of the CDM prior to the starting date of the project through checking the board meeting minute, and that the benefits of the CDM were as decisive factor in the decision to proceed with the project activity. Consequently the project activity complies with the requirements of the "Guidelines on the demonstration and assessment of prior consideration of the CDM (version 04)"

Investment analysis

* Project name in the UNFCCC website for the prior consideration that is "Use of off Gas for Cogeneration Project in PT KPP" is different to the project name used in the GSP and final PDD. PP notified this change to UNFCCC secretariat on 3 August 2012 and got the answer as current procedure do not provide for making retroactive changes to published Prior Consideration Forms and this change to be needed a confirmation from the DOE. Thus KFQ checked the project title change history and confirmed the project title in final PDD "Using off gas cogeneration project in PT KPP" is correct.

- **Choice of approach**

  The benchmark analysis option has been adopted for the project activity as the project activity generates financial return other than CDM income and electricity imported from the regional grid which is dominated by fossil fuel-fired power plants and coal based steam boiler is the only alternative except the project activity without CDM. To determine the project shall be implemented or not, the project internal return rate (IRR) is identified as the financial indicator.

  Thus a benchmark analysis (option III) is justified for conducting the investment analysis

- **Benchmark selection**

  The evaluation of the project's financial viability is based on the internal rate on return (IRR). The PP selected the benchmark rate, as 13.58% according to the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS*' issued by Bank Indonesia. The 13.58% of benchmark of electricity industry is therefore appropriate for this project.

  Furthermore, KFQ was able to confirm this is suitable and reasonable as followings:

  a) This benchmark, 13.58% is derived from the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS' issued by Bank Indonesia which is national bank of Indonesia. The benchmarks provided in this publication are the summary of an average of interests between 2008 and 2010 in the investment loan category from 5 Indonesian bank groups such as Bank Persero, Bank Pemerintah Daerah, Bank Swasta Nasional, Bank Asing dan Bank Campuran and Bank Umum. Consequently, this publication can be considered as credible and reliable data source for benchmarks. And the publication is widely applied in Indonesia for assessing the financial viability of various types of project.

  b) Most of registered CDM projects in manufacturing industry in Indonesia use the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS' issued by Bank Indonesia for the benchmark analysis.

  Hence, the validation team concluded that this benchmark, 13.58% is valid to applying the project.

- **Input values**

  All input values apart from investment cost, combined tariff and operational lifetime used in the investment analysis are taken from feasibility study report (FSR) which is the basis material for decision making for investment in the project activity at Board Meeting on 21

* Average of interests between 2006 and 2010 in the investment loan category from 5 Indonesian banks such as Bank Persero, Bank Pemerintah Daerah, Bank Swasta Nasional, Bank Asing dan Bank Campuran and Bank Umum http://www.bi.go.id/web/id/Statistik/Statistik+Ekonomi+dan+Keuangan+Indonesia/Versi+HTML/Sektor+Moneter/

December 2010. The FSR was completed by Poscopower* for the proposed project and finished on 15 October 2010 based on feasibility study by PT KRAKATAU POSCO (PT KP) who is the waste gas supplier as an Integrated Steel Mill(ISM) company in 30 December 2009. Thus FSR was used as basis of investment decision at board meeting The consideration of CDM benefits prior to the starting date of the project activity has been found in the board meeting minute held on 21 December 2010.
The input values during the time gap between the completion of the feasibility study (15 October 2010) and the investment decision (21 December 2010) is less than three months, thus it is unlikely in the context of the underlying project activity that the input values would have materially changed as per para. 113 (a)/VVM ver. 01.2. KFQ was able to confirm it through interview with PP and relevant documents.

As for the investment cost, PP approved 231,000,000USD investment cost in the FSR at the Board meeting stated above and adjusted to 277,000,000USD at the board decision meeting on 05 August 2011 due to mainly civil works and equipment costs increase† found in the course of reviewing proforma quotations for purchasing equipments. The validation team confirmed it through the document for board decision on 05 August 2011‡ prior to project start date (05 October 2011).
KFQ confirmed that the project investor, Poscopower would or not decide to proceed with the project again before starting construction or commitment to big expenditure and got to conclusion the adjusted investment cost is applicable for the investment analysis at the time of investment decision under comprehensive understanding of starting date and additionality.

As for the combined tariff, even though the energy output consists of both electricity and steam, the tariff was estimated only reflecting the electricity tariff in total energy generation (165MW) deducting the waste gas tariff in FSR. Thus PP re-estimated the combined tariff reflecting separated tariff such as electricity and steam and waste gas purchase tariff based on the PPA between PT. Krakatau Poscopower and PT. Krakatau Posco. Moreover, as explained above, PPA has been developed by the purpose of captive energy exchange between PP and PT KP and the output from the project activity will not be sold to the off site facility thus the applied tariff from the PPA is more accurate and reasonable to apply.

As for the operational lifetime, even though 15 years on the FSR, however PP applied 20 years in a conservative manner.

* Poscopower is one side of Joint Venture who is the PP and the other side is PT KDL. According to the FSR, Poscopoer is main part of investment decision such as 90% of investment cost burden to them and PT KDL only support a administrative aproval and provide the manpower . Thus most of the authority for investment for the project in on Poscopower.
† Sea water intake and channel construction, Piling construction etc.
‡ Adjusted investment cost from the board decision for investment cost (05 August 2011) is assessed below investment cost section of the report

Accordingly, validation team can finally conclude that all input values are applicable at the time of investment decision.

For the assessment of the validity of each input value, further to this, KFQ cross-checked the applied values when possible with actual contracts and references, then compared them with KFQ's internal statistic results of the evaluation of similar projects. The validation team selected the 5 similar projects considering below three conditions for project selection.

1) Type : Waste gas recovery and cogeneration (electricity, heat) project
2) Project status: registered as CDM (4 projects) or in the CDM pipeline (1 project)
3) Physical boundary: worldwide
4) Time boundary: before 13 May 2011 (end of GSC period of proposed project activity)

Because there is no waste gas recovery and cogeneration project in the field of integrated Steel Mill plant as a CDM project in Indonesia, the validation team selected waste gas recovery and cogeneration (electricity, heat) project as CDM registered or developing at present, regardless of waste gas source. In addition, the selected similar projects are all developed in other country, we compared the input values with similar project as unit cost base.

[Table 3] List of similar projects

No.	Project	Capacity (MW)	power generation (MWh)	Operation hour	Captive power consumption	Investment cost (million USD)	Investment / Capacity (million USD/ MW)	Annual O&M cost (million USD)	O&M / Capacity (million USD/ MW)
	Proposed project	200	1,239,229	7969	6%	277	1.39	4.5	0.023
1	Coke Oven Gas Comprehensive Utilization for Co-generation Project in Shandong Jikuang Morningsun Thermal Power Co., Ltd	42	252,000	6000	9%	51.76	1.33	5.494	0.131
2	28MW Waste Coke Oven Gas Cogeneration Project for Henan Shuncheng Group	28	205,104	7325	10%	21.63	0.83	1.192	0.043
3	Wugang Waste Gas Recovery and Power Generation Project	100	572,830	7200	15%	69.51	0.75	5.272	0.053
4	Wugang Gas-Steam Combined Cycle Power Plant (CCPP) Project	300	2,170,370	7235	3%	329.66	1.18	39.588	0.132

5	Electric Power Co-Generation by LDG Recovery – CST – Brasil	16	158,196			19.70	1.23	0.296	0.018
Average			671,700	6940	9%	98.452	1.06	10.368	0.075

The details on assessment for validity of each input values are as follows:

Total investment cost: 277,000,000 USD, 1.39 million USD/MW

Total investment cost has been adopted from board decision document for the investment cost from the FSR. .

At first, the validation team compared the proposed project activity with other 5 similar projects. The average investment cost per capacity of similar projects is 1.06 million USD/MW with range of 0.83 million USD/MW ~ 1.33 million USD/MW while that of the proposed project (1.39 million USD/MW) is higher than average investment cost.

The validation team thus assessed this total investment cost as follow.

We found that the reason of higher investment cost is due to the installation of cooling water providing facility. The project designed cooling water usage from the sea water thus cooling water supplying construction such as water channel excavation, pulling sea water system and waterproof treatment etc. required much construction cost that is 28.7% of total investment cost. This kind of work need much more investment cost than other similar projects[*].

In addition, the installed equipment such as gas-fired boilers, turbines, generators and construction works in similar projects were almost provided from the domestic provider whereas the proposed project planned to provide all the equipment and construction works from abroad[†] Therefore we could conclude higher investment cost of proposed project is valid and reasonable under our sectoral knowledge and expertise.

The validation team reviewed actually incurred investment cost for this project activity at the timing of validation such as Offshore contract and Onshore contracts which is main construction contracts is shown approximately 232,787,000 USD[‡]. It is already incurred 84% of planned investment cost used in the investment analysis of the proposed project activity. We found remaining expenditure will be incurred for commissioning, S/V, government permit and approval cost, commissioning fuel cost etc. Even applying actually incurred investment cost, the IRR is 12.4% which is below than the benchmark.

[*] In order to construct cooling water supplying from the sea, the proposed project need new sea water pumping system including sea water channel(1.5km) and sea water pipeline installation (150m) in the project site.

† POSCO E&C

[‡] List of incurred investment cost (100.7% of the total investment cost) is provided in the section 6, Reference

Based on the above assessment, KFQ could conclude that total static investment cost in financial analysis is not overestimated and valid at the time of the investment decision.

Annual O&M cost: 4,500,000 USD/y (1.62% of the total investment cost, 0.023 million USD/KW)

Total annual O&M cost has been adopted from the FSR and it consists of labour and welfare cost, maintenance and overhaul cost and other variable cost. The validation team checked detail estimation of each O&M cost item through the FSR.

In addition, because the POSCO who is one side of PT KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea* over 30 years, O&M cost of each items are estimated based on these experiences and operation results.

The labour and welfare cost (2.5 million USD) is determined based on the salary and welfare and expense for the personnel, distinguished by local employee (54 person) and dispatched employee (13 person) from Korea considering the price level of both countries. Maintenance / overhaul cost (0.5 million USD) and other variable cost (1.5 million USD) which consists of repair cost (0.7 million USD) and other management cost (0.8 million USD) are estimated by operation result of the Gwangyang waste gas recovery and cogeneration project in ISM Plant.

The validation team found that the annual O&M cost of the Gwangyang ISM plant is 0.0203 million USD/MW that is slightly lower than the proposed project. However even applying 0.0203 USD/MW, the IRR is still below the benchmark (10.3%).

All items of O&M cost is from the FSR and validation team confirmed these costs in FSR, deemed appropriate based on the sectoral and local expertise of audit team,

To check validity of O&M cost, the validation team reviewed it with other 5 similar projects and found that O&M cost of the total investment cost for this proposed project activity is lower than the average O&M cost (6.93% of the total investment cost, 0.075 million USD/MW respectively) Furthermore, the validation team checked each item of unit O&M cost with 5 similar projects with the relevant evidences and documents such as labour and welfare cost, maintenance and overhaul cost and other variable cost and we found that all of them are higher than proposed project.

The validation team checked operation record of Gwangyang waste gas recovery and cogeneration project, the similar projects' O&M cost and interviewed with the staff of POSCO and we confirmed applied values are reasonable and valid.

* Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

Annual net energy output : 1,239,229MWh/y, (Plant load factor : 90.9%)

Annual energy output has been adopted based on FSR. The annual energy output can be estimated as sum of annual electricity output and annual steam output.

According to the FSR, annual energy output was multiplied maximum capacity of possible energy generation estimated from the amount of waste gas generation from ISM process for cogeneration (165MW)* multiplied by annual possible operation hour (8027h/y) considering the maintenance and overhaul period. The average energy output was made out as 1,324,455MWh/y. However, the validation team found that PP separate the possible energy capacity as electricity (158.23MW) and steam (32ton/h) in order to make out the exact annual energy output in cogeneration situation and also the maintenance and overhaul time has been adjusted in the process of finalizing a PPA between PP and PT KP with reflecting a TRIP hour (137h/y). Therefore PP got the annual operation hour as 7969 hour and thus the annual energy output as 1,314,885 MWh/y† and we confirmed this figure is more correct and valid to applying investment analysis. The validation team tested IRR with 1,324,455MWh/y of annual energy output in the FSR and found that IRR becomes 11.45% which is still below benchmark.

The plant load factor (90.9% = 7,969h/8760h) is determined from PPA between PP and recipient company‡. Because the proposed project has been developing by purpose of captive energy exchange between PP and recipient company thus the output from the project will not be sold to the off site recipient. Consequently, the PPA is very significant to assess on project's economic feasibility. Therefore, validation team confirmed the plant load factor of the proposed project is provided to banks and/or equity financiers while applying the project activity for project financing and it is also satisfied the Guideline for the reporting and validation of plant load factors (EB48 Annex 11). Furthermore, we checked the operation hour of similar projects and found the average operation hour of 4 similar project among 5 projects§ is 6,940 hour/year and Gwangyang ISM Plant is 6,941 hour/year** which are lower the proposed project.

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* PP applied that surplus waste gas which will be recovered and used for cogeneration such as project activity from the energy balance of proposed project as maximum waste gas usage for investment analysis in a conservative manner instead of using the waste gas generation baic unit (LDG gas) of Pohang ISM plant energy balance. PP selected basic unit of LDG as 90 Nm3/Ton in energy balance instead of Pohang ISM Plant (66 Nm3/Ton) However, regard to emission reduction calculation, PP applied Pohang ISM Plant (90 Nm3/Ton) as waste gas generation baic unit (LDG gas) .

† 1,314,885 MWh/y is gross energy output. Net energy output shall be reflected a captive power consumption (6%) on electricity output.

‡ PT. KRAKATAU POSCO

§ The operation hour of 'Electric Power Co-Generation by LDG Recovery – CST – Brasil' project could not be obtained due to the quite different energy generation approach applied.

** Estimated annual electricity generation during 2007 ~ 2008, Feasibility study of Gwangyang ISM Plant, #9 waste gas generation

The maximum capacity of possible energy generation (165MW) is designed from the maximum waste off gas generation from ISM process. According to the waste gas balance which analyzed a production and consumption of by-product gas from ISM on FSR, total production of waste off gas in the ISM process is 637,539 Nm^3/h* and 54.1% of waste gas is consumed in ISM process and remaining 45.9% of waste off gas (292,837Nm^3/h, 362,418,594kcal/h) will be used in the project activity. It was confirmed by the gas balance in feasibility study by PP which was based on the actual experiences of development and operation of waste gas recovery and cogeneration projects from the ISM plants in Korea†

As a result of this waste gas balance, we found the maximum capacity of possible energy generation (165MW) is reasonable and valid.

Annual electricity output : 1,260,935 MWh/y

Annual electricity output has been adopted based on FSR estimation. As explained above, the maximum capacity of possible energy generation (165MW). The annual electricity generation can be estimated as the applicable capacity (158.23MW) that is maximum waste off gas fed into the turbines for electricity generation except waste off gas for bypassed steam generation (6.77MW) which from the condensing extraction turbine, multiplies annual operating hour (7969h) and the result is 1,260,935 MWh/year. (158.23MW * 7,969 hour/year = 1,260,935 MWh/year)

Annual steam output : 53,950 MWh/y

Regard to the energy output of the project, because FSR only researched total capacity of possible energy generation (165MW, electricity and steam generation), PP demonstrated the steam output by separating both energy output such as electricity and steam.

Annual steam output has been calculated by Steam Balance Study of the project and the outcome of the study applied to the FSR. According to the Steam Balance Study, the steam generation and consumption in the ISM process in the absence of project activity, the shortage of steam generation expected to 32ton/h, thus 32ton/h steam will be generated from the two boilers with the capacity of 45ton/h.

The project activity is designed as condensing extraction turbine type, so the electricity and steam output from the project activity is mutually supplementary. Thus even though the fluctuation of steam generation resulted by the steams consumption required, total energy output maintains the overall capacity of the project activity (165MW) which is derived from the maximum waste gas utilization in the waste energy generation facility (ISM process).

* BFG : 539,726 Nm^3/h, COG : 65,388 Nm^3/h, LDG : 32,425 Nm^3/h

† Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

In addition, the validation team checked same waste gas recovery and cogeneration projects in Pohang and Gwangyang ISM Plant through the performance result of and interview with the staff of these companies. And we found the average unit steam generation for these plants is 13~14 ton/h as per 100MW total generation capacity that is close to the proposed project (16 ton/h per 100MW). We could accept this small difference caused by climate condition between Korea and Indonesia and considering mutual supplementary with the electricity generation through our sectoral expertise and conclude the estimation of steam generation is reason and valid.

Captive power consumption : 6% of total energy output

In order to estimate net electricity output estimation, 6% (9.9MW) of total energy output from the auxiliary electricity consumed equipments by the project activity is applied. The validation team checked the designed equipment electricity consumption capacity in Elec. Load List of project design. Total electricity consumption capacity of project activity is identified as 19.685MW in the Load List, however 6% of total energy output (9.9MW) was applied considering the rated output of each electricity equipment and also in a conservative manner.

Meanwhile, validation team checked the available 4 similar projects for auxiliary electricity consumption. The average consumption rate of similar projects is 9.0% of gross electricity generation that is higher than the proposed project (6.0%). Even the smallest rate of auxiliary electricity consumption (3%) in similar projects, the IRR results show below the benchmark rate (10.6%).

Thus, the validation team conclude the estimated annual captive power consumption (75,656MWh[*]) is reason and valid.

Combined tariff : 3.24 cent/KWh

Even though the energy output consists of both electricity and steam, the tariff was estimated only reflecting the electricity tariff in total energy generation (165MW) deducting the waste gas tariff in FSR[†]. Thus PP re-estimated the combined tariff reflecting separated tariff such as electricity and steam and waste gas purchase tariff based on the PPA between PP and PT KP. Moreover, as explained above, PPA has been developed by the purpose of captive energy exchange between PP and PT KP and the output from the project activity will not be sold to the off site facility thus the applied tariff from the PPA is more accurate and reasonable to apply. Even applying the tariff (2.81 cent/KWh) which is applied in FSR with the deduction

[*] Captive power consumption from the electricity generation : 1,260,935 MWh * 0.06 = 75,656 MWh
Captive power consumption from the steam generation : 53,953 MWh * 0.06 = 3,237MWh

[†] Tariff in FSR : 2.81 cent/KWh = 10.77 cent/KWh (electricity tariff in total energy generation (165MW)) – waste gas tariff (7.96 cent/KWh)

of waste gas price, the IRR becomes 8.3% which is lower than the IRR when the combined tariff (3.24 cent/KWh) applied for the proposed project.

The basic concept of tariff estimation in PPA is

i) The electricity tariff is fixed by PLN electricity tariff in order to guarantee a fair trade between PP and PT KP
ii) The steam tariff and waste gas tariff is determined from the electricity tariff
iii) PP's profit is set by Payable Capacity Charge for electricity and steam*
iv) Payable Energy Charge for electricity and steam† varies PLN electricity tariff's fluctuation
v) In conclusion, the combined tariff is maintained as fixed price even if PLN price is fluctuated

PP made a combined tariff calculation in the PPA as below.

▪ Combined tariff = {(Electricity tariff * Enthalpy ratio for electricity)
+ (Steam tariff * Enthalpy ratio for steam)}‡ – waste gas tariff

Enthalpy ration for electricity (90.43%) and steam (9.57%) is derived from the Main steam Enthalpy (Electricity)§ and the Process steam Outlet Enthalpy (Steam)** according to the Enthalpy table which is made in the process of PPA study based on the boilers specification from the equipment provider and Heat Balance Diagram made by FUJI Electric systems on 9 November 2010. and this enthalpy calculation is followed by "IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam". This ratio is resulted by calculating the all generated steam converted to electricity through the turbine and generator and steam by the condensing extraction type. Furthermore we found the Enthalpy ration for electricity (90.43%) and steam (9.57%) calculation method is widely applied for the PPA in other similar waste gas recovery and cogeneration projects conducted by PP in order to trade waste gas and output energy. Thus we confirmed this resulted enthalpy ratio is definitely different with the energy output ration in IRR calculation†† which will be actually generated energy output ratio considering amount of waste gas supply and steam demand / supply. We tested the IRR in case applying the ratio as electricity (90.43%) and steam (9.57%), the IRR still below benchmark (11.3%).

* Payable Capacity Charge is a price for fixed cost such as equipment investment that is consisted of reflecting Depreciation, Investment return, Operation maintenance, Interest, Tax etc.
† Payable Energy Charge is a price for variable cost, thus this price fluctuate with electricity and steam generation and sales by project operation
‡ Weighted average tariff
§ Main steam Enthalpy (Electricity) : 339,069.6kg/hr * 819.8148kcal/kg = 277,974,276 kcal/hr (125.53bar, 538 ℃)
** Process steam Outlet Enthalpy (Steam) : 39,344.4kg/hr * 747.915kcal/kg = 29,426,267 kcal/hr (38.21bar, 368.4 ℃)
†† Energy output ration in IRR calculation : electricity output (94%) and steam output (6%)

Therefore the validation team confirmed the enthalpy calculation is reasonable and applied appropriately.

Each tariffs applied from the PPA are evaluated as below.

Electricity Tariff : 8.89 cent/KWh

Electricity tariff has been determined in the process of PPA negotiation between PP and PT KP (recipient company). According to the PPA, basic concept of payable charge for electricity has been fixed as follows.

- Payable Charge for Electricity = Payable Capacity Charge for Electricity[*] + Payable Energy Charge for Electricity[†]
  = Purchaser's Receipt Price (from PLN) * Amount of generated Electricity

Thus the electricity tariff is applied as PLN purchaser's price for the project as 8.89 cent/KWh based on the electricity price quote a new connection between PP and PLN dated 30 November 2010[‡]. To assess the validity of the applied electricity tariff, the validation team found the average electricity sales price in industrial field from the PLN is 7.26 cent/KWh according to the PLN Statistics 2011 published by PT PLN and checked the applied tariff in other CDM registered projects in Indonesia at the time of investment decision of proposed project[§] and found the highest tariff is 8.20 cent/KWh that is below than the tariff applied in the proposed project.

Therefore, KFQ could conclude that the application of electricity tariff in PPA, 8.89 cent/KWh is valid for the purpose of demonstrating an additionality of the project.

Steam tariff : 16.17 cent/KWh (3,397 cent/ton)

Steam tariff has been determined in the process of PPA negotiation between PP and PT KP (recipient company) basis of the performance estimation after operation. According to the PPA, basic concept of payable charge for steam has been fixed as follows.

- Steam tariff = Payable charge for steam / Amount of steam sales

[*] Payable Capacity Charge of Electricity is price for fixed cost such as equipment investment that is consisted of reflecting Depreciation, Investment return, Operation maintenance, Interest, Tax etc.

[†] Payable Energy Charge for Electricity is price for variable cost such as fuel cost, thus this price fluctuate with electricity generation by project operation

[‡] According to the electricity price quote a new connection, the price offered 605 Rupia/KWh, 745 Rupia/KWh, 810 Rupia/KWh classified by the grade consumer. Hence, PP selected the highest grade price for investment analysis and thus we confirmed applied electricity tariff (815 Rupia/KWh, 8.89 cent/KWh) considering any small the currency exchange rate is valid to use in a conservative manner.

[§] The applied electricity tariff from PLN was surveyed which was at the timing of investment decision of proposed project that is the year 2010 as below.

- Project Lumut Balai Unit 1 – 2 PT. Pertamina Geothermal Energy (Ref. No. 5785) : 7.53 cent/KWh
- Project Ulubelu Unit 3 – 4 PT. Pertamina Geothermal Energy (Ref. No. 5773) : 7.53 cent/KWh
- Wampu Hydro Electric Power Project (Ref. No. 5368) : 7.23 cent/KWh
- Wayang Windu Phase 2 Geothermal Power Project (Ref. No. 3193) : 8.20 cent/KWh

▪ Payable charge for steam = Payable Capacity Charge for Steam + Payable Energy Charge for Steam

(1) Payable Capacity Charge for Steam = Contracted Capacity Charge * Enthalpy ratio for steam

(2) Payable Energy Charge for Steam = Payable Energy Charge for Electricity * Calories consumed for Steam / Calories consumed for Electricity

Parameters	Value	Unit	Verification
Amount of steam sales	23,040	Ton/month	Amount of steam generation (32 ton/h) * 24 * 30
Contracted Capacity Charge	368,598,142	Cent/month	Contracted capacity charge for both electricity and steam : 4,423,177,700 cent/year / 12
Enthalpy ratio for steam	9.57	%	- Main steam Enthalpy (for electricity generation) : 339,069.6kg/hr * 819.8148kcal/kg = 277,974,276 kcal/hr (125.53bar, 538 ℃) - Process steam Outlet Enthalpy (for steam by condensing extraction type) : 39,344.4kg/hr * 747.915kcal/kg = 29,426,267 kcal/hr (38.21bar, 368.4 ℃)
Payable Capacity Charge for Electricity	333,313,665	Cent/month	Contracted Capacity Charge (368,598,142 cent/month) * Enthalpy ratio for Electricity (90.43%)
Payable Energy Charge for Electricity	677,748,494	Cent/month	Payable Charge for Electricity (1,011,062,159 Cent/month) – Payable Capacity Charge for Electricity (333,313,665 Cent/month)
Calories consumed for Steam	17,232	Gcal/month	Amount of steam sales (23,040 Ton/month) * (Process steam inlet Enthalpy (747.915kcal/kg) / 1000
Calories consumed for Electricity	271,760	Gcal/month	Amount of electricity sales(113,760,000KWh/month) * Electricity generation unit price(2,388.8Kcal/KWh) / 1000000
Payable Energy Charge for Steam	42,975,184	Cent/month	Payable Energy Charge for Electricity (677,748,494 Cent/month) * Calories consumed for Steam (17,232 Gcal/month) / Calories consumed for Electricity (271,760 Gcal/month)

Calculated as above, the steam tariff will be determined by Payable Capacity Charge for Steam, Payable Energy Charge for Steam and Amount of steam sales. As we explained above, Capacity Charge is fixed as PP's profit and thus Energy Charge of steam and Amount of steam sales only impact on the steam tariff. Consequently, Energy Charge for steam is determined by Energy Charge for Electricity that is the PLN electricity price.

Because there is no steam exchange in the industrial market in Indonesia, the steam tariff does not exist in public market. Therefore, the steam tariff must be made by above calculation or equivalent method. To make more concrete investigation, we checked steam tariff applied in Korean industry market at the time of investment decision of proposed project and we found a steam was sold as the price of 35,000 KRW/ton (3222.83cent/ton, 1USD = 1086KRW) from the stream supply contract* that is lower than the tariff applied on the proposed project.

Thus, the validation checked calculation of steam tariff with confirming the source of each value, the steam tariff (16.17 cent/KWh (3,397 cent/ton)) is appropriate and valid to apply.

Waste gas tariff : 6.08 cent/KWh (2.54cent/Mcal)

According to the PPA, the waste gas tariff will be determined by actual expense basis depending on the performance estimation after operation. Thus PP estimated the waste gas tariff for the project activity as following calculation.

- Waste gas tariff = Payable charge for waste gas / Total sales
- Payable charge for waste gas = Payable Energy Charge for Electricity + Payable Energy Charge for Steam

Parameters	Value	Unit	Verification
Payable Energy Charge for Electricity	677,748,494	Cent/month	Payable Charge for Electricity (1,011,062,159 Cent/month) – Payable Capacity Charge for Electricity (333,313,665 Cent/month)
Payable Energy Charge for Steam	42,975,184	Cent/month	Payable Energy Charge for Electricity (677,748,494 Cent/month) * Calories consumed for Steam (17,232 Gcal/month) / Calories consumed for Electricity (271,760 Gcal/month)
Amount of electricity sales	113,760,000	KWh/month	Amount of steam generation (158MW) * 30 * 24 * 1000
Amount of steam sales	4,877,620	KWh/month	- Amount of steam generation (32 ton/h) * 24 * 30 = 23,040 ton/month - According to the Main steam Enthalpy table, to produce 45ton steam, it needed 9.53MW † Thus, 212KW/ton
Total sales	118,637,620	KWh/month	Amount of electricity sales + Amount of steam sales

Calculated as above, the waste gas tariff will be determined by Energy Charge for Electricity and Energy Charge for Steam. And these Energy Charges only impact on the

* Steam Spply Contract betweem Dongkuk Industries Co., Ltd. and OCI Ltd., 17 December 2010
† Process steam flow : 339,069.6kg/hr (100MW + 45Ton/hr) – 309,632kg/hr (100MW + 0Ton/hr) = 29.437 ton/hr

waste gas tariff. Consequently, as explained above, Energy Charge for electricity and steam is determined by Energy Charge for Electricity that is the PLN electricity price respectively. In summary, the waste gas tariff is determined by Energy Charge for Electricity that is the PLN electricity price.

For robust confirmation, the validation team looked into the suitability of the waste gas tariff (6.08 cent/KWh) as below.

According to the PPA, the waste gas tariff was determined taking into account the revenue of this project reflecting the operation cost thus the waste gas tariff will be changed when the revenue and the operating cost changes. Even though waste gas tariff is changed in accordance with the reasons above, the combined tariff* is fixed because the waste gas tariff is closely linked with the PLN electricity price and steam tariff in order to meet PP's revenue. Therefore we found that the waste gas tariff is determined by the actual expense based on the performance estimation after project implementation in the PPA and considering that multiple gas recovery facilities for the project would be incurred high expense than other single gas recovery facility generally thus the waste gas tariff will be set higher.

Finally, the validation team confirmed the waste gas tariff was not estimated excessively considering the recovery equipment investment from the PT. Krakatau Posco side which is the waste gas provider.

To make more concrete investigation, the validation team have tried to investigate market price of the waste gas in host country, however there is no waste gas recovery and trading in Indonesia industry, therefore we investigated 5 similar projects case in China selected by below basis.

1) Type : Waste gas recovery and cogeneration (electricity, heat) project
2) Project status: registered as CDM (4 projects) or in the CDM pipeline (1 project)
3) Physical boundary: worldwide
4) Time boundary: before 02/07/2013 (date of review requested)

< Waste gas tariff of similar projects >

Project name	Elec. Tariff (cent/KWh)	Steam Tariff	Elec. Ratio	Steam Ratio	Sub-combined Tariff	Waste gas Tariff	Combined Tariff

* Combined tariff = (Electricity tariff + Steam tariff) – waste gas tariff

	(A)	(cent/KWh) (B)	(%) (C)	(%) (D)	(ent/KWh) (E)*	(cent/kwh) (F)	(cent/KWh) (E-F)
Coke Oven Gas Comprehensive Utilization for Co-generation Project in Shandong Jikuang Morningsun Thermal Power Co., Ltd	6.48	11.28	77.3	22.7	7.57	3.48	4.09
28MW Waste Coke Oven Gas Cogeneration Project for Henan Shuncheng Group	4.58	8.34	60.5	39.5	6.06	3.90	2.16
Wugang Waste Gas Recovery and Power Generation Project	6.32	5.34	84.3	15.7	6.16	2.56	3.60
Wugang Gas-Steam Combined Cycle Power Plant (CCPP) Project	6.00	5.24	91.0	9.0	5.93	2.16	3.77
Shanxi Linfen 2×6MW Coke Oven Gas Power Generation Project	4.83	7.52	82.58	17.2	5.29	2.01	3.28
AVERAGE	5.64	7.54	79.2	20.8	6.20	2.82	3.38
Proposed project	8.89	16.17	94.0	6.0	9.32	6.08	3.24

As a result of investigation, the validation team found the average waste gas tariff of similar projects is 2.82 cent/KWh that is lower than that of the proposed project, 6.08 cent/KWh, but the average combined tariff of similar projects, 3.38 cent/KWh, is a little higher than that of the proposed project, 3.24 cent/KWh. It is because the average of electricity tariff of similar projects, 5.64 cent/KWh, is definitely lower than the proposed project's electricity tariff, 8.89 cent/KWh. Consequently, even applying the highest combined tariff of similar projects, 4.09 cent/KWh, to the proposed project, the resulted IRR is not over the benchmark.

Through thorough assessment as above, it is believed that the waste gas price internal price as it was decided in a fair trade way. Consequently, validation team concludes that applied waste gas tariff (6.08 cent/KWh) is reasonable and valid to applying in the investment analysis of the project.

* Sub-combined Tariff has been calculated by reflecting a ratio of cogeneration (electricity, steam) to each individual tariffs
E = (A*C)+(B*D)

In conclusion, the combined tariff is maintained as fixed price even if PLN price is fluctuated because the steam tariff and the waste gas tariff were interlocked with the PLN electricity price. Therefore, the validation team concludes that the combined tariff in financial analysis is valid at the time of the investment decision.

TAX

The validation team confirms that the tax rates for Income tax (25%) are properly applied in accordance with Indonesia regulation* and also Income tax (25%) is correctly calculated in accordance with EB 62 Annex 5, Guidelines on the assessment of investment analysis (version 05). Furthermore, this rate is compared with rate used in other waste heat recovery projects in Indonesia.

Interest rate on loan: 6%/year

The interest rate used in the PDD and IRR calculation is 6% from the loan contract and it is quoted from FSR. According to the published bank interest rate† on the Bank Indonesia at the time of FSR completion and the investment decision, the interest rate is 6.5%. The validation team confirmed the applied interest rate is reasonable through checking the financial statistics in Indonesia and also our sectoral expertise and knowledge.
We tested applying published interest rate (6.5%), it almost never impact on the IRR.

Even though decrease of loan interest by principal repayment year by year, PP applied fixed loan interest in whole 20 operation years on the IRR calculation spread sheet in a conservative manner.

KFQ can confirm that the applied interest rate on the loan, 6% of interest rate is valid.

Operational lifetime (20 years)

The operational lifetime has been adopted as 20 years that is adjusted from the FSR (15 years).

Even though the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years according to the PPA, considering the lifetime of main equipment, PP applied 20 years as operational lifetime for the proposed project that is also in accordance with the maximum 20 years operation lifetime recommended in the Guidelines on the Assessment of Investment Analysis (Ver. 05).

The validation team checked equipment lifetime by confirmation letter from the equipment supplier‡ dated on 16 August 2012 and confirmed the lifetime of all main equipment such as steam turbines, generators and boiler is 25 years. Furthermore, we tested the IRR applying the 25 years operation lifetime as the confirmation letter from the equipment supplier and found the IRR shows still below the benchmark (11.0%).

* Law No. 36 year 2008 for tax rate, article 17 (2a)
† BI rate from Bank Indonesia : 6.5% (2009 ~ 2010)
‡ POSCO E&C

Thus the validation team concluded that this project lifetime (20 years) is valid and the lifetime of equipment covers the crediting period (10 years) of the project activity.

Residual value (5%)

The residual value for this project activity is 5% of fixed asset is from the FSR. This residual value was determined using the declining balance method on depreciation.

The validation team investigated the accounting policy and principles of residual value in Indonesia, however there is not any statement for percentage of the residual value or book value. Thus we concluded the 5% of residual value, estimated by project owner is considered reasonable from our sectoral expertise and knowledge since there is no rules in the accounting principles of the host country.

- **Calculation and conclusion**

The validation team has checked all sources of the IRR calculation, as presented in Sub-step 2c in the PDD. KFQ confirms that the values do not materially change between the decision to proceed with the investment and the finalization of FSR as per para. 113 (a)/VVM ver. 01.2. The calculation of spread sheet was completed by the PP and relevant evidence documented was cross-checked with the values in the PDD. The values used in the PDD and associated annexes are fully consistent with the PDR and KFQ has confirmed that input values used in the PDD and the spread sheet are in compliance with the FSR as per para. 113 (b)/VVM ver. 01.2. In addition, the board meeting minute for decision making of proposed project on 21 December 2010 reflected the FSR definitely which was developed by PT. KRAKATAU POSCO (PT KP) who is the waste gas supplier as an Integrated Steel Mill(ISM) company in 30 December 2009. Thus the input values from the FSR are valid and applicable at the time of the investment decision and in compliance with para. 113 (c)/ VVM ver. 01.2.

There is a difference in estimated annual emission reductions between the PDD ver. 01 (1,289,576 tonnes of CO_2e) and final PDD ver. 06 (809,138tonnes of CO_2e). And, the project IRR in the GSC PDD (6.9%) is different with final PDD ver. 05 (10.2%). These differences are caused by the applied the input values for investment analysis improperly and some mistakes from the PP. These wrong application and mistakes were detected by validation team as CARs/CLs in the table 2 of Appendix A "Resolution of Corrective Action and Clarification Requests" and we confirmed all revised vales are valid and applicable.

The after-tax IRR without CDM revenues is 10.2% which confirmed that the project in the absence of CDM benefits and compared to the benchmark of 13.58%, is not financially attractive. With CDM revenue, the project IRR increases to 15.0%[*].

[*] The project IRR With CDM revenue
- In case 10 Euros / CER : 15.0%
- In case 20 Euros / CER : 17.2%

Thus, KFQ is able to confirm that the input values in PP's evaluation are valid and through above thorough assessment, KFQ is able to confirm that the input values in PP's evaluation are appropriate representing the economic situation of the project at the time of investment decision and also financial calculations are correct they have been applied consistently.

- **Sensitivity analysis**

A sensitivity analysis has been carried out for parameters contributing more than 20% to revenues or costs which are static total investment cost, tariff, O&M cost, and annual net output. Basically, ±10% variation has been considered in sensitivity analysis and moreover the critical assumptions of each parameter, which makes the investment analysis result exceed benchmark rate are considered in sensitivity analysis.

1) Total investment cost

We tested when total static investment cost decrease 10%, the result of the after-tax IRR shows still below benchmark (11.8%). In order to reach benchmark, total investment cost shall decrease by 19.2%.

However, the validation team checked actual incurred investment cost for the project activity such as Offshore contract and Onshore contracts which is main construction contracts and shown that 232,787,000 USD that is 84% of planned investment cost has been incurred already and remaining investment cost will be paid.

Therefore, it is impossible for the total investment cost to decrease by 19.2%.

2) Combined tariff

We tested when the combined tariff increase 10%, the result of the equity after-tax IRR shows still below benchmark (11.5%). In order to reach benchmark, combined tariff shall increase by 26%.

According to the PPA, the combined tariff is decided by difference between sales tariff (weighted average for electricity tariff and steam tariff) and waste gas tariff. The electricity tariff is decided as electricity purchasing price from the PLN. And steam and waste gas tariff are calculated as linked with the electricity tariff of the PLN. The basic concept of PPA between PP and PT KP is that the even if PLN electricity price fluctuate in the electricity market, the combined tariff of proposed project will not be changed because PPA fixed Payable Capacity Charge for Electricity and Payable Capacity Charge for Steam, meanwhile only Payable Energy Charge for Electricity and Steam will be fluctuated as same as PLN electricity price fluctuation. In other words, if electricity purchasing price from PLN is increased, the steam price and waste gas price is also increased as electricity price increase. Therefore, PP could make a fixed profit regardless of the price of PLN.

The validation team checked the process of combined tariff determination in the PPA, and concluded the combined tariff for the project is fixed as 3.24 cent/KWh and thus it is impossible for the combined tariff to increase by 26%.

3) O&M Cost

We tested when O&M cost decrease 10%, the result of the equity after-tax IRR shows still below benchmark (10.3%). In order to reach benchmark, O&M cost shall decrease by 232%. According to the Inflation Report (Consumer Price Index) from the Bank Indonesia*, the validation team found Indonesian average inflation rate during the 2007 ~ 2011 is 6.43% thus it is impossible for the O&M cost to decrease by 232%. In addition, if the O&M cost is not considered in the investment analysis, the IRR still below the benchmark (11.7%).

4) Annual net output

We tested when annual net output (electricity and steam) increase 10%, the after-tax IRR shows still below benchmark (11.5%). In order to reach benchmark, the annual net output shall increases by 26%, from 1,239,229MWh to 1,561,428MWh.

The net output is calculated based on the total capacity of energy output and the annual operation hours of the ISM process. Total energy output (165MW) is estimated by the maximum waste off gas generation from ISM process line. And according to the FSR, the maximum waste off gas which shall be used for the project activity will be generated 292,837Nm^3/hr that is 152.5MW, even below than 165MW. Moreover, the operation hour (7,969h/y) is estimated by reflecting a maintenance and overhaul time. Because PP set the maintenance and overhaul time during the whole operating period as scheduled in PPA, thus maintenance and overhaul time and the operation hour cannot be changed. In addition, POSCO who is one side of PT. KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has many experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea over 30 years, in doing so they have much of expertise for operation planning and also we found the estimated annual operation hour of Gwangyang ISM Plant is 6,655 hour that is lower than the proposed project. Therefore, it is impossible for the annual net output to increase by 26%.

These results show that even under very favorable circumstances the after-tax IRR is still lower than the 13.58% benchmark. As a result, we can conclude that the project overall was also not financially attractive.

* http://www.bi.go.id/biweb/Templates/Moneter/Default_Inflasi_EN.aspx?NRMODE=Published&NRNODEGUID=%7bC6BDA4D3-9471-4D99-A3B7-3A2ADE59E98C%7d&NRORIGINALURL=%2fweb%2fen%2fMoneter%2fInflasi%2fData%2bInflasi%2f&NRCACHEHINT=Guest
Inflation rate (Customer Price Index) : 2007 - 6.4%, 2008 - 10.3%, 2009 - 4.9%, 2010 - 5.1%, 2011 - 5.4%

Thus, KFQ conclude that the applied parameters are complete for sensitivity analysis and the demonstration is undertaken suitably with objective evidence that the variation of each parameter to reach benchmark is not likely happened. Accordingly the validation team could conclude that the sensitivity result supports that the project is financially unattractive without CER revenues.

- **Common practice analysis**

Common practice analysis has been validated according to the "Demonstration and Assessment of Additionality (Version 07.0)" and the "Guidelines on common practice (version 02.0)" as follows.

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

According to the guideline, the installed capacity of 100MW~ 300MW (± 50% capacity of the capacity of the proposed project activity, 200W) is defined and as a result, projects between 100MW and 300MW were chosen for the common practice analysis. This identified range, therefore, is reasonably defined and in compliance with the guideline.

Step 2: Identified similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

➔ ***The host country of this project is Indonesia and the applicable geographical area is entire host country as default. The common practice analysis has been performed considering the Indonesia level as the relevant locational extension. Moreover PP extended geographical area to the ASEAN countries. 10 countries[*] included in ASEAN (Association of South-East nations) are adjacent geographically and the economic level also similar to promote Economy Integration next year[†]. Accordingly, it can be said that the projects in ASEAN took place in a comparable environment in the context of similar investment conditions such as access to financing considering economic level, access to technology as well as natural conditions in the region, ASEAN. Thus, PP identified the applicable geographical area is entire host country and ASEAN countries. The validation team confirmed the selection of applicable geographical area as entire host country and ASEAN countries is valid in line with the Guidelines on common practice (version 02.0) and our regional knowledge.***

(b) The projects apply the same measure as the proposed project activity;

[*] Bruni Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam / http://www.aseansec.org/18619.htm

[†] http://www.aseansec.org/10372.htm

➔ ***The proposed project utilizes the waste gas sourced by Integrated Steel Mill plant to cogenerate. Thus the projects which recover the waste gas from ISM process in order to cogeneration will be identified.***

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

➔ ***The energy source of the proposed project is waste gas generated from the Integrated Steel Mill process in a greenfield facility. Thus there is no technology switch measure is implemented by the proposed project, it is not applicable.***

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

➔ ***The proposed project utilizes the waste gas sourced from the ISM plant. Thus steel production plants would be considered.***

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

➔ ***The project of the applicable output range from 100MW to 300MW will be identified.***

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity;

➔ ***The proposed project's PDD was published for global stakeholder consultation on 14 April 2012 and the start date of proposed project activity is based on the date of contract of power plant installation (Offshore contract) (05 October 2011). Thus projects that have commercial operation before the start date of the proposed project (05 October 2011) will be selected for the common practice analysis.***

Based on the condition in Step 2, PP investigated similar project, however according to the Steel Production 2011 published by World Steel Association* and relevant website†, PP found there are no Integrated Steel Mill plant in host country, Indonesia and also no cogeneration by using the recovered waste gas from ISM of course. Only the steel production factories are used the technology of Electric Are Furnace process which is totally different with the ISM process‡. In order to make clear for identifying the similar project, PP investigated the Steel Statistical

* KONDISI INDUSTRI BAJA HANDAPI PASAR BEBAS AC-FTA,2010/ PT MEDIA DATA RESET
http://www.worldsteel.org/statistics/BFI-production.html

† http://en.wikipedia.org/wiki/List_of_power_stations_in_Indonesia

‡ No waste off gas generated in Electric Are Furnace process thus it cannot be implemented waste gas recovery

Yearbook 2011 published by Korea Iron and Steel Association and found there is no ISM plant in Indonesia and ASEAN countries.

The validation team confirmed there is no project for similar project in common practice analysis according to the official sources and local and industrial expertise. Thus, $N_{all} = 0$

Step 3: **Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.**

No project identified at the Step 2 ($N_{all} = 0$), thus Step 3 is skipped
We confirmed N_{all} is zero

Step 4: **Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.**

Within similar projects identified in step 3, N_{diff} = zero.

Step 5: Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

In accordance with step 4 of the guideline, F of the proposed project activity is 0 ($N_{diff} = N_{all}$, therefore: $N = 1 - N_{diff}/N_{all} = 1 – 1 = 0$), and $N_{all} – N_{diff} = 0$.
According to common practice criteria of "Tool for the Demonstration and Assessment of Additionality (version 07.0)", the proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all} - N_{diff}$ is greater than 3. As stated in Step 4, it is identified that $F < 0.2$ and $N_{all} - N_{diff} < 3$.
Therefore, validation team concluded that this project is not common practice according to all the documents reviewed and the available information. Moreover it is complied with Additionality tool (version 07.0) and Guideline on common practice (version 02.0), EB 69 Annex 8

To conclude the additionality assessment, we can state that, according to all the documents we have reviewed, the additionality of the project based on the available information is fulfilled.

Nevertheless, CAR 7, CAR 8, CL 1, CL 4, and CL 5 were raised in the course of the validation and were successfully closed (ref Annex: Validation Protocol- Table 3).

3.5 Monitoring Plan

The project activity have applied the indicative simplified baseline and monitoring methodologies for selected CDM project activity ACM0012(Version 4). It includes all the parameters to arrive at the estimation of the baseline emissions and thereby emission reductions. The selected monitoring methodology is deemed to be the most applicable for this project. The application of the monitoring methodology is transparent.

3.5.1 Parameters determined ex-ante

The quantity of electricity supplied to the recipient ($EG_{i,j\,y}$) and The CO2 emission factor for the electricity ($EF_{Elec,\,i\,,j\,,y}$) for electricity generation and Net quantity of heat supplied to the unit process in recipient facility ($HG_{n,j,y}$) and The CO_2 emission factor of the element process that would have supplied the heat to recipient facility ($EF_{heat,j,y}$) are determined ex-ante for the entire crediting period. The formulas and values selected for the calculation are listed in the PDD. Formulas and values were verified by KFQ and found correct.

The quantity of electricity supplied to the recipient ($EG_{i,j\,y}$), is determined on the basis of electricity output that can be generated from the waste gas, which would have been released in the absence of CDM project activity. The amount of proceeded electricity generation is calculated from the maximum available waste off gas from the power generator during planned operating hour. Thus, $EG_{i,j\,y}$ is determined as 1,037,334MWh.

By means of checking the Indonesian DNA (Directorate General of Electricity, Ministry of Energy and Mineral Resources) website* and interview with the staff of Indonesian DNA†, the validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was published on 27 March 2012 and found the most recent data was available on electricity generation and dispatch to JAMALI grid at the time of uploading the PDD for global stakeholders comment on UNFCCC website (14 April 2012).

In the absence of the project activity, the same amount of electricity would have been produced in the grid, thus the baseline of the project activity are the emissions generated by generation of electricity in the JAMALI grid of Indonesia.

The PDD has correctly identified the electricity system as Java-Madura-Bali (JAMALI) grid in

* http://pasarkarbon.dnpi.go.id/web/index.php/news/view/electricity-emission-factors-update-2011.html

† The local consultant Mr. Irhan (CDM Indonesia) interviewed with a staff of Indonesian DNA, Mr. A. Smyanugraha in 34 July 2013and found OM, BM, CM calculation procedure is correctly in accordance with the "Tool to calculate the emission factor for an electricity system" (version 02.2.1). The photos for the calculation procedure which were taken at interview has been provided to the DOE.

accordance with applied tool in section B.4 and B.6.1. The project activity will be supplied the net electricity generated from JAMALI grid.

Operating Margin (OM) and Build margin (BM) emission factors are correctly taken from the Emission Factor of JAMALI grid published by DNA of Indonesia on its official website and is available on public domain is reliable data source available to PP. The validation team has reviewed the correctness of data used for the baseline determination by reviewing the information on emission factor of JAMALI grid on DNA website.

In accordance with "Tool to calculate the emission factor for an electricity system", the emission factor can be calculated by one of the following options:

a) Either by calculating combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM)

Or

b) By calculating weighted average emissions in the current generation mix.

PP has calculated CM by opting the option (a) i.e. calculating 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' which is further calculate on the basis on operation margin (OM) and build margin (BM).

The validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was the most recent data available on electricity generation and dispatch to JAMALI grid in Indonesia at the time of uploading the PDD for global stakeholders comment on UNFCCC website.

The simple OM emission factor was calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO2/MWh) of all generating power plants serving the system for year 2008, 2009 and 2010, as 0.769 tCO2e/MWh (fixed ex-ante). In calculating above low-cost/must-run power plants units were not included.

The weighted average CO2 emission factor of build margin was calculated as the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The validation team checked by interviewing with the staff of Indonesian DNA and confirms that the selection of the options was correct. In validating this step, assessment team further confirms that:

(i) the identified power capacity additions comprise 20% of the system generation for the year under consideration.

(ii) none of the considered power capacity additions considered under (i) above have been built more than ten years earlier.

The weighted average of build margin emission factor for year 2010 is calculated as 0.712 tCO2e/MWh (fixed ex-ante).

This is in line with the guidance provided in the "Tool to calculate the emission factor for an electricity system" and we checked combined margin emission factor for the JAMALI grid of Indonesia have been calculated to be 0.741 tCO2e/MWh by applying the weightage for OM and BM as 50:50 through "Emission factor for the latest information on the CDM project eight interconnected power system in Indonesia" issued by Executive director national council of climate change on 27 March 2012 which is based on "Emission Factor Delivery for CDM project" issued by Directorate General of Electricity on 08 February 2012. The combined margin emission factor is fixed ex ante for the entire crediting period.

As result of applying the emission factor issued by Indonesian DNA (0.741 tCO_2/MWh), PP revised amount of emission reduction as 809,138 tonCO_2/y in PDD and ER spreadsheet and we confirmed the emission reduction calculation correct.

The validation team checked that the applied emission factor of JAMALI grid in Indonesia issued by Indonesian DNA is published in order to apply CDM project and checked registered CDM projects developed in Indonesia used this published emission factor as well. Thus we confirmed applied emission factor (0.741 tCO_2/MWh) is valid to use.

According to ACM0012 version 4.0, there are three methods for estimation capping of baseline emissions. The validation team confirms that the project facility is now under construction simultaneously with the ISM plant, so there are no historical data on energy released by the WECM through the on-site visit, therefore Method-1 is not applicable to the project because of unavailability of relevant data. Meanwhile, the waste gas consumption for cogeneration and each ISM process are directly measureable and this monitoring method also available, moreover the manufacture's data for the amount of product ($Q_{BL\ product}$) and the amount of waste energy per unit of product ($Q_{BL\ product}$) which is reflected on the energy balance in FSR are provided by PP. Consequently, Method-2 in the methodology for the calculation of fcap has been applied for the project activity.

Based on the methodology for fcap estimation, the equation of Method-2 defined as below.

$$f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$$

$$Q_{WCM,BL} = Q_{BL,product} \times q_{wcm,product}$$

Where:

$Q_{WCM,BL}$ = Quantity of waste energy generated prior to the start of the project activity (kg or m3 at NTP or TJ or MWh of WECM or other relevant unit)

$Q_{WCM,y}$ = Quantity of WECM used for energy generation during year y (kg or m3 at NTP or TJ or MWh of WECM or other relevant unit)

$Q_{BL\ product}$ = Production associated with the relevant waste energy generation as it occurs in the baseline scenario. The minimum of the following two figures should be used: (1) average annual historical production data from start-up of the facility, if the facility's operational history is less than three years, or (2) the most relevant manufacture's data for normal operating conditions. In the case of Greenfield facilities or where data is not available, the manufacture's data for normal operating conditions shall be used (Units for product can be in no. of pieces, tons, m3 or other appropriate unit)

$q_{wcm,\ product}$ = Amount of waste energy per unit of product generated by the process (that generates waste energy) in the facility (Units in kg or m3 at NTP/unit product, MWh/unit product or TJ/unit product or other appropriate unit)

In order to estimate ex-ante parameter $Q_{WCM,BL}$, PP used energy balance (refer to Table 3) from the Feasibility Study by PT KP that is established based on the technical specification of equipment's manufacture and supplier, POSCO E&C.

$Q_{WCM,BL} = Q_{BL,\ product} \times q_{WCM,\ product}$ = (Coke Oven Plant: 1,790,000ton * 320Nm3/ton) + (Blast Furnace: 3,000,000ton * 1,576 Nm3/ton) + (Steel making plant : 3,156,000ton * 90 Nm3/ton) = 5,584,840,000 Nm3

Even though $Q_{WCM,BL}$ based on the energy balance estimated above, the validation team investigated the amount of waste energy per unit of product generated by the process from other similar ISM plant in Korea such as Pohang ISM Plant and Gwangyang ISM Plant and we found that LDG Steel making plant (66 Nm3/ton) in Pohang ISM Plant is less than the proposed project (90 Nm3/ton) in the same context of explanation of No. 3 of this report. Thus we calculated $Q_{WCM,BL}$ using 66 Nm3/ton of waste energy per unit of product generated instead of 90 Nm3/ton in order to estimate conservative manner. Thus the modified $Q_{WCM,BL}$ is calculated as below.

$Q_{WCM,BL} = Q_{BL,\ product} \times q_{WCM,\ product}$ = (Coke Oven Plant: 1,790,000ton * 320Nm3/ton) + (Blast Furnace: 3,000,000ton * 1,576 Nm3/ton) + (Steel making plant : 3,156,000ton * 66 Nm3/ton) = 5,509,096,000 Nm3

Because calculated $Q_{WCM,BL}$ above is for whole waste gas production in ISM plant, quantity of waste energy generated for iron and steel production process as a process fuel ($Q_{BL, process}$) shall be deducted.

Therefore,

$Q_{WCM,BL} = (Q_{BL, product} \times q_{WCM, product}) - Q_{BL, process} = 5,509,096,000$ Nm3 - 3,019,591,986 Nm3 = 2,489,504,014 Nm3

The validation team validated and through the checks with the methodology ACM 0012 ver. 04.0 and relevant documents for estimation of $Q_{WCM,BL}$ and all parameters have been correctly calculated based on the methodology using appropriate data and also confirmed $Q_{WCM,BL}$ has been capped with a low value estimation in a conservative manner as well. As presented conservative approach of $Q_{WCM,BL,}$ the emission reduction has been recalculated in PDD.

Net quantity of heat supplied to the unit process in recipient facility ($HG_{n,j,y}$) is calculated as basis of feasibility study for quantity of saturated low pressure steam generation & consumption in boiler steam balance table which is studied on FSR. Thus, $HG_{n,j,y}$ is determined as 452.23 TJ.

The CO_2 emission factor of the element process supplying heat that has or would have supplied the recipient facility ($EF_{heat,j,y}$) is calculated by using the lower limit of the uncertainty at a 95% confidence interval value applied from IPCC 2006 Guidelines for National Greenhouse Gas Inventories and efficiency of the element process and default fraction of steam. $EF_{heat,j,y}$ is determined as 89.5 tCO_2/TJ.

3.5.2 Parameters monitored ex-post

The project activity have applied the methodology ACM0012 (Version 4) and "Tool to calculate the emission factor for an electricity system (Version 2.2.1) for the monitoring.
It includes all the parameters to arrive at the estimation of the baseline emissions and thereby emission reductions. The selected monitoring methodology is deemed to be the most applicable for this project. The application of the monitoring methodology is transparent.

According to the ACM0012 (Version 4), monitoring of parameters for both baseline and project emission calculation are required. Leakage emissions do not need to be considered.

Parameters that are not available ex-ante require estimation. These were estimated and validated as per the description provided in section 3.3 of this report. And the monitoring parameters requiring ex-post monitoring are confirmed as below table 3.

Thus, we could confirm that the parameters for achieving emission reduction calculation by the prescribed equations for baseline emissions, project emission and emission reductions in B.6 of the PDD have been listed in B.7.1 of the PDD in a complete manner. The meter installation, monitoring frequency, recording frequency, accuracy class and QA/QA procedure have been prescribed for each parameter in compliance with relevant national standards.

[Table 3] Monitoring Parameters Requiring Ex-post Monitoring

Parameter Title	Description	Unit	Comment
$Q_{wcm,BGF,y}$ $Q_{wcm,LDG,y}$ $Q_{wcm,COG,y}$	Quantity of waste off gases used for energy generation during year y	Nm^3	**Data Checklist** / **Yes/No** 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
$EG_{j,y}$	The net quantity of electricity supplied to the recipient facility by the project activity during the year y	MWh	**Data Checklist** / **Yes/No** 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
$HG_{j,y}$	Net quantity of heat supplied to the recipient facility j by the project activity during the year y	TJ	**Data Checklist** / **Yes/No** 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
$Q_{feed\ water,y}$	The quantity of feed water provided to the boiler during year *y*	Ton	**Data Checklist** / **Yes/No** 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

Parameter Title	Description	Unit	Comment
$T_{feed\ water,\ y}$	Temperature of feed water provided to the boiler	°C	Data Checklist / Yes/No: 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
$P_{feed\ water,\ y}$	Pressure of feed water provided to the boiler	Kg/m^2	Data Checklist / Yes/No: 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
$Q_{steam,\ return,\ y}$	Quantity of steam returned to the recipient facility, ISM	Ton	Data Checklist / Yes/No: 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
$T_{steam,\ return,\ y}$	Temperature of steam returned to the recipient facility, ISM	°C	Data Checklist / Yes/No: 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

<table>
<tr><th>Parameter Title</th><th>Description</th><th>Unit</th><th>Comment</th></tr>
<tr><td>$P_{steam, return, y}$</td><td>Pressure of steam returned to the recipient facility, ISM</td><td>bar</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>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>
</td></tr>
<tr><td>$ws_{i,j}$</td><td>Fraction of total heat that is used by the recipient j in the project that in absence of the project activity would have been supplied by the ith element process</td><td>-</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>N/A</td></tr>
<tr><td>Indication of accuracy provided?</td><td>N/A</td></tr>
<tr><td>QA/QC procedures described?</td><td>N/A</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>$FC_{i,y}$</td><td>The quantity of fossil fuel i combusted in the project activity during year y</td><td>Mass or volume unit</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>N/A</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>
</td></tr>
<tr><td>$EF_{CO2,i,y}$</td><td>CO_2 emission factor of fossil fuel i combusted in the project activity</td><td>ton CO_2/GJ</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>N/A</td></tr>
<tr><td>Has this value been verified?</td><td>N/A</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>N/A</td></tr>
<tr><td>QA/QC procedures described?</td><td>N/A</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr>
</table>
</td></tr>
</table>

Parameter Title	Description	Unit	Comment
$NCV_{i,y}$	Weighted average net calorific value of fossil fuel i combusted in the project activity	GJ/ mass or volume unit	Data Checklist / Yes/No: 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
$COG_{process, y}$	The quantity of COG used in each process(Coke oven, Coke By-Product, Sinter plant, Blast furnace, Lime Calcining Plant, Basic oxygen furnace, Continuous Casting Plant and Plate Mill and Rolling) during year y	Nm^3	Data Checklist / Yes/No: 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
$BFG_{process, y}$	The quantity of BFG used in each process(Coke oven, Blast furnace, Plate Mill) during year y	Nm^3	Data Checklist / Yes/No: 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
$LDG_{process, y}$	The quantity of LDG used in each process (Plate Mill) during year y	Nm^3	Data Checklist / Yes/No: 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

<table>
<tr><th>Parameter Title</th><th>Description</th><th>Unit</th><th>Comment</th></tr>
<tr><td>$EC_{PJ,y}$</td><td>The electricity consumed for the project activity in emergency and start-up case during the year y</td><td>MWh</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>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>
</td></tr>
<tr><td>Abnormal operation of the project facility including emergencies and shut down</td><td>The hours of abnormal operation of parts of project facility that can have an impact on waste energy generation and recovery</td><td>Hour</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate Description of parameter?</td><td>Yes</td></tr>
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<tr><td>Correct value provided for estimation?</td><td>N/A</td></tr>
<tr><td>Has this value been verified?</td><td>N/A</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
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<tr><td>QA/QC procedures described?</td><td>N/A</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr>
</table>
</td></tr>
</table>

The validation team verified all meters such as flow meters, manometers, thermometers and watt-hour meters which will be installed.

The waste gas flow meters will be installed at the output point of Blast Furnace, BOF (converter) and Coke Oven and also the flow meters for COG, BFG and LDG consumption in ISM will be installed in front of each process of ISM.

As classified by extended boundary for mixture of waste fuel gases, even though the use of waste gas in the absence of project activity would not be reduced due to the implementation of project activity, PP will monitor throughout the crediting period for each of the quantity of waste gases used in each ISM process in order to determine whether there is a decrease in the utilization of waste gas by other uses at the project facility during monitoring period and it will be verified during the site visit by verifying DOE. The monitoring parameters for each waste gas use in the ISM process were defined in PDD section B.7 and we confirmed the monitoring arrangements described in the monitoring plan are feasible and the means of implementation of the monitoring plan are sufficient to ensure verifiable emission reductions.

According to the methodology ACM 0012 ver.04 Annex 3, if there is a decrease in the energy recovery of WECM(s) in the extended boundary excluding the project activity WECM, a technical justification along with energy balance will be explained why the reduction in recover is not due to the CDM project. If this explanation is not satisfactory and there are possibilities of increase in emission due to the project activity within the extended project boundary, no CERs will be claimed for the rest of the monitoring period.

And the measurement device for temperature, pressure, quantity of feed water and steam will be installed at the inlet of boilers and outlet of steam turbine respectively. One watt-hour meter will be installed at the outlet of generator. This watt-hour meter is for net electricity supplied to the recipient facility after deducting the captive electricity use. A flow meter for the quantity of fossil fuel consumed by project activity will be installed and monitored and crosschecked with purchase receipt.
All data from the measuring equipment are continuously measured and recorded monthly and all the meters which has accuracy degree ±0.2% for watt hour meter, ±1.0% of F.S for flow meter, ±1.0% for pressure device and ±1.5% for temperature device were sealed before used according to the relevant national standard. During the operational period, all meters would be calibrated based on the national industry standard or manufacture's specification by qualified institution or entity, calibration reports will be provided by qualified institution or entity. The data will be kept for 2 years from the end of the crediting period.

All of data will be automatically measured and archived by Data Acquisition System (DAS) and the reading of the metering facilities shall be conducted at midnight of the last day of each applicable billing period. The monitoring system will check a summary of operations over the previous 24 hours including total generation (electricity/steam), waste gas consumption for the project activity, major equipment abnormal conditions, tagged out equipment, waste gas consumption each process of ISM etc. In case where waste gas is released under abnormal operations like emergencies or shut downs, the time is recorded and the emission reductions will not be claimed.

As for the capping factor (f_{cap}), according to the methodology ACM 0012, it shall be settled ex post by actual measurement for each crediting year, f_{cap} is set to 1 in case the calculated value of f_{cap} is higher than 1, whereas f_{cap} will be less than 1 if the actual measured electricity output $Q_{wcm,y}$ is greater that the value $Q_{wcm,BL}$ in baseline*.

The general manager of project owner such as PT. Krakatau Poscopower has the overall authority and responsibility for the monitoring implementation.
The operational staff is in charge of operation and maintenance of equipment of the project and the staff in the CDM team would undertake the monitoring tasks including data collection and recording, Calibration, data storage and archiving and QA/QC and reporting to CDM team manager who is appointed by project owner. Thus the CDM manager has responsibilities of the monitoring plan implementation.

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* $f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$

Qwcm,BL : Quantity of waste energy generated prior to the start of the project activity
Qwcm,y : Quantity of WECM used for energy generation during year y

The monitoring staffs will be received training related to the CDM monitoring plan and reporting requirements, prior to registration of the project. Furthermore, new members of staff joining the CDM team during the implementation of project activity will also be given training in relation to their responsibilities. We confirmed the training plan through the Personnel operation plan established by PT KPP on 3 February 2012.

By document review, physical inspection and interview with the project owner, it is confirmed by the validation team that the monitoring arrangements described in the monitoring plan are feasible and the means of implementation of the monitoring plan are sufficient to ensure verifiable emission reductions.

The validation team confirmed that this monitoring plan is in accordance with the ACM0012 (Version 4) and "Tool to calculate the emission factor for an electricity system (Version 2.2.1). All monitoring parameters for the project is contained in the monitoring plan and the project participants have ability to implement the monitoring plan described in the PDD

Nevertheless, CAR 10 was raised in the course of the validation and was successfully closed (ref Annex: Validation Protocol- Table 3).

3.6 Calculation of GHG Emissions

According to ACM0012 (Version 4), emission reduction is calculated as following equation:

$$ER_y = BE_y - PE_y$$

- ER_y (t $CO_{2/yr}$): emissions reductions of the project activity during the year y
- BE_y (t $CO_{2/yr}$): baseline emissions due to displacement of electricity during the year y
- PE_y (t $CO_{2/yr}$): project emissions during the year y

The ex-ante baseline emission is calculated as :

$BE_y = BE_{En,y} + BE_{Ther,y}$

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) = 1*1* (1{,}103{,}547 * 0.94) * 0.741$$

$$BE_{Ther,y} = f_{cap} * \sum_j \left\{ \left(\sum_n f_{wcm,n,y} * HG_{n,j,y} \right) * EF_{heat,j,y} \right\} = 1*1* (452.23 * 89.5)$$

BE_y =768,664tCO_2/y + 40,474 tCO_2/y = 809,138tCO_2/y

The ex-ante project emission is calculated as :

$PE_y = PE_{AF,y} + PE_{El,y} = 0$

KFQ confirmed that the PP estimated appropriately leakage associated with the project activity as zero according to ACM0012.

The ex-ante emission reduction is calculated as :

$ER_y = BE_y - PE_y$

$= 809{,}138tCO_2/y - 0 = 809{,}138tCO_2/y$

In the PDD, the parameters to be determined ex-ante are applicable to the proposed project activity. All parameters have been validated and are in compliance with methodology ACM0012 as presented in Section 3.3.
All data and parameters listed in the PDD B.6.2 do not need to be monitored and will remain fixed throughout the crediting period. According to assessment in Section 3.3, the application of these values will result in a conservative estimate of emissions reductions.

Emission reduction by this project activity is estimated to be $809{,}138tCO_2e$ per year and $8{,}091{,}380tCO_2e$ over the 10 years crediting period. The validation team concluded that the GHG calculation is transparent and the amount of estimated emission reduction is reasonable. Also validation team confirmed that all the assumptions and data used by PP are considered reasonable and the methodologies have been applied correctly to calculate baseline emission, project emission and emission reduction.

3.7 Environmental Impacts

Through document review and interview with PP and local stakeholders, the validation team confirmed the PP has undertaken environmental impact assessment (EIA) published by PT. Mahakarya Lintasindo and approved by Cilegon city hall in 5 January 2012 in accordance with relevant Indonesian laws and regulations.
The EIA report referred to anticipated environmental impacts by the project activity with suggestions of mitigation would measure against pollution of impact on the air(dust), noise, water and so on. No significant ecological influence on the local area was anticipated.

The validation team concluded that the potential environmental impacts have been sufficiently identified in the PDD and no major adverse effects have been expected from the project activity.

3.8 Comments by Local Stakeholders

Regarding to stakeholders' comments for the proposed project activity, a meeting with local stakeholders was carried out to invite comments from local stakeholders in 16 February 2012. PP distributed the invitation letters in order to invite stakeholders on 27 January 2012 and 20 stakeholders include the government and nongovernment parties were participated.

At the meeting, PP explained project description of proposed project activity including CDM development and also explained environmental and social influences from the project activity and comments received have been taken into consideration during construction and operation to achieve environmental and social benefits. No negative comments for impact on the local economy, development and environment have been received at the meeting.

KFQ has checked meeting minute and interviewed with 2 local government officers and 2 local stakeholders. All the interviewee represented that the proposed project receives strong support from the local people and the proposed project keeps the environmental regulation and also looking for growth of local economy.

The validation team confirmed that all relevant local stakeholders have been invited to consultation via appropriate media, the summary of comments received as provided in the PDD are appropriate, and due accounts was taken properly and described in the PDD well.

4. COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

Korean Foundation for Quality published the project documents on http://cdm.unfccc.int/Projects/Validation. Starting date of the global stakeholder consultation process is 14 April 2012 and invited comments by Parties, stakeholders and non-governmental organizations during a period of 30 days.

No comment was received.

5. Validation opinion

Korean Foundation for Quality (KFQ) has performed a validation of the 'Using off gas cogeneration project in PT KPP' in Indonesia. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and subsequent decision by the CDM Executive Board.

The validation is based on the information made available to us and the engagement conditions detailed in this report. The only purpose of this report is its use during the registration process as part of the CDM project cycle. Hence, KFQ cannot be held liable by any party for decisions made or not made based on the validation opinion, which will go beyond that purpose. And it has provided KFQ with sufficient evidence to determine the fulfillment of stated criteria. The validation consisted of the following 3 phases : i) a desk review of the project design, the baseline and monitoring plan, ii) follow-up interviews with project stakeholders and iii) the Resolution of outstanding issues and the issuance of the final validation report and opinion.

The project is developed as a unilateral CDM project and the host country is the Indonesia. The country fulfills the participation criteria and has approved the project and authorized the project participant. The Indonesia DNA confirmed that the project assists in achieving sustainable development.

The validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards China.

By waste gas recovery, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change. An analysis of the investment demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are hence 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. Additionally the assessment team reviewed the estimation of the projected emission reductions.
We can confirm that the indicated amount of emission reductions of 809,138ton CO_2e over the 10 years credit period, resulting in a calculated annual average of 8,091,380ton CO_2e, represents a reasonable estimation using the assumptions given by the project documents.

The responsibilities and authorities of monitoring and maintenance are clearly defined and a detailed monitoring plan has been developed.

In our opinion, the 'Using off gas cogeneration project in PT KPP', as described in the revised PDD of 30 July 2013 (Ver. 06), meets relevant UNFCCC requirements for the CDM and relevant host country criteria and correctly applies the baseline and monitoring methodology ACM0012(version 4). Thus the 'Using off gas cogeneration project in PT KPP' will hence be recommended by KFQ for requesting for registration as a CDM project to UNFCCC.

Signed on behalf of the Korean Foundation for Quality

Signature : 

Name : Yu Shim JEONG

Date : 30 July 2013

6. REFERENCES

Reference No.	Documentation and/or website	Remarks
1	Project Design Document for CDM project titled Using off gas cogeneration project in PT KPP - Version 01: 09 April 2012 - Version 05: 05 November 2012 - Version 06: 30 July 2013	PDD
2	Supporting Excel Spreadsheet on Investment Analysis - Version 01 : 11 June 2011 - Version 08 : 05 November 2012 - Version 09.2 : 30 July 2013	Reference spreadsheet (Investment Analysis)
3	Emission Reduction and Electricity Emission Factor Calculation Sheet - Version 08 : 05 November 2012 - Version 09.2 : 30 July 2013	Reference spreadsheet (Emission Reduction)
4	- ACM0012 : Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects (Version 4) - Guidelines for Completing the Project Design Document (CDM-PDD), and the Proposed New Baseline and Monitoring Methodologies (CDM-NM) (Version 07) - Tool for the demonstration and assessment of additionality (Version 7.0) - Glossary of CDM terms (Ver. 05) - Guidance on the Demonstration and Assessment of Prior consideration of the CDM (Ver.04) - Guidelines on the Assessment of Investment Analysis (Ver. 05) - Tool to determine the remaining lifetime of equipment (ver. 01) - Tool to calculate the emission factor for an electricity system" (Ver. 02.2.1) - Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Ver. 02) - Guideline for validation of plant load factors (ver. 01) - Clean Development Mechanism Validation and Verification Manual (Ver. 01.2) - Guidelines on common practice (Ver. 01.0)	Methodology Guidelines and Tools
5	- LoA, Indonesia National Council on Climate Change (Dewan Nasional Perubahan Iklim), 27 August 2012 http://www.dnpi.go.id/	LoA
6	- FSR, PT KP, 31 December 2009 - FSR, Poscopower, 15 October 2010	FSR
7	- EIA, PT. Mahakarya Lintasindo, June 2011 - EIA approval, Cilegon city hall, 5 January 2012	EIA
8	- TANDA TERIMA BERKAS PERMOHON IMB (construction approval), 04 August, 2011 - TANDA DAFTAR PERUSAHAAN PERSEROAN TERBATAS (business license), 15 August 2011 - IZIN PRINSIP PENANAMAN MODAL (business approval), 15 December 2011	Business license

	- BANDAN KOORDINASI PENANAMAN MODAL (investment notification), 03 February 2012 - Board member list of PT. Krakatau Poscopower and PT. Krakatau Posco - Taxer identification certificate : SURAT PENGUKUHAN PENGUSAHA KENA PAJAK, Ministry of Finance Republic Indonesia Directorate General of Tax, PT. Krakatau Poscopower and PT. Krakatau Posco	
9	- Decree of the state minister for environment/KEP.13/MENLH/3/1995, Indonesia - Company list which are located near project activity http://www.kiec.co.id/index.php?page=content&cid=20 - Law of Republic of Indonesia, No:30/2009 regarding Electricity (UNDANG-UNDANG REPUBLIK INDONESIANOMOR 30 TAHUN 2009) - Electricity trade policy http://www.kdl.co.id/?page=content&cid=15 - Plant(ISM) layout design document - Report for the Area of Coal-fired Plant with a capacity of 200MW - Reference for the size of coal based power plant in Indonesia http://globalenergyobservatory.org/geoid/41522 http://globalenergyobservatory.org/geoid/41522 - Conditions facing the steel industry of the free market AC-FTA, 2010 - Renewable energy market assessment report: Indonesia (5page) http://ita.doc.gov/td/energy/Indonesia%20Renewable%20Energy%20Assessment%20(FINAL).pdf - Private participation on Hydropower Development(3page) http://energy-indonesia.com/03dge/Mochamad%20Sofyan.pdf - Ocean energy in Indonesia (14~15page) http://wreeec2011bali.com/uploads/files/Presentation%20Prof%20Mukhtasor.pdf - http://cilegonkota.bps.go.id/publikasi/CDA%202010.pdf _Cilegon in figure 2010(page11) - The Development of Photovoltaic System in Indonesia (9page) https://circle.ubc.ca/bitstream/id/160590/Wirasaputra_Vincent_2012_EECE492_Final_Report.pdf - Regulations Minister of Energy and Mineral Resources of Indonesia No. 31/2005 - PERATURAN MENTERI ENERGI DAN SUMBER DAYA MINERAL NOMOR : 0031 TAHUN 2005 - Handbook of energy and economic statistics of Indonesia 2011 which is published by Ministry of Energy and Mineral Resource - Peraturan Menteri Energi Dan Sumbre Daya Mineral Republik Indonesia Nomor : 13 Tahun 2012_Penghematan Pemakaian Tenaga Listrik - PT. MITRA OIL PERTAMINA's catalogue http://ptmitraoilpertamina.indonetwork.co.id/2846356/harga-jual-kami-mulai-tanggal-01-s-d-15-september-2011.htm - Indonesia Mineral, Coal and Geothermal Statistics 2006, p.28(applied NCV for Suralaya Coal) - Guideline for implementing green house gas emission reduction action plan - http://ptmitraoilpertamina.indonetwork.co.id/2846356/harga-jual-kami-...1 - http://www.iisd.org/gsi/sites/default/files/ffs_actionplan_indonesia.pdf, - http://www.businessweek.com/news/2012-03-26/indonesia-fuel-price-rise-needed-to-protect-growth-basri-says - http://www.naturalgas.org/naturalgas/transport.asp - Enthalpy table from the Heat Balance Diagram, 3rd party design institute, FUJI Electric systems, 09 November 2010	Baseline determination

	- Waste gas balance , Gwangyang ISM Plant (#1 ~ #9) - Emission Standard for Stationary Source, Decree of the State Minister for Environment of the Republic of Indonesia - LONGTERM INFRASTRUCTURE DEVELOPMENT PLAN TO MEET DOMESTIC GAS DEMAND, The 5th International Indonesian Gas Conference & Exhibition, 25 January 2011 - PERBANDINGAN BIAYA PEMBANGKITAN LISTRIK NUKLIR DAN FOSIL DENGAN MEMPERTIMBNGKAN ASPEK LINGKUNGAN, http://www.batan.go.id/ptrkn/file/tkpfn16/Makalah_peserta/Kel_E/47.M.Nasrullah,E348-352rev2.pdf - http://www.iaea.org/INPRO/cooperation/4th_GIF_Meeting/14-Bill-Rasin-GIF-Economics.pdf - Levelized cost analysis PERBANDINGAN BIAYA PEMBANGKITAN LISTRIK NUKLIR DAN FOSIL DENGAN MEMPERTIMBNGKAN ASPEK LINGKUNGAN, http://www.batan.go.id/ptrkn/file/tkpfn16/Makalah_peserta/Kel_E/47.M.Nasrullah,E348-352rev2.pdf PLN Statistics 2010, Page 38 : Average Generation Cost per kWh, Page 23 : Energy Production by Type of Power Plant (Gwh)	
10	- Technical specification for equipments, POSCO E&C	Project design
11	- Notification of CDM to Indonesia DNA, 10 November 2011 - Notification of CDM to UNFCCC secretariat, 08 November 2011 - Board meeting minute for investment decision, 21 December 2010	Prior consideration
12	- ISM Power Plant Project Master Schedule, PT KP - CDM consultancy agreement, RCC Co., Ltd., 01 November 2011 - LoA, Indonesia National Council on Climate Change (Dewan Nasional Perubahan Iklim), 27 August 2012	CDM continuation
13	- Contract of power plant installation (Offshore contract), POSCO Engineering & Construction Co., Ltd., 05 October 2011 - Onshore contract include Steam turbines and Generators purchase, POSCO Engineering & Construction Co., Ltd., PT KE, 07 November 2011	Start date
14	- PPA, PT KP, 1 October 2012 - Equipment technical specification, Posco E&C - Confirmation letter from the equipment supplier, POSCO E&C, 16 August 2012	Remaining lifetime / Spec.
15	- Loan contract, Standard Chartered Bank Korea Limited, 4 June 2012	funding
16	- the Indonesian DNA (Directorate General of Electricity, Ministry of Energy and Mineral Resources) website http://pasarkarbon.dnpi.go.id/web/index.php/news/view/electricity-emission-factors-update-2011.html - The photos for the calculation procedure which were taken at interview	Emission factor
17	- INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS, Bank Indonesia http://www.bi.go.id/web/id/Statistik/Statistik+Ekonomi+dan+Keuangan+Indonesia/Versi+HTML/Sektor+Moneter/	Benchmark selection
18	- FSR, PT KP, 31 December 2009 - FSR, Poscopower, 15 October 2010 - Board meeting material for investment decision, 21 December 2010 - Board decision for investment cost, 05 August 2011 - Power Purchas Agreement (PPA), PT. KRAKATAU POSCO and PT. Krakatau Poscopower , 1 October 2012	Investment analysis

	- Amendment of Joint Venture Agreement, Poscopower & PT KDL, 13 July 2011 - Joint Venture Agreement, Poscopower & PT KDL, 14 July 2011 - Similar projects survey sheet Coke Oven Gas Comprehensive Utilization for Co-generation Project in Shandong Jikuang Morningsun Thermal Power Co., Ltd 28MW Waste Coke Oven Gas Cogeneration Project for Henan Shuncheng Group Shaanxi Shenmu Hengdong Waste Gas Based Electricity Generation Project Wugang Waste Gas Recovery and Power Generation Project Wugang Gas-Steam Combined Cycle Power Plant (CCPP) Project Shenmu County Jieneng Multipurpose Use Power Co. Ltd. 100MW Semi-coke Waste Gas for Power Generation Project Electric Power Co-Generation by LDG Recovery – CST – Brasil	
19	- Offshore contract, POSCO Engineering & Construction Co., Ltd., 05 October 2011 - Onshore contract, POSCO Engineering & Construction Co., Ltd., PT KE, 07 November 2011	Investment cost
20	- O&M cost record, Gwangyang ISM Plant (#9)	O&M cost
21	- Power Purchas Agreement (PPA), PT. KRAKATAU POSCO and PT. Krakatau Poscopower, 1 October 2012 - Enthalpy table from the Heat Balance Diagram, 3rd party design institute, FUJI Electric systems, 09 November 2010 - Tariff (electricity, steam, waste gas) calculation sheet - Electricity price quote a new connection between PP and PLN, 30 November 201 - Applied tariff survey in Indonesia at the year of 2010 Project Lumut Balai Unit 1 – 2 PT. Pertamina Geothermal Energy (Ref. No. 5785) : 7.53 cent/KWh Project Ulubelu Unit 3 – 4 PT. Pertamina Geothermal Energy (Ref. No. 5773) : 7.53 cent/KWh Wampu Hydro Electric Power Project (Ref. No. 5368) : 7.23 cent/KWh Wayang Windu Phase 2 Geothermal Power Project (Ref. No. 3193) : 8.20 cent/KWh - PLN Statistics 2011, PT PLN - IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam - Steam Spply Contract betweem Dongkuk Industries Co., Ltd. and OCI Ltd., 17 December 2010	Tariff
22	- Steam output annual average record, Pohang ISM Plant (#1 ~ #12), Gwangyang ISM Plant (#1 ~ #9) - Electricity load List, PT KP - Steam balance sheet, PT KP - Waste gas generation and consumption table in FSR, PT KP - Waste gas generation and consumption record, Gwangyang ISM Plant (#1 ~ #9), 2008 - Maintenance and overhaul plan (part of board meeting material on 21 December 2012), PT KP	Annual energy output
23	- Law No. 36 year 2008 for tax rate, article 17 (2a)	TAX
24	- BI rate from Bank Indonesia : 6.5% (2009 ~ 2010)	Interest
25	- Inflation Report (Consumer Price Index) from the Bank Indonesia http://www.bi.go.id/biweb/Templates/Moneter/Default_Inflasi_EN.aspx?NRMODE=Published&NRNODEGUID=%7bC6BDA4	Sensitivity analysis

	D3-9471-4D99-A3B7-3A2ADE59E98C%7d&NRORIGINALURL=%2fweb%2fen%2fMoneter%2fInflasi%2fData%2bInflasi%2f&NRCACHEHINT=Guest	
26	- http://en.wikipedia.org/wiki/List_of_power_stations_in_Indonesia - KONDISI INDUSTRI BAJA HANDAPI PASAR BEBAS AC-FTA,2010/ PT MEDIA DATA RESET - Steel Statistical Yearbook, 2011/ Korea Iron and Steel Association - http://www.worldsteel.org/statistics/BFI-production.html - PLN statistics 2011, http://www.pln.co.id/eng/?p=2773 - http://www.worldsteel.org/statistics/BFI-production.html, Kondisi Industri Baja Hadapi Pasar Bebas AC-FTA, 2010 - Bruni Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Na http://www.aseansec.org/18619.htm - http://www.aseansec.org/10372.htm	Common practice analysis
27	- Implementation of Metrology, Decree of the State Minister for Environment of the Republic of Indonesia - Calibration Mary Year of 2012, Regulation of Trade Minister Republic of Indonesia - GENERAL PROVISION OF KWh METER OF ALTERNATING CURRENT - Accuracy : Equipment technical specification, Posco E&C Single line diagram, Posco E&C	Meters accuracy calibration
28	- Personnel operation plan, PT KPP, 3 February 2012	Training
29	- local stakeholders meeting minute, 16 February 2012	Comments by Local Stakeholders

Appendix A

Validation protocol for CDM project activities

Table 1: Requirements and Means of Validation for Clean Development Mechanism Project Activity

MoV =Means of Verification, DR=Document Review, I=Interview

Question	Ref.	Criteria	Comments	Draft. Concl.	Final Concl.
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?	EB 41	Annex 12	The project title is Using off gas cogeneration project in PT KPP. The project titled with the energy source of the project. Hence, it can be clearly identified.	**OK**	**OK**
A.1 2 Are there any indication concerning the revision number and the date of the revision?	EB 41	Annex 12	The available GSC PDD is indicated as version 01 dated on 09 April 2012, GSC started on 15 June 2011.	**OK**	**OK**
A.2 Project Design Document					
A.2.1 The PDD used as a basis for validation shall be prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC website.	VVM	55	Yes, The PDD is prepared in accordance with the latest template (CDM-PDD, Ver.03.0) and the 'Guideline for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodologies (CDM-NM) (Ver. 07.0)'.	**OK**	**OK**
A.2.1.1 Is the PDD in accordance with the applicable CDM requirements for completing PDDs?	VVM	56	Yes, The PDD is in accordance with the applicable CDM requirement for 'Guideline for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodologies (CDM-NM) (Ver. 07.0)'.	**OK**	**OK**
A.2.2 The validation report shall contain a statement regarding the compliance of the PDD with relevant forms and guidance.	VVM	57	Yes, A statement regarding the compliance of the PDD with relevant forms and guideline is contained in section of Introduction of this validation report.	**OK**	**OK**

A.3 Description of the project activity					
A.3.1 The PDD shall contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation.	VVM	58	Yes, The information provides the reader with a clear understanding of the proposed CDM project activity. The overview of project is transparently provided in section A.2 and A.4 of the PDD. During the on-site audit, the project activities and technical aspects of its implementation described in the PDD have been proven by the validation team.	**OK**	**OK**
A.3 1.1 Does the description and information in the PDD sufficiently cover all relevant elements, is accurate and provide the reader with a clear understanding of the proposed CDM activity ?	VVM	59	Yes. The information provides the reader with a clear understanding of the proposed CDM project activity. The proposed project is a waste gas recovery project in Cilegon city, Banten province of Indonesia. The main objective of the project is to utilize a waste off gas recovered from the Integrated Steel Mill(ISM) process which is now under construction by PT. KRAKATAU POSCO (PT KP) and generate electricity and steam for supplying to steel manufacturing works. The main equipment such as 2 sets of gas-fired boiler (2*45T/H, Natural circulation, Outdoor type), 2 sets of steam turbine (2*100MW, Reheat type condensing turbine indoor use) and 2 sets of generator (Horizontally mounted, rotating field, Air cooled, three phase Synchronous type) will be installed. Thus, 284,190Nm^3/h of waste off gas came from the integrated steel works will be recovered and utilized as a fuel of the gas-fired boilers. As a result of cogeneration process, 1,037,334MWh/yr of electricity and 255,008 ton/year [*] of steam will be generated from the steam turbines and generators. In the absence of the project implementation, the waste gas would directly be released to the atmosphere. The electricity and steam generated by the project would displace part of the electricity imported from regional grid (JAMALI grid) owned by PLN which is the National Power Company and newly built fossil fuel based steam boiler system. Thereby, the project implementation would contribute to the emission reduction of GHG. The estimated GHG emission reduction is 809,138tCO_2e per year.	**OK**	**OK**

[*] 32ton/hr x 7,969 hr/y = 255,008 ton/y = 53,950 MWh/yr

A.3.1.2 Is the proposed project activity in existing or utilizing existing equipments? If so, does the description in the PDD reflect the project activity for the following types of CDM project activities unless other means are specified in the methodology? (a) Large scale projects (b) Non-bundled SSC (c) Bundled SSC	VVM	60	The project activity is a newly-built waste gas recovery project which is utilizing the waste gas from ISM plant, involved 200MW capacity beside the coke production facility. Thus the proposed project is a large scale projects.	**OK**	**OK**
A.3.1.3 For other individual proposed small scale CDM project activities with emission reductions not exceeding 15,000 tonnes per year, was a physical site visit conducted as appropriate?	VVM	61	On-site assessment was conducted on 8 ~ 9 May 2012.	**OK**	**OK**
A.3.1.4 For all other proposed CDM project activities not referred to in paragraphs A.3.1.1~A.3.1.3, Was the validation undertaken by reviewing available designs and feasibility studies, and comparison analysis to equivalent projects, as appropriate. Was the physical site visit conducted? If not, justify the reason.	VVM	62	Please refer A.3.1.3.	**OK**	**OK**
A.3.1.5 If the proposed project activity involve the alteration of an existing installation or process, was the project description clearly stated the differences resulting from the project activity compared to the pre-project situation	VVM	63	The project activity is a newly-built waste gas recovery project which is utilizing the waste gas from ISM plant which is also newly built. The project description clearly stated in PDD.	**OK**	**OK**
A3.1.6 Is all information presented consistent with details provided by further chapters of the PDD, especially section A.4, A.4.3and B.3?	EB 41	Annex 12	Yes, the validation team confirms that all information is consistent with details provided in further chapters including section A.4, A.4.3.and B.3 of the PDD.	**OK**	**OK**
A.3.1.7 Is the brief explanation how the project will reduce greenhouse gas emission transparent and suitable?	EB 41	Annex 12	Yes, The project activity will utilize a waste off gas recovered from the Integrated Steel Mill(ISM) process which is now under construction by PT. KRAKATAU POSCO and generate electricity and steam for supplying to steel manufacturing works. The electricity and steam generated by the project would displace the electricity imported from the regional grid which is dominated by fossil fuel-fired power plants and coal based steam boiler respectively. Doubtless, this applied technology will reduce GHG emission significantly.	**CAR 2**	**OK**

			However, in order to confirm the available energy source of proposed project, please provide the waste gas generation from the ISM plant and consumption for each waste gas type (BFG, COG, LDG).		
A.3.1.8 Will the project create other environmental or social benefits than GHG emission reductions?	EB 41	Annex 12	Yes, the project will contribute to sustainable development by reducing the emission of GHGs and mitigate other environmental pollution, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates at the power plants when replacing the equivalent electricity from the grid. And the peoples shall have a direct bearing on improving their professional skills on waste energy recovery as well as the quality of their lives. Furthermore, the project activity promotes economic development in the region and it will contribute to the local economic development through creation of new employment.	**OK**	**OK**
A.3.1.9 What proofs are available demonstrating that the project description is in compliance with the actual situation or planning?	EB 41	Annex 12	During the on-site assessment, numerous proofs for the described project activity were evidenced. The planning is described in the Feasibility Study Report. The following data deliver evidences for the actual situation of the project activity: - Contract of power plant installation (Offshore contract) : 05 October 2011 - Onshore contract (include Steam turbines and Generators purchase) : 07 November 2011 - EIA approval : Cilegon city hall, 5 January 2012 All identified documents are listed as References in this validation report and the project description is in compliance with the actual situation.	**OK**	**OK**
A. 3.2 The validation report shall: (a) Describe the process undertaken to validate the accuracy and completeness of the project description; (b) Contain the DOE's opinion on the accuracy and completeness of the project description.	VVM	64	Yes. Validation team reported the process undertaken to validate the accuracy and completeness of the project description in the PDD and stated DOE's opinion on the accuracy and completeness of the project description.	**OK**	**OK**
A.4 Participation requirements/Approval					

A.4.1 All parties involved have approved the project activity and CDM project activities shall assist Parties not included in Annex I to the Convention in achieving sustainable development.	VVM	44, 125	The project is developed as a unilateral CDM project thus only host party has been involved in the project as project participant. LoA of the Host Party have not been submitted. to validation team.	**CAR 1**	**OK**
A.4 1.1 Has the DNA of the Host Party involved in the proposed CDM project activity in section A.3 of the PDD provided a written letter of approval which confirms? - The country is a Party to the Kyoto Protocol - Participation is Voluntary - The Host Party confirming that the proposed CDM project activity contributes to sustainable development of the country - It refers to the precise proposed CDM project activity title in the PDD being submitted for registration. Please indicate whether the letter is provided from the PP or the DNA	VVM	45, 53 126	Please refer A.4.1	**CAR 1**	**OK**
A.4.1.2 Has the letter of approval been issued by the respective host party's DNA and valid for the CDM project activity under validation?	VVM	47	Please refer A.4.1	**CAR 1**	**OK**
A.4.1.3 Has the DNA of the Annex I country involved in the proposed CDM project activity in section A.3 of the PDD provided a written letter of approval which confirms? - The country is a Party to the Kyoto Protocol - Participation is Voluntary - It refers to the precise proposed CDM project activity title in the PDD being submitted for registration Please indicate whether the letter is provided from the PP or the DNA	VVM	45,53	The project is developed as a unilateral CDM project thus Annex I country is not involved in the project..	**OK**	**OK**
A.4.1.4 Has the letter of approval been issued by the respective Annex-I party's DNA and valid for the CDM project activity under validation?	VVM	47	Please refer A.4.1.3	**OK**	**OK**

A.4.1.5 Is the letter(s) of approval authentic? Please describe the means of assessment.	VVM	48, 53	Please refer A.4.1	**CAR 1**	**OK**
A.4 1.6 Is the letter(s) of approval unconditional?	VVM	46	Please refer A.4.1.	**CAR 1**	**OK**
A.4.2 All project participants have been listed in a consistent manner in the project documentation and their participation in the project activity has been approved by a party to the Kyoto Protocol.	VVM	51	Yes. Through documents review and interview with the project owner, it has been confirmed that there is no entities other than this approved as project participant included in Section A.3 of the PDD.	**OK**	**OK**
A.4.2.1 Is the table required for the indication of project participants correctly applied?	EB 41 VVM	Annex 12, 52	Yes. The information provided is consistency with further chapter of the PDD. Through documents review and interview with the project owner, it has been confirmed that there are no entities other than this approved as project participant included in Section A.3 of the PDD.	**OK**	**OK**
A.4.2.2 Is all information in participants/ Parties provided in consistent with details provided by further chapters of the PDD (in particular Annex I)?	EB 41 VVM	Annex 12 52	Yes. Please refer A.4.2.1. But no Annex I country involved.	**OK**	**OK**
A.4.2.3 Has the project participation of each project participant been approved by at least one Party involved, either in a letter of approval or in a separate letter specifically to approve participation?	VVM	52	Please refer A.4.1.	**CAR 1**	**OK**
A.4.2.4 Are there any other entities than those approved as project participants included in section A.3. of the PDD?	VVM	52	No. There are no other entities than those approved as project participant indicated in section A.3. of the PDD. Participant from host party: PT. Krakatau Poscopower	**OK**	**OK**
A.4.3 If letters of approval contain additional specification of the project activity, such as the PDD version number, please follow VVM paragraph 50	VVM	50	There's no additional specification of the project activity.	**OK**	**OK**

A.4.4 The validation report shall, for each Party involved: (a) Indicate whether a letter of approval has been received, with clearly referencing the letter itself and any supporting documentation; (b) Indicate whether the DOE received this letter from the project participants or directly from the DNA; (c) Indicate the means of validation employed to assess the authenticity if VVM paragraph 48 applies; (d) Contain a clear statement regarding whether the DOE considers the letters are in accordance with VVM paragraphs 45.48.	VVM	49	Please refer A.4.1	**CAR 1**	**OK**
A.4.5 The validation report shall state whether the host Party.s DNA confirmed the contribution of the project to the sustainable development of the host Party. This may be reported together with the DOE.s assessment of the validity of the host Party.s approval (refer to VVM paragraphs 49 and 50).	VVM	127	Yes, The validation report state the host party's DNA confirmed the contribution of the project to the sustainable development of the host party and validation team assessed the validity of the host party's approval.	**OK**	**OK**
A.4.6 The validation report shall, for each project participant: (a) Indicate whether the participation has been approved by a Party to the Kyoto Protocol; (b) Describe the means of validation employed to draw this conclusion.	VVM	54	Please refer A.4.1	**CAR 1**	**OK**
A.5. Technological description of project activity					
A.5.1 Location of the project activity					
A.5.1.1 Does the information provided on the location of the project activity allow for a clear identification of the site?	EB 41	Annex 12	Yes. The project location could be clearly identified according to the PDD. The project is located in Cilegon city, Banten province of Indonesia. The coordinates of the power house are: Latitude: 6.007139 Longitude: 105.9719 However, the location of project site is not in accordance with the GPS	**CL 2**	**OK**

			coordination and the address is not in accordance with the PDD Annex I information		
A.5.1.2 How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (Ownership, Licenses, Contracts etc.)?	VVM	62	The EIA is approved by Cilegon city hall on 5 January 2012 and construction approved on 04 August, 2011 (TANDA TERIMA BERKAS PERMOHON IMB). These two approvals can demonstrate that project proponent can implement the project at the site. Also main equipment purchasing (Onshore contract) and contract of power plant installation (Offshore contract) was signed on 07 November 2011 and 05 October 2011 respectively.	**OK**	**OK**
A.5.2 Categories of the project activity					
A.5.2.1 To which category (ies) does the project activity belong to? Is the category correctly identified and indicated?	EB 41	Annex 12	Yes. The capacity of the project is 200MW and the generated electricity and steam by waste gas are supplied to ISM process which is to meet own demand. Hence this project activity belongs to sectoral scope 1: Energy Industries and sectoral scope 4: Manufacturing Industries. The category is correctly identified and indicated in A.4.2 of the PDD.	**OK**	**OK**
A.5.3 Technology to be employed by the small-scale project activity					
A.5.3.1. Is the technology implemented by the Project activity environmentally safe?	VVM	62	Yes. Referring to the approved EIA, it will not cause any significant environmental impacts.	**OK**	**OK**
A.5.3.2 Does the description of technology to be applied provide sufficient and transparent input/information to evaluate its impact on the GHG balance?	EB 41	Annex 12	Yes. The project activity is a waste gas recovery project, which will produce power and steam for the substitution of grid supplied electricity mainly from coal fired power plants and coal based steam boiler respectively. Doubtless, these technologies will reduce GHG emissions significantly.	**OK**	**OK**
A.5.3.3 Does the implementation of the project activity require any technology transfer from Annex-I-countries to the host country(ies)?	EB 41	Annex 12	No. In this case, the advanced domestic-made facilities are used, hence, there is no technology transfer from Annex-I countries to the host country.	**OK**	**OK**

A.5.3.4. Is the information provided in compliance with actual situation or planning?	VVM	62	Yes. The validation team checked that the information provided is incompliance with actual situation during the on-site visit. Also, all relevant evidences including the turbine, generator, boilers purchase contracts were submitted to validation team.	**OK**	**OK**
A.5.3.5 Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period?	-	-	Yes. In order to ensure the implementation of this monitoring plan, monitoring staffs will receive training on operating and monitoring before project operation by the equipment provider. The validation team confirmed training plan through the Personnel operation plan made by PT KPP on 03 February 2012. In the following years within the crediting period, relevant training would also be carried out based on this training plan.	**OK**	**OK**
A.5.3.6 Does the project make provisions for meeting training and maintenance needs?	-	-	Please refer A.5.3.5.	**OK**	**OK**
A.5.4 Estimated amount of emission reductions over the chosen crediting period					
A.5.4.1 Is the form required for the indication of projected emission reductions correctly?	EB 41	Annex 12	Yes. The table used for the indication of projected emission reduction correctly applied.	**OK**	**OK**
A.5.4.2 Are the figures provided consistent with other data presented in the PDD?	EB 41	Annex 12	Yes. The yearly emission reduction is estimated to be 809,138t CO_2. The same figure is quoted in the entire PDD.	**OK**	**OK**
A.5.5 Public funding of the project activity					
A.5.5.1 Public funding for the project from parties in Annex I shall not be a diversion of official development assistance.	EB 41	Annex 12	Yes. The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Indonesia. Project owner's equity capital and loan from Standard Chartered Bank Korea Limited were composed for the investment of this project. The loan evaluation and granting released by Standard Chartered Bank Korea Limited were reviewed by the validation team.	**OK**	**OK**

A.5.6 Confirmation that the small-scale project activity is not a de-bundled component of a large scale project activity					
A.5.6.1 Does the proposed small-scale project activity meet the requirements of the simplified modalities and procedures for small-scale CDM project activities?	VVM	135	The proposed project activity designed as Large scale project fully addressed in PDD. Thus the project is not belonging to Small-scale CDM project.	**OK**	**OK**
A.5.6.2 Does the project activity qualifies within the thresholds of the three possible types of small scale project activities? [Type (i) project activities: renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts; Type (ii) project activities: energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 Giga watt hours per year; Type (iii) project activities: other project activities that both reduce anthropogenic emissions by sources and directly emit less than 60 kilo tones of carbon dioxide equivalent annually.]	VVM	136	N/A. Please refer A.5.6.1.	**OK**	**OK**
A.5.6.3 Does the project activity conform to one of the approved small-scale categories?	VVM	136	N/A. Please refer A.5.6.1.	**OK**	**OK**
A.5.6.4 Does the project activity apply the relevant tool and methodology?	VVM	134	N/A. Please refer A.5.6.1.	**OK**	**OK**
A.5.6.5 Are the small-scale methodologies applied in conjunction with the general guidance to the methodologies, which provides guidance on equipment capacity, equipment performance, sampling and other monitoring-related issues?	VVM	136	N/A. Please refer A.5.6.1.	**OK**	**OK**

A.5.6.6 Is the project activity not a de-bundled component of a large-scale project, i.e., is there a registered small scale. CDM project activity or an application to register another CDM project activity: (a) with the same project participants; (b) in the same project category and technology/measure; and (c) registered within the previous 2 years; and (d) whose project boundary is within 1 km of the proposed boundary of the proposed small-scale activity at the closest point?	VVM General guideline to SSC	136	N/A. Please refer A.5.6.1.	**OK**	**OK**
A.5.6.7 Does the project activity apply specific requirements on demonstration of additionality for SSC together with Chapter V, section E, subsection 6 in VVM and the 'Non-binding best practice examples to demonstrate additionality for SSC project activity?	VVM	137	N/A. Please refer A.5.6.1.	**OK**	**OK**
B. Application of a baseline and monitoring methodology					
B.1 Title and reference of the approved baseline and monitoring methodology applied to the project activity.					
B.1.1 The DOE shall validate that the selected baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM EB is applicable to the project activity, including that the used version is valid. The DOE shall apply specific guidance provided by the CDM EB in respect to any approved methodology.	VVM	65, 66, 68, 69	ACM0012 (ver. 04) is applied to the proposed project activity and the 'Tool for the demonstration and assessment of additionality (Ver 07.0) and the 'Tool to calculate the emission factor for an electricity system (Ver 02.2.1) are used. However, the title of methodology in PDD is not correct.	**CL 3**	**OK**
B.1.2 Are reference number, version number, and title of the baseline and monitoring methodology clearly quoted? Is the applied version the most recent one and/or this version still applicable? Is there specific guidance or tool used in this project activity in respect to the approved methodology?	EB 41 VVM	Annex 12 70	Yes. As clearly indicated the applied methodology is ACM0012. And the 'Tool for the demonstration and assessment of additionality (Ver 07.0) and the 'Tool to calculate the emission factor for an electricity system (Ver 02.2.1) are used.	**OK**	**OK**

B.1.3 Are the applicability criteria in the baseline methodology all fulfilled and described in the PDD? (List up the applicability criteria)	VVM	71	The applicability of methodology (ACM0012 ver.04) is not clearly demonstrated with relevant evidence. - We cannot confirm the project activity does not use waste pressure energy but recovery waste off gas from the Greenfield integrated steel mill. - We cannot confirm in case where waste gas is released under abnormal operations like emergencies or shut downs, the emission reductions will not be claimed - The WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction or not. - The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1(for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology. - Etc.	**CAR 5**	**OK**
B.1.4 Is the project activity not expected to result in emissions other than those allowed by the methodology?	VVM	71	Yes. There is no other emission allowed by the methodology ACM0012.	**OK**	**OK**
B.1.5 Is there request for clarification of , revision to or deviation from a methodology? If so, please describe the process and results.	VVM	72,73, 74,75	No. There is no- clarification, revision or deviation for the project activity. KFQ confirmed it through the document review and interview with the PP.	**OK**	**OK**
B.1.6 For each applicability condition listed in the approved methodology selected, the DOE shall clearly describe in the validation report the steps taken to assess the relevant information contained in the PDD against these criteria. The validation report shall include an unambiguous validation opinion regarding the applicability of the selected methodology to the proposed CDM project activity.	VVM	76	Yes. Validation report describes that this proposed project activity met each applicability condition listed in the ACM0012 in section 3.3 of validation report.	**OK**	**OK**
B.1.7 The validation report shall contain information regarding greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed CDM project activity which are expected to contribute more	VVM	77	N/A. For the proposed project activity, CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	**OK**	**OK**

than 1% of the overall expected average annual emissions reductions, which are not addressed by the applied methodology.					
B.2 Project Boundary and Description of the source and gases included in the project boundary					
B.2.1. The PDD shall correctly describe the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.	VVM	67,78	PP provided information on the project boundary including the physical delineation of the proposed project activity included within the project boundary for the purpose of calculating project and baseline emissions.	**OK**	**OK**
B.2.2 Does the project boundary include the physical delineation of the proposed CDM project activity?	VVM	79	Yes. The spatial extent of the project boundary includes the projects' electricity and steam generation facility and all internal power system and internal steam system connected physically to the electricity and steam generation system.	**OK**	**OK**
B.2.3 Are all emission sources and gases related to the baseline scenario and leakage clearly identified and described in a complete and transparent manner?	EB 41 VVM	Annex 12, 79	All emission sources are gases related to the baseline scenario, project scenario and leakage are clearly identified and described in a complete and transparent manner. CO_2 emissions from the electricity generation supplied from the grid and fossil fuel consumption in element process for thermal energy are displaced due to the project activity. Thus these are included in the project boundary as baseline emissions sources.	**OK**	**OK**
B.2.4 If the methodology allows the PPs to choose whether a source or gas is to be included within the project boundary. If so, Have the PPs justified that choice and is the justification provided reasonable?	VVM	79	Sources and GHG required by the methodology have been included within the project boundary. The identified boundary and the selected sources and gases are clearly justified for the project activity.	**OK**	**OK**
B.2.5 Is a flow diagram of the project boundary, physically delineating the project activity presented based on the descriptions provided in section "A.4.3. Technology to be employed by the project activity"?	EB 41	Annex 12	A flow diagram of the project boundary, physically delineating the project activity presented based on the descriptions provided in section B.3 of the PDD.	**OK**	**OK**

B.2.6 In the validation report, the DOE shall describe how the validation of the project boundary has been performed, by detailing the documentation assessed (e.g. a commissioning report) and by describing its observations during any site visit undertaken in accordance with VVM paragraphs 59.62 (i.e. observations of the physical site or equipment used in the process). The DOE shall provide a statement whether the identified boundary and the selected sources and gases are justified for the project activity. Should the DOE identify emission sources that will be affected by the project activity and are not addressed by the selected approved methodology, the DOE shall request clarification of, revision to or deviation from the methodology, as appropriate, as described in VVM paragraph 73.	VVM	80	Validation team confirmed the project boundary via observation of the physical site during the on-site visit. Also validation team assessed documentation such as FSR, board meeting minute for decision making, EIA to identify the project site and boundary of the project activity. Validation report describes how DOE assessed project boundary and emission resources that affected by the project activity. Also it indicates that DOE does not need to request clarification of, revision to or deviation from the methodology.	**OK**	**OK**
B.3 Description of how the baseline scenario is identified and description of the identified baseline scenario					
B.3.1 The PDD shall identify the baseline for the proposed CDM project activity, defined as the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity.	VVM	81	Yes. In accordance with ACM0012 Version 04, as the project activity is the installation of a waste gas recovery power plant, the baseline scenario is selected as electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the CM calculations described in the 'Tool to calculate the emission factor for an electricity system' and steam supplied from fossil fuel based steam boiler.	**OK**	**OK**
B.3.2 Have any procedure contained in the methodology to identify the most reasonable baseline scenario, been correctly applied?	VVM	82	As the baseline methodology ACM0012 prescribes that a baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative. However, PP should demonstrate the baseline determination in accordance with the methodology ACM 0012. (1) It is not clearly demonstrated the of alternatives selection for baseline scenario determination. - Scenario W1, W3, W5, W6 - Scenario P2, P5, P6, P7, P8, P9 P10 - Scenario H2, H3, H4, H5, H6, H7, H8, H9, H12, H13	**CAR 6**	**OK**

			(2) Please demonstrate the assessment of selected combination scenarios with relevant evidence for demonstration and make clear the reason of adoption or rejection for every combination scenarios.		
B.3.3 Does the selected methodology require use of tools (such as "Tool for the demonstration of additionality" and the "Combined tool to identify the baseline scenarion and demonstrate additionality") to establish the baseline scenario?	VVM	82	Yes. The PP have applied the 'Tool for the demonstration and assessment of additionality'(ver. 07.0) to establish the baseline scenario.	**OK**	**OK**
B.3.4 If, yes, was the methodology consulted on the application of these tools ?(in such cases, the guidance in the methodology shall supersede the tool)	VVM	82	Yes. Selected methodology (ACM 0012) requires a use of tools such as "Tool for the demonstration of additionality" and the PP followed instruction in the Tools applied to the project activity.	**OK**	**OK**
B.3.5 Does the methodology require several alternative scenarios to be considered in the identification of the most reasonable baseline scenario?	VVM	83	Please refer B.3.2.	**CAR 6**	**OK**
B.3.6 If, yes, are all scenarios that are considered by the project participants and are supplementary to those required by the methodology reasonable in the context of the proposed CDM project activity?	VVM	83	Please refer B.3.2.	**CAR 6**	**OK**
B.3.7 Is the baseline scenario identified reasonable by validating assumptions, calculations and rations used, as described in the PDD? And is all the documents and sources referred to in the PDD used for establishing the baseline scenario and correctly quoted and interpreted?	VVM	84	Please refer B.3.2.	**CAR 6**	**OK**
B.3.8 Was the information provided in the PDD cross checked with other credible and credible sources, such as local expert opinion, if available ?(identify the sources)	VVM	84	Please refer B.3.2.	**CAR 6**	**OK**

B.3.9 Have all applicable CDM requirements been taken into account in the identification of the baseline scenario for the proposed CDM project activity?	VVM	85	Please refer B.3.2.	**CAR 6**	**OK**
B.3.10 Have all relevant policies and circumstances been identified and correctly considered in the PDD, in accordance with the guidance by the CDM EB?	VVM	85	Please refer B.3.2.	**CAR 6**	**OK**
B.3.11 Does the PDD provide a verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity?	VVM	86	Yes. All the assumptions and data used by PP including reference and sources are provided in the PDD. And all the documentation is used for establishing the baseline scenario and correctly quoted and interpreted in the PDD.	**OK**	**OK**
B.3.12 The DOE shall clearly describe in the validation report the steps taken to assess the requirement given in VVM paragraphs 81 and 82 and shall provide an opinion as to whether: (a) All the assumptions and data used by the project participants are listed in the PDD, including their references and sources; (b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD; (c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable; (d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD; (e) 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.	VVM	87	Yes. Please refer 'section 3.3. Baseline Determination' of the validation report.	**OK**	**OK**
B.3.13 The validation report shall clearly describe other steps taken, and sources of information used, by the DOE to cross check the information contained in the PDD on this matter.	VVM	88	Yes. Please refer 'section 3.3. Baseline Determination' of the validation report.	**OK**	**OK**

B.4 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.4.1 CDM benefit shall be considered necessary in the decision to undertake the project as a proposed CDM project activity.	VVM	98/103	As starting date of the project activity is 05 October 2011 (the date of contract of power plant installation), which is after 2 August 2008. Validation team had assessed the evidence that the project participants informs the Indonesia DNA and the UNFCCC secretariat in writing of the commencement of the project activity according to the "Guidelines on the demonstration and assessment of prior consideration of the CDM, version 04" (EB 62, Annex 13) The validation team checked that the PP informed their intention to seek CDM status for the proposed project activity to the Indonesia DNA on 10 November 2011 (accepted on 11 November 2011) and PP inform the notification to the UNFCCC secretariat on 08 November 2011, (accepted on 10 November 2011) respectively. Even though PP noticed their project to the Indonesia DNA and to the UNFCCC Secretariat by e-mail, the validation team have assessed the evidence that an incentive from the CDM was seriously considered in the decision to proceed with the project activity and the project owner at that time was aware of CDM development in Indonesia and decided to carry out project with CDM. The consideration of CDM benefits prior to the starting date of the project activity has been found in the board meeting minute held on 21 December 2010. The validation team was able to verify all the relevant documents which demonstrate that benefits from CDM had been seriously considered before the starting of the project activity. However, the validation team requested to provide the board meeting minute for investment cost adjust (08 August 2011) after first investment decision (21 December 2010)	**CL 1**	**OK**
B.4.1.1 Is the start date of the project activity in accordance with the "Glossary of CDM terms"?	VVM	99	The starting date of the project has been validated by KFQ as 05 October 2011 which represents the date of contract of power plant installation (Offshore contract) between PP and POSCO Engineering & Construction Co., Ltd. KFQ confirmed that this starting date is the earliest date at which either the implementation or construction or real action of a project activity begins after reviewing the documents below. To confirm this date, validation team examined following dates:	**OK**	**OK**

			• Contract of power plant installation (Offshore contract) : 05 October 2011 • Onshore contract (include Steam turbines and Generators purchase) : 07 November 2011 • Operation start : expected to January 2014 Thus, KFQ regarded 'Contract of power plant installation (Offshore contract)' as an official implementation to proceed with the project activity and accepted it as the starting date because it is the earliest date at which either the implementation or construction or real action of a project activity begins. The validation team confirmed that the starting date of project activity is in accordance with the Glossary of the CDM terms.		
B.4.1.2 Is it a new project activity (project activities with start date on or after 02 Aug 2008) or an existing project activity (project activities with a start date before 02 Aug 2008)?	VVM	100	This proposed project is a new project activity such as the starting date of the proposed project activity is after 02 August 2008 (05 October 2011).	**OK**	**OK**
B.4.1.3 For a new project, for which PDD has not been published for global stakeholder consultation or a new methodology proposed to the EB before the project activity start date, had the PP informed the Host party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status?	VVM	101	Please refer to B.4.1	**OK**	**OK**
B.4.1.4 For an existing project activity, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, are the following evidences provided?	VVM	102	The starting date of the proposed project activity is 05 October 2011. This start date is prior to the date of publication of the PDD for global stakeholder consultation dated on 14 April 2012 The validation team confirmed the evidence for start date and the registered form of publication of the PDD for global stakeholder consultation.	**OK**	**OK**
B.4.1.5 Evidence that must indicate that awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project, including, inter alia : Minutes and/or notes related to the	VVM	102	Please refer to B.4.1	**OK**	**OK**

consideration of the decision by the Board of Directors, or equivalent , of the project participant, to undertake the project as a proposed CDM project activity?					
B.4.1.6 Reliable evidence from project participant that must indicate that continuing and real actions were taken to secure status for the project in parallel with its implementation including, inter alia : - Contract with consultants for CDM/PDD/methodology services - ERPA or other documentation related to the sale of the potential CERs - Evidence of agreements or negotiation with a DOE for validation service - Submission of a new methodology to the CDM EB - Publication in newspaper - Interview with DNA - Earlier correspondence on the project with the DNA or the UNFCCC secretariat	VVM	102	After management decision for the project activity, we checked reliable evidence such as continuing and real actions from project participant in order to secure status for the project in parallel with its implementation. In order to proceed with the application, the project owner signed the CDM consultancy agreement with CDM consulting company (RCC Co., Ltd.) on 01 November 2011. After that, DOE contract for CDM validation was made on 08 February 2012 and the PP received the LoA of Indonesia on 27 August 2012 from the National Council on Climate Change. (Dewan Nasional Perubahan Iklim) However, in order to demonstrate the validity of continuation, PP should provide the evidence of project history in PDD Table B-4 and the date of these histories are not correct in PDD. Please correct the date.	**CL 4**	**OK**
B.4.2 The PDD shall describe how a proposed CDM project activity is additional.	VVM	94	Yes, The PDD provided description that how a proposed CDM project activity is additional in section B.5 of the PDD by using the "Tool for the demonstration and assessment of additionality" (Version 07.0) approved by EB.	**OK**	**OK**
B.4.2.1 Does the PDD describe how a proposed CDM project activity is additional? Are the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality assessed and verified?	VVM	95	Yes. The PP analyzed investment barrier of this proposed project activity and it is well described in section B.5 of the PDD. Please refer section B.4 of this report.	**OK**	**OK**
B.4.2.2 Does the PDD state the latest version of the additionality tool and documents being used?	VVM	96	Yes. The approved "Tool for the Demonstration and Assessment of Additionality" version 07.0 is used. The validation team cross-checked the web site: http://cdm.unfccc.int/Reference/tools/index.html.	**OK**	**OK**

B.4.3 The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribe the baseline scenario and hence no further analysis is required?	VVM	105	As the baseline methodology ACM0012 prescribes that a baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative. However, PP should demonstrate the baseline determination in accordance with the methodology ACM 0012. (1) It is not clearly demonstrated the of alternatives selection for baseline scenario determination. - Scenario W1, W3, W5, W6 - Scenario P2, P5, P6, P7, P8, P9 P10 - Scenario H2, H3, H4, H5, H6, H7, H8, H9, H12, H13 (2) Please demonstrate the assessment of selected combination scenarios with relevant evidence for demonstration and make clear the reason of adoption or rejection for every combination scenarios.	**CAR 6**	**OK**
B.4.3.1 Does the list of alternatives given in the PDD ensure that: (a) the list of alternatives includes as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity (b) the list contains all plausible alternatives that the DOE, on basis of its local and sectoral knowledge, considers to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity (c) the alternatives comply with all applicable and enforced legislation.	VVM	106	(a) Yes. (b) No. Please refer to B. 4.3 (1) (c) No. Please refer to B. 4.3 (1)	**CAR 6**	**OK**
B. 4.3.2 Have realistic and credible alternatives been identified providing comparable outputs or services? (step 1a)	VVM	106(b)	No. Please refer to B. 4.3 (2)	**CAR 6**	**OK**

B. 4.3.3 Is the project activity without CDM included in these alternatives? (Step 1a)	VVM	106(a)	Yes. The proposed project activity without CDM is included as Alternative "P1 ; Project activity not undertaken as a CDM project activity" and "H1 ; The project activity is not undertaken as a CDM project activity"	**OK**	**OK**
B.4.3.4 Is a discussion provided for all identified alternatives concerning the compliance with applicable laws and regulations? (step 1b)	VVM	106(c)	No. Please refer to B. 4.3 (1)	**CAR 6**	**OK**
B.4.3.5 In case the PDD argues that specific laws are not enforced in the country or region Is evidence available concerning that statement? (step 1b)	VVM	106(c)	No. Please refer to B. 4.3 (1)	**CAR 6**	**OK**
B.4.4 If investment analysis has been used to demonstrate the additionality of the proposed CDM project activity, the PDD provide evidence that the proposed project activity would not be the most economically or financially attractive alternative or economically or financially feasible, without the revenue from the sale of CERs (In case of applying step 2: investment analysis of the additionality tool: Is the analysis method identified appropriately (step 2a)? which option is seleted and why).	VVM	108	Yes. The proposed activity would be not economically or financially feasible, without the revenue from the sale of CERs. It is concluded based on the after-tax IRR calculation that 10.2% is less than the benchmark of 13.58%. For this project, the benchmark analysis (Option III) was applied to conduct the investment analysis.	**OK**	**OK**
B.4.4.1 Was this shown by one of the following approaches? - Demonstrate that the proposed CDM project activity would produce no financial or economic benefits other than CDM-related income. Document the costs associated with the proposed CDM project activity and the alternatives identified and demonstrate that there is at least one alternative which is less costly than the proposed CDM project activity; - The proposed CDM project activity is less economically or financially attractive than at least one other credible and realistic alternative;	VVM	109	Yes. 'The financial returns of the proposed CDM project activity would be insufficient to justify the required investment was selected to show the proposed project activity would not be the most economically or financially attractive alternative or economically or financially feasible without the revenue from the sale of CERs.	**OK**	**OK**

- The financial returns of the proposed CDM project activity would be insufficient to justify the required investment.					
B.4.4.2 Does the investment analysis comply with the latest version of the "Guidance on the Assessment of investment analysis" and with other relevant guidance including the latest guidelines on plant load factors guidelines for the reporting and validation of plant load factors?	VVM	110	Yes. The latest version of the approved "Guidance on the Assessment of Investment Analysis (Version 05)" is used. The validation team crosschecked the web site: http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf The plant load factor is determined from PPA between PP and recipient company. Because the proposed project has been developing by purpose of captive energy exchange between PP and recipient company thus the output from the project will not be sold to the off site recipient. Consequently, the PPA is very significant to assess on project's economic feasibility. Therefore, validation team confirmed the plant load factor of the proposed project is provided to banks and/or equity financiers while applying the project activity for project financing and it is also satisfied the Guideline for the reporting and validation of plant load factors (EB48 Annex 11). The validation team crosschecked the web site: http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid35.pdf	**OK**	**OK**
B.4.4.3 Is the period of assessment limited to the proposed crediting period of the CDM project activity?	EB 51	Ann 58	According to the 'Tool to determine the remaining lifetime of equipment' (ver.01)" the remaining lifetime of relevant equipment shall be determined prior to the implementation of the project activity. Please demonstrate the remaining lifetime of relevant equipment and show the remaining lifetime could cover the crediting period.	**CAR 4**	**OK**
B.4.4.4 Does the project IRR or Equity IRR calculations reflect the period of expected operation of the underlying project activity(technical lifetime), or if a shorter period is chosen – include the fair value of the project activity assets at the end of the assessment period?	EB 51	Ann 58	No. Please refer to B.4.4.3 The fair value was not considered in the project activity assets at the end of the assessment period.	**CAR 4** **CAR 7**	**OK**

B.4.4.5 Is the most suitable financial indicator clearly identified (IRR, NPV, Cost benefit ratio, or (levelized) unit cost)?	EB 51	Ann 58	Yes. The evaluation of the project's financial viability is based on the internal rate on return (IRR). However, the benchmark selection approach for IRR financial indicator is not applicable.	**CAR 7**	**OK**
B.4.4.6 Are Input values used valid and applicable at the time of the investment decision taken by the project participant?	EB 41	Ann 58	Yes. All input values apart from investment cost, combined tariff and operational lifetime used in the investment analysis are taken from feasibility study report (FSR) which is the basis material for decision making for investment in the project activity at Board Meeting on 21 December 2010. The FSR was completed by Poscopower* for the proposed project and finished on 15 October 2010 based on feasibility study by PT KRAKATAU POSCO (PT KP) who is the waste gas supplier as an Integrated Steel Mill(ISM) company in 30 December 2009. Thus FSR was used as basis of investment decision at board meeting The consideration of CDM benefits prior to the starting date of the project activity has been found in the board meeting minute held on 21 December 2010. The input values during the time gap between the completion of the feasibility study (15 October 2010) and the investment decision (21 December 2010) is less than three months, thus it is unlikely in the context of the underlying project activity that the input values would have materially changed as per para. 113 (a)/VVM ver. 01.2. KFQ was able to confirm it through interview with PP and relevant documents. As for the investment cost, PP approved 231,000,000USD investment cost in the FSR at the Board meeting stated above and adjusted to 277,000,000USD at the board decision meeting on 05 August 2011 due to mainly civil works and equipment costs increase† found in the course of reviewing proforma quotations for purchasing equipments. The validation team confirmed it through the document for board decision on 05 August 2011‡ prior to project start date (05 October 2011).	**OK**	**OK**

* Poscopower is one side of Joint Venture who is the PP and the other side is PT KDL. According to the FSR, Poscopoer is main part of investment decision such as 90% of investment cost burden to them and PT KDL only support a administrative aproval and provide the manpower . Thus most of the authority for investment for the project in on Poscopower.

† Sea water intake and channel construction, Piling construction etc.

‡ Adjusted investment cost from the board decision for investment cost (05 August 2011) is assessed below investment cost section of the report

			KFQ confirmed that the project investor, Poscopower would or not decide to proceed with the project again before starting construction or commitment to big expenditure and got to conclusion the adjusted investment cost is applicable for the investment analysis at the time of investment decision under comprehensive understanding of starting date and additionality. As for the combined tariff, even though the energy output consists of both electricity and steam, the tariff was estimated only reflecting the electricity tariff in total energy generation (165MW) deducting the waste gas tariff in FSR. Thus PP re-estimated the combined tariff reflecting separated tariff such as electricity and steam and waste gas purchase tariff based on the PPA between PP and PT KP. Moreover, as explained above, PPA has been developed by the purpose of captive energy exchange between PP and PT KP and the output from the project activity will not be sold to the off site facility thus the applied tariff from the PPA is more accurate and reasonable to apply. As for the operational lifetime, even though 15 years on the FSR, however PP applied 20 years in a conservative manner. Accordingly, validation team can finally conclude that all input values are applicable at the time of investment decision.		
B.4.4.7 In the case, does the project participants rely on values form FSR that are approved by national authorities for proposed project activities? (a) The FSR has been the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed; (b) The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE should validate the appropriateness of the values;	VVM	113	Yes. All the input value were identified and assessed through the FSR and the material for decision making for CDM development thus the selected input values have been used as the basis of the decision to proceed with the investment. Refer to the B.4.4.6. The key parameters used for IRR calculation has been presented in Table B.5 of PDD. The spreadsheet and related documents have been verified by the validation team. According to the Article 6 of the "Guidelines on the assessment of investment analysis (version 05)", all input values used in the investment analysis should be valid and applicable at the time of the investment decision. For the assessment of the validity of each input value, further to this, KFQ cross-checked the applied values when possible with actual contracts and	**CAR 7**	**OK**

(c) On the basis of its specific local and sectoral expertise, confirmation is provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision.			references, then compared them with KFQ's internal statistic results of the evaluation of similar projects. The validation team selected the 5 similar projects considering below three conditions for project selection. 1) Type : Waste gas recovery and cogeneration (electricity, heat) project 2) Project status: registered as CDM (4 projects) or in the CDM pipeline (1 project) 3) Physical boundary: worldwide 4) Time boundary: before 13 May 2011 (end of GSC period of proposed project activity) The detail assessments for the input values are as below. Among input values, total investment cost, O&M cost, Tariff and residual value are addressed at the Table 2. Resolution of Corrective Action and Clarification Requests of the report due to the CAR raised. **Annual net energy output : 1,239,229MWh/y, (Plant load factor : 90.9%)** Annual energy output has been adopted based on FSR. The annual energy output can be estimated as sum of annual electricity output and annual steam output. According to the FSR, annual energy output was multiplied maximum capacity of possible energy generation estimated from the maximum waste off gas generation from ISM process (165MW) multiplied by annual possible operation hour (8027h/y) considering the maintenance and overhaul period. The average energy output was made out as 1,324,455MWh/y. However, the validation team found that PP separate the possible energy capacity as electricity (158.23MW) and steam (32ton/h) in order to make out the exact annual energy output in cogeneration situation and also the maintenance and overhaul time has been adjusted in the process of finalizing a PPA between PP and PT KP with reflecting a TRIP hour (137h/y). Therefore PP got the annual operation hour as 7969 hour and thus the annual energy output as 1,314,885 MWh/y[*] and we confirmed this figure is more correct and valid to applying investment analysis. The validation team tested IRR with 1,324,455MWh/y of annual energy output in the FSR and found that IRR becomes 11.45% which is still below benchmark.		

[*] 1,314,885 MWh/y is gross energy output. Net energy output shall be reflected a captive power consumption (6%) on electricity output.

			The plant load factor (90.9% = 7,969h/8760h) is determined from PPA between PP and recipient company*. Because the proposed project has been developing by purpose of captive energy exchange between PP and recipient company thus the output from the project will not be sold to the off site recipient. Consequently, the PPA is very significant to assess on project's economic feasibility. Therefore, validation team confirmed the plant load factor of the proposed project is provided to banks and/or equity financiers while applying the project activity for project financing and it is also satisfied the Guideline for the reporting and validation of plant load factors (EB48 Annex 11). Furthermore, we checked the operation hour of similar projects and found the average operation hour of 4 similar project among 5 projects† is 6,940 hour/year and Gwangyang ISM Plant is 6,941 hour/year‡ which are lower the proposed project. The maximum capacity of possible energy generation (165MW) is estimated from the maximum waste off gas generation from ISM process. According to the waste gas balance which analyzed a production and consumption of by-product gas from ISM on FSR, total production of waste gas in the ISM process is 637,539 Nm^3/h§ and 54.1% of waste gas is consumed in ISM process and remaining 45.9% of waste off gas (292,837Nm^3/h, 362,418,594kcal/h) will be used in the project activity. It was confirmed by the gas balance in feasibility study by PP which was based on the actual experiences of development and operation of waste gas recovery and cogeneration projects from the ISM plants in Korea** As a result of this waste gas balance, we found the maximum capacity of possible energy generation (165MW) is reasonable and valid. **Annual electricity output : 1,260,935 MWh/y** Annual electricity output has been adopted based on FSR estimation. As explained above, the maximum capacity of possible energy generation		

* PT. KRAKATAU POSCO

† The operation hour of 'Electric Power Co-Generation by LDG Recovery – CST – Brasil' project could not be obtained due to the quite different energy generation approach applied.

‡ Estimated annual electricity generation during 2007 ~ 2008, Feasibility study of Gwangyang ISM Plant, #9 waste gas generation

§ BFG : 539,726 Nm^3/h, COG : 65,388 Nm^3/h, LDG : 32,425 Nm^3/h

** Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

			(165MW). The annual electricity generation can be estimated as the applicable capacity (158.23MW) that is maximum waste gas fed into the turbines for electricity generation except waste gas for bypassed steam generation (6.77MW) which from the condensing extraction turbine, multiplies annual operating hour (7969h) and the result is 1,260,935 MWh/year. (158.23MW * 7,969 hour/year = 1,260,935 MWh/year) **Annual steam output : 53,950 MWh/y** Regard to the energy output of the project, because FSR only researched total capacity of possible energy generation (165MW, electricity and steam generation), PP demonstrated the steam output by separating both energy output such as electricity and steam. Annual steam output has been calculated by Steam Balance Study of the project and the outcome of the study applied to the FSR. According to the Steam Balance Study, the steam generation and consumption in the ISM process in the absence of project activity, the shortage of steam generation expected to 32ton/h, thus 32ton/h steam will be generated from the two boilers with the capacity of 45ton/h. The project activity is designed as condensing extraction turbine type, so the electricity and steam output from the project activity is mutually supplementary. Thus even though the fluctuation of steam generation resulted by the steams consumption required, total energy output maintains the overall capacity of the project activity (165MW) which is derived from the maximum waste gas utilization in the waste energy generation facility (ISM process). In addition, the validation team checked same waste gas recovery and cogeneration projects in Pohang and Gwangyang ISM Plant through the performance result of and interview with the staff of these companies. And we found the average unit steam generation for these plants is 13~14 ton/h as per 100MW total generation capacity that is close to the proposed project (16 ton/h per 100MW). We could accept this small difference caused by climate condition between Korea and Indonesia and considering mutual supplementary with the electricity generation through our sectoral expertise and conclude the estimation of steam generation is reason and valid. **Captive power consumption : 6% of total energy output** In order to estimate net electricity output estimation, 6% (9.9MW) of total		

			energy output from the auxiliary electricity consumed equipment by the project activity is applied. The validation team checked the designed equipment electricity consumption capacity in Elec. Load List of project design. Total electricity consumption capacity of project activity is identified as 19.685MW in the Load List, however 6% of total energy output (9.9MW) was applied considering the rated output of each electricity equipment and also in a conservative manner. Meanwhile, validation team checked the available 4 similar projects for auxiliary electricity consumption. The average consumption rate of similar projects is 9.0% of gross electricity generation that is higher than the proposed project (6.0%). Even the smallest rate of auxiliary electricity consumption (3%) in similar projects, the IRR results show below the benchmark rate (10.6%). Thus, the validation team conclude the estimated annual captive power consumption (75,656MWh[*]) is reason and valid. **TAX** The validation team confirms that the tax rates for Income tax (25%) are properly applied in accordance with Indonesia regulation[†] and also Income tax (25%) is correctly calculated in accordance with EB 62 Annex 5, Guidelines on the assessment of investment analysis (version 05). Furthermore, this rate is compared with rate used in other waste heat recovery projects in Indonesia. **Interest rate on loan: 6%/year** The interest rate used in the PDD and IRR calculation is 6% from the loan contract and it is quoted from FSR. According to the published bank interest rate[‡] on the Bank Indonesia at the time of FSR completion and the investment decision, the interest rate is 6.5%. The validation team confirmed the applied interest rate is reasonable through checking the financial statistics in Indonesia and also our sectoral expertise and knowledge. We tested applying published interest rate (6.5%), it almost never impact on the IRR.		

[*] Captive power consumption from the electricity generation : 1,260,934 MWh * 0.06 = 75,656 MWh
Captive power consumption from the steam generation : 53,953 MWh * 0.06 = 3,237MWh

[†] Law No. 36 year 2008 for tax rate, article 17 (2a)

[‡] BI rate from Bank Indonesia : 6.5% (2009 ~ 2010)

			Even though decrease of loan interest by principal repayment year by year, PP applied fixed loan interest in whole 20 operation years on the IRR calculation spread sheet in a conservative manner. KFQ can confirm that the applied interest rate on the loan, 6% of interest rate is valid. **Operational lifetime (20 years)** The operational lifetime has been adopted as 20 years that is adjusted from the FSR (15 years). Even though the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years according to the PPA, considering the lifetime of main equipment, PP applied 20 years as operational lifetime for the proposed project that is also in accordance with the maximum 20 years operation lifetime recommended in the Guidelines on the Assessment of Investment Analysis (Ver. 05). The validation team checked equipment lifetime by confirmation letter from the equipment supplier* dated on 16 August 2012 and confirmed the lifetime of all main equipment such as steam turbines, generators and boiler is 25 years. Furthermore, we tested the IRR applying the 25 years operation lifetime as the confirmation letter from the equipment supplier and found the IRR shows still below the benchmark (11.0%). Thus the validation team concluded that this project lifetime (20 years) is valid and the lifetime of equipment covers the crediting period (10 years) of the project activity. However, PP should demonstrate the validity of input values with associated evidences as follows. - The benchmark selection approach is not applicable - Investment cost : Please demonstrate the validity of investment cost compare with other similar project and provide the actually incurred investment cost based on the relevant evidence. - Tariff : Please demonstrate the tariff selection method based on PPA - O&M cost : Please let us know the O&M cost based on FSR estimation.		

* POSCO E&C

B.4.4.8 Was a thorough assessment of all parameters and assumptions used in calculating the relevant financial indication and determine the accuracy and suitability of these parameters using the available evidence and expertise in relevant accounting practices conducted?	VVM	111	All the input value were identified and assessed through the FSR that was basis of decision to proceed with this project activity as a CDM project. The key parameters used for IRR calculation has been presented in section B.5 of PDD and are consistent with the FSR. The spreadsheet and related documents have been verified by the validation team. Since input parameters impact the IRR results, the actual figures quoted from other official documents issued by the 3rd organizations are used for double check. However, the validity of input values with associated evidences should be demonstrated.	**CAR 7**	**OK**
B.4.4.9 Were the parameters cross-checked against third-party or publicly available sources, such as invoices or price indices?	VVM	111	Please refer to B.4.4.8.	**CAR 7**	**OK**
B.4.4.10 Were feasibility reports, public announcements and annual financial reports related to the proposed CDM project activity and the project participants reviewed?	VVM	111	Yes. All feasibility reports, board meeting minute and public announcements related to the proposed CDM project activity were reviewed.	**OK**	**OK**
B.4.4.11 Was the correctness of computations carried out and documented by the project participants assessed?	VVM	111	Yes. The correctness of computations carried out and documented by the project participants assessed.	**OK**	**OK**
B.4.4.12 Was the sensitivity analysis by the project participants to determine under what conditions variations in the result would occur, and the likelihood of these conditions?	VVM	111	No. Sensitivity analysis should be demonstrated in a reasonable manner for each parameter.	**CAR 8**	**OK**
B.4.4.13 Is any benchmark applied in the investment analysis suitable? - Determine whether the type of benchmark applied is suitable for the type of financial indicator presented. - Ensure that any risk premiums applied in determining	VVM	112	No. Please refer to B.4.4.7.	**CAR 7**	**OK**

the benchmark reflect the risks associated with the project type or activity. - Determine whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark by, for example, assessing previous investment decisions by the project participants involved and determining whether the same benchmark has been applied or if there are verifiable circumstances that have led to a change in the benchmark.					
B.4.5 Barrier analysis has been used to demonstrate the additionality of the proposed CDM project activity? If so, please follow VVM 115~118	VVM	115	Barrier analysis was not used to demonstrate the additionality of the proposed CDM project activity.	**OK**	**OK**
B.4.6 Are project participants able to demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in attachment A of Appendix B of 4/CMP.1 Annex II ?	General Guideline to SSC	5, 7	Please refer to B.4.5	**OK**	**OK**
B.4.7 For proposed large-scale CDM project activities, common practice analysis shall be carried out	VVM	119	Yes. This proposed project activity is a large-scale project. PP conducted common practice analysis and it is well described in section B.5 of the PDD.	**OK**	**OK**
B.4.7.1 If yes, was common practice analysis carried out as a credibility check of the other available evidence used by the project participants to demonstrate additionality?	VVM	119	PP should demonstrate the validity of the common practice in the PDD in accordance with the "Tool for the demonstration and assessment of additionality"(Version 07.0) and the "Guidelines on common practice" (version 02.0).	**CL 5**	**OK**
B.4.7.2 Is the geographical scope (e.g. the defined region) of the common practice analysis appropriate for the assessment of common practice related to the project activity's technology or industry type? (For certain technologies the relevant region for assessment will be local and for others it may be transnational/global)	VVM	120(a)	Please refer to B.4.7.1	**CL 5**	**OK**

B.4.7.3 Was a region other than the entire host country is chosen. If yes, was the explanation why this region is more appropriate assessed?	VVM	120(a)	Please refer to B.4.7.1	**CL 5**	**OK**
B.4.7.4 Using official sources and local and industry expertise was it determined to what extent similar and operational projects (e.g., using similar technology or practice), other than CDM project activities, have been undertaken in the defined region?	VVM	120(b)	Please refer to B.4.7.1	**CL 5**	**OK**
B.4.7.5 Are similar and operational projects, other than CDM project activities, are already "widely observed and commonly carried out" in the defined region? What is the evidence?	VVM	120(c)	Please refer to B.4.7.1	**CL 5**	**OK**
B.4.7.6 If, yes, was it assessed whether there is essential distinctions between the proposed CDM project activity and the other similar activities?	VVM	120(c)	Please refer to B.4.7.1	**CL 5**	**OK**
B.4.8 The validation report shall clearly describe all steps taken, and sources of information used, by the DOE to cross-check the information contained in the PDD on this matter. The validation report shall contain information regarding how the DOE has determined that the documentation assessed is authentic, where appropriate.	VVM	97	Yes. Validation report describes all the steps taken and sources of information used by DOE to cross-check the information contained in the PDD for common practice analysis in section 3.4 and Section 6 of the PDD.	**OK**	**OK**
B.4.9 The validation report shall: (a) Describe the DOE.s validation of the project activity start date provided in the PDD; (b) Describe the evidence for prior consideration of the CDM (if necessary) that was assessed; (c) Provide a clear validation opinion regarding whether the proposed CDM project activity complies with the	VVM	104	(a) Please refer B.4.1.1 , (b) Please refer B.4.1 (c) In the course of assessing B.4.1, validation team can confirm that proposed CDM project activity complies with the requirements of the latest version of the Guidance on Prior consideration of CDM. However, the validation team requested to provide the board meeting minute for investment cost adjust (08 August 2011) after first investment	**CL 1**	**OK**

requirements of the latest version of the Guidance on prior consideration of CDM.			decision (21 December 2010)		
B.4.10 The validation report shall describe whether the DOE considers the listed alternatives to be credible and complete.	VVM	107	Yes. Validation report describes that KFQ considered the listed alternatives to identify baseline scenario are credible and complete.	**OK**	**OK**
B.4.11 The validation report shall: (a) Describe in detail how the parameters used in any financial calculations have been validated; (b) Describe how the suitability of any benchmark applied has been assessed; (c) Confirm whether the underlying assumptions are appropriate and the financial calculations are correct.	VVM	114	Please refer B.4.4.7and B.4.4.13. And validation team confirmed that underlying assumptions employed are appropriate and calculation in investment analysis is correctly performed and it is well indicated in section 3.4 of the validation report.	**OK**	**OK**
B.4.12 The validation report shall: (a) Provide an assessment of each barrier listed in the PDD, which describes how the DOE has undertaken validation of the barrier; (b) Provide an overall determination of the credibility of the barrier analysis performed.	VVM	118	To demonstrate additionality of the proposed project activity, PP conducted investment analysis. Therefore step 3, Barrier analysis is excluded.	**OK**	**OK**
B.4.13 The validation report shall provide details regarding: (a) How the geographical scope of the common practice analysis has been validated; (b) How the DOE has undertaken an assessment of the existence of similar projects; (c) How the DOE has assessed the essential distinctions between the proposed CDM project activity and any similar projects that are widely observed and commonly carried out; (d) Confirmation by the DOE that the proposed CDM project activity is not common practice.	VVM	121	The validation team concluded that this project is not common practice according to all the documents reviewed and the available information. The assessment of common practice is well described in section 3.4 of the validation report.	**OK**	**OK**

B.5 Emission Reductions					
B.5.1. Algorithms and/or formulae used to determine emission reductions					
B.5.1.1 The steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions shall comply with the requirements of the selected methodology?	VVM	89	Yes. According to the ACM0012 (Version 04), all the steps and equations were applied to calculate project emissions, baseline emissions, leakage and emission reductions for the proposed project activity.	**OK**	**OK**
B.5.1.2 Have the equations and parameters in the PDD been correctly applied with the respect those on the selected approved methodology?	VVM	90	The equations applied are consistent with the ACM0012 (Version 04). PP should demonstrate the emission factor (CM) calculation in accordance with "Tool to calculate the emission factor for an electricity system (Version 2.2.1)" - Please show the validity of IPP (Independent Power Producer) source in OM calculation. - IPCC 2006 value application	**CAR 9**	**OK**
B.5.1.3 Are all Parameters included completely? - Title in line with methodology? - Data unit correctly expressed? - Appropriate description? - Source clearly referenced? - Correct value provided? - Has this value been verified? - Choice of data correctly justified? - Measurement method correctly described?	VVM	90	Yes. Listed parameters are properly described.	**OK**	**OK**
B.5.1.4. Does the methodology provide for selection between different options for equations or parameters?	VVM	90	No different options were selected for equations or parameters with the methodology ACM0012 (Version 04).	**OK**	**OK**
B.5.1.5. If, yes, has adequate justification been provided (based on the choice of the baseline scenario, context of the proposed CDM project activity and other evidence provided)?	VVM	90	Yes, the choices of options to determine the Emission Factor are fully justified in the PDD. By means of checking the Indonesian DNA (Directorate General of Electricity, Ministry of Energy and Mineral Resources) website and interview with the staff of Indonesian DNA , the validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was published on 27 March 2012 and found the most recent data was available on electricity generation and dispatch to JAMALI	**CAR 9**	**OK**

			grid at the time of uploading the PDD for global stakeholders comment on UNFCCC website (14 April 2012). In the absence of the project activity, the same amount of electricity would have been produced in the grid, thus the baseline of the project activity are the emissions generated by generation of electricity in the JAMALI grid of Indonesia. The PDD has correctly identified the electricity system as Java-Madura-Bali (JAMALI) grid in accordance with applied tool in section B.4 and B.6.1. The project activity will be supplied the net electricity generated from JAMALI grid. Operating Margin (OM) and Build margin (BM) emission factors are correctly taken from the Emission Factor of JAMALI grid published by DNA of Indonesia on its official website and is available on public domain is reliable data source available to PP. The validation team has reviewed the correctness of data used for the baseline determination by reviewing the information on emission factor of JAMALI grid on DNA website. In accordance with "Tool to calculate the emission factor for an electricity system", the emission factor can be calculated by one of the following options: a) Either by calculating combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM) Or b) By calculating weighted average emissions in the current generation mix. PP has calculated CM by opting the option (a) i.e. calculating 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' which is further calculate on the basis on operation margin (OM) and build margin (BM). The validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was the most recent data available on electricity generation and dispatch to JAMALI grid in Indonesia at the time of uploading the PDD for global stakeholders comment on UNFCCC website.		

			The simple OM emission factor was calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO2/MWh) of all generating power plants serving the system for year 2008, 2009 and 2010, as 0.769 tCO2e/MWh (fixed ex-ante). In calculating above low-cost/must-run power plants units were not included. The weighted average CO2 emission factor of build margin was calculated as the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The validation team checked by interviewing with the staff of Indonesian DNA and confirms that the selection of the options was correct. In validating this step, assessment team further confirms that: (i) the identified power capacity additions comprise 20% of the system generation for the year under consideration. (ii) none of the considered power capacity additions considered under (i) above have been built more than ten years earlier. The weighted average of build margin emission factor for year 2010 is calculated as 0.712 tCO2e/MWh (fixed ex-ante). This is in line with the guidance provided in the "Tool to calculate the emission factor for an electricity system" and we checked combined margin emission factor for the JAMALI grid of Indonesia have been calculated to be 0.741 tCO2e/MWh by applying the weightage for OM and BM as 50:50 through "Emission factor for the latest information on the CDM project eight interconnected power system in Indonesia" issued by Executive director national council of climate change on 27 March 2012 which is based on "Emission Factor Delivery for CDM project" issued by Directorate General of Electricity on 08 February 2012. The combined margin emission factor is fixed ex ante for the entire crediting period. As result of applying the emission factor issued by Indonesian DNA (0.741 tCO2/MWh), PP revised amount of emission reduction as 809,138 tonCO2/y in PDD and ER spreadsheet and we confirmed the emission reduction calculation correct. The validation team checked that the applied emission factor of JAMALI grid in Indonesia issued by Indonesian DNA is published in order to apply		

			CDM project and checked registered CDM projects developed in Indonesia used this published emission factor as well. Thus we confirmed applied emission factor (0.741 tCO2/MWh) is valid to use.		
B.5.1.6. Will data and parameters monitored throughout the crediting period of the proposed CDM project activity?	VVM	91	The emission factor for electricity is determined ex ante for the project activity. But $EG_{i,j,y,}$ $HG_{n,j,y,}$ $ws_{i,j,}$ $FC_{i,y}$ $EF_{co2i,y,}$ $NCV_{i,,y}$ should be monitored throughout the crediting period of the proposed CDM project activity. However, PP shall demonstrate the applicability of emission factor for electricity. Please refer to B.5.1.5	**OK**	**OK**
B.5.1.7. If, no, and these data and parameters will remain fixed through the crediting period, are all data sources and assumptions - appropriate and correct? - applicable to the proposed CDM project activity? - resulting in a conservative estimate of the emission reductions?	VVM	91	Please refer to B.5.1.6.	**OK**	**OK**
B.5.1.8 Will data and parameters be monitored on implementation and hence become available only after validation of the project activity?	VVM	91	Yes. The following parameters will be monitored on implementation and these are available only after validation. - $EG_{i,j,y,}$ $HG_{n,j,y,}$ $ws_{i,j,}$ $FC_{i,y}$ $EF_{co2i,y,}$ $NCV_{i,,y}$	**OK**	**OK**
B.5.1.9 If yes, are the estimated provided in the PDD for these data and parameters reasonable?	VVM	91	The validation team cannot confirm the estimated procedure of energy output resulted by the proposed project activity. - Electricity : 1,260,935MWh/year - Steam : 32ton/hour	**CAR 3**	**OK**
B.5.1.10 The DOE shall clearly describe in the validation report the steps taken to assess the requirement outlined in paragraph 89 above and shall provide an opinion as to whether: (a) All assumptions and data used by the project participants are listed in the PDD, including their references and sources; (b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD; (c) All values used in the PDD are considered reasonable in the context of the proposed CDM project activity; (d) The baseline methodology has been applied correctly	VVM	92	KFQ validates that: (a) All assumptions and data used by the project participants are listed in the PDD, including their references and sources; (b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD; (c) Values used in the PDD are considered reasonable in the context of the proposed CDM project activity; (d) The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions; (e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.	**OK**	**OK**

to calculate project emissions, baseline emissions, leakage and emission reductions; (e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.			Please refer to section 3.6 (calculation of GHG emissions) of the validation.		
B.5.1.11 The validation report shall clearly describe how the DOE has verified the data and parameters used in the equations, including references to any other data sources used.	VVM	93	Please refer B.5 of this protocol.	**OK**	**OK**
B.5.2. Data and parameters that are available at validation					
B.5.2.1. Is the choice of ex-ante or ex-post vintage of OM and BM factors clearly specified in the PDD?	EB 41	Annex 12	Yes, the choice of ex-ante or ex-post vintage of OM and BM factors clearly specified in the PDD. Please refer to B.5.1.5	**CAR 9**	**OK**
B.5.3 Ex-ante calculation of emission reductions					
B.5.3.1. Is the projection based on the same procedures as used for future monitoring?	EB 41	Annex 12	Yes, the ex-ante approach is adopted for calculation of the emissions and will not be changed during the crediting period. Therefore, the net electricity fed to ISM plants and grid will be the key parameter to determine the annual baseline emission, namely, the annual projection.	**OK**	**OK**
B.5.3.2. Are the GHG calculations documented in a complete and transparent manner?	EB 41	Annex 12	The emission reduction calculation process is documented in a transparent manner. Please refer to B.5.1.5	**CAR 9**	**OK**
B.5.3.3. Is the form/table required for the indication of projected emission reductions correctly applied?	EB 41	Annex 12	Yes. The tables related to indicate the project emission reductions are suitable applied.	**OK**	**OK**
B.5.3.4. Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period?	EB 41	Annex 12	Yes. The lifetime of this proposed project activity is expected to be 15 years in the FSR but PP applied operation lifetime as 20 years followed by Guidelines on the assessment of investment analysis (Ver. 05) and the fixed crediting period is chosen. Thus, projection of emission reduction for	**OK**	**OK**

			10 years is in line with the project's time schedule and crediting period.		
B.5.3.5. Is the data provided in this section in consistency with data as presented in other chapters of the PDD?	-	-	Yes. The data is consistent throughout the whole PDD.	**OK**	**OK**
B.6. Application of the monitoring methodology and description of the monitoring plan					
B.6.1. Data and parameters monitored					
B.6.1.1. The PDD shall include a monitoring plan. This monitoring plan shall be based on the approved monitoring methodology applied to the proposed CDM project activity.	VVM	122	Yes. The PDD includes a monitoring plan for the project activity and it is developed based on the methodology ACM0012 version 04.	**OK**	**OK**
B.6.1.2 Are all necessary parameters included properly? - Title in line with methodology? - Data unit correctly expressed? - Appropriate description of parameter? - Source clearly referenced? - Correct value provided for estimation? - Has this value been verified? - Measurement method correctly described? - Correct reference to standards? - Indication of accuracy provided? - QA/QC procedures described? - QA/QC procedures appropriate?	VVM	123 (a)	No. Monitoring parameter description in PDD B.7.1 is not clearly reflecting project status. - The monitoring parameters are not defined whole in the PDD B.7.1 e.g) Temperature and Pressure of feed water ($T_{feed\ wate,y}$, $P_{feed\ water,y}$) - Measurement and record frequency for all parameters - It is not correct the value from the IPCC 2006 - The description of ECj,y is not in accordance with whole PDD.	**CAR 10**	**OK**
B.6.2. Implementation of the monitoring plan					
B.6.2.1. Is the operational and management structure clearly described and in compliance with the envisioned situation?	VVM	123(b)	Yes, the operational and management structure clearly described in section B.7.2 of the PDD and in compliance with the situation.	**OK**	**OK**
B.6.2.2. Are responsibilities and institutional arrangements for data collection and archiving clearly provided?	VVM	123(b)	The general manager of project owner such as PT. Krakatau Poscopower has the overall authority and responsibility for the monitoring implementation. The operational staff is in charge of operation and maintenance of	**OK**	**OK**

			equipment of the project and the staff in the CDM team would undertake the monitoring tasks including data collection and recording, Calibration, data storage and archiving and QA/QC and reporting to CDM team manager who is appointed by project owner. Thus the CDM manager has responsibilities of the monitoring plan implementation. The monitoring staffs will be received training related to the CDM monitoring plan and reporting requirements, prior to registration of the project. Furthermore, new members of staff joining the CDM team during the implementation of project activity will also be given training in relation to their responsibilities. We confirmed the training plan through the Personnel operation plan established by PT KPP on 3 February 2012. By document review, physical inspection and interview with the project owner, it is confirmed by the validation team that the monitoring arrangements described in the monitoring plan are feasible and the means of implementation of the monitoring plan are sufficient to ensure verifiable emission reductions.		
B.6.2.3. Does the monitoring plan provide current good monitoring practice?	VVM	123(b)	Yes. The monitoring plan is clearly described in PDD. - Monitoring organization - Monitoring equipment - Measure & Archive - QA & AC	**OK**	**OK**
B.6.2.4. Does project participant has ability to implement the monitoring plan?	VVM	123(b)	Yes. The personnel involved in the proposed project operation processes implement the CDM manual to guarantee that emissions reductions achieved. The validation team could confirm that PP has ability to implement the monitoring plan for the proposed project activity via interviewing project manager on the project site.	**OK**	**OK**
B.6.2.5. If applicable: Does an annex provide useful information enabling a better understanding of the envisioned monitoring provisions?	VVM	123(b)	No. The PP did not describe monitoring plan in an Annex of PDD.	**OK**	**OK**
B.6.3 The validation report shall: (a) State the DOE.s opinion of the compliance of the monitoring plan with the requirements of the methodology;	VVM	124	(a) The validation report describes the DOE's opinion of the compliance of the monitoring plan with the requirements of the methodology. (b) The validation report also describes steps undertaken to assess the monitoring plan within the project design.	**OK**	**OK**

(b) Describe the steps undertaken to assess whether the monitoring arrangements described in the monitoring plan are feasible within the project design; (c) State the DOE.s opinion of the project participants ability to implement the monitoring plan.			(c) Lastly, the validation report expresses the DOE's opinion of the PP ability to implement the monitoring plan in section 3.5 of the validation report.		
B.7. Date of completion of the application of the baseline study and monitoring methodology an the name of the responsible person(s)/entity(ies)					
B.7.1. Is there any indication of a date when the baseline was determined?	EB 41	Annex 12	Yes. Date of completion of the application of the baseline is 30 November 2011 and it is well indicated in B.8 of the PDD.	**OK**	**OK**
B.7.2. Is this consistent with the time line of the PDD history?	-	-	Yes, The PDD (ver.01) was completed on 09 April 2012 which is also used for GSC and on site assessment.	**OK**	**OK**
B.7.3. 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?	EB 41	Annex 12	Yes, The responsible person indicated in PDD are also the ones being interviewed for baseline verification during the on site assessment.	**OK**	**OK**
B.7.4. Is information provided whether this person/entity is also considered a project participant?	EB 41	Annex 12	Yes. The above mentioned person is not from project participant's company.	**OK**	**OK**
C. Duration of the Project/ Crediting Period					
C.1 Are the project's starting date and operational life time clearly defined and evidenced?	EB 41	Annex 12	Yes. The starting date of the project has been validated by KFQ as 05 October 2011 which represents the date of contract of power plant installation (Offshore contract) between PP and POSCO Engineering & Construction Co., Ltd. KFQ confirmed that this starting date is the earliest date at which either the implementation or construction or real action of a project activity according to CDM glossary (version 05). The operational lifetime is expected to be 20 years.	**OK**	**OK**
C.2. Choice of the crediting period and related information					

C.2.1. Is the assumed crediting period clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max.10 years)?	EB 41	Annex 12	Yes. The designed operational lifetime of the project is estimated as 15 years by the FSR but PP applied operation lifetime as 20 years followed by Guidelines on the assessment of investment analysis (Ver. 05) and a fixed crediting period of 10 year is selected starting in 01 March 2014 or effective date to UNFCCC, whichever later.	**OK**	**OK**
C.2.2 Is the start of the crediting period clearly defined and reasonable?	EB 41	Annex 12	Yes. It's clearly defined in the PDD. Starting date of crediting period will start from 01 March 2014 or effective date to UNFCCC, whichever later.	**OK**	**OK**
D. Environmental Impacts					
D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts					
D.1.1 Has an analysis of the environmental impacts of the project activity been sufficiently described?	EB 41	Annex 12	Yes, the environmental impacts of the project activity such as Air Quality, Noise and Water Quality etc. have been clearly described in the EIA and these are properly summarized in the PDD.	**OK**	**OK**
D.1.2 Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	EB 41	Annex 12	Yes. The validation team confirmed the PP has undertaken environmental impact assessment (EIA) by PT. Mahakarya Lintasindo and approved by Cilegon city hall in 5 January 2012 in accordance with relevant Indonesian laws and regulations. The validation team concludes that the potential environmental impacts have been sufficiently identified in the PDD and no major adverse effects have been expected from the project activity.	**OK**	**OK**
D.1.3 Will the project create any adverse environmental effects?	EB 41	Annex 12	It could be checked by document review onsite that the impacts assessed in the EIA dealt with air, noise and waste water etc. Referred to the EIA and the approval of EIA, the project will create no negative impacts on the environment.	**OK**	**OK**
D.1.4 Are transboundary environmental impacts considered in the analysis?	-	-	The proposed project is located within Indonesia, and it has no trans boundary environmental impacts: hence this section is not applicable.	**OK**	**OK**

D.1.5 The validation report shall describe whether the project participants have undertaken an analysis of environmental impacts and, if required by the host Party, an environmental impact assessment in accordance with procedures as required by the host Party.	VVM	133	Yes. Please refer D.1~D.4	**OK**	**OK**
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 Part					
D.2.1 Have the project participants submitted documentation on the analysis of the environmental impacts of the project activity? Who undertake the analysis?	VVM	131	Referring to the EIA and the approved document, the impacts on the environment are not significant. This was conducted by the certified entity, PT. Mahakarya Lintasindo. Please refer D.1 of protocol.	**OK**	**OK**
D.2.2 Does the project comply with environmental legislation in the host country? When was the EIA approved?	VVM	132	Yes, the project is in conformity with the environmental legislation of Indonesia and the EIA has been approved by authorized organization, Cilegon city hall. Please refer to D.1.2.	**OK**	**OK**
E. Stakeholder Comments					
E.1. Brief description how comments by local stakeholders have been invited and compiled					
E.1.1 Local stakeholders shall be invited by the PPs to comment on the proposed CDM activity prior to the publication of the PDD on the UNFCCC website?	VVM	128	Yes. KFQ published the project documents on http://cdm.unfccc.int/Projects/Validation. Starting date of the global stakeholder consultation process is 14 April 2012 and invited comments by Parties, stakeholders and non-governmental organizations during a period of 30 days. No comment was received.	**OK**	**OK**
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	EB 41 VVM	Annex 12 129	A meeting with local stakeholders was carried out to invite comments from local stakeholders in 16 February 2012. PP distributed the invitation letters in order to invite stakeholders on 27 January 2012 and 20 stakeholders include the government and nongovernment parties were participated. At the meeting, PP explained project description of proposed project activity including CDM development and also explained environmental and social influences from the project activity and comments received have	**OK**	**OK**

			been taken into consideration during construction and operation to achieve environmental and social benefits. No negative comments for impact on the local economy, development and environment have been received at the meeting. KFQ has checked meeting minute and interviewed with local stakeholders. All the interviewee represented that the proposed project receives strong support from the local people and the proposed project keeps the environmental regulation and also looking for growth of local economy. The validation team confirmed that all relevant local stakeholders have been invited to consultation via appropriate media, the summary of comments received as provided in the PDD are appropriate, and due accounts was taken properly and described in the PDD well.		
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?	EB 41	Annex 12	There are no regulations/laws in Indonesia for carrying out the stakeholder consultation process for this project activity.	**OK**	**OK**
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	VVM	129	Yes. Please refer E.1.1	**OK**	**OK**
E.1.5 The validation report shall: (a) Describe the steps taken to assess the adequacy of the local stakeholder consultation; (b) State the DOE.s opinion on the adequacy of the local stakeholder consultation.	VVM	130	Yes. Please refer E.1.1~E.1.5 And DOE stated opinion on the adequacy of the local stakeholder consultation in section 3.8 of the validation report.	**OK**	**OK**
E.2. Summary of the comments received					
E.2.1 Is a summary of the stakeholder comments received complete?	VVM	129	Yes. Survey received is well explained in section E.2 of the PDD.	**OK**	**OK**

E.2.2 Has due account been taken of any stakeholder comments received? And have described this process in the PDD	VVM	129	The comments were generally positive to project activity. 4 comments received from the stakeholders. PP explained the answers for all comments and no more questions rose. The stakeholders were all satisfied. For our confirmation, validation team interviewed with 4 representatives of local stakeholders. Then, we conclude that local stakeholders are supporting this project activity and they do not have any negative opinion for the project as well.	**OK**	**OK**
F. Annexes 1-4					
Annex 1: Contact Information					
F.1.1 Is the information provided consistent with the one given under section A.3?	EB 41	Annex 12	Yes. The project participant is described as PT. Krakatau Poscopower in PDD A.3.	**OK**	**OK**
F.1.2 Is the information on all private participants and directly involved Parties presented?	EB 41	Annex 12	Yes. The PDD-Annex 1 clearly mentions this information.	**OK**	**OK**
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?	EB 41	Annex 12	It is stated that the project does not receive any public funding from Annex I countries.	**OK**	**OK**
F.1.4. If necessary: Is an affirmation available that any such funding from Annex – countries does not result in a diversion of ODA?	EB 41	Annex 12	N/A	**OK**	**OK**
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 section of the PDD?	EB 41	Annex 12	Yes. Please kindly refer to B.5 of protocol. All the data used for baseline calculation are consistent throughout the PDD. The calculation procedure and basic data of emission factor of the grid system is presented on Annex 3 of PDD.	**OK**	**OK**

F.1.6. Is the data provided verifiable? Has sufficient evidence been provided to the validation team?	EB 41	Annex 12	Please refer B.5 of protocol.	**OK**	**OK**
F.1.7. Does the additional information substantiate/support statements given in other section of the PDD?	EB 41	Annex 12	Please see F.1.5 of protocol.	**OK**	**OK**
Annex 4: Monitoring information					
F.1.8. If additional background information on monitoring is provided: Is this information consistent with data presented in other section of the PDD?	EB 41	Annex 12	Yes. Please refer B.6.2.2 and B.6.2.3	**OK**	**OK**
F.1.9. Is the information provided verifiable? Has sufficient evidence been provided to the validation team?	EB 41	Annex 12	Yes, Please refer B.6.2	**OK**	**OK**
F.1.10. Do the additional information and/or documented procedures substantiate/support statements given in other section of the PDD?	EB 41	Annex 12	Yes, Please refer B.6.2	**OK**	**OK**

Table 2. Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 1	Summary of project owner response and validation team	Validation team conclusion
CAR 1: Please provide the LoA issued by Host Country with the MoC to the DOE.	A.4.1 A.4.1.1 A.4.1.2 A.4.1.5 A.4.1.6 A.4.2.3 A.4.4 A.4.6	The project participant is PT. Krakatau Poscopower as the project owner from the Host Party, Indonesia. The project is developed as a unilateral CDM project thus only host party has been involved in the project as project participant. The Host Party meets the requirements to participate in the CDM. The Letter of Approval (LoA) from Indonesia was obtained on 27 August 2012 authorizing PT. Krakatau Poscopower as project participant. Indonesia LoA is indicating that: - The country is a Party to the Kyoto Protocol - Indonesia has ratified the Kyoto Protocol on 28 July 2004 - Participation is Voluntary - The Host Party confirming that the proposed CDM project activity contributes to sustainable development of the country - It refers to the precise proposed CDM project activity title in the PDD being submitted for registration. The validation team checked detail information of the LoA of Indonesia such as address, signature & name on LoA and website of Indonesian DNA as well. http://www.dnpi.go.id/ MoC of the proposed project has been provided by PP on 19 October 2012. We confirmed all information MoC in correct.	CAR 1 is closed.

CAR 2: In order to confirm the available energy source of proposed project, please provide the waste gas generation from the ISM plant and consumption for each waste gas type (BFG, COG, LDG).	A.3.1.7	PP provided the waste gas balance in order to figure available energy source of proposed project out. According to the waste gas balance which is analyzed a production and consumption of by-product gas from ISM on FSR. Total production of waste gas in the ISM process is 637,539 Nm^3/h (BFG : 539,726 Nm^3/h, COG : 65,388 Nm^3/h, LDG : 23,778Nm^3/h) and 54.8% of waste gas is consumed in ISM process and remaining 45.2% of waste off gas (284,190Nm^3/h) will be used in the project activity. It was confirmed by the gas balance in feasibility study by PP which was based on the actual experiences of development and operation of waste gas recovery and cogeneration projects from the ISM plants in Korea*. Thus the maximum waste gas which shall be used for the project activity will be generated 284,190Nm^3/hr. The validation team confirmed energy source and amount of waste gas for proposed project is correctly demonstrated.	CAR 2 is closed.
CAR 3: The validation team can not confirm the estimated procedure of energy output resulted by the proposed project activity. - Electricity : 1,185,279MWh/year - Steam : 452.23TJ	B.5.1.9	***For electricity generation,*** $EG_{i,j,y} = EG_{GEN,} - EG_{PJtoPJ,y}$ EG_{GEN} (1,103,547MWh) Verified by calculating designed electricity generating capacity (138.48MW) multiplies annual operating hour (7969h). Designed electricity generating capacity (138.48MW) is calculated by total energy output such as both electricity and steam (145.25MW) which is estimated in FSR, minus 35ton/hr (6.77M†) of steam generation. Total energy output (145.25MW) is estimated by the maximum waste off gas generation from ISM process. Waste gas balance in Feasibility Study shows that the maximum waste gas which shall be used for the project activity will be generated 284,190Nm^3/hr. And this amount of waste gas was based on the actual experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM plants in Korea. The validation team checked waste gas balance in Korean ISM Plants and confirmed waste gas availability of proposed project is valid. The annual operating hour (7969h, 90.9% of PLF) is derived from the maintenance & repair and plan during 15 operating years in FSR. Because PP set the maintenance and overhaul time during the whole operating period as scheduled in PPA, thus maintenance and overhaul time and the operation hour cannot be changed. In addition, POSCO who is one side of PT.	CAR 3 is closed.

* Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

† According to the enthalpy table from the Heat Balance Diagram made by 3rd party design institute, in order to generate 1 ton of process steam, 0.21MWh of electricity in needed. Thus 6.77MWh is needed for 32 tons of process steam. The validation team confirmed that the converting process from the steam amount to electricity amount is correct.

		KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has many experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea over 30 years, in doing so they have much of expertise for operation planning and also we found the estimated annual operation hour of Gwangyang ISM Plant is 6941 hour [*] that is lower than the proposed project. $EG_{PJtoPJ,y}$(66,213MWh) The value of $EG_{PJtoPJ,y}$ (6% of electricity output (1,103,547MW)) applied based on installed capacity of the electricity consumption facility in the project such as pump, fan, air-compressor etc. The validation team checked the designed equipment electricity consumption capacity in Elec. Load List of project design. Total electricity consumption capacity of project activity is identified as 19.685MW in the Load List, however 6% of total energy output (9.9MW) was applied considering the rated output of each electricity equipment. Meanwhile, validation team checked the available 4 similar projects for auxiliary electricity consumption. The average consumption rate of similar projects is 9.0% of gross electricity generation that is higher than the proposed project (6.0%). Even the smallest rate of auxiliary electricity consumption (3%) in similar projects, the IRR results show below the benchmark rate (11.9%). Thus, the validation team conclude the estimated captive power consumption (66,213MW[†]) is reasonable and valid. ***For steam generation,*** $HG_{n,j,y}$ (452.23 TJ) Net quantity of heat supplied (process steam) is calculated from the difference of both enthalpy of steam supply to facilities (2,837.1KJ/Kg at 260°C, 12.75bar) and enthalpy of feed water to the boiler (1,063.7KJ/Kg at 245.3°C, 0bar). These enthalpies are derived from the Heat Balance Diagram made by 3rd party design institute, FUJI Electric systems, on 9 November 2010. Annual steam output has been calculated by Steam Balance Study of the project and the outcome of the study applied to the FSR. According to the Steam Balance Study, the steam generation and consumption in the ISM process in the absence of project activity, the shortage of steam generation expected to 32ton/h thus 32ton/h steam will be generated from the two boilers with the capacity of 45ton/h.	

[*] Estimated annual electricity generation during 2007 ~ 2008, Feasibility study of Gwangyang ISM Plant, #9 waste gas generation
[†] Captive power consumption from the electricity generation : 1,103,547MWh * 0.06 = 66,213MWh

		Therefore, net quantity of heat supplied is (2,837.1 KJ/Kg - 1,063.7 KJ/Kg) * 32ton/h * 7,969h / 10^6 = 452.23 TJ The validation team checked the calculation equation and source data used for the calculation and confirmed calculated steam output is correct.	
CAR 4: According to the 'Tool to determine the remaining lifetime of equipment' (ver.01)" the remaining lifetime of relevant equipment shall be determined prior to the implementation of the project activity. Please demonstrate the remaining lifetime of relevant equipment and show the remaining lifetime could cover the crediting period.	B.4.4.3	The lifetime of main project equipment (gas-fired boiler, steam turbine and generator) are demonstrated through statement for Power Purchas Agreement (PPA) between PP and recipient facility* dated on 1 October 2012. According to the PPA, the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years based on the equipment lifetime. In addition, we checked equipment lifetime by confirmation letter from the equipment supplier† dated on 16 August 2012 and confirmed the lifetime of all main equipment such as steam turbines, generators and boiler is 25 years. Furthermore, default value for technical lifetime according to Tool to determine the remaining lifetime of equipment (ver.01), these main equipment of the project activity over 25 years. Even though the term of supplying of electricity and steam generated by each unit from Seller to Purchaser is agreed as 15 years according to the PPA, considering the lifetime of main equipment, PP applied 20 years as operational lifetime for the proposed project that is also in accordance with the maximum 20 years operation lifetime recommended in the Guidelines on the Assessment of Investment Analysis (Ver. 05). Furthermore, we tested the IRR applying the 25 years operation lifetime as the confirmation letter from the equipment supplier and found the IRR shows still below the benchmark (11.0%). Thus the verification team confirmed that this project lifetime (20 years) is valid and the remaining lifetime of equipment covers the crediting period (10 years) of the project activity.	CAR 4 is closed.

* PT. KRAKATAU POSCO

† POSCO E&C

CAR 5 : The applicability of methodology (ACM0012 ver.04) is not clearly demonstrated with relevant evidence. (1) We can not confirm the project activity does not use waste pressure energy but recovery waste off gas from the Greenfield integrated steel mill. (2) We can not confirm in case where waste gas is released under abnormal operations like emergencies or shut downs, the emission reductions will not be claimed (3) The WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction or not. (4) The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1(for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology.	B.1.3	(1) The project activity does not recover the waste pressure. The output of proposed project such as electricity and steam is from the waste gas. It is identified with the FSR, approval documents* for the project and interview with staffs. (2) The emission reduction will not be claimed for the hours during the abnormal operation of the part of project facility which have impact on waste energy generation and recovery. The monitoring process during the abnormal operation is established in the monitoring plan of PDD. (3) All the waste energy in identified WECM stream that will be utilized in the project activity would be wholly released to atmosphere in the absence of the project activity at the Greenfield facility. The waste energy is an energy source for generation of electricity and steam. The validation team checked waste gas balance in Feasibility Study, Plant(ISM) layout design document issued by the PT KP, manufacturer's original design specifications and confirmed that the whole waste energy utilized in the project activity was released into the atmosphere in the absence of the project activity at the Greenfield facility. Thus, WECM stream would not be partially recovered in the absence of the CDM project activity to supply the heat of reaction. (4) PP investigated existing facilities in order to find the facilities which would be the use of waste energy from the source followed by required condition in methodology option 1. As a result of investigation through the "Conditions facing the steel industry of the free market AC-FTA, 2010", PP found there are 9 factories† related to manufacturing the steel product in Indonesia. However, these 9 factories are not the ISM but electric arc furnace steel factory. Because the electric arc furnace technology which is totally different from ISM‡, PP exclude these factories as applicable reference facility as required in methodology. Thus PP researched other existing facility expanding the geographical area as worldwide.	CAR 5 is closed.

* TANDA TERIMA BERKAS PERMOHON IMB (construction approval), 04 August, 2011
IZIN PRINSIP PENANAMAN MODAL (business approval), 15 December 2011
TANDA DAFTAR PERUSAHAAN PERSEROAN TERBATAS (business license), 15 August 2011

† PT Krakatau Steel, PT Krakatau Wajatama, PT KHI Pipe industries, PT Cigading Habeam, PT Ispatindo, PT Gunung Garuda, PT Essar, PT Jakarta Cakra Tunggal, PT Budi Dharma steel

‡ Electric arc furnace technology is significantly different with ISM technology for example Energy source (Electricity : Coal), source of output (scarp : iron ore, coal, coke) etc. Furthermore, Electric arc furnace factories are not generate a waste gas (COG, BFG, LDG) in the process.

According to Steel Statistical Yearbook 2011 published by Korea Iron and Steel Association, the number of facilities in accordance with the condition* in the option 1 of methodology Annex 1 is only 4 facilities. The list of facilities is shown below table 1.

[Table 1] World Ironworks implemented in the previous 10 year (3,420m^3~4,180m^3)

Country	Ironworks	No. of B.F.	Diameter of Hearth(m)	Volume in B. F. (m^3)	Year & Month of Firing
Austria	Voestalpine, Linz	No. 1	12	3,550	October 2004
China	Sandong, Iljo	-	-	3,800	September 2008
	Ansan, Younggu	No. 1	13.3	4,038	September 2008
		No. 2	13.3	4,038	April 2009

Consequently, the number of reference facilities which applicable to the condition in methodology does not reached 5 facilities thus, PP could not assess the extent of use of WECM and baseline practice factor through the method of option 1, thus PP used option 2 in Annex 1.

In accordance with the applied methodology option 2 of Annex 1 for assessment of extent of use of WECM and determination of baseline practice factor for CDM project activity implemented in Greenfield facilities, the methodology requires that the manufacturer of the project facility† should be invited to submit an alternative design including the usage of WECM that is recovered under project. Therefore, POSCO E&C, as the manufacture and provider of project facility such as gas-fired boiler, steam turbine and generator), was invited to submit the following alternative designs identified in the PDD as below:

√ Alternative designs 1 : The waste energy generation facility with surplus waste gas cogeneration (USE of waste gas)

√ Alternative designs 2 : The waste energy generation facility without surplus waste gas

* Blast Furnace implemented in the previous 10 years and +/-10% in terms of capacity of the facility as compared to the proposed facility (capacity of the BF of PT KP is 3,800m^3)

† According to the Definition of the methodology, the waste energy is recovered by a third party in a separate facility, the .project facility will encompass both the waste energy generation facility and the waste energy recovery facility.

		cogeneration and energy supplied from fossil fired power plant (NO USE of waste gas) √ Alternative designs 3 : The waste energy generation facility without surplus waste gas cogeneration and energy supplied from the grid (NO USE of waste gas) Three alternative designs submitted by the manufacture and provider of project facility and it has been assessed through investment analysis in accordance with the option 2 of Annex 1 in the applied methodology. To figure levelized cost out for these selected alternative designs, PP assumed only electricity generation for the project activity instead of cogeneration because the proposed project activity will operate a condensing extraction turbine for generating steam that is only to be needed pipeline installation to generate steam in the electricity generation process. Therefore the construction of pipeline for steam comprises a negligible cost compared to total investment cost. Thus, it is reasonable to compare the proposed project with other power generation project using levelized cost analysis. The financial indicator unit cost of service (i.e. levelized costs of electricity generation in MWh) has been applied for this investment analysis among the three alternative designs. The levelized cost is equivalent to the annualized costs divided by annual electricity generated. The input values involved in the calculation of levelized cost are investment, O&M cost, tariff, residual value rate and discount factor etc. When utilizing the levelized cost as the financial indicator in investment cost analysis, the alternative with the lowest costs is considered to be most economically attractive and most plausible alternative design. As for the alternative design 1, the levelized cost for electricity generation using surplus waste gas is the proposed activity situation thus the input values are given from the FSR and PPA. Thus the levelized cost of alternative design 1 is calculated as 94.91 USD/MWh and we confirmed the calculation and this resulted value is correct. Please refer to IRR spreadsheet Ver. 9. As for the alternative design 2, applicable fossil fuels are Heavy oil, Natural gas and Coal for electricity generation. Among them, heavy-oil is far expensive than other fuels* (refer to	

* Fuel price per unit energy : Heavy oil : 18.96 USD/GJ, LNG : 7.38USD/GJ, Coal : 2.06 USD/GJ

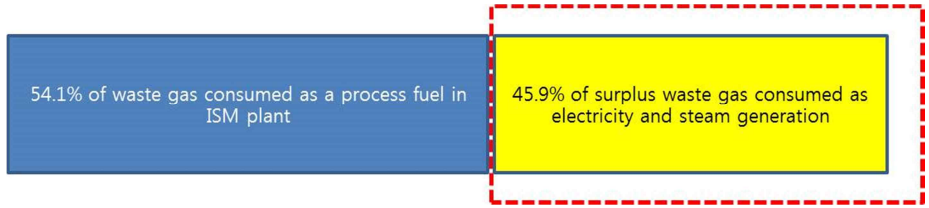
		step 2 of baseline identification in the validation report) and the levelized cost for Natural gas also more expensive than Coal*. Thus coal fired power plant is selected as alternative design 2. PP All the input values used in the alternative design 2 are derived from the Indonesian National Report publiched by National Nuclear Energy Agency(2010)† which is using the "mini G4Econs Model from IAEA" (International Atomic Energy Agency) and input values used for levelized cost can be deemed as a reliable data source verified by the validation team. Also the applicability of input parameters adopted in the calculation of levelized cost has been validated as per the VVM 113(c). Therefore, validation team confirmed that the appropriateness of inputs values using in levelized cost calculation and found the. levelized cost of alternative design 2 is 59.66 USD/MWh. As for the alternative design 3, the unit cost of electricity production in JAMALI grid (71.97 USD/MWh)‡ is applied for levelized cost because the electricity tariff used input value for investment analysis in PDD (8.89 cent/KWh) is electricity sales price in JAMALI grid thus it is not applicable to the levelized cost comparison. We found the source and calculation of unit cost of electricity production in JAMALI grid is valid. As a result of levelized cost above, it was demonstrated that alternative design 2, "the waste energy generation facility without surplus waste gas cogeneration and energy supplied from fossil fired power plant (NO USE of waste gas)", is the most financially attractive. Therefore the procedure carried out above concludes that the proposed greenfield facility would have wasted the energy in the absence of the project activity. As a result of Annex I option 2 analysis (refer to No. 2 of the report), proposed greenfield facility would have wasted the energy in the absence of the project activity that means there is no electricity generation from the identified WECM stream at the Reference waste energy	

* Levelized cost of Coal : 59.66 USD/MWh , Levelized cost of Natural gas : 61.52 USD/MWh

† PERBANDINGAN BIAYA PEMBANGKITAN LISTRIK NUKLIR DAN FOSIL DENGAN MEMPERTIMBNGKAN ASPEK LINGKUNGAN,

http://www.batan.go.id/ptrkn/file/tkpfn16/Makalah_peserta/Kel_E/47.M.Nasrullah,E348-352rev2.pdf

‡ PLN Statistics 2010, Page 38 : Average Generation Cost per kWh, Page 23 : Energy Production by Type of Power Plant (Gwh)

		generating facility. Thus the remained surplus waste gas will be wasted and the fpractice value should be 1 as shown in below Case 1, in doing so the validation team confirms that the formulas applied to calculate baseline emission including EGi,j,y calculation in PDD that is the condition of no recovery of waste gas in the absence of project activity is applicable to use of baseline emission calculation. Case 1) baseline emission of proposed project considered as usage of surplus (partially) waste gas from the ISM plan t  √ EGi,j,y = {(Fj,y × (EGPJ,y × 45.9%)} × 1 In case baseline emission of proposed project considered as usage of surplus (partially) waste gas from the ISM plant, the capacity of cogeneration is 145.25MW (138.48MW for electricity + 6.77MW for steam). Thus EGi,j,y was calculated as 145.25MW * 1 * operation hour from the Case 1 which is the proposed project's baseline boundary. To make more concrete explanation, if the baseline emission of proposed project regarded as whole waste gas from the ISM plant (100% of waste gas generated from the ISM plant), the ISM plant will use waste gas partially in the absence of CDM project from the output of Annex 1 option 2 alternative design analysis. In this case the baseline emission will be calculated by using formulas in methodology section 1.2.2 as below Case 2. Case 2) baseline emission of proposed project considering as usage in whole waste gas from the ISM plant	

<table>
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√ EGi,j,y = Fj,y × EGPJ,y × 0.459

In case baseline emission of proposed project considering as a usage in whole waste gas production from the ISM plant, the capacity of cogeneration is 316.44MW based on energy balance. However, according to the definition of fpractice, “reference waste energy generating facility” such as ISM process will use a part of waste gas, fpractice should be regarded as 0.459. In doing so, EGi,j,y was calculated as 316.44MW * 0.459 * operation hour from the Case 2 which is same with Case 1 finally.

As shown above calculation, the validation team confirmed that the fpractice is closely linked with amount of use of waste gas in the absence of CDM project and we confirms that the EGi,j,y in baseline emission calculation is focusing on the boundary of waste gas use but the calculated value is same in each baseline emission boundary.</td>
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<tr>
<td>CAR 6 :

PP should demonstrate the baseline determination in accordance with the methodology ACM 0012.

(1) It is not clearly demonstrated the of alternatives selection for baseline scenario determination.
- Scenario W1, W3, W5, W6
- Scenario P2, P5, P6, P7, P8, P9 P10
- Scenario H2, H3, H4, H5, H6, H7, H8, H9, H12, H13

(2) Please demonstrate the assessment of selected combination scenarios with relevant evidence for demonstration</td>
<td>B.3.2
B.3.5 ~ B.3.10
B.4.3 ~ B.4.3.2
B.4.3.3~B.4.3.5</td>
<td>(1) For the proposed project, the baseline candidates involve the coke production line (where waste energy is produced and the power will be consumed) and the power generation facility (where the power is produced).

For the use of waste energy, the realistic and credible alternatives are:
<table>
<tr><th>Option</th><th>Description</th><th>Validation result</th><th>Conclusion</th></tr>
<tr><td>W1</td><td>WECM is directly vented to the atmosphere without incineration;</td><td>According to the regulation,* direct venting of the waste gas to the atmosphere without incineration is restricted by the legal and regulatory requirements of Indonesia. Thus, it is not a credible alternative.</td><td>Exclude</td></tr>
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<td>CAR 6 is closed.</td>
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</table>

* Decree of the state minister for environment/KEP.13/MENLH/3/1995, Indonesia

and make clear the reason of adoption or rejection for every combination scenarios.			W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized;	In the absence of the proposed project, the waste gas could be released to the atmosphere after incineration. And this is in accordance with the national regulation.	Include	
			W3	Waste gas/heat is sold as an energy source;	The validation team checked companies list * which are located near project activity and then there are no companies or industrial places which are needed waste gas such as the low heat caloric compared to fossil fuel and contains lots of dust so that cleaning facility needed. In addition there are no needs of waste gas from the project because it could be some restriction of continuous supply compare with other fossil fuel because waste gas is just generated at blowing time so that buffering facility essentially needed. Thus, it is not a credible alternative.	Exclude	
			W4	Waste energy is used for meeting energy demand at the recipient facility(ies)	This alternative is feasible from technical and legal perspectives. Utilizing the waste gas as energy source to electricity and steam generation is included in the project activity.	Include	
			W5	A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilized;	The total energy (electricity and steam) required by ISM process which is recipient facility is much larger than the energy generated by the project activity. Thus all of the surplus waste gas for the proposed project activity from the ISM process will be used for generating the electricity and steam. The validation team confirmed waste gas generation and usage from the gas balance in Feasibility Study by PT KP. Thus, it is not a credible alternative.	Exclude	

* http://www.kiec.co.id/index.php?page=content&cid=20

		W6	All the waste energy produced at the facility is captured and used for export electricity generation or steam.	All electricity and steam generated from the surplus waste gas will be exported to PT. KP (ISM plant). According to the Joint Venture Agreement between Posco Power and PT KDL, even though electricity generated in power plant could not export other entity directly and should be gone through the national power company such as PLN followed by the law in Indonesia, because PT KDL is branch company of national steel mill (PT Krakatau Steel), KDL has an authority for electricity trade in ISM plant*. Thus the joint venture (PT KPP) received an authority of electricity trade in the proposed project site due to transferring the electricity trade authority from the PT KDL. Thus, the scenario is same as the proposed project. It is a credible alternative.	Include

For power generation, the realistic and credible alternatives are:

Option	Description	Validation result	Conclusion
P1	Project activity not undertaken as a CDM project activity	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
P2	On-site or off-site existing fossil fuel fired cogeneration plant	The validation team confirmed there is no on site existing fossil fuel fired cogeneration plant through the plant layout design and project location is a newly developed and the project activity as a first tenant. It was confirmed by interview with local officer and physical site inspection as well. Moreover although there is the off-site existing fossil fuel fired cogeneration plant, the electricity which is generated in power plant could	Exclude

* http://www.kdl.co.id/?page=content&cid=15

					not export other entity directly according to the law in Indonesia*. The electricity should be transmitted to PLN who is the national electricity company. Thus, P2 is not applicable.		
			P3	On-site or off-site Greenfield fossil fuel fired cogeneration plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include	
			P4	On-site or off-site existing renewable energy based cogeneration plant	It is not a credible alternative as same reason of P2.	Exclude	
			P5	On-site or off-site Greenfield renewable energy based cogeneration plant	There are no renewable energy sources such as wind†, hydro‡, ocean energy§ and biomass** in the region of the project and due to huge initial investment and low efficiency for supplying power for solar energy††, these renewable energy based cogeneration plant is not possible. It was confirmed by the relevant references for each renewable energy source and physical site inspection as well. Thus, P5 is not applicable.	Exclude	
			P6	On-site or off-site existing fossil fuel based existing identified captive power plant	There is no on-site or off-site existing fossil fuel based existing identified captive power plant as the project activity is Greenfield project. Moreover, it could not be a credible alternative as same reason of P2 as well.	Exclude	

* UNDANG-UNDANG REPUBLIK INDONESIANOMOR 30 TAHUN 2009

† Renewable energy market assessment report: Indonesia (5page)_ Indonesia's potential for wind energy is limited.
http://ita.doc.gov/td/energy/Indonesia%20Renewable%20Energy%20Assessment%20(FINAL).pdf

‡ Private participation on Hydropower Development(3page)_ As the project is located at seafront, it is lack of hydropower
http://energy-indonesia.com/03dge/Mochamad%20Sofyan.pdf

§ Ocean energy in Indonesia (14~15page) _ around the project site, ocean energy is limited.
http://wreeec2011bali.com/uploads/files/Presentation%20Prof%20Mukhtasor.pdf

** Not only in the project site but also in Cilegon, there is no plantation. thus biomass is hard to get.
http://cilegonkota.bps.go.id/publikasi/CDA%202010.pdf _Cilegon in figure 2010(page11)

†† The Development of Photovoltaic System in Indonesia (9page) _ In the project area, the solar irradiation is not suitable.
https://circle.ubc.ca/bitstream/id/160590/Wirasaputra_Vincent_2012_EECE492_Final_Report.pdf

			P7	On-site or off-site existing identified renewable energy or other waste energy based captive power plant	There is no on-site or off-site existing identified renewable energy or other waste energy based captive power plant as the project activity is Greenfield project. Moreover, it could not be a credible alternative as same reason of P2 as well.	Exclude	
			P8	On-site or off-site Greenfield fossil fuel based captive plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include	
			P9	On-site or off-site Greenfield renewable energy or other waste energy based captive plant	Regard to the on-site or off-site Greenfield renewable energy, it is not a credible alternative as same reason of P5. Regarding to using other waste energy, the validation team checked the proposed project just could use the waste off gas from the ISM through power purchase agreement (PPA) with PT KP and feasibility study as well. And we confirms not any kind of waste energy which could be recovered and used for power generation exists in the process of ISM through ISM design document. Therefore PP could not use other waste energy from the ISM. P9 is not applicable.	Exclude	
			P10	Sourced from grid-connected power plants	This alternative is in compliance with all applicable legal and regulatory requirements.	Include	
			P11	Existing captive electricity generation using waste energy. (if the project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency or lower recovery than the project activity)	There is no existing captive electricity generation using waste energy because the project activity is Greenfield project. It was confirmed by ISM design document and FSR. Thus, P11 is not applicable.	Exclude	

			P12	Existing cogeneration using waste energy. But at a lower efficiency or lower recovery	There is no existing power cogeneration using waste energy because the project activity is Greenfield project. Moreover, in the absence of the proposed project, the waste gas would directly be released to the atmosphere. Also, according to Regulations Minister of Energy and Mineral Resources of Indonesia No. 31/2005, using energy-efficient products and technologies are recommended to be applied. The lower efficiency of cogeneration is thus deemed to be not complying with the regulation. In addition, the scenario represents captive generation with lower efficiency than the project activity is impossible to find in the region. According to the FSR, there is no applicable technique with significant lower efficiency for the use of waste gas to cogeneration currently available. Meanwhile, the project owner chooses the appropriate technology with state of the art performance. Therefore, the lower efficiency of waste gas to cogeneration is not a business-as-usual choice. Thus, P12 is not applicable.	Exclude	

For heat generation, the realistic and credible alternatives are:

Option	Description	Validation result	Conclusion
H1	The project activity is not undertaken as a CDM project activity	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
H2	On-site or off-site existing fossil fuel based cogeneration plant	It is not a credible alternative as same reason of P2.	Exclude
H3	On-site or off-site Greenfield fossil fuel based cogeneration plant	This alternative is in compliance with all applicable legal and regulatory requirements.	Include
H4	On-site or off-site existing renewable energy based cogeneration plant	It is not a credible alternative as same reason of P4.	Exclude

			H5	On-site or off-site Greenfield renewable energy based cogeneration plant	It is not a credible alternative as same reason of P5.	Exclude		
			H6	An existing fossil fuel based element process	There is no fossil fuel based element process because the project activity is Greenfield project. It was confirmed by ISM design document and FSR. Thus, H6 is not applicable.	Exclude		
			H7	A new fossil fuel based element process	This alternative is in compliance with all applicable legal and regulatory requirements.	Include		
			H8	An existing renewable energy or other waste energy based element process to supply heat	There is no existing renewable energy or other waste energy based element process to supply heat because the project activity is Greenfield project. In addition, the validation team checked the proposed project just could use the waste gas from the ISM through power purchase agreement (PPA) with PT KP and feasibility study as well. And we confirms not any kind of waste energy which could be recovered and used for heat generation exists in the process of ISM through PPA and ISM design document. Therefore PP could not use other waste energy from the ISM. Thus, H8 is not applicable.	Exclude		
			H9	A new renewable energy or other waste energy based element process to supply heat	The steam from the project will be generated in a bypass steam generation way from the condensing extraction turbine that is collateral operation of the electricity generation using waste gas and the amount of steam supply from the project is very small part of the cogeneration (4.3%). Thus facilitating new other waste energy based independent element process to supply steam (e.g. waste gas fired boilers) is not financially attractive in a cogeneration project compare to operating collateral operation and not business-as-usual choice to the project owner.	Exclude		

					In regard to a new renewable energy process to supply heat, there are no renewable energy sources such as wind, hydro, ocean energy and biomass in the region of the project and due to huge initial investment and low efficiency for supplying power for solar energy, these renewable energy for heat generation are not possible. It was confirmed by the relevant references for each renewable energy source and physical site inspection as well. Therefore, alternative H9 is not a credible alternative		
			H10	Any other source such as district heat	There is no heat/steam exchange in Indonesia industry in doing so heat/steam is only to be generated and consumed within the captive plant. Consequently, there is no district heat facility is available in the project location. It was confirmed by interview with local officer and on-site inspection.	Exclude	
			H11	Other heat generation technologies (e.g. heat pumps or solar energy)	Using other generation technologies such as heat pump is not efficient and it is hard to make an output as much as project activity. Therefore, the validation team conclude it is not economic attractive to produce the amount of steam produced by the proposed project using heat pumps or solar energy. In addition, the project activity is only possible due to the utilizing the waste gas from the ISM plant thus other steam generation technologies such as heat pumps or solar energy cannot be the PP's business field. Thus, H11 is not applicable.	Exclude	

			H12	Steam/process heat generation from waste energy, but with lower efficiency or lower recovery	The validation team found a lower efficiency technology or lower recovery results less financial attraction in general. Therefore, it makes more serious barrier for the project. Moreover, in the absence of the proposed project, the waste gas would directly be released to the atmosphere. Also, according to Regulations Minister of Energy and Mineral Resources of Indonesia No. 31/2005, using energy-efficient products and technologies are recommended to be applied. The lower efficiency of steam generation is thus deemed to be not complying with the regulation. According to the FSR, there is no applicable technique with significant lower efficiency for the use of waste gas to steam generation currently available. Meanwhile, the project owner chooses the appropriate technology with state of the art performance. Therefore, the lower efficiency of waste gas to steam generation is not a business-as-usual choice. Thus, H12 is not applicable.	Exclude	
			H13	Cogeneration with waste energy, but at a lower efficiency or lower recovery	It is not a credible alternative as same reason of H12.	Exclude	
			H14	On-site fossil fuel consumption to supply heat	This alternative is in compliance with all applicable legal and regulatory requirements.	Include	
		(2) For the use of waste energy, the possible baseline scenario is selected as below. • Scenario W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized; • Scenario W4: Waste energy is used for meeting energy demand at the recipient facility(ies)					

• Scenario W6: All the waste energy produced at the facility is captured and used for export generation or steam.

For power generation, the possible baseline scenario is selected as below.

• Scenario P1: Project activity not undertaken as a CDM project activity

• Scenario P3: On-site or off-site Greenfield fossil fuel fired cogeneration plant

• Scenario P8: On-site or off-site Greenfield fossil fuel based captive plant

• Scenario P10: Sourced from grid-connected power plants

For heat generation, the possible baseline scenario is selected as below.

• Scenario H1: The project activity is not undertaken as a CDM project activity

• Scenario H3: On-site or off-site Greenfield fossil fuel based cogeneration plant

• Scenario H7: A new fossil fuel based element process

• Scenario H14: On-site fossil fuel consumption to supply heat

To sum up, the most plausible scenarios obtained from the combination of the alternatives are presented in the following table 2

< Table 2> Combination of baseline options and scenario

Combination	Baseline scenario			Description of Situation
1	W2	P3	H3	The waste gas is released to the atmosphere after incineration, a new on-site fossil fuel based cogeneration plant is constructed to provide ISM electricity and steam

2	W2	P8	H14	The waste gas is released to the atmosphere after incineration, Greenfield fossil fuel based captive plant is constructed to provide electricity, On-site fossil fuel is consumed to supply steam
3	W2	P10	H7	The waste gas is released to the atmosphere after incineration, the electricity is imported from JAMALI grid and the heat is supplied fossil fuel based steam boiler.
4	W4/ W6	P1	H1	The waste gas is used for generating the electricity and steam to satisfy the demand at the recipient facility, not undertaken as a CDM project activity

Thus, possible and reasonable combinations of each scenario are described as follows;

• Combination 1: W2 and P3 and H3

• Combination 2: W2 and P8 and H4

• Combination 3: W2 and P10 and H7

• Combination 4: W4/W6 and P1 and H1

Step 2: Step 2 and/or Step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenario by eliminating non-feasible option (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).

For the alternative combination 1;

In order to assess the validity of alternative combination 1, firstly PP investigated available fossil fuel for cogeneration that would have been used by the recipient all the fossil fuels available in the host country, including those which can be imported. As result of investigation, PP found the available fossil fuels are LNG, heavy oil and coal in Indonesia. Therefore, the possibility of alternative combination 1 was validated as divided into those fuels' possibility of use.

Firstly, according to the "Long term infrastructure development plan to meet domestic gas demand / ministry of energy and mineral resources, directorate general of oil and gas" from the 5th International Indonesian Gas Conference & Exhibition, Western Jawa region

where is exact project site needs additional LNG supply because this area is not equipped gas supply infrastructure. Therefore, PT PGN (Perusahaan Gas Negara)* limited the quantity of gas supplying for new customer LNG.† The validation team found it is not available of use of LNG due to lack of gas supply infrastructure in project area through the relevant document above, site inspection and interview with local officer as well.

Secondly, the price of heavy-oil‡ is far expensive than other fuels. PP investigate that the unit fuel price of each fossil fuel and found heavy oil (18.96USD/GJ) is much expensive than other fuels. Refer to the Table 3 below. Thus, for the large quantity of power plant for generating electricity and steam, the heavy-oil is not a credible scenario due to the cost of the fuel. In addition, we found the government got rid of the subsidy of oil through the "Indonesia's Fuel Subsidies: Action plan for reform" by Indonesian Institute for Energy Economics dated of March 2012.§ Therefore, the price of oil is expected to expensive more than before.

< Table 3> Fuel price comparison per unit of energy

	Fuel price		Energy in joule		Price of fuel
					USD/GJ
LNG	7.79	USD/mm BTU	1.055	J/BTU	7.38
Heavy Oil	0.68	USD/ Lit	0.03586**	GJ/Lit	18.96
Coal	62.39	USD/tone	25.3	GJ/tone	2.60

Thirdly, a coal seems to be most probable fossil fuel for alternative of project activity considering the viewpoint of fuel cost. However, PP excluded coal as a fuel for selecting most plausible alternative. Because the installation of the coal based cogeneration power plant needs huge land requirement, it is essential prerequisite. In order to operate coal based cogeneration plant with 200MW capacity, it need almost same land requirement as the proposed project's site to store the coal. However the project activity is just a part of the ISM for supplying the electricity and steam and the ISM design was already planned and fixed by PT KP thus PP could not broaden their project site and also it need much construction cost to build coal based cogeneration plant off-site due to the coal feeding

* National Gas Company
† Handbook of energy and economic statistics of Indonesia 2011 which is published by Ministry of Energy and Mineral Resource
‡ http://ptmitraoilpertamina.indonetwork.co.id/2846356/harga-jual-kami-...1
§ http://www.iisd.org/gsi/sites/default/files/ffs_actionplan_indonesia.pdf, http://www.businessweek.com/news/2012-03-26/indonesia-fuel-price-rise-needed-to-protect-growth-basri-says
** Volumetric energy density of Diesel oil (35.86 MJ/L)

		system installation. The validation team found a coal based cogeneration plant is not applicable for alternative scenario by checking the plant design layout of ISM plant and the reference for the size of coal based power plant in Indonesia. To sum up the availability of alternative combination 1 above, the validation team confirmed the alternative combination 1 is not plausible baseline scenario. **For the alternative combination 2;** As assessed in the alternative combination 1, using fossil fuel such as LNG and Heavy oil for both electricity generation from a captive plant and on-site steam supply is not applicable because of financially unattractive and not equipped infrastructure. Thus only coal based electricity generation from a captive plant and on-site steam supply is applicable for this combination. Even though this combination 2 assumed separated energy generation facility (electricity, steam), not cogeneration plant, only coal based captive power plant for electricity generation also needed huger land requirement because captive power plant for electricity generation charged much higher portion (94%) of total energy generation of proposed project. Thus only captive power plant for electricity generation is also impossible to build it at the project site as same reason in combination 1. Thus validation team confirmed the alternative combination 2 is not plausible baseline scenario in the context of alternative combination 1. **For the alternative combination 3;** In alternative combination 3, considered in these terms, the electricity would be from the Grid Company (JAMALI) and this is available in abundance. Also the electricity grid is dominated by coal-fired plants. Coal is the main fuel used in the JAMALI Grid to generate electricity as it is available in abundance in Indonesia and there is no supply constraint or any utilization limitation in Indonesia laws and regulations. As for the steam supplied by fossil fuel based steam boiler, it is explained the fossil fuel[*] for cogeneration power plant is not applicable scenario in alternative combination 1. However the amount[†] of steam supply from the project is only small part of the cogeneration in the proposed project[‡], so only steam boiler installation operated by fossil fuel based on and land requirement for fossil fuel storage is possible. And the selected fossil fuel for steam boiler is coal considering financially attraction from the unit fuel price of each fossil fuel and not equipped gas supply infrastructure which is investigated alternative combination 1 above. Thus the validation team confirmed the alternative combination 3 is plausible baseline scenario.	

[*] Applicable fossil fuel is coal by the reason of economical advantage than other fossil fuel and infrastructure possibility as explained in combination 1.
[†] Amount of steam generation : 32ton/hr
[‡] The steam output charges only 6% of total energy output, FSR

		For the alternative combination 4; In alternative combination 4, the project activity is not undertaken as a CDM project. It does not encounter any fuel supply constraints as the proposed project activity utilizes waste gas to generate electricity and steam. Thus the validation team confirmed the alternative combination 4 is plausible baseline scenario. However, the validation team verified by investment analysis according to the "Tool for the demonstration and assessment of additionality" and found it is not feasible and should not be the baseline scenario of the project. More details in the section of 3.4 Additionality. Consequently, the baseline scenario is concluded to be combination scenario 3 : "The waste gas is released to the atmosphere after incineration, the electricity is imported from JAMALI grid and the heat is supplied fossil fuel based steam boiler. The validation team confirmed that no reasonable alternative has been excluded. ***Step 3: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the baseline scenario*** Combination scenario 3 (W2/P10/H7) identified by the PDD is one of the scenarios described in methodology Table 2, where the proposed project falls (ACM0002 Ver.04). Therefore, the methodology is to be applicable to the proposed project. We confirmed that all the assumptions and data used by the project participants are investigated including their references and sources and all documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD. And assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Thus the validation team concludes that the ACM0012 (Ver. 04) and Tool for the demonstration and assessment of additionality (Ver. 07) have been correctly applied to the identification of alternatives to the project activity and the identification of alternatives are complete under relevant national and/or sectoral policies and circumstances, and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.	

CAR 7 The PP should demonstrate the validity of input values with associated evidences as follows. (1) The benchmark selection approach is not applicable (2) Investment cost : Please demonstrate the validity of investment cost compare with other similar project and provide the actually incurred investment cost based on the relevant evidence. (3) Tariff : Please demonstrate the tariff selection method based on PPA (4) O&M cost : Please let us know the O&M cost based on FSR estimation. (5) Residual value : Please reflect the residual value in the investment analysis	B.4.4.4 B.4.4.5 B.4.4.7~B.4.4.9 B.4.4.13	(1) The evaluation of the project's financial viability is based on the internal rate on return (IRR). The PP selected the benchmark rate, as 13.58% according to the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS*' issued by Bank Indonesia. The 13.58% of benchmark of electricity industry is therefore appropriate for this project. Furthermore, KFQ was able to confirm this is suitable and reasonable as followings: a) This benchmark, 13.58% is derived from the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS' issued by Bank Indonesia which is national bank of Indonesia. The benchmarks provided in this publication are the summary of an average of interests between 2008 and 2010 in the investment loan category from 5 Indonesian bank groups such as Bank Persero, Bank Pemerintah Daerah, Bank Swasta Nasional, Bank Asing dan Bank Campuran and Bank Umum. Consequently, this publication can be considered as credible and reliable data source for benchmarks. And the publication is widely applied in Indonesia for assessing the financial viability of various types of project. b) Most of registered CDM projects in manufacturing industry in Indonesia use the 'INTEREST RATE OF RUPIAH LOANS BY GROUP OF BANKS' issued by Bank Indonesia for the benchmark analysis. Hence, the validation team concluded that this benchmark, 13.58% is valid to applying the project. (2) Total investment cost has been adopted from the board decision document for the investment cost from the FSR. At first, the validation team compared the proposed project activity with other 5 similar projects. The average investment cost per capacity of similar projects is 1.06 million USD/MW with range of 0.83 million USD/MW ~ 1.33 million USD/MW while that of the proposed project (1.39 million USD/MW) is higher than average investment cost. The validation team thus assessed this total investment cost as follow. We found that the reason of higher investment cost is due to the installation of cooling water providing facility. The project designed cooling water usage from the sea water thus cooling water supplying construction such as water channel excavation, pulling sea water system and waterproof treatment etc. required much construction cost that is 28.7%	CAR 7 is closed

* Average of interests between 2006 and 2010 in the investment loan category from 5 Indonesian banks such as Bank Persero, Bank Pemerintah Daerah, Bank Swasta Nasional, Bank Asing dan Bank Campuran and Bank Umum
http://www.bi.go.id/web/id/Statistik/Statistik+Ekonomi+dan+Keuangan+Indonesia/Versi+HTML/Sektor+Moneter/

		of total investment cost. This kind of work need much more investment cost than other similar projects*. In addition, the installed equipment such as gas-fired boilers, turbines, generators and construction works in similar projects were almost provided from the domestic provider whereas the proposed project planned to provide all the equipment and construction works from abroad† Therefore we could conclude higher investment cost of proposed project is valid and reasonable under our sectoral knowledge and expertise. The validation team reviewed actually incurred investment cost for this project activity at the timing of validation such as Offshore contract and Onshore contracts which is main construction contracts is shown approximately 232,787,000 USD‡. It is already incurred 84% of planned investment cost used in the investment analysis of the proposed project activity. We found remaining expenditure will be incurred for commissioning, S/V, government permit and approval cost, commissioning fuel cost etc. Even applying actually incurred investment cost, the IRR is 12.4% which is below than the benchmark. Based on the above assessment, KFQ could conclude that total static investment cost in financial analysis is not overestimated and valid at the time of the investment decision. (3) **<u>Combined tariff : 3.24 cent/KWh</u>** Even though the energy output consists of both electricity and steam, the tariff was estimated only reflecting the electricity tariff in total energy generation (165MW) deducting the waste gas tariff in FSR§. Thus PP re-estimated the combined tariff reflecting separated tariff such as electricity and steam and waste gas purchase tariff based on the PPA between PP and PT KP. Moreover, as explained above, PPA has been developed by the purpose of captive energy exchange between PP and PT KP and the output from the project activity will not be sold to the off site facility thus the applied tariff from the PPA is more accurate and reasonable to apply. Even applying the tariff (2.81 cent/KWh) which is applied in FSR with the deduction of waste gas price, the IRR becomes 8.3% which is lower than the IRR when the combined tariff (3.24 cent/KWh) applied for the proposed project.	

* In order to construct cooling water supplying from the sea, the proposed project need new sea water pumping system including sea water channel(1.5km) and sea water pipeline installation (150m) in the project site.

† POSCO E&C

‡ List of incurred investment cost (100.7% of the total investment cost) is provided in the section 6, Reference

§ Tariff in FSR : 2.81 cent/KWh = 10.77 cent/KWh (electricity tariff in total energy generation (165MW)) – waste gas tariff (7.96 cent/KWh)

		The basic concept of tariff estimation in PPA is i) The electricity tariff is fixed by PLN electricity tariff in order to guarantee a fair trade between PP and PT KP ii) The steam tariff and waste gas tariff is determined from the electricity tariff iii) PP's profit is set by Payable Capacity Charge for electricity and steam* iv) Payable Energy Charge for electricity and steam† varies PLN electricity tariff's fluctuation v) In conclusion, the combined tariff is maintained as fixed price even if PLN price is fluctuated PP made a combined tariff calculation in the PPA as below. ▪ Combined tariff = {(Electricity tariff * Enthalpy ratio for electricity) + (Steam tariff * Enthalpy ratio for steam)} – waste gas tariff Enthalpy ration for electricity (90.43%) and steam (9.57%) is derived from the Main steam Enthalpy‡ (Electricity) and the Process steam Outlet Enthalpy§ (Steam) according to the Enthalpy table which is made in the process of PPA study based on the boilers specification from the equipment provider and Heat Balance Diagram made by FUJI Electric systems on 9 November 2010. and this enthalpy calculation is followed by "IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam". This ratio is resulted by calculating the all generated steam converted to electricity through the turbine and generator and steam by the condensing extraction type. Furthermore we found the Enthalpy ration for electricity (90.43%) and steam (9.57%) calculation method is widely applied for the PPA in other similar waste gas recovery and cogeneration projects conducted by PP in order to trade waste gas and output energy. Thus we confirmed this resulted enthalpy ratio is definitely different with the energy output ration in IRR calculation** which will be actually generated energy output ratio considering amount of waste gas supply and steam demand / supply. We tested the IRR in case applying the ratio as electricity (90.43%) and steam (9.57%), the IRR still below benchmark (11.3%). Therefore the validation team confirmed the enthalpy calculation is reasonable and	

* Payable Capacity Charge is a price for fixed cost such as equipment investment that is consisted of reflecting Depreciation, Investment return, Operation maintenance, Interest, Tax etc.

† Payable Energy Charge is a price for variable cost, thus this price fluctuate with electricity and steam generation and sales by project operation

‡ Main steam Enthalpy (Electricity) : 339,069.6kg/hr * 819.8148kcal/kg = 277,974,276 kcal/hr (125.53bar, 538 ℃)

§ Process steam Outlet Enthalpy (Steam) : 39,344.4kg/hr * 747.915kcal/kg = 29,426,267 kcal/hr (38.21bar, 368.4 ℃)

** Energy output ration in IRR calculation : electricity output (94%) and steam output (6%)

		applied appropriately. Each tariffs applied from the PPA are evaluated as below. **Electricity Tariff : 8.89 cent/KWh** Electricity tariff has been determined in the process of PPA negotiation between PP and PT KP (recipient company). According to the PPA, basic concept of payable charge for electricity has been fixed as follows. ▪ Payable Charge for Electricity = Payable Capacity Charge for Electricity* + Payable Energy Charge for Electricity† = Purchaser's Receipt Price (from PLN) * Amount of generated Electricity Thus the electricity tariff is applied as PLN purchaser's price for the project as 8.89 cent/KWh based on the electricity price quote a new connection between PP and PLN dated 30 November 2010‡. To assess the validity of the applied electricity tariff, the validation team found the average electricity sales price in industrial field from the PLN is 7.26 cent/KWh according to the PLN Statistics 2011 published by PT PLN and checked the applied tariff in other CDM registered projects in Indonesia at the time of investment decision of proposed project§ and found the highest tariff is 8.20 cent/KWh that is below than the tariff applied in the proposed project. Therefore, KFQ could conclude that the application of electricity tariff in PPA, 8.89 cent/KWh is valid for the purpose of demonstrating an additionality of the project. **Steam tariff : 16.17 cent/KWh (3,397 cent/ton)** Steam tariff has been determined in the process of PPA negotiation between PP and PT KP (recipient company) basis of the performance estimation after operation. According to the PPA, basic concept of payable charge for steam has been fixed as follows.	

* Payable Capacity Charge of Electricity is price for fixed cost such as equipment investment that is consisted of reflecting Depreciation, Investment return, Operation maintenance, Interest, Tax etc.

† Payable Energy Charge for Electricity is price for variable cost such as fuel cost, thus this price fluctuate with electricity generation by project operation

‡ According to the electricity price quote a new connection, the price offered 605 Rupia/KWh, 745 Rupia/KWh, 810 Rupia/KWh classified by the grade consumer. Hence, PP selected the highest grade price for investment analysis and thus we confirmed applied electricity tariff (815 Rupia/KWh, 8.89 cent/KWh) considering any small the currency exchange rate is valid to use in a conservative manner.

§ The applied electricity tariff from PLN was surveyed which was at the timing of PPA and FSR publication that is the year 2010 as below.
Project Lumut Balai Unit 1 – 2 PT. Pertamina Geothermal Energy (Ref. No. 5785) : 7.53 cent/KWh
Project Ulubelu Unit 3 – 4 PT. Pertamina Geothermal Energy (Ref. No. 5773) : 7.53 cent/KWh
Wampu Hydro Electric Power Project (Ref. No. 5368) : 7.23 cent/KWh
Wayang Windu Phase 2 Geothermal Power Project (Ref. No. 3193) : 8.20 cent/KWh

▪ Steam tariff = Payable charge for steam / Amount of steam sales
▪ Payable charge for steam = Payable Capacity Charge for Steam + Payable Energy Charge for Steam
(1) Payable Capacity Charge for Steam = Contracted Capacity Charge * Enthalpy ratio for steam
(2) Payable Energy Charge for Steam = Payable Energy Charge for Electricity * Calories consumed for Steam / Calories consumed for Electricity

Parameters	Value	Unit	Verification
Amount of steam sales	23,040	Ton/month	Amount of steam generation (32 ton/h) * 24 * 30
Contracted Capacity Charge	368,598,142	Cent/month	Contracted capacity charge for both electricity and steam : 4,423,177,700 cent/year / 12
Enthalpy ratio for steam	9.57	%	- Main steam Enthalpy (for electricity generation) : 339,069.6kg/hr * 819.8148kcal/kg = 277,974,276 kcal/hr (125.53bar, 538 ℃) - Process steam Outlet Enthalpy (for steam by condensing extraction type) : 39,344.4kg/hr * 747.915kcal/kg = 29,426,267 kcal/hr (38.21bar, 368.4 ℃)
Payable Capacity Charge for Electricity	333,313,665	Cent/month	Contracted Capacity Charge (368,598,142 cent/month) * Enthalpy ratio for electricity (90.43%)
Payable Energy Charge for Electricity	677,748,494	Cent/month	Payable Charge for Electricity (1,011,062,159 Cent/month) – Payable Capacity Charge for Electricity (333,313,665 Cent/month)
Calories consumed for Steam	17,232	Gcal/month	Amount of steam sales (23,040 Ton/month) * (Process steam inlet Enthalpy (747.915kcal/kg) / 1000
Calories consumed for Electricity	271,760	Gcal/month	Amount of electricity sales(113,760,000KWh/month) * Electricity generation unit price(2,388.8Kcal/KWh) / 1000000
Payable Energy Charge for Steam	42,975,184	Cent/month	Payable Energy Charge for Electricity (677,748,494 Cent/month) * Calories consumed for Steam (17,232 Gcal/month) / Calories consumed for Electricity (271,760 Gcal/month)

Calculated as above, the steam tariff will be determined by Payable Capacity Charge for

Steam, Payable Energy Charge for Steam and Amount of steam sales. As we explained above, Capacity Charge is fixed as PP's profit and thus Energy Charge of steam and Amount of steam sales only impact on the steam tariff. Consequently, Energy Charge for steam is determined by Energy Charge for Electricity that is the PLN electricity price.
Because there is no steam exchange in the industrial market in Indonesia, the steam tariff does not exist in public market. Therefore, the steam tariff must be made by above calculation or equivalent method. To make more concrete investigation, we checked steam tariff applied in Korean industry market at the time of investment decision of proposed project and we found a steam was sold as the price of 35,000 KRW/ton (3222.83cent/ton, 1USD = 1086KRW) from the stream supply contract* that is lower than the tariff applied on the proposed project.
Thus, the validation checked calculation of steam tariff with confirming the source of each value, the steam tariff (16.17 cent/KWh (3,397 cent/ton)) is appropriate and valid to apply.

Waste gas tariff : 6.08 cent/KWh (2.54cent/Mcal)
According to the PPA, the waste gas tariff will be determined by actual expense basis depending on the performance estimation after operation. Thus PP estimated the waste gas tariff for the project activity as following calculation.

- Waste gas tariff = Payable charge for waste gas / Total sales
- Payable charge for waste gas = Payable Energy Charge for Electricity + Payable Energy Charge for Steam

Parameters	Value	Unit	Verification
Payable Energy Charge for Electricity	677,748,494	Cent/ month	Payable Charge for Electricity (1,011,062,159 Cent/month) – Payable Capacity Charge for Electricity (333,313,665 Cent/month)
Payable Energy Charge for Steam	42,975,184	Cent/ month	Payable Energy Charge for Electricity (677,748,494 Cent/month) * Calories consumed for Steam (17,232 Gcal/month) / Calories consumed for Electricity (271,760 Gcal/month)
Amount of electricity sales	113,760,000	KWh/ month	Amount of steam generation (158MW) * 30 * 24 * 1000
Amount of steam	4,877,620	KWh/	- Amount of steam generation (32 ton/h) * 24 *

* Steam Spply Contract betweem Dongkuk Industries Co., Ltd. and OCI Ltd., 17 December 2010

sales		month	30 = 23,040 ton/month - According to the Main steam Enthalpy table, to produce 45ton steam, it needed 9.53MW * Thus, 212KW/ton	
Total sales	118,637,620	KWh/ month	Amount of electricity sales + Amount of steam sales	

Calculated as above, the waste gas tariff will be determined by Energy Charge for Electricity and Energy Charge for Steam. And these Energy Charges only impact on the waste gas tariff. Consequently, as explained above, Energy Charge for electricity and steam is determined by Energy Charge for Electricity that is the PLN electricity price respectively. In summary, the waste gas tariff is determined by Energy Charge for Electricity that is the PLN electricity price.

For robust confirmation, we investigate the average waste gas tariff of 4 similar project in Table 3 and found average waste gas tariff is 3.03 cent/KWh that is lower than the proposed project, but the tariff which reflected electricity tariff on the waste gas tariff is same as proposed project† since we found the electricity tariff of similar project also lower than the proposed project. Thus we concluded applied waste gas tariff (6.08 cent/KWh) is valid.

In conclusion, the combined tariff is maintained as fixed price even if PLN price is fluctuated because the steam tariff and the waste gas tariff were interlocked with the PLN electricity price. Therefore, the validation team concludes that the combined tariff in financial analysis is valid at the time of the investment decision.

(4) Total annual O&M cost has been adopted from the FSR and it consists of labour and welfare cost, maintenance and overhaul cost and other variable cost. The validation team checked detail estimation of each O&M cost item through the FSR.

In addition, because the POSCO who is one side of PT. KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea‡ over 30 years, O&M cost of each items are estimated based on these experiences and operation results.

* Process steam flow : 339,069.6kg/hr (100MW + 45Ton/hr) – 309,632kg/hr (100MW + 0Ton/hr) = 29.437 ton/hr

† Average electricity tariff of siomilar projects (5.84 cent/KWh) – Average waste gas tariff of siomilar projects (3.03 cent/KWh) = 2.81 cent/KWh
Average electricity tariff of proposed project (8.89 cent/KWh) – Average waste gas tariff of proposed project (6.08 cent/KWh) = 2.81 cent/KWh

‡ Waste gas recovery and cogeneration projects in Pohang ISM Plant (#1 ~ #12)
Waste gas recovery and cogeneration projects in Gwangyang ISM Plant (#1 ~ #9)

		The labour and welfare cost (2.5 million USD) is determined based on the salary and welfare and expense for the personnel, distinguished by local employee (54 person) and dispatched employee(13 person) from Korea considering the price level of both countries. Maintenance / overhaul cost (0.5 million USD) and other variable cost (1.5 million USD) which consists of repair cost (0.7 million USD) and other management cost (0.8 million USD) are estimated by operation result of the Gwangyang waste gas recovery and cogeneration project in ISM Plant. The validation team found that the annual O&M cost of the Gwangyang ISM plant is 0.0203 million USD/MW that is slightly lower than the proposed project. However even applying 0.0203 USD/MW, the IRR is still below the benchmark (10.3%). All items of O&M cost is from the FSR and validation team confirmed these costs in FSR, deemed appropriate based on the sectoral and local expertise of audit team, To check validity of O&M cost, the validation team reviewed it with other 5 similar projects and found that O&M cost of the total investment cost for this proposed project activity is lower than the average O&M cost (6.93% of the total investment cost, 0.075 million USD/MW respectively) Furthermore, the validation team checked each item of unit O&M cost with 5 similar projects with the relevant evidences and documents such as labour and welfare cost, maintenance and overhaul cost and other variable cost and we found that all of them are higher than proposed project. The validation team checked operation record of Gwangyang waste gas recovery and cogeneration project, the similar projects' O&M cost and interviewed with the staff of POSCO and we confirmed applied values are reasonable and valid. (5) The residual value for this project activity is 5% of fixed asset is from the FSR. This residual value was determined using the declining balance method on depreciation. The validation team investigated the accounting policy and principles of residual value in Indonesia, however there is not any statement for percentage of the residual value or book value. Thus we concluded the 5% of residual value, estimated by project owner is considered reasonable from our sectoral expertise and knowledge since there is no rules in the accounting principles of the host country.	
CAR 8 Sensitivity analysis should be demonstrated in a reasonable manner for each parameter.	B.4.4.12	A sensitivity analysis has been carried out for parameters contributing more than 20% to revenues or costs which are static total investment cost, tariff, O&M cost, and annual net output. Basically, ±10% variation has been considered in sensitivity analysis and moreover the critical assumptions of each parameter, which makes the investment analysis result exceed benchmark rate are considered in sensitivity analysis.	CAR 8 is closed.

		1) Total investment cost We tested when total static investment cost decrease 10%, the result of the after-tax IRR shows still below benchmark (11.8%). In order to reach benchmark, total investment cost shall decrease by 19.2%. However, the validation team checked actual incurred investment cost for the project activity such as Offshore contract and Onshore contracts which is main construction contracts and shown that 232,787,000 USD that is 84% of planned investment cost has been incurred already and remaining investment cost will be paid. Therefore, it is impossible for the total investment cost to decrease by 19.2%. **2) Combined tariff** We tested when the combined tariff increase 10%, the result of the equity after-tax IRR shows still below benchmark (11.5%). In order to reach benchmark, combined tariff shall increase by 26%. According to the PPA, the combined tariff is decided by difference between sales tariff (weighted average for electricity tariff and steam tariff) and waste gas tariff. The electricity tariff is decided as electricity purchasing price from the PLN. And steam and waste gas tariff are calculated as linked with the electricity tariff of the PLN. The basic concept of PPA between PP and PT KP is that the even if PLN electricity price fluctuate in the electricity market, the combined tariff of proposed project will not be changed because PPA fixed Payable Capacity Charge for Electricity and Payable Capacity Charge for Steam, meanwhile only Payable Energy Charge for Electricity and Steam will be fluctuated as same as PLN electricity price fluctuation. In other words, if electricity purchasing price from PLN is increased, the steam price and waste gas price is also increased as electricity price increase. Therefore, PP could make a fixed profit regardless of the price of PLN. The validation team checked the process of combined tariff determination in the PPA, and concluded the combined tariff for the project is fixed as 3.24 cent/KWh and thus it is impossible for the combined tariff to increase by 26%. **3) O&M Cost** We tested when O&M cost decrease 10%, the result of the equity after-tax IRR shows still below benchmark (10.3%). In order to reach benchmark, O&M cost shall decrease by	

		232%. According to the Inflation Report (Consumer Price Index) from the Bank Indonesia*, the validation team found Indonesian average inflation rate during the 2007 ~ 2011 is 6.43% thus it is impossible for the O&M cost to decrease by 232%. In addition, if the O&M cost is not considered in the investment analysis, the IRR still below the benchmark (11.7%). **4) Annual net output** We tested when annual net output (electricity and steam) increase 10%, the after-tax IRR shows still below benchmark (11.5%). In order to reach benchmark, the annual net output shall increases by 26%, from 1,239,229MWh to 1,561,428MWh. The net output is calculated based on the total capacity of energy output and the annual operation hours of the ISM process. Total energy output (165MW) is estimated by the maximum waste off gas generation from ISM process line. And according to the FSR, the maximum waste off gas which shall be used for the project activity will be generated 292,837Nm^3/hr that is 152.5MW. Because PP set the maintenance and overhaul time during the whole operating period as scheduled in PPA, thus maintenance and overhaul time and the operation hour cannot be changed. In addition, POSCO who is one side of PT KRAKATAU POSCO and also waste gas supplier as an Integrated Steel Mill(ISM) company has many experiences of developing and operating of waste gas recovery and cogeneration projects from the ISM in Korea over 30 years, in doing so they have much of expertise for operation planning and also we found the estimated annual operation hour of Gwangyang ISM Plant is 6655 hour that is lower than the proposed project. Therefore, it is impossible for the annual net output to increase by 26%. These results show that even under very favorable circumstances the after-tax IRR is still lower than the 13.58% benchmark. As a result, we can conclude that the project overall was also not financially attractive.	

*http://www.bi.go.id/biweb/Templates/Moneter/Default_Inflasi_EN.aspx?NRMODE=Published&NRNODEGUID=%7bC6BDA4D3-9471-4D99-A3B7-3A2ADE59E98C%7d&NRORIGINALURL=%2fweb%2fen%2fMoneter%2fInflasi%2fData%2bInflasi%2f&NRCACHEHINT=Guest
Inflation rate (Customer Price Index) : 2007 - 6.4%, 2008 - 10.3%, 2009 - 4.9%, 2010 - 5.1%, 2011 - 5.4%

CAR 9 PP should demonstrate the emission factor (CM) calculation in accordance with "Tool to calculate the emission factor for an electricity system (Version 2.2.1)" - Please show the validity of IPP (Independent Power Producer) source in OM calculation. - IPCC 2006 value application	B.5.1.2 B.5.1.5 B.5.2.1 B.5.3.2	By means of checking the Indonesian DNA (Directorate General of Electricity, Ministry of Energy and Mineral Resources) website* and interview with the staff of Indonesian DNA†, the validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was published on 27 March 2012 and found the most recent data was available on electricity generation and dispatch to JAMALI grid at the time of uploading the PDD for global stakeholders comment on UNFCCC website (14 April 2012). In the absence of the project activity, the same amount of electricity would have been produced in the grid, thus the baseline of the project activity are the emissions generated by generation of electricity in the JAMALI grid of Indonesia. The PDD has correctly identified the electricity system as Java-Madura-Bali (JAMALI) grid in accordance with applied tool in section B.4 and B.6.1. The project activity will be supplied the net electricity generated from JAMALI grid. Operating Margin (OM) and Build margin (BM) emission factors are correctly taken from the Emission Factor of JAMALI grid published by DNA of Indonesia on its official website and is available on public domain is reliable data source available to PP. The validation team has reviewed the correctness of data used for the baseline determination by reviewing the information on emission factor of JAMALI grid on DNA website. In accordance with "Tool to calculate the emission factor for an electricity system", the emission factor can be calculated by one of the following options: a) Either by calculating combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM) Or b) By calculating weighted average emissions in the current generation mix. PP has calculated CM by opting the option (a) i.e. calculating 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' which is further calculate on the basis on operation margin (OM) and build margin (BM). The validation team was able to check that the data vintage used (2008, 2009 and 2010) for emission factor calculation was the most recent data available on electricity generation and dispatch to JAMALI grid in Indonesia at the time of uploading the PDD for global stakeholders comment on UNFCCC website. The simple OM emission factor was calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO2/MWh) of all generating power plants serving the system for year 2008, 2009 and 2010, as 0.769 tCO2e/MWh (fixed ex-	CAR 9 is closed.

* http://pasarkarbon.dnpi.go.id/web/index.php/news/view/electricity-emission-factors-update-2011.html

† The local consultant Mr. Irhan (CDM Indonesia) interviewed with a staff of Indonesian DNA, Mr. A. Smyanugraha in 34 July 2013and found OM, BM, CM calculation procedure is correctly in accordance with the "Tool to calculate the emission factor for an electricity system" (version 02.2.1). The photos for the calculation procedure which were taken at interview has been provided to the DOE.

<table>
<tr>
<td></td>
<td></td>
<td>ante). In calculating above low-cost/must-run power plants units were not included.
The weighted average CO2 emission factor of build margin was calculated as the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.
The validation team checked by interviewing with the staff of Indonesian DNA and confirms that the selection of the options was correct. In validating this step, assessment team further confirms that:
(i) the identified power capacity additions comprise 20% of the system generation for the year under consideration.
(ii) none of the considered power capacity additions considered under (i) above have been built more than ten years earlier.
The weighted average of build margin emission factor for year 2010 is calculated as 0.712 tCO2e/MWh (fixed ex-ante).
This is in line with the guidance provided in the “Tool to calculate the emission factor for an electricity system” and we checked combined margin emission factor for the JAMALI grid of Indonesia have been calculated to be 0.741 tCO2e/MWh by applying the weightage for OM and BM as 50:50 through “Emission factor for the latest information on the CDM project eight interconnected power system in Indonesia” issued by Executive director national council of climate change on 27 March 2012 which is based on “Emission Factor Delivery for CDM project” issued by Directorate General of Electricity on 08 February 2012. The combined margin emission factor is fixed ex ante for the entire crediting period.
As result of applying the emission factor issued by Indonesian DNA (0.741 tCO2/MWh), PP revised amount of emission reduction as 809,138 tonCO2/y in PDD and ER spreadsheet and we confirmed the emission reduction calculation correct.
The validation team checked that the applied emission factor of JAMALI grid in Indonesia issued by Indonesian DNA is published in order to apply CDM project and checked registered CDM projects developed in Indonesia used this published emission factor as well. Thus we confirmed applied emission factor (0.741 tCO2/MWh) is valid to use</td>
<td></td>
</tr>
<tr>
<td>CAR 10

Monitoring parameter description in PDD B.7.1 is not clearly reflecting project status.
(1) The monitoring parameters are not defined whole in the PDD B.7.1
e.g) Temperature and Pressure of</td>
<td>B.6.1.2</td>
<td>(1) The monitoring parameters, $T_{feed\ water,\ y}$, $P_{feed\ water,\ y}$ and $COG_{process,\ y,}$ $BFG_{process,\ y}$ are described in the PDD B.7.1 and we confirmed these parameters are correctly identified.
<table>
<tr><th>Parameter Title</th><th>Description</th><th>Unit</th><th>Comment</th></tr>
<tr><td>$Q_{wcm,BGF,y}$
$Q_{wcm,LDG,y}$
$Q_{wcm,COG,y}$</td><td>Quantity of waste off gases used for energy generation</td><td>Nm^3</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes/No</th></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>
</table>
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<td>CAR 10 is closed.</td>
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feed water ($T_{feed\ water,\ y}$, $P_{feed\ water,\ y}$) and The quantity of COG/BFG used in each process $COG_{process,\ y}$, $BFG_{process,\ y}$) (2) Measurement and record frequency for all parameters (3) The description of ECj,y is not in accordance with whole PDD.				during year y		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	
			$EG_{j,y}$	The net quantity of electricity supplied to the recipient facility by the project activity during the year y	MWh	**Data Checklist**	**Yes/No**	
						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	
			$HG_{j,y}$	Net quantity of heat supplied to the recipient facility j by the project activity during the year y	TJ	**Data Checklist**	**Yes/No**	
						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	
			$Q_{feed\ water,y}$	The quantity of feed water provided to the boiler during year *y*	Ton	**Data Checklist**	**Yes/No**	
						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
		$T_{feed\ water,\ y}$	Temperature of feed water provided to the boiler	°C	**Data Checklist** / **Yes/No** 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	
		$P_{feed\ water,\ y}$	Pressure of feed water provided to the boiler	Kg/m^2	**Data Checklist** / **Yes/No** 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	

		$Q_{steam, return, y}$	Quantity of steam returned to the recipient facility, ISM	Ton	**Data Checklist** / **Yes/No** 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	
		$T_{steam, return, y}$	Temperature of steam returned to the recipient facility, ISM	°C	**Data Checklist** / **Yes/No** 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	
		$P_{steam, return, y}$	Pressure of steam returned to the recipient facility, ISM	bar	**Data Checklist** / **Yes/No** 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	

		$ws_{i,j}$	Fraction of total heat that is used by the recipient *j* in the project that in absence of the project activity would have been supplied by the *i*th element process	-	**Data Checklist** / **Yes/No** 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? N/A Indication of accuracy provided? N/A QA/QC procedures described? N/A QA/QC procedures appropriate? N/A	
		$FC_{i,y}$	The quantity of fossil fuel i combusted in the project activity during year y	Mass or volume unit	**Data Checklist** / **Yes/No** Data unit correctly expressed? Yes Appropriate Description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A 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	
		$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel i combusted in the project activity	ton CO_2/ GJ	**Data Checklist** / **Yes/No** Data unit correctly expressed? Yes Appropriate Description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A Has this value been verified? N/A Measurement method correctly described? N/A Correct reference to standards? Yes Indication of accuracy provided? N/A QA/QC procedures described? N/A QA/QC procedures appropriate? N/A	

		$NCV_{i,y}$	Weighted average net calorific value of fossil fuel i combusted in the project activity	GJ/ mass or volume unit	**Data Checklist** / **Yes/No** 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	
		COG $_{process, y}$	The quantity of COG used in each process(Coke oven, Coke By-Product, Sinter plant, Blast furnace, Lime Calcining Plant, Basic oxygen furnace, Continuous Casting Plant and Plate Mill and Rolling) during year y	Nm^3	**Data Checklist** / **Yes/No** 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	
		BFG $_{process, y}$	The quantity of BFG used in each process(Coke oven, Blast furnace, Plate Mill) during year y	Nm^3	**Data Checklist** / **Yes/No** 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	

		LDG $_{process, y}$	The quantity of LDG used in each process (Plate Mill) during year y	Nm^3	**Data Checklist** / **Yes/No** 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	
		$EC_{PJ,y}$	The electricity consumed for the project activity in emergency and start-up case during the year y	MWh	**Data Checklist** / **Yes/No** 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		
		Abnormal operation of the project facility including emergencies and shut down	The hours of abnormal operation of parts of project facility that can have an impact on waste energy generation and recovery	Hour	**Data Checklist** / **Yes/No** Data unit correctly expressed? Yes Appropriate Description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A Has this value been verified? N/A Measurement method correctly described? Yes Correct reference to standards? Yes Indication of accuracy provided? N/A QA/QC procedures described? N/A QA/QC procedures appropriate? N/A		

		(2) All of data will be continuously measured and archived by Data Acquisition System (DAS) and the reading of the meters shall be conducted at midnight of the last day of each applicable billing period by the representative of both parties. The monitoring system will check a summary of operations over the previous 24 hours, including total generation, fuel consumption, major equipment abnormal conditions, tagged out equipment, etc. and all data recorded monthly basis. These are correctly described on the PDD. (3) The electricity for gas cleaning equipment would be consumed in baseline and project emissions. Thus electricity consumption for gas cleaning is ignored according to the methodology. Additionally, all electricity consumed for the project activity will be supplied from electricity generated by the project activity. The electricity consumed for the project activity will be deducted from total electricity generated by the project activity. Thus, the electricity consumed for the project activity is also ignored and the ex-ante project emission is zero. However, in case of the emergency situation or the start-up of project activity, the electricity will be supplied from the JAMALI grid. Thus it will be monitored and considered as the project emission ($EC_{PJ,y}$).	
CL 1 : Please provide the management decision document for investment cost adjust (2011. 08. 05) after first investment decision (2010. 12 .21)	B.4.1 B.4.9	PP approved 231,000,000USD investment cost in the FSR at the Board meeting stated above and adjusted to 277,000,000USD at the board decision meeting on 05 August 2011 due to mainly civil works and equipment costs increase* found in the course of reviewing proforma quotations for purchasing equipments. The validation team confirmed it through the document for board decision on 05 August 2011† prior to project start date (05 October 2011). KFQ confirmed that the project investor, Poscopower would or not decide to proceed with the project again before starting construction or commitment to big expenditure and got to conclusion the adjusted investment cost is applicable for the investment analysis at the time of investment decision under comprehensive understanding of starting date and additionality.	CL 1 is closed.
CL 2 : Technical description of the project	A.5.1.1	(1) The geo-coordination is revised as East 105.9719, South 6.007139 and it is described on PDD A.4.1.4 (2) The address of the project site is revised as Afrika Street No.2, Krakatau Industrial	CL 2 is closed.

* Sea water intake and channel construction, Piling construction etc.

† Adjusted investment cost from the board decision for investment cost (05 August 2011) is assessed below investment cost section of the report

activity in PDD A.4 is not correct. (1) The location of project site is not in accordance with the GPS coordination. (2) The address is not in accordance with the PDD Annex I information.		complex, Cilegon, Banten, Indonesia and it is described on PDD A.4.1.4.	
CL 3 : The title of methodology in PDD is not correct.	B.1.1	The title of methodology has been revised correctly as ""Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects (version 04)" in whole PDD.	CL 3 is closed.
CL 4 : PP should provide the evidence of project history in PDD Table B-4 and the date of these histories are not correct in PDD. Please correct the date.	B.4.1.6	PP provided the all evidences of project history in PDD B.5 (Table B-4) and all the events are confirmed by these evidences. The validation team confirmed the date and events are real and not nay false on them.	CL 4 is closed.

CL 5 : PP should demonstrate the validity of the common practice in the PDD in accordance with the "Tool for the demonstration and assessment of additionality"(Version 07.0) and the "Guidelines on common practice" (version 02.0).	B.4.7.1~B.4.7.6	Common practice analysis has been validated according to the "Demonstration and Assessment of Additionality (Version 07.0)" and the "Guidelines on common practice (version 02.0)" as follows. ***Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.*** According to the guideline, the installed capacity of 100MW~ 300MW (± 50% capacity of the capacity of the proposed project activity, 200W) is defined and as a result, projects between 100MW and 300MW were chosen for the common practice analysis. This identified range, therefore, is reasonably defined and in compliance with the guideline. ***Step 2: Identified similar projects (both CDM and non-CDM) which fulfill all of the following conditions:*** (a) The projects are located in the applicable geographical area; ➔ ***The host country of this project is Indonesia and the applicable geographical area is entire host country as default. The common practice analysis has been performed considering the Indonesia level as the relevant locational extension. Moreover PP extended geographical area to the ASEAN countries. 10 countries* included in ASEAN (Association of South-East nations) are adjacent geographically and the economic level also similar to promote Economy Integration next year†. Accordingly, it can be said that the projects in ASEAN took place in a comparable environment in the context of similar investment conditions such as access to financing considering economic level, access to technology as well as natural conditions in the region, ASEAN. Thus, PP identified the applicable geographical area is entire host country and ASEAN countries. The validation team confirmed the selection of applicable geographical area as entire host country and ASEAN countries is valid in line with the Guidelines on common practice (version 02.0) and our regional knowledge.*** (b) The projects apply the same measure as the proposed project activity; ➔ ***The proposed project utilizes the waste gas sourced by Integrated Steel Mill plant to cogenerate. Thus the projects which recover the waste gas from ISM process in order to cogeneration will be identified.*** (c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;	CL 5 is closed.

* Bruni Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam / http://www.aseansec.org/18619.htm

† http://www.aseansec.org/10372.htm

		➔ ***The energy source of the proposed project is waste gas generated from the Integrated Steel Mill process in a greenfield facility. Thus there is no technology switch measure is implemented by the proposed project, it is not applicable.*** (d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant; ➔ ***The proposed project utilizes the waste gas sourced from the ISM plant. Thus steel production plants would be considered.*** (e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1; ➔ ***The project of the applicable output range from 100MW to 300MW will be identified.*** (g) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity; ➔ ***The proposed project's PDD was published for global stakeholder consultation on 14 April 2012 and the start date of proposed project activity is based on the date of contract of power plant installation (Offshore contract) (05 October 2011). Thus projects that have commercial operation before the start date of the proposed project (05 October 2011) will be selected for the common practice analysis.*** Based on the condition in Step 2, PP investigated similar project, however according to the Steel Production 2011 published by World Steel Association* and relevant website†, PP found there are no Integrated Steel Mill plant in host country, Indonesia and also no cogeneration by using the recovered waste gas from ISM of course. Only the steel production factories are used the technology of Electric Are Furnace process which is totally different with the ISM process‡. In order to make clear for identifying the similar project, PP investigated the Steel Statistical Yearbook 2011 published by Korea Iron and Steel Association and found there is no ISM plant in Indonesia and ASEAN countries. The validation team confirmed there is no project for similar project in common practice	

* KONDISI INDUSTRI BAJA HANDAPI PASAR BEBAS AC-FTA,2010/ PT MEDIA DATA RESET
http://www.worldsteel.org/statistics/BFI-production.html

† http://en.wikipedia.org/wiki/List_of_power_stations_in_Indonesia

‡ No waste off gas generated in Electric Are Furnace process thus it cannot be implemented waste gas recovery

		analysis according to the official sources and local and industrial expertise. Thus, Nall = 0 ***Step 3:*** **Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.** No project identified at the Step 2 ($N_{all} = 0$), thus Step 3 is skipped We confirmed N_{all} is zero **Step 4**: **Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number $N_{diff.}$** Within similar projects identified in step 3, N_{diff} = zero. **Step 5: Calculate factor F = 1 - Ndiff/Nall representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.** In accordance with step 4 of the guideline, F of the proposed project activity is 0 ($N_{diff} = N_{all}$, therefore: $N = 1 - N_{diff}/N_{all} = 1 – 1 = 0$), and $N_{all} – N_{diff} = 0$. According to common practice criteria of "Tool for the Demonstration and Assessment of Additionality (version 07.0)", the proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all} - N_{diff}$ is greater than 3. As stated in Step 4, it is identified that $F < 0.2$ and $N_{all} - N_{diff} < 3$. Therefore, validation team concluded that this project is not common practice according to all the documents reviewed and the available information. Moreover it is complied with Additionality tool (version 07.0) and Guideline on common practice (version 02.0), EB 69 Annex 8	

Appendix B
Qualification of Validation Team

CERTIFICATE OF COMPETENCE

Name: Nam Hoon KIM

Qualification:

	Validation	Verification
-Lead auditor	■	■
-Auditor	☐	☐
-Technical Expert	☐	☐
-Local Expert	☐	☐

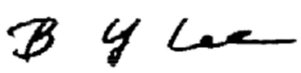
Scopes of Expertise:

Technical Area (TA)

1.2 Energy generation from renewable energy sources

Approved by qualified person for Auditors Qualification of KFQ on 28 February 2011

Sustainability Management Institute
Byung Yong LEE



CERTIFICATE OF COMPETENCE

Name: Sung Han YOON

Qualification:

	Validation	Verification
-Lead auditor	■	■
-Auditor	☐	☐
-Technical Expert	☐	☐
-Local Expert	☐	☐

Scopes of Expertise:

Technical Area (TA)

1.1 Thermal energy generation from fossil fuels and biomass including thermal electricity from solar

1.2 Energy generation from renewable energy sources

11.2 GHG capture and destruction.

13.1 Waste handling and disposal

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 6 January 2012.

Sustainability Management Institute
Nam Hoon KIM

CERTIFICATE OF COMPETENCE

Name: Jong Hwan LEE

Qualification:

	Validation	Verification
-Lead auditor	☐	☐
-Auditor	☐	☐
-Technical Expert	■	■
-Local Expert	☐	☐

Scopes of Expertise:

Technical Area (TA)

3.1 Energy demand

4.3 Iron and Steel

4.7 Cokes

9.1 Metal production

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 26 December 2011.

Sustainability Management Institute
Nam Hoon KIM

CERTIFICATE OF COMPETENCE

Name: Tae Seok JANG

Qualification:

	Validation	Verification
-Lead auditor	☐	☐
-Auditor	☐	☐
-Technical Expert	☐	☐
-Local Expert	■	■

Scopes of Expertise:

Local expert of Indonesia

Technical Area (TA)

N/A

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Local expert on 06 January 2012.

Sustainability Management Institute
Nam Hoon KIM

Appendix C
Qualification of Technical Reviewer

CERTIFICATE OF COMPETENCE

Name: Jong Mun PARK

Qualification:

	Validation	Verification
-Lead auditor	■	■
-Auditor	☐	☐
-Technical Expert	☐	☐
-Local Expert	☐	☐

Scopes of Expertise:

Technical Area (TA)

1.1 Thermal energy generation from fossil fuels and biomass including thermal electricity from solar

Approved by Qualification Committee of KFQ on 17 November 2011

Sustainability Management Institute
Nam Hoon KIM

CERTIFICATE OF COMPETENCE

Name: In Chan PARK

Qualification:

	Validation	Verification
-Lead auditor	☐	☐
-Auditor	☐	☐
-Technical Expert	■	■
-Local Expert	☐	☐

Scopes of Expertise:

Technical Area (TA)

3.1 Energy demand

4.3 Iron and Steel

4.7 Cokes

9.1 Metal production

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 11 January 2012.

Sustainability Management Institute
Nam Hoon KIM