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Response to Request for Review
'Using off gas cogeneration project in PT KPP'
(Ref. 9327)

Korean Foundation for Quality (KFQ) had performed the validation of 'Using off gas cogeneration project in PT KPP' No. 9327 located in Indonesia. The submission for registration was made on 28/12/2012.

Seven requests for review have been issued. The communication of this request for review was received on 02/07/2013.

We thank the CDM Executive Board and the Secretariat for giving us the opportunity to clarify about our considerations in validating the project mentioned.

Please find below KFQ response to the issues raised by the request for review.

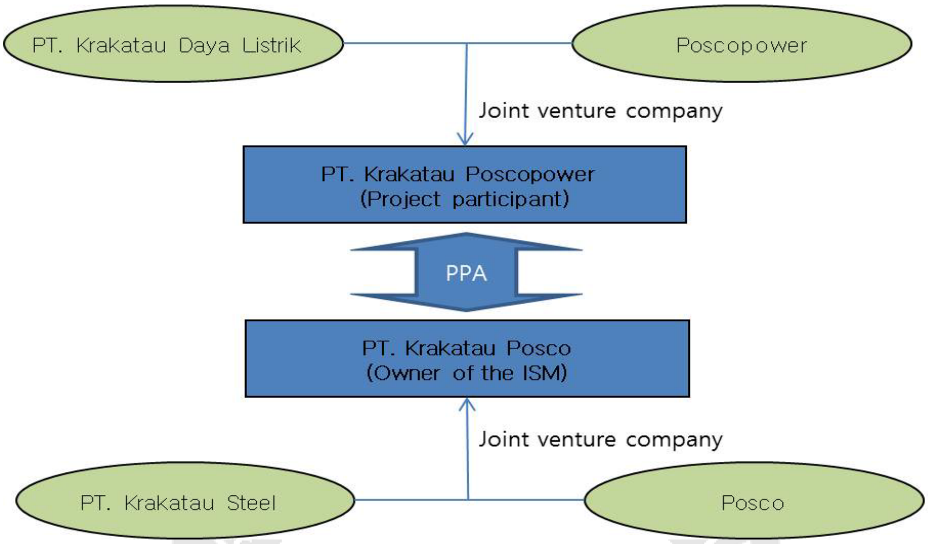
<u>Request for review :</u>

1. **The DOE shall further substantiate how it has validated the suitability of input values, in particular the waste gas tariff (6.08 cent/KWh) considering it appears to be an internal price for the waste gas between the owner of the project activity (PT. Krakatau Poscopower) and the owner of the project facility (PT. Krakatau Posco). In doing so, the DOE shall also explained how it has validated the relationship among the owner of the project activity (PT. Krakatau Poscopower), PT. Krakatau Daya Listrik, the owner of the project facility (PT. Krakatau Posco) and PT. Krakatau Steel. Please refer to EB 60, paragraph 93.**

Response by DOE:

The relationship between PT. Krakatau Poscopower (PP) and PT. Krakatau Posco (owner of the ISM) is defined as below diagram.

<Diagram 1. Relationship between PT. Krakatau Poscopower and PT. Krakatau Posco >



PT. Krakatau Poscopower (PP) was established as a joint venture company among PT. Krakatau Daya Listrik and Poscopower. And PT. Krakatau Posco (Owner of the ISM) was established as a joint venture company among PT. Krakatau Steel and Posco respectively.
In order to confirm whether the waste gas tariff is internal price or not, the validation team investigated these two companies in the view point of the legal and financial aspect.

Firstly, we checked Business license[†] and Taxer identification certificate[‡] of these two companies and found their business field is totally different such as Energy generation and supply for PT. Krakatau Poscopower and Production of iron and steel for PT. Krakatau Posco. Also, the taxer numbers of them are granted separately. Thus they are legally independent entities.

Secondly, we checked board member list of each company and found each board member is composed of different members, it means each company seeks their own profit independently. In this context, the PPA for the tariff of project activity was made between PT. Krakatau Poscopower and PT. Krakatau Posco. And the PPA was approved by the board of each party as a result of negotiation between them based on electricity sales tariff which is decided by the PLN price (National Power Company) like other project activities.

In the meanwhile, the validation team looked into the suitability of the waste gas tariff (6.08 cent/KWh). According to the PPA, the waste gas tariff was determined taking into account the revenue of this project

[†] TANDA dafta PERUSAHAAN Perseroan Terbatas, Cilegon city government

[‡] SURAT PENGUKUHAN PENGUSAHA KENA PAJAK, Ministry of Finance Republic Indonesia Directorate General of Tax

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)

<Table 1. Waste gas tariff of similar projects >

Project name	Elec. Tariff (cent/KWh) (A)	Steam Tariff (cent/KWh) (B)	Elec. Ratio (%) (C)	Steam Ratio (%) (D)	Sub-combined Tariff (ent/KWh) (E)**	Waste gas Tariff (cent/kwh) (G)	Combined Tariff (cent/KWh) (E-G)
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	4.83	7.52	82.58	17.2	5.29	2.01	3.28

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

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

Gas Power Generation Project							
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.

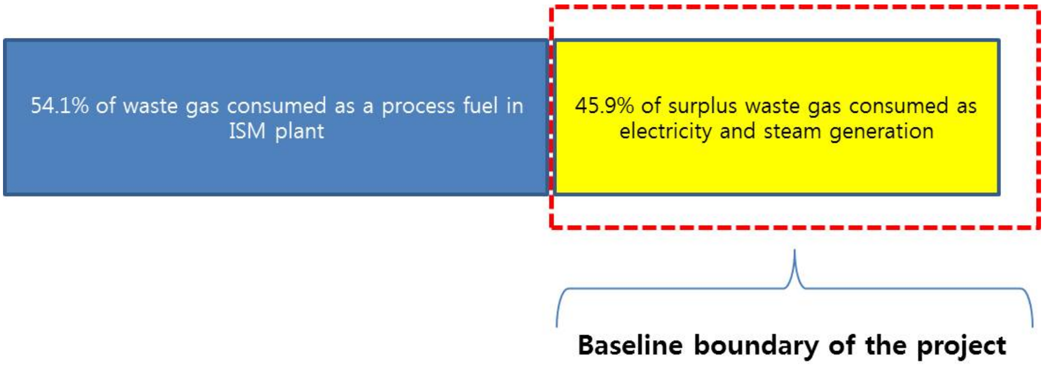
2. The DOE shall further substantiate how it has validated the extent of use of waste gas from the greenfield waste energy generation facility (project facility), given the fact that the alternative designs identified and analyzed under option 2 of Annex 1 are for the project activity rather than the project facility whereas the applied methodology requires the assessment of alternative design of the project facility. Please refer to ACM0012 version 4, Annex 1, option 2.

Response by DOE:

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 >



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 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 were 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, 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 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.

In addition, as explained below No. 5 of this report, the validation team confirmed that the practice of "reference waste energy generating facility" ($f_{practice}$) is interlinked with the boundary of waste gas use in the absence of CDM project and we confirms that the fpractice in $EG_{i,j,y}$ calculation is focusing on the boundary of waste gas use and thus fpractice for proposed project is not meaningful as a result of $EG_{i,j,y}$

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

[‡‡] 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)

calculation in No. 5 of this report's explanation. (Please refer to No. 5 of this report).

3. The DOE shall further explain how it has validated that the use of waste gas in the absence of project activity would not be reduced due to the implementation of project activity, in particular how to verify whether there is any decrease in the utilization of waste gas by other uses at the project facility given that the values for the baseline utilization of waste gas at the project facility is to be monitored instead of being determined prior to the implementation of project activity. In doing so, an energy balance shall be established for the demand and supply of energy in all the applications covered in extended project boundary, and the energy balance shall be provided in the PDD and validated by the DOE. Please refer to ACM0012 version 4, Annex 3.

Response by DOE:

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.

<Table 2. Production and consumption of waste gas of ISM complex (Energy balance) >

		Production (TON)	Unit	B.F.G		C.O.G		L.D.G	
				Specific	Production / Consumption (N㎥)	Specific	Production / Consumption (N㎥)	Specific	Production / Consumption (N㎥)
Production	Coke Oven Plant	1,790,000	N ㎥/Ton			320	572,800,000		
	Blast Furnace	3,000,000	N ㎥/Ton	1,576	4,728,000,000				
	Steel making Plant	3,156,000	N ㎥/Ton					90	284,040,000
	Sum		N ㎥/H		**539,726**		**65,388**		**32,425**
Consumption	Sintering Plant	4,128,000	N㎥/Ton		-	2.3	9,381,818		
	COKE Oven Plant	1,790,000	N㎥/Ton	631.0	1,129,490,000	35.9	64,175,568		
	Coke By-Product	1,790,000	N㎥/Ton	0.0	-	4.3	7,729,545		
	Blast Furnace	3,000,000	N㎥/Ton	418.6	1,255,680,000	27.7	83,236,364		
	Lime Calcining Plant	259,000	N㎥/Ton		-	185.5	48,032,727		

	Basic Oxygen Furnace	**3,156,000**	N㎥/Ton		-	2.0	6,455,455		
	Continuous casting Plant	**3,000,000**	N㎥/Ton		-	0.5	1,363,636		
	Plate Mill	**1,840,000**	N㎥/Ton	119.2	219,328,000	40.6	74,770,909	14.9	27,416,000
	OLC Maintenance					229	2,004,845		
	Loss		%	1.0	47,280,000	1.0	5,728,000	12.0	34,084,800
	Sum		N㎥		**2,651,778,000**		**306,313,186**		**61,500,800**
	Sum per hour		N㎥/H		**302,714**		**34,967**		**7,021**
Power Plant (Production – Consumption)			N㎥		**2,076,222,000**		**266,486,814**		**222,539,200**
	Consumption per hour		N㎥/H		**237,012**		**30,421**		**25,404**
	Calorie per hour		Kcal./H		1,777,758,733		1,333,851,824		50,808,037

Source : Feasibility Study 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[†††]. 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.

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

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) 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§§§ 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 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 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 above Table 2.

<Table 3. 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

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

§§§ 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

	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 3, 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.

4. The DOE shall further explain how it has validated the baseline scenario for the heat generation, in particular how baseline alternative H9 (A new renewable energy or other waste energy based element process to supply heat) is eliminated since it is not clear whether other waste energy recovery process (e.g. waste gas fired boilers) is a creditable alternative and how the DOE has validated the elimination of that alternative. Please refer to VVM version 1.2, paragraph 83.

Response by DOE:

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

[****] 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

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.

5. The DOE shall explain how it has validated the correctness of the formulas applied to calculate baseline emissions given that the waste gas would be partially recovered in steel plant whereas the formula applied is only applicable to the condition of no recovery of waste gas in the absence of project activity. Please refer to ACM0012 version 4, page 24 - 26.

Response by DOE:

As explained on No. 2 of this report, the boundary for baseline emission of proposed project considered only usage in surplus waste gas (45.9% of whole waste gas generated from the ISM plant) after using at iron and steel production processes for ISM process fuel (54.1%) and this ISM process fuel is definitely not for electricity or steam generation, therefore it can be assumed that the waste gas would be no recovered from the surplus waste gas point of view in the absence of CDM project.

The applied methodology ACM 0012 ver.04 page 24 – 26, section 1.2.2. "Adjustment for a Greenfield project facility" calculation parameters are defined as below.

Fj,y is defined as *"Fraction of total electricity generated by the project activity, that is supplied to recipient j in year y (%)"*. However, the proposed greenfield facility would have wasted the energy in the absence of the project activity as determined boundary for baseline emission, there is no electricity generation definitely. In addition, even though boundary for baseline emission considering as whole usage in whole waste gas from the ISM plant, the recovered waste gas at the ISM processes is used for process fuel, not electricity or steam generation.

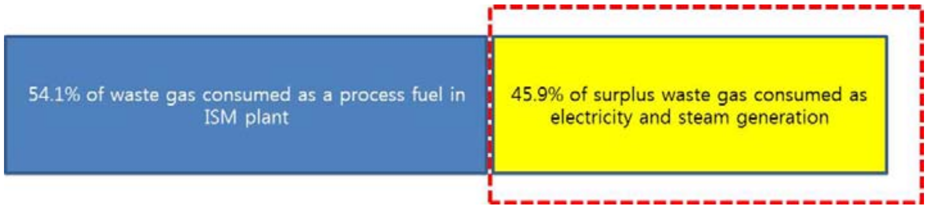
$f_{practice}$ is defined as "*the practice of "reference waste energy generating facility", to be calculated using the guidelines given in Annex 1. It represents the extent to which the "reference waste energy generating facility" would have recovered the electricity from identified WECM stream(s) in the baseline*.

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

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

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 plant



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

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.

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 $f_{practice}$, "reference waste energy generating facility" such as ISM process will use a part of waste gas, $f_{practice}$ 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 $f_{practice}$ 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.

In conclusion, the validation team concludes that the formulas in the methodology section 1.2.2 “Adjustment for a Greenfield project facility” need not to be selected for baseline emission calculation because the proposed greenfield facility would have wasted the energy in the absence of the project activity as determined boundary for baseline emission, there is no electricity generation definitely and $f_{practice}$ is not meaningful to calculating the baseline emission.

6. The DOE shall further explained how it has validated the capping parameter fcap, in particular the ex-ante parameter Qwcm,BL (quantity of waste energy generated prior to the start of the project activity). Please refer to ACM0012 version 4, page 31.

Response by DOE:

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 2) 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.

7. The DOE shall further substantiate how it has validated the appropriateness and conservativeness of the ex-ante grid emission factor (0.87393 tCO2e/MWh) given the fact that it is not clear whether the emission factor has been calculated based on the latest available data at the time of the validation. Please note that the emission factor of the project activity is based on data from 2007-2009 whereas the emission factor issued by Indonesian DNA on 27 March 2012 is based on data from 2008 to 2010 (as per other registered projects

from Indonesia). Please refer to VVM version 1.2, paragraph 91.

Response by DOE:

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

[†††††] 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.

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.