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Dear Members of the CDM Executive Board,

Request for review – 1903 "Electrotherm 30 MW combined waste heat recovery and coal based captive power plant at Kutch" Project

Please find below our responses to the issues raised as part of the request for review for this project.

1. **The DOE is requested to further explain how it has validated the barrier analysis and how the CDM would help to overcome the barriers.**

Project participant answer:

Although this question is addressed to the DoE, we would like to provide the following further clarifications:

<u>Technological and other barriers:</u>
The DOE has evaluated the following aspects related to technological and other barriers that increase the risk of the project activity: (a) impact of waste heat availability on the power generation potential of the project activity, (b) raw material (ore, coal) quality and prices on the project performance and operational levels of the underlying industry and (c) impact from lack of qualified labour to operate the project plant. (Section B.5. has been updated in version 4 of the PDD in order to clarify the approach used to evaluate technological barriers).[1]

For each barrier, the DOE checked how/if it actually affected the viability of the project and why it would not affect the baseline option “generation of electricity in an existing/new fossil fuel based captive power” (the other baseline option, import of electricity from the grid, does not face any technological barrier as it would only require purchasing more electricity from the grid).

[1] Project participants have also added a few additional supporting facts and sources (highlighted in red in the table) in response to the specific concerns raised in the request for review.

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Table 1: Technological and other barriers (attachment 14)

Type of barrier	Related to	Barrier		Fact/figure	Source	How it affects the project?	How does CDM mitigate this barrier??	Why does it not affect the option "coal used in on-site boilers"? (the other option, grid-connected electricity, is the 'do-nothing' option and therefore is not affected by any of the barriers)
Technological and economical	Waste heat availabillity	Large fluctuations in kiln operation and sponge iron production	1	Kiln utilization fluctuates between 25% and 95%	Table B5-1 and Footnote 33 Att 8.5	Waste heat availability depends directly on the varying sponge iron production which cannot be easily forecasted due to the complexity of the process and depends on factors external to the project's control. Resulting in highly uncertain revenues. There is a fundamental difference between thermal and waste heat recovery power in that the latter's profitability depends on a lot of parameters which are uncertain and beyond the control of the project activity	Increases revenue to compensate for reduced revenue during lower operation or shutdown intervals	Coal boilers output does not depend on sponge iron production, prices for iron ore and high grade coal as well as sponge iron prices. It also does not depend on iron ore availability. Coal basd power plants can maintain the same production level and export excess electricity, if any, to the grid in order to make most efficient use of the invested capital.
		Uncertainty of sponge iron prices	2	Sponge iron prices have been largely fluctuating and have come down to a relatively low level of 8,000 INR/t in 2005.	Att 8.3	Deteriorating market conditions may lower sponge iron production when raw material prices rise. Therefore fuel availabilty and project output are uncertain and exposed to market prices of sponge iron, high grade coal and iron ore. (see also barrier 4)	Carbon revenues denominated in hard currency mitigates against currency risks (e.g. in the case where iron ore and coal must be imported); improves revenue and profit margin related to the core business and enable the project developer to maintain sponge iron production even under disadvantageous maket prices of sponge iron and raw material	
		Unavailitiy or iron ore	3	According to another report published in 'Steelworld' plant shutdowns due to unavailability of iron ore already occurred in some regions in the host country. 70 sponge iron plants were shut down in Chattisgarh state in 2006 due to lack of iron ore.	Footnotes 29-30 Att 8.4	Low quality ore is not suitable for sponge iron production, hence production has to be shut down and project cannot generate power	Increases revenue to compensate for reduced revenue during shutdown due to (external) market conditions	
		High price of premium coal and iron ore	4	Sponge iron kilns need high quality coal and iron ore. This premium raw material is expensive due to fierce competition from steel and power sectors as well as due to an expaning sponge iron industry. Prices for high grade coal and iron ore are expected to constantly increase in the future.	Footnotes 20-23 Att 8.1, 8.2, 8.3, 8.4	Rising raw material prices and narrowing profit margins force the project developer to lower its sponge iron production because either premium feedstock is too expensive or the use of poor quality causes inefficiencies in the reaction in the kiln and results in lower reactivity (see barrier 6) and lower waste heat generation. Therefore fuel availabilty and project output are uncertain and may decrease	Carbon revenues denominated in hard currency mitigates against currency risks where coal or iron ore is imported; increases revenue that allow the project developer to pay higher raw material prices and maintain its profit margin and plant operation when economic conditions deteriorate	Coal boilers don't need premium coal and can easily shift to low grade fuels to overcome supply constraints and mitigate price shocks. There is abundant low grade coal available in India, esp in vincinity to the project location (Kutch coal fields). This is exacerbated by the facts that coal boilers have the flexibility to use a mix of many types of coal optimised according to market prices, while waste heat recovery boiler can use only one type of fuel whose availability is very variable.

Technological and economical	Waste heat quality	High content of fines in flue gases due to low quality ore	5	there is only low quality ore available in India. This impacts the power generation potential of the kiln	Footnote 26 Att 8.3	Low quality ore contains high content of fines which causes problems in the WHRB operation, resulting in additional cost of repair and increase downtime and hence a lower power generation.	Hard currency carbon revenues allows the developer to import higher grade iron ore and coal (ie mitigates currency risk); where lower quality raw materials are used, carbon provides compensation for lower project output due to lower kiln efficiency	Coal boilers do not face problems due to fuel quality because: - Coal quality is more steady + can be selected out of several types of coal - Coal heating value can be measured and any change can be compensated by firing a higher quantity of fuel. Power generation is much more ceratain and predictable.
		Loss of energy caused by poor quality of iron ore and coal	6	unavailability of high quality iron ore and coal requires using low quality ore containing high content of fines and low grade coal.	Footnotes 24-25 Att 8.3 , PDD page 20	This increases the presence of particulate matters in flue gases. Those particulate matters remove some energy from the flue gases. It also results in a lower reactivity of the ore with the coal in the kiln which reduces waste heat generation. Less energy is available for use by the project, hence decreasing the project output. (see also barrier 4)		
		Efficiency loss in the turbine due to changing steam conditions	7	Changing flue gas quality affects steam parameters, which in turn affect efficiency of the steam turbine	Footnote 27 Att 8.6	Lower efficiency means lower project output	Increases revenue to compensate for specific technologic disadvantages of waste heat recovery technology that impact its revenue potential	
	Low cost of baseline fuel in captive power plant		8	Captive power plant can select the cheapest fuel mix available with flexibility - and there are many cheap options in the project area, e.g: - zero-cost coal char (which makes up about 10% of on-site fuel consumption) - Kutch lignite	Footnote 32	Cheap and flexible baseline fuel decreases the relative attractiveness of the project		Coal boilers can select low cost fuel option
	High shutdown time of WHRB		9	On average, sponge iron kiln operates 289 days a year whereas coal boiler usually operates around 350days	Footnote 28 Att 8.5	High shutdown time means lower project output		Coal boiler have lower shutdown time than WHRB
Labour availability	Lack of skilled labour and experience		10	There seems to be a lack of local adequately skilled labour since the project developer hired about 50% of its staff from regions other than the State of Gujarat	Att 8.7	Coordination of parallel of waste heat recovery boiler operation and fossil fuel feeding requires specific skills due to high fluctuations of waste heat generation. Improper training and insufficient skills of the workforce will result in reduced power output and increase probability of damangeing the equipment.	Increases revenue to compensate for additional labour, trainng and o&m costs or for revenue loss due to improper handling of the technology	Coal boiler technology is well known in India and is already used by the project developer. Staff is very qualified to operate it
			11	The project developer has not operated WHR boilers previously. There is no experience available in the existing workforce of the project developer to maintain and operate a waste heat recovery based power generation system.				
	Need for training		12	provision of training by external specialists is necessary. EPC company and boiler manufacturer will provide training				
Common practice	Project is first of its kind		13	See common practice section		High risk of underperformance and/or higher costs due to lack of experience	Provides an incentive for first of its kind ventures where success is uncertain; CDM increases the visibility/PR benefits of this flagship, pioneer project.	

Barrier due to prevailing practice

In order to assess whether the 'common practice' barrier is strong enough to discourage investment in waste heat recovery power generation without availability of CDM funding, all similar industries to which similar economic conditions apply were identified in the PDD. As most suitable 'reference industries', all sponge iron plants located in the state of Gujarat ('reference region') have been chosen since (a) those plants are from the same sector as the industry in which the project activity takes place, (b) are exposed to the same regulatory framework and economic as well as market conditions as the industry in which the project activity takes place and (c) because the total number of all 'reference industries' (14 companies, 11 existing plants with 15 existing sponge iron units, 3 plants under construction) is large enough to arrive at a representative result of such an investigation. Note that all sponge iron industries of the state of Gujarat are located within the District of Kutch due to its favourite strategic location and infrastructural support for the particular industry.

After a careful investigation of publicly available information, published by credible institutions (Table 2[2] [3], a similar table has been included in section B.5. in the updated version 4 of the PDD in order to illustrate the findings of the review of different evidence and to provide a simple overview of the common practice situation), it was observed that all 14 existing sponge iron plants in Gujarat State are using electricity supplied either from the grid or by a thermal captive power plant – although 3 plants have started to also install a waste heat recovery system under CDM. Excluding those CDM-funded projects, there is no other similar activity occurring in the region and sector of the project and therefore the proposed project activity can be considered as the first of its kind in the region.

The common practice analysis supports the finding of the investigation of technological barriers, i.e. that there is a high risk perception for waste heat recovery power generation prevalent within the sponge iron industry, resulting in very few projects being developed and almost all using CDM to overcome these barriers.

[2] Note: the numbers relating to existing and planned plants differs between the Kutch Iron and Steel Association survey and the Honourable Secretary's letter due to a different classification of 'sponge iron plants' into 'units' by the survey and 'plants' in the Honourable Secretary's letter. Another difference is the time in which both statements were given. The survey is dated October 2007 and the letter is dated May 2008. Over this time, projects that were under construction in October 2007 might have become operational by May 2008.

[3] The Joint Plant Committee is the only institution in India which is officially empowered to collect data on the Indian iron and steel industry, resulting in the creation and maintenance of the only basic databank on this industry.

Table 2: Common practice (attachment 14)

		All sectors		Sponge iron sector	
India	# Plants	n/a	As a final review of the captive power sector, the DOE has undertaken another review of data published in 2005 by the Central Electricity Authority of India (CEA) about captive power plants which was not limited to the region of the state of Gujarat but looked at the whole of India (attachment 7). Though such an approach cannot really be considered as conservative as it does not restrict the investigation of captive power supply prevailing practice to installations governed by similar economic conditions, it might provide enough information in order to allow the DOE to take an opinion as to whether or not the project activity can be accepted as first of its kind in the 'reference region'. The data from the CEA indicates that only 3.8% of the total installed captive power capacity (14 plants) in India is made up by waste heat, waste gas or a mix of waste heat and fossil fuels.	147 [Att 6. Joint plant study]	As regards the sponge iron sector in India, the DOE has reviewed a report of the Joint Plant Committee, an organisation that promotes the development of the Indian steel industry (attachment 6), which surveys sponge iron plants in India in the year of 2005. The report indicates that only 10.8% (16) of all surveyed sponge iron plants in India have a power supply based on captive power generation from thermal sources or waste heat recovery. At the time of validation 21 waste heat recovery projects in the sponge iron sector were registered as CDM projects (see common practice analysis in PDD) meaning that it is unlikely that many waste heat recovery plants are developed without access to carbon finance. This study does not mention any existing captive power plants in sponge iron industries in the state of Gujarat. Among all Indian states, the one with the most similar conditions to Gujarat is the state of Chhattisgarh, which also has a high concentration of sponge iron plants due to its proximity to raw material sources. Chhattisgarh state is host to 8 of the 16 captive power plants identified by the Joint Plant Committee and to 12 of the 21 registered waste heat recovery projects in India sponge iron sector – which again suggests that CDM has been a key driver in incentivising waste heat recovery projects in the sponge iron industry, which were not happening before the CDM incentive started to materialise.
	# Plants with CPP	280 [Att 7. CEA report]		16 i.e. 10.8% inc. 8 in Chattisgarh [Att 6. Joint plant study]	
	# Plants with CPP with WHR	14 [Att 7. CEA report] 21 with CDM [UNFCCC website, PDD com ractice section]		12 with CDM in Chattisgarh [UNFCCC website, PDD com ractice section]	

		All sectors		Sponge iron sector	
Gujarat	# Plants	c.740 [Att 4. Stanford study says 163 represents 22% of all plants]	The DOE has reviewed a study of the captive power sector in the state of Gujarat published by the 'Program on Energy and Sustainable Development' of Stanford University (attachment 4). This study describes Gujarat state's favourable regulatory environment for the installation of captive power plants in the industrial sector as compared to other parts of the host country. The study identifies 163 captive power plants in Gujarat using coal, natural gas, naphta, residual crude oil, furnace oil, high speed diesel, light diesel oil and lignite as fuels. 86% of the installed capacity of those plants is based on fossil fuel sources. Waste heat is not categorised as a separate fuel but might fall within the same category as renewable sources and could make up somewhere between 0 and 10% of the installed capacity (the last category is "others", which represents 3% of captive power plants in Gujarat). This finding further substantiates the opinion that captive power generation using waste heat is not very common in the state of Gujarat. In order to cross-check this finding, the DOE has undertaken a further review of information about industrial installations within the metallurgical industry in the state of Gujarat. The Ministry of Industry of Gujarat has such information available in electronic format, in which it records applications for all new industrial installations (attachment 5). The DOE has requested this database from the Ministry of Industry of Gujarat and carried out a review of all power generation installations. It found that there is no record of any waste heat recovery power plant (except Sal Steel ltd., which is seeking CDM status) in the state of Gujarat. It has observed that the information provided by the Ministry of Industry is consistent with all other information reviewed.	**11** existing + **3** new [Att 1. Kutch study]	A survey (attachment 1) undertaken by the Kutch Iron and Steel Association in October 2007 indicates that there are 15 existing sponge iron units (in 11 existing plants) in the 'reference region' and 6 more units under construction at that time (out of which 3 are in new plants and 3 are an expansion of existing plants). Existing sponge iron plants tend to use various sources of electricity: grid, captive thermal power plants or a mix of both sources. A key reason is that the sponge iron industry requires a reliable power supply in order to operate efficiently. With regard to the 3 sponge iron plants under construction, every new plant is proposing a power supply based on grid import only. A small minority (3) of sponge iron industries in the 'reference region' have started installing waste heat recovery power plants and only one is operational yet. All waste heat recovery power plants planned or implemented have started the process of securing CDM status which further reinforces the need for these projects to secure carbon finance in order to be viable. This is confirmed by documentation publicly available on websites of CDM institutions at the time of validation (attachment 2). Those projects that were proposed as CDM projects are obviously excluded from the analysis since they would not be built without CDM financing. In Addition, the Honourable Secretary of the Kutch Iron and Steel Association, who can be considered, due to its experience, network and position, as a sponge iron industry expert provided such a statement in writing (attachment 3), which confirms the result obtained from the review of the survey provided by the 'Kutch Iron and Steel Association' as discussed above. According to the Honourable Secretary's opinion, 'Waste heat recovery power plants are not very common in sponge iron industry and (the proposed project activity) is one of the first in the region'. This statement was validated by the DOE during their common practice review. A study from the Joint Plant Commitee (attachment 6) does not mention any existing captive power plants in sponge iron industries in the state of Gujarat.
	# Plants with CPP	163 [Att 4. Stanford study]		**zero** [Att 6. Joint Plant study] or **8** [Att 1. Kutch study]	
	# Plants with CPP with WHR	**1** [Att 5. Ministry of industry] **0-10%** of 163 [Att 4. Stanford study]		**zero** [PP] **first of its kind** [Att. 3 Letter from Honourable Secretary of Kutch Iron ans Steel Association] or **4** [Att 1. Kutch study] - **all seeking CDM** [Att. 2] or **1** **(with CDM)** [Att. 5 Ministry of Industry]	

Conclusion

The DOE carried out a thorough investigation of technological barriers to waste heat recovery projects and found that there are several barriers applying to waste heat recovery projects but none of those barriers applies to the same extent to the baseline alternatives. The DOE has validated that those technological barriers result in a higher risk to waste heat recovery as compared to the potential baseline alternatives, which dis-incentivises investment in, and lowers the attractiveness of power generation from, waste heat recovery.

A further investigation of the common practice situation of power supply to sponge iron plants in the region in which the project is located was undertaken. It was found that waste heat recovery power generation is not existent in the sponge iron industry in the region and it was also demonstrated that the proposed project activity is the first of its kind (if we exclude projects developed under CDM), posing serious barriers to its implementation without carbon funding.

As well as enhancing the visibility of this flagship pioneer project in its region, CDM helps overcome the barriers faced by the project by providing an additional source of funding to compensate for the low and uncertain project output, the higher maintenance and training costs and the risk of underperformance due to the lack of experience of the plant and of the sector in general. In the absence of CDM, the plant would continue to draw power from the grid and from its coal-fired captive power plant, which corresponds both to the historical practice of the plant and to the common practice in the industry.

(Section B.5. has been updated in version 4 of the PDD in order to clarify the additional risks involved in waste heat recovery projects as compared to the grid electricity import or coal based captive power generation.)

2. **The DOE is requested to further explain how it has validated the baseline scenario for the different components of the project activity, including how the alternative scenarios were eliminated.**

Project participant answer:

Although this question is addressed to the DoE, we would like to provide the following further clarifications:

During validation, the DOE has reviewed all credible and realistic alternatives to the project activity that would provide the same output. It reviewed alternatives for (a) waste heat use and (b) power generation in the absence of the project activities. Alternatives for (c) steam/heat generation are not applicable within the project context since the project activity does not co-generate steam. It has found that the most likely scenarios would be the (a) release of waste heat into the atmosphere without any productive use and (b) import of electricity from the grid or the installation of a coal based captive power plant to meet the internal energy demands. (Table 3)

Table 3: Baseline selection (attachment 14)

Scenario	option	likely?	why ?
Use of waste heat	W1: directly release the waste heat	yes	Out of all realistic and credible baseline alternatives for the use of waste heat, the only reasonable option is the direct release of waste heat into the atmosphere without incineration or any productive use.
	W2: release waste heat after incineration	no	waste heat cannot be incinerated due to a lack of hydrogen and methane and because there are no legal requirements to incinerate waste heat
	W3: export of waste heat as energy source to a third party	no	An energy export of process steam seems also not economic since there is no suitable consumer located close to the project site. Lack of infrastructure would impose barriers to the economic use of waste heat as energy source.
	W4: use of waste heat for meeting internal thermal energy demands	no	As regards the use of waste heat for internal thermal applications, there is currently no demand within the sponge iron or the steel plant other than to feed the boilers and generate electricity, which corresponds to the project activity and is not viable in absence of CDM as demonstrated in the barriers analysis.
Power Generation	P1: project activity without access to carbon funding	no	the DOE has validated a thorough common practice and barrier test that the project activity faces prohibitive barriers due to the business as usual scenario in the sponge iron industry in the region, where no waste heat recovery power plants exist and considerable barriers due to technological characteristics of such a type of project activity that increase the risk involved in waste heat recovery and discourage investment. The DOE has therefore eliminated this alternative as potential baseline scenario.
	P2: On-site or off-site existing/new fossil fuel fired cogeneration plant	no	project activity does not co-generate steam and electricity
	P3: On-site or off-site existing/new renewable energy based cogeneration plant	no	project activity does not co-generate steam and electricity
	P4: the generation of electricity in an existing or newly built fossil fuel fired captive power plant	yes	In order to evaluate the probability of generating electricity from an existing or new captive thermal power plant as baseline alternative, the DOE has referred to its observations during the common practice analysis, in which it has found that most of the existing sponge iron plants in the region in which the project activity is located supply electricity through thermal captive power plants and import of electricity from the grid. It has further checked the current power supply arrangements for the project developer's since 2005 existing sponge iron plant. It found that the existing sponge iron and steel plant are drawing power from the grid and that the installation of a coal based thermal power plant of 30MW capacity is underway and was expected to start operation after construction delays in the 4th quarter of 2007. This plant is able to reliably supply almost the entire electricity needs of the sponge iron and steel plant. A small portion of electricity will continue to be imported from the grid in cases of higher operational levels of the factory. The DOE has validated the actual electricity supply situation since 2005 for the existing plant through an on-site inspection during validation. Continuing to use the current supply arrangements and continuing to implement the coal based thermal power plant would represent the business as usual scenario for power supply in the sponge iron industry in the region where the project is located as well as in the host country. Since grid electricity and coal have considerable competitive advantages over waste heat recovery, especially with regard to lack of common practice and technological barriers, the DOE has found that generating electricity in an existing or new fossil fuel based power plant would be a potential baseline alternative to the project developer. In order to understand which fossil fuel would be used, the DOE investigated the economics of several fossil fuel technologies (attachment 4, 9), as summarised in the table on page 16 of the PDD. As per this information it appears that coal or lignite are indeed the most economic alternative fuels due to moderate investment cost and very low fuel cost. According the study of the captive power sector in the state of Gujarat published by the 'Program on Energy and Sustainable Development' of Stanford University (attachment 4), industries in the State of Gujarat are installing captive power plants based on coal, gas or naphta as fuel. Though natural gas has only slightly higher fuel cost, coal or lignite are found the most likely fuel options for a thermal captive power plant due to its vicinity to coal and lignite fields and since the project developer is using coal anyway for its sponge iron plant. Aggregate demand power from higher coal order volumes results in scale economics to the project developer, further improving the attractiveness of a coal based captive power plant over other fuel options. The DOE has finally accepted the most likely fossil fuel to be coal or lignite and validated that a coal based captive power plant is one potential baseline alternative to the project activity.

Power Generation	P5: the generation of electricity in an existing or newly built renewable energy captive power plant	no	Another baseline alternative is the generation of electricity from renewable sources. For an evaluation of the likelihood of generation electricity in an existing or new renewable energy power plant, the DOE has reviewed the economics of several renewable energy technologies as provided by project participants in the table on page 16 of the PDD based on information available from the Ministry of Non-conventional Energy Sources, the United Nations Development Programme and the International Energy Agency (attachment 10). During this investigation, the DOE has found that renewable energy sources are not as attractive to investors as thermal sources due to high initial investment and high operational cost of renewable energy technologies. Apart from that, hydro and biomass sources are not available in the region, since Kutch district lies within a very arid region without much agriculture industry, making it too expensive to source such fuels. Wind faces the same resource risk than waste heat recovery as it is unpredictable and generation cannot be accurately forecasted. The DOE concluded that a renewable power plant is economically not attractive and faces too many risks and disadvantages to attract investment, and therefore eliminated scenario P5 from the plausible alternatives.
	P6: the generation of electricity in the grid	yes	In order to evaluate the probability of generating electricity in grid connected power plants and importing it to the sponge iron and steel plant as baseline alternative, the DOE has referred to its observations during the common practice analysis, in which it has found that most of the existing sponge iron plants in the region in which the project activity is located supply electricity through thermal captive power plants and import of electricity from the grid. It has further checked the current power supply arrangements for the project developer's existing sponge iron plant (Attachment 15). It found that the existing sponge iron and steel plant are drawing power from the grid and that the installation of a coal based thermal power plant of 30MW capacity is underway and was expected to start operation after construction delays in the 4th quarter of 2007 . A small portion of electricity, the excess demand after completion of the 30MW thermal power plant will continue to be imported from the grid in cases of higher operational levels of the factory. The DOE has validated the actual electricity supply situation since 2005 for the existing plant through an on-site inspection during validation. It has observed that grid electricity import of the total power demand is actually happening at the sponge iron and steel plant of the project developer. Since this scenario represents the historical power supply scenario in the project plant as well as in all other existing sponge iron plants (attachment 1, 3) in the region, it does not require any investment and the DOE has therefore validated that this alternative a potential baseline alternative to the proposed project activity.
	P7: the generation of electricity in a captive waste heat recovery power plant of lower efficiency than the proposed project activity	no	As a last baseline option, the DOE has investigated the probability of generation of electricity from waste heat recovery with a lower efficiency than the proposed project activity. It has found that the same barriers would apply to this alternative as to the proposed project activity. An alternative of lower efficiency would even be less attractive to the project developer than the proposed project activity since the waste heat recovery boilers would have a lower output (the amount of waste heat available being fixed by the amount of iron ore produced) and so lower revenues, while the investment cost of an inefficient system would not be very different from that of an efficient system. The DOE has therefore eliminated this option on the same grounds as it has eliminated the proposed project activity from the list of potential baseline alternatives.

Conclusion

The discussion above demonstrates that the only remaining credible and realistic baseline alternatives (potential baseline alternatives) are (a) the continuation of release of waste heat into the atmosphere without incineration and (b) the generation of electricity in power plants connected to the grid or the generation of electricity in a thermal power plant using coal. This result is in accordance with the observed actual power supply arrangement on site as well as the observed actual energy supply practice within the industry and region. All other alternatives have been eliminated based on economic, technological or common practice barriers after careful investigation of credible and relevant information. The DOE has therefore validated that the most likely potential baseline scenario for the use of waste heat is the continuation of releasing waste heat into the atmosphere without incineration and the generation of electricity in power plants connected to the grid, or the generation of electricity in a thermal power plant using coal. To be conservative (lower emission factor of grid electricity as compared to coal; attachment 12, 13), and as the plant has been importing power from the grid in the past, the import of electricity from the grid (continuation of current practice, (attachment 15) was selected as the most reasonable baseline scenario.

3. **Further clarification is required on how the DOE has validated the emission factor calculation. A spreadsheet needs to be provided for all calculations related to the baseline analysis.**

Project participant answer:

Although this question is addressed to the DoE, we would like to provide the following further clarifications:

The grid emission factor used was the one published by the Central Electricity Authority (CEA) (attachment 12) for the project region. This emission factor is calculated according to ACM0002, version 7 and is widely used for other CDM project activities in the host country. The DOE validated an applicable emission factor for electricity generated in the western regional electricity grid in 2006/07 of 0.79 tCO2/MWh.[4]

Please note that in order to validate expected emission reductions from the proposed project activity as stated in the PDD, the DOE has reviewed an emission reduction spreadsheet provided by the project developer (attachment 13) that follows the applied methodology ACM0012, version 01. It was found that all calculations are correct and the estimated volume of emission reductions likely to be achieved by the project activity.

(Section B.4 and B. 6.2. have been updated in version 4 of the PDD in order to demonstrate conservativeness of the baseline emission factor.)

[4] It was evidenced that the selected baseline is conservative as compared to a coal based captive power plant with an emission factor of about 1 tCO2/MWh (attachment 13) (assuming a fuel emission factor of 25.8 tC/TJ and a plant efficiency of 33%)

We hope that the information provided adequately addresses the concerns raised.

Yours sincerely

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Annexes:

Attachment 1: Kutch Iron & Steel Association survey: 'Sponge iron plants in Kutch District'

Attachment 2: published CDM documentation related to 3 waste heat recovery power plants implemented as CDM projects in sponge iron plants in the state of Gujarat

Attachment 3: Letter from Mr. Dhote, Honourable Secretary of Kutch Iron & Steel Association: Status of waste heat recovery power plants in the sponge iron sector

Attachment 4: Stanford University study: 'Captive Power Plants: A case study of Gujarat'

Attachment 5: Ministry of Industry, Gujarat; Database of industrial installations

Attachment 6: Joint Plant Committee study: 'Survey on the Indian sponge iron industry'

Attachment 7: Central Electricity Authority report: 'Details of captive power plants and status of supply of surplus power to the grid'

Attachment 8.1: Steelworld report: 'Coal – the most critical raw material for sponge iron making'

Attachment 8.2: Ministry of coal India report: 'The expert committee on Road Map for Coal Sector Reforms'

Attachment 8.3: Steelworld report: 'Sponge iron industry – an overview of problems and solutions'

Attachment 8.4: Steelworld report: 'Ban on ore exports gaining momentum'

Attachment 8.5: Project developer plant records: 'Sponge iron kiln I production data – September 06 – August 07'

Attachment 8.6: Patel M.R., Navin Nath: 'Improve Steam Turbine Efficiency'

Attachment 8.7: Project developer records: 'Power plant staff list'

Attachment 9: International Energy Agency: 'Gas fired power generation in India – Challenges and opportunities'

Attachment 10.1: Ministry of Non-conventional energy sources India: 'Wind energy'

Attachment 10.2: UNDP report: 'Removal of Barriers to Biomass Power Generation in India'

Attachment 11: Ministry of Power India: 'Annual Report 2006'

Attachment 12: Central Electricity Authority: 'CO2 Emission Database – version 3.0'

Attachment 13: Project participant: 'Baseline emission calculation'