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Att: CDM Executive Board

Your ref.:	Our ref.:	Date:
CDM Ref 3020	MLEH/KCHA	3 May 2010

Response to request for review
"GHG Emission Reductions through grid connected high efficiency power generation"

Dear Members of the CDM Executive Board,

We refer to the requests for review raised by three Board members concerning DNV's request for registration of project activity 3020 "GHG Emission Reductions through grid connected high efficiency power generation", and we would like to provide the following initial response to the issues raised by the requests for review.

Comment 1:

The DOE should validate the suitability of the 14% benchmark for the project activity and provide the source/reference used.

DNV response:

The project proponent has considered a benchmark of 14%, which is the Central Electricity Regulatory Commission (CERC), Government of India approved Return on Equity (RoE) for thermal power projects in India. As per the "Tool for the demonstration and assessment of additionality", version 05.2, page 6, point 6e, "Discount rates and benchmarks shall be derived from Government/official approved benchmark where such benchmarks are used for investment decisions." The 14% RoE (post tax) is the CERC approved guaranteed return on equity under cost plus regime which the project proponent would have secured in the baseline scenario.

The reference of the 14% RoE is available at http://cercind.gov.in/21012004/tandctariff.pdf page 122 (Annex-I) and

http://www.cercind.gov.in/28122004/CERC%20new%20terms%20&%20conditions%20of%20tariff%20_2004-09_.pdf, page 2 (Annex-II).

Further as per the "Guidance on the Assessment of Investment Analysis", *"Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented"*. Also the guidance mentions that *"benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities"*. The benchmark selected by the project proponent has been used for power sector projects in India whereby the power companies are eligible to get a ROE of 14%. As mentioned above this benchmark has been provided by the relevant national authority. Further, as explained in the validation report, clause 4.4.3.2 this benchmark is conservative as compared to the local lending rates increased by a suitable risk premium which comes to 16.5 %.

Comment 2:

The DOE should clarify how it has considered the tariff applied as appropriate to assess the additionality, in the context of the tariff policy document issued by the Minister of Power, where it is mentioned CDM benefits would be available to the bidders.

DNV response:

The tariff policy document issued by Ministry of Power mentions that the supercritical technology based projects may be eligible for CDM benefits and the bidder may apply for it which could incentivize the bidder (Annex-III). This is more due to the fact that the supercritical technology, being totally new in India, few bidders would have been interested to go for it. CDM would have provided a cushion against the risks/barriers of this technology to the project developers. However, it was left to the discretion of the bidder whether they should consider CDM revenue in the project financials/tariff computation. The levelized tariff of INR 2.26/kWh was arrived at without considering CDM benefits (evident from Appendix 2_CGPL Financial model sheet and the levelized tariff computation sheet). The RoE for a levelized tariff of INR 2.26/kWh was 10.20% which was below the benchmark figure of 14%. However on consideration of CDM benefit, the RoE crosses the 14% benchmark figure and stands at 15.59%.

Comment 3:

The DOE should further substantiate the validation of the sensitivity analysis, as: (a) the results could not be directly replicated with the spreadsheet submitted; (b) why the tariff was not considered.

DNV response:

The results of the sensitivity analysis results may be directly replicated from the spreadsheet "Appendix 2_CGPL Financial model". For example to check the sensitivity of RoE with project cost (without CDM revenue consideration): In the input sheet, in cell D169, the percentage change in project cost is to be added. Let it be –x%. In the same sheet, the figure from cell F33 is to be copied to cell D33 and the figure from cell F57 is to be copied to cell D57 (to avoid circular reference). In the financials sheet, the number from I43 is to be copied into cell I46. The equity IRR is shown in cell C56. Now to get the RoE figure, go to cell C68. By trial and error and by putting different values of RoE, the figures in cell C73 and C56 are equal. This figure in cell C68 is the RoE.

Similarly to check the sensitivity of RoE with coal price, in the input sheet, in cell D75, the percentage change in coal cost is to be added. Let it be –x%. In the same sheet, the figure from cell F33 is to be copied to cell D33 and the figure from cell F57 is to be copied to cell D57 (to avoid circular reference). In the financials sheet, the number from I43 is to be copied into cell I46. The Equity IRR is shown in cell C56. Now to get the RoE figure, go to cell C68. By trial and error and by putting different values of RoE, the figures in cell C73 and C56 are equal. This figure in cell C68 is the RoE.

Similarly to check the sensitivity of RoE with PLF, in the input sheet, in cell H112, the percentage change in PLF is to be added. Let it be x%. In the same sheet, the figure from cell F33 is to be copied to cell D33 and the figure from cell F57 is to be copied to cell D57 (to avoid circular reference). In the financials sheet, the number from I43 is to be copied into cell I46. The Equity IRR is shown in cell C56. Now to get the RoE figure, go to cell C68. By trial and error and by putting different values of RoE, the figures in cell C73 and C56 are equal. This figure in cell C68 is the RoE.

Similarly to check the sensitivity of RoE with O&M costs, in the input sheet, in cell D121, the percentage change in O&M costs is to be added. Let it be –x%. In the same sheet, the figure from cell F33 is to be copied to cell D33 and the figure from cell F57 is to be copied to cell D57 (to avoid circular reference).In the financials sheet, the number from I43 is to be copied into cell I46. The Equity IRR is shown in cell

C56. Now to get the RoE figure, go to cell C68. By trial and error and by putting different values of RoE, the figures in cell C73 and C56 are equal. This figure in cell C68 is the RoE.

It must be noted that the tariff is not constant over the project period. INR 2.26/kWh is the levelised tariff calculated over the project period. The tariff comprises of an escalable part and a non-escalable part. This is also evident from the PPA. The non-escalable part is fixed for complete PPA period. Hence, there is no question of sensitivity. For the escalable portion, the escalation rate used was as per the escalation index provided by CERC (CERC notification dated 22.11.06 available at http://cercind.gov.in/22112006/Revised%20indices%20notification%2022.11.2006.pdf) and this was applicable to all bidders. Thus, the sensitivity analysis has not considered the tariff since the assumed tariff had already incorporated allowable escalation rates as provided by the CERC. Also it should be further noted that the levelised tariff was already finalized by the PP during the time of submitting the bid. Considering the escalable and non-escalable components of the PPA over 25 years, the levelized tariff has been found to be INR 2.26/kWh and hence the RoE sensitivity is not done with respect to the tariff.

Comment 4:

The DOE should explain how it has validated the barriers in line with VVM paragraphs 114 (a), 115 and 116 (a).

DNV response:

The referred paragraphs of the VVM state the following:

114. Issues that have a clear direct impact on the financial returns of the project activity cannot be considered barriers and shall be assessed by investment analysis. This does not refer to either

(a) Risk related barriers, for example risk of technical failure, that could have negative effects on financial performance, or

(b) Barriers related to the unavailability of sources of finance for the project activity.

In line with the above, barriers due to prevailing practice, technological barrier and investment barrier has been discussed. It is our opinion that none of the three barriers have any clear direct impact on the financial returns of the project activity and is hence considered as barriers. Only the technological barrier could have had some indirect impact on the financial returns of the project. However paragraph 114 (a) mentions that the guidance is not applicable to *"Risk related barriers, for example risk of technical failure, that could have negative effects on financial performance"*

Thus the selected barriers are valid and hence assessed separately from the investment analysis.

Paragraph 115 and 116 (a) states the following:

115. The DOE shall apply a two-step process to assessing the barrier analysis performed, as follows:

(a) Determine whether the barriers are real. The DOE shall assess the available evidence and/or undertake interviews with relevant individuals (including members of industry associations, government officials or local experts if necessary) to determine whether the barriers listed in the PDD exist. The DOE shall ensure that existence of barriers is substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics. If existence of a barrier is substantiated only by the opinions of the project participants, the DOE shall not consider this barrier to be adequately substantiated. If the DOE considers, on the basis of its sectoral or local

expertise, that a barrier is not real or is not supported by sufficient evidence, it shall raise a CAR to have reference to this barrier removed from the project documentation;

(b) Determine whether the barriers prevent the implementation of the project activity but not the implementation of at least one of the possible alternatives. Since not all barriers present an insurmountable hurdle to a project activity being implemented, the DOE shall apply its local and sectoral expertise to judge whether a barrier or set of barriers would prevent the implementation of the proposed CDM project activity and would not equally prevent implementation of at least one of the possible alternatives, in particular the identified baseline scenario.

(iii) Reporting requirements

116. 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;

In line with paragraph 115 above DNV has assessed the evidence available from independent sources (e.g., CERC, CRISIL, CEA, ADB, IFC, Mott Macdonald etc.) to confirm the existence of the mentioned barriers. In the course of the validation, based on the documents referred above as well as in the validation report previously, DNV considers that each of the barriers mentioned in the PDD are found to be of prohibitive nature and could prevent the implementation of the proposed project activity. The same is substantiated by different independent sources of data as mentioned below.

That there is a lack of trained manpower for the project operation in India is evident from the fact that even though almost 68% of total electricity generation capacity in India is coal based, yet there is not a single supercritical power plant in operation. Each of the technological risks like higher thermal shock/stress tube failure etc. as mentioned in the PDD are also found to be identified through different international surveys such as SWIS Power Procurement – Comparative Supercritical Study by Western Power and Mott McDonald Report on UMPP risk analysis.

Financing related problems are evident from the fact that the project technology was the first one in the country and it is expected that obtaining debt for the same would be difficult or a very high interest rate would be charged. Till date entire investment in thermal power sector by all types of investors (both Indian and overseas investors) has been in the subcritical units. The fact that there is no operating supercritical unit in India can be checked from any website of Government of India like CEA (http://www.cea.nic.in/planning/Conclave%2018-19%20Aug%2009/3_session_2A_Thermal%20Main%20Plnt_Suresh%20Chandra.pdf), CERC (http://cercind.gov.in/) or Ministry of Power (http://www.powermin.nic.in/whats_new/pdf/CEA.pdf).

Further, it must be noted that the main financers, International Finance Corporation (IFC) and the Asian Development Bank (ADB), have considered the impact of carbon credit as part of their financial due diligence for the loan to CGPL. Both parties have considered revenues from CDM as integral part of the project's cash flow (Annex-IV) before sanctioning the loan for the project and also considers that "….*the revenue from the sale of CERs will form an important part of the Project's cash flow which would be utilized for servicing its debt*". Thus it is evident that the financing of the project was heavily dependent on the revenues from CDM.

Also as already mentioned in the validation report, it is noteworthy to mention that the Indian EPC contractors are familiar with engineering, procurement and construction (EPC) services primarily for the sub-critical units in the scale of 300MW, 400MW, 500MW etc. but not with 800 MW units (Reference: CRISIL-Power Generation: Equipment Availability-A Critical Focus Area and CRISIL, April 2007, Opinion, Page 16). Hence, as Indian EPC contractors were unfamiliar with 800 MW supercritical units, the project proponent had to go for EPC contract through package route, the project activity is exposed to

a risk on the integration issues of various packages. Also delay made by one party could lead to a potential risk of delaying the entire project. Contrasted to a typical single party EPC contract, in package philosophy the liability of the contractor (in the form of liquidated damage paid to the project developer) on account of delay is low but the project developer is exposed to high risks of non-completion even if a single contractor, who is supposed to deliver one of the critical jobs, defaults. For the proposed project activity, a delay in implementation and supply of power would lead to high penalty. As per the PPA, there is a penalty of INR 10000 per day per MW (PPA clause no. 4.6) for late implementation and supply of power.

Thus all the barriers mentioned in the PDD and assessed through the validation report were assessed to be real barriers in implementing the project through independent sources. This is inline with paragraph 115 (a)

As per paragraph 115 (b), none of the barriers prevent the implementation of the baseline alternative of a coal-based sub-critical plant. There is no dearth of experience in India for operation or design and engineering of a sub-critical power plant. There are no technological risks in the operation of the sub-critical plants as the technology is well established in India. Also since there are no major risks involved in the baseline technology the availability of finance is also not an issue for sub-critical plants. Hence the identified barriers do not prevent the implementation of the baseline alternative.

We would also like to note that some of the barriers mentioned in the initial PDD could not be established from independent sources and hence as per the guidance provided by the VVM, DNV has ensured the removal of these barriers from the PDD

In line with paragraph 116 (a), the assessment and validation of each of the barriers and the documents reviewed to asses the same has already been detailed in the validation report. Thus we consider that the provisions of the paragraphs 114, 115 and 116 (a) of the VVM has been adequately addressed in the validation report.

Comment 5:

The DOE should further substantiate the common practice analysis as in other sections of the VR it is mentioned that there might exist other supercritical power plants which are not CDM projects.

DNV response:

All supercritical projects in India are coming up with the consideration of CDM. The list of such power plants is tabulated below.

Name of project	Configuration	CDM consideration & proof
NTPC Sipat		Yes (New methodology proposed NM0217) http://cdm.unfccc.int/methodologies/PAmethodologies/publicview.html?meth_ref=NM0217
Adani Power Limited	2X660 MW	Yes Registered with UNFCCC (ref. no. 2716)
Adani Power Maharashtra	2X660 MW	Yes. Project currently under CDM validation.

Limited		http://cdm.unfccc.int/UserManagement/FileStorage/9EZJUKHBC1NPXY872FS6MTR4LOWG53
Adani Power Rajasthan Limited	2X660 MW	Yes PP has engaged consultant for acquiring CDM benefits.
Adani Power Dahej Limited	4X660 MW	Yes. PP has engaged consultant for acquiring CDM benefits.
Adani Power Maharashtra Limited	3X660 MW	Yes (Under validation) http://cdm.unfccc.int/Projects/Validation/DB/ZY3Q22OL7GTRMSYHQ61OVQJQ1DIY36/view.html
Adani Power Ltd	3X660 MW	Yes (Under validation) http://cdm.unfccc.int/Projects/Validation/DB/HPNQ8XG7LERF11EI9CG7M3Z07VJWJD/view.html
Sasan Power Limited	6X660 MW	Yes (Under validation) http://cdm.unfccc.int/Projects/Validation/DB/JB9AVH5IAWF0MDFULY3P4678XR05JN/view.html
Krishnapatnam UMPP	6X660 MW	Yes http://www.indiainfoline.com/Markets/Company/Fundamentals/Management-Discussions/Reliance-Power-Ltd/532939
Tilaiya UMPP	6X660 MW	Not yet known. The UMPP has been bagged by the same PP of Sasan & Krishnapatnam UMPP.
NCC Power Project Limited	4x660 MW	Yes Validated from engagement letter with consultant
APGENCO	2x800 MW	Yes Validated from engagement letter with consultant
Electrosteel Thermal Limited	2X660 MW	Yes Validated from the engagement letter with consultant
Vedanta Aluminium Limited	3x660 MW	Yes Engagement letter with consultant
Sterlite Energy Limited	3x660 MW	Yes Engagement letter with consultant
IFFCO Chhattisgarh Power Limited	2x660 MW	Yes Engagement letter with consultant
Sophia Power Company	2X660 MW	Yes (Under validation) http://cdm.unfccc.int/Projects/Validation/DB/IA8VQAT2JPKZD0S

Limited		A8FGE1W5FSSKAC7/view.html
Jas Infrastructure Capital Private Limited	4X660 MW	Yes Engagement letter with consultant
Jawahar Lal Darda Yavatmal Energy Limited	4X660 MW	Yes Validated from the engagement letter with consultant
CLP Power India Private Limited (Jhajjar Power Ltd)	2X660 MW	Yes (Under validation) http://cdm.unfccc.int/Projects/Validation/DB/3IKF29S0E5VI6ELUC27KHIPNG4MSSH/view.html

We do not have information on the Tilaiya UMPP which is being developed by the same PP of Sasan and Krishnapatnam UMPP and is hence expected to go through the CDM route only. It should be further noted that the present project activity was the first supercritical project under UMPP to have initiated implementation of the project activity.

Comment 6:

The DOE should further substantiate how it has considered the arguments for the exclusion of natural gas and liquid fossil fuels among the baseline alternatives as appropriate, in particular, (a) whether the higher cost of liquid fossil fuel) and uncertainties in natural gas prices could not be incorporated in the levelized cost analysis, in line with the requirements from Step 2, p.3 in the methodology; and (b) the unavailability of natural gas given that there are natural gas-based CDM project activities in the same region (applying AM0029; power generation with natural gas) which have established a surplus in natural gas supply.

DNV response:

It is most unrealistic in India to conceive a power plant using liquid fuels like diesel/FO/Naphtha. The highest capacity of power plant run on diesel is 128 MW, naphtha is 240 MW whereas oil is 105.7 MW (http://www.cea.nic.in/planning/c%20and%20e/government%20of%20india%20website.htm). Due to limited supply of these liquid fuels, it is highly improbable that a 4000 MW power plant can run on diesel/naphtha/oil. Moreover, all these plants run as peak load stations and hence are not plausible alternatives to the proposed project activity which will be operated as a base load station. This is in accordance with the methodology which requires that the alternatives to the project *"…should deliver similar services (e.g. peak vs. base load power)"*

Plant Load Factor for Diesel based Power Plants in India[1]

[1] http://www.cea.nic.in/power_sec_reports/general_review/0405/ch2.pdf, http://www.cea.nic.in/power_sec_reports/executive_summary/2006_03/6.pdf, http://www.cea.nic.in/power_sec_reports/Executive_Summary/2007_03/6.pdf, http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_07_03.pdf, http://www.cea.nic.in/power_sec_reports/general_review/0405/ch3.pdf

	Unit	2006-07	2005-06	2004-05
Generation	GWh	2488.77	1989.68	2559.62
Installed capacity	MW	1201.75	1201.75	1201.75
Load Factor	%	23.64%	18.90%	24.31%

Since the liquid fuel fired power plants do not provide similar services as the project activity, hence they have been excluded. As per methodology ACM0013, version 2.1, Step 2, page 3, "Calculate the suitable financial indicator for all alternatives remaining after Step 1". Since liquid fuels (like diesel, FO, naphtha) are excluded in step 1, hence the levelized cost analysis is not done for these power plants.

With reference to gas based registered CDM projects in the region, the maximum gas based capacity as evident from the UNFCCC web-site is 1147.5 MW (project reference no.1116). The following table has been extracted from the registered PDD of project 116:

Table 3:

Sr.No.	Alternative	Levelised Cost (Rs/kWh)[21]
A	Project activity not implemented as a CDM project, i.e. 1147.5 MW gas based combined cycle power plant with advance class gas turbine.	>Rs.3
B	Power Generation using natural gas but technology other than the project activity (i.e. 1050 MW gas based CCPP)	>Rs.3
C	Power generation technologies using energy sources other than Natural gas.	
1.	**1000MW coal fired pit head based power plant using conventional technology**	**1.94**
2.	1015 MW coal (imported) fired port based power plant using conventional technology.	2.60
3.	1320 MW coal fired pit based power plant using super critical boiler technology.	2.11
4.	1320 MW coal (imported) fired port based power plant using super critical boiler technology.	2.68
5.	Cluster of 20 diesel fired power plants of 50 MW.	More than Rs. 7**
6.	1000 MW Lignite fired power generation plant	2.14

** as the cost per unit of power is very high in diesel fired power plants, no sensitivity analysis has been carried out for such power plant.

Thus, it can be seen that coal fired pit head based power plant using conventional i.e. sub-critical technology is economically the most attractive baseline scenario.

The above table clearly establishes that the cost of natural gas based power generation is even higher than the project activity and also that coal-fired power plant using conventional, i.e. sub-critical technology, is economically the most attractive baseline scenario. The above table also establishes the meteorically higher price of oil based electricity generation.

According to Planning Commission, Ministry of Power, Govt of India, "Although gas is relatively a clean fuel, at present there is uncertainty about the availability, period of availability and price of gas. Only 2,114 MW gas based capacity has been planned for 11th 5 Year Plan of India where gas supply has

already been tied up."(Ref: Report of Working Group on Power for 11th Plan, Demand for Power and Generation Planning, Ministry of Power, Govt. of India).

According to the report of Working Group on Petroleum and Natural Gas for XIth Plan (2007-12), [Ref: Planning Commission, Govt. of India] there is a natural gas demand–supply gap (shortfall in supply) to the extent of 67.98 MMSCMD in 2007-08 which may fall to 42.81 MMSCMD in 2008 – 09. According to the same projections, from this level, the gap would increase steadily to 91.13 MMSCMD by 2011-12. At present in India, only the industries in power and fertilizer sector and small-scale users deserve the supply of Government regulated natural gas under Administered Price Mechanism (APM). According to a policy document (L-12015/5/04-GP (i) of Ministry of Petroleum and Natural Gas the power and fertilizer sector and some other specific units will receive NG supply against their existing allocation. Also, in case of reduction in availability of this gas in future, the supplies to APM consumer would be reduced on a pro-rate basis. The project proponent – CGPL does not have any existing allocation of NG. Tata Power Company Limited has an existing allocation of 1 MMSCMD which is not even sufficient to run their existing 128 MW gas based capacity. Furthermore, considering the declining volume of APM gas supply in future (Ref: Crisil Research Natural Gas Update – November 2007) it is highly unlikely that the 4000 MW or nearing power generation capacity would come up based on APM gas supply.

Two important policy guidelines for natural gas utilization are the Integrated Energy Policy (2005) and Gas Utilization Policy (2008). The Integrated Energy Policy (2005) of India projects the gas supply deficit in India and highlights the fact that no new gas based power generation capacity can be installed under such gas deficit situation.

According to the gas utilization policy released by Ministry of Petroleum & Natural Gas, the following would be the order of priority for allocation of future natural gas produced:

Allocated Priority for first 40 MMSCMD KG D6 Gas

1. Existing Gas based Urea plants- Full utilization

2. Max. 3 MMSCMD for existing LPG plants

3. Up to 18 MMSCMD Gas/Lqd. Based Power plants (incl. plants to be commissioned in 2008-09)

4. Max. 5 MMSCMD for CNG&PNG

5. Any additional gas available- Existing Power Plants

Additional demand of fertilizer plants beyond 2008-09 would be given highest priority at that stage and will be met from gas production in subsequent years. This policy would impede the implementation of any new gas based power generation project in the country till the gas supply deficit is met. Therefore, the feasibility of natural gas utilization as fuel for power generation (to the tune of 4000 MW) seems to be rather weak and the feasibility would depend upon the priority sector categorization, gas availability and affordability and associated infrastructure.

The unavailability of natural gas in India is evident from a number of different sources:

CITY GAS DISTRIBUTION BUSINESS: CREDIT IMPLICATIONS OF RECENT REGULATIONS- ICRA, Page 7, the section discusses the unavailability of gas for City gas Distributors. As per the Gas Utilization Policy, Govt of India, greenfield power plants are below CGD in the priority list. So if gas is unavailable for CGD then it will not be available for Greenfield power plants.

The CRISIL Research document (Opinion 2009) also talks of the demand supply gap of NG. Page 17 of the document clearly states that "Despite power being the largest consumer of natural gas, the share of natural gas-based power capacity is likely to decrease from the current 9.1 per cent in 2008-09 (total

power generation capacity 147,965 MW) to 8.8 per cent in 2013-14 (total power generation capacity projected at 207,131 MW), as we expect lower additions in power plants using natural gas as fuel. With greenfield power plants getting last priority in the gas utilisation policy, CRISIL Research does not expect many players to set up gas-based power plants, while coal-based power plants would receive a fillip."

The problem due to shortage of gas is also evident from the annual reports of CEA which depicts a loss of production due to shortage of gas. The following is an extract from the CEA annual report of 2007-08:

10.6 LOSS OF GENERATION DUE TO SHORTAGE OF GAS:

The generating capacity of gas turbine power stations is not fully utilized due to inadequate supply of gas. The shortfall in supply of gas is made up by utilizing Naptha & RLNG to the extent possible. Loss of generation from gas turbine power stations corresponding to 90% PLF from year 2003-04 onwards has been assessed as under:

Year	Loss of Generation due to gas shortage in BU
03-04	21.69
04-05	23.71
05-06	23.88
06-07	26.33
07-08	31.17

Moreover the allocation of KG Basin gas has been decided by the Ministry of Petroleum & Gas, Govt of India and the highest capacity power plant to which gas has been allocated is only 1128 MW.

From the above discussion, DNV could conclude that because of (i) availability deficit of natural gas for a power generation project of such a scale as the project activity and (ii) higher cost of power generation, natural gas based power generation is not a plausible baseline alternative as compared to coal based sub-critical power plant which is the eventual baseline scenario for the project. We would also like to note that registered CDM projects are supposed to be outside of the purview of plausible baseline alternatives since it is already established that these projects are deterred by one reason or other.

Comment 7:

The DOE should explain how it has assessed that the alternatives "500 MW subcritical technology" and "800 MW supercritical technology" provide comparable outputs. In addition, the DOE should confirm: a) the levelized cost generation and the sensitivity analysis (as the results from this analysis could not be replicated); b) the PLF of 85% and the auxiliary consumption of 7.5% which were assumed for both technologies (sub/supercritical); and c) the fuel cost and GCV for the imported coal.

DNV response:

The assessment has been carried out under the provision of the applied methodology ACM0013 version 2.1. The methodology defines power plants as *"A power plant is a facility for the generation of electric power from thermal energy from combustion of a fuel. In case where several power units have been installed at one site, each unit should beconsidered as a power plant"*. The project activity comprises of 5 units of 800 MW capacity, each of which are considered as separate plants as per the provisions of the

methodology. Further the baseline selection requires *"These alternatives need not consist solely of power plants of the same capacity, load factor and operational characteristics (i.e. several smaller plants, or the share of a larger plant may be a reasonable alternative to the project activity), however they should deliver similar services (e.g. peak vs. baseload power)"*. Thus, for comparison of levelized cost (which is INR/kWh) between the project and baseline alternative the total capacity of the power plant is not relevant, rather the methodology requires plants with comparable outputs (which may not be of the same capacity). In this case both 800 MW unit and 500 MW unit would serve as base load stations and hence gives comparable outputs. Also, the highest available subcritical unit size in India is 500 MW and the same has been considered for comparison with the project case.

The results of the sensitivity analysis may be replicated from the levelized cost sheet "Appendix 1". For checking sensitivity with the coal prices by x%, go to Input Output Sheet and cell H27 and B27 and multiply each with x%. The levelized cost is displayed in cells J2, J3, J4 and J5 of the Input Output Sheet. For checking sensitivity with PLF, by x%, go to Input Output Sheet and cell D21 and multiply x%. The levelized cost is displayed in cells J2, J3, J4 and J5 of the Input Output Sheet. For checking sensitivity with project cost, by x%, go to Input Output Sheet and cell E4 and D4 and multiply each with x%. The levelized cost is displayed in cells J2, J3, J4 and J5 of the Input Output Sheet.

PLF of 85% and auxiliary consumption of 7.5% is the standard figures for subcritical unit. The CERC Availability Based Tariff Order indicates the auxiliary consumption for subcritical technology has been taken from CERC guidelines. In the Mott MacDonald report on UMPP Risk Analysis, PLF and auxiliary consumption values have been estimated to be 85% and 7.5%, respectively. Hence DNV considers that the assumptions are justified.

The imported coal price, used for IRR calculation, has been estimated based upon the prevailing market scenario during pre-bidding period. The FOB price was estimated based on "Consultant's Report" published by CERC, Govt of India, page 42. The value applied is INR 2460 per tonne as landed cost. As there is no governmental source for confirming imported coal price in India, DNV has cross checked this with other registered project from the same region (UNFCCC no. 1116) wherein the applied value for imported coal prices has been found to be INR 2479 per tonne. Thus DNV considers that the applied coal price is justified.

It has already been specified in the validation report that GCV for imported coal has been taken from sample proximate analysis report from the project consultant (TCE Consulting Engineers Limited). This has further been validated from the long term contract with the coal producers.

Comment 8:

The DOE should further substantiate the validation of the sensitivity analysis, as the PDD discusses parameters which are not mentioned by the DOE in the Validation Report (e.g. imported coal prices).

DNV response:

In the validation report, sensitivity analysis has been validated and described in two stages:

(i) *at baseline determination (refer section 4.3.2 of validation report)*

In this case variation of levelized cost of power generation has been verified for the identified alternatives (i.e., domestic coal based subcritical plant, domestic coal based supercritical plant, imported coal based subcritical plant and imported coal based supercritical plant) with the variation of coal price, PLF and project cost. A + 20% variation in respective coal price (domestic/imported) yielded that domestic coal based subcritical power plant remains the financially most attractive scenario (lowest levelized cost). In a similar manner, DNV could confirm that domestic coal based subcritical power plant still remains the

most financially attractive scenario. This has already been mentioned in the validation report that assumed variations in the coal prices are reasonable since coal being the most predominant energy source in India, change in coal price not only affects energy cost, but also the socio-economy of the country. Thus a 20% rise in domestic coal prices is unlikely in the near future. Actually, the levelized cost for domestic coal based subcritical plant equals to that of the project case on 28% increase in domestic coal price, which DNV considers an unlikely event. It is also observed that at a PLF of even 100%, the domestic coal based sub-critical alternative remains the least cost option. Also it is unreasonable to assume that the project cost for the super-critical technology will reduce by more than 10% considering that the technology is new and costs are only likely to increase rather than decrease. Thus, DNV considers that levelized cost for domestic coal based sub-critical power plant is lowest amongst the options and hence selection of sub-critical technology based power plant as the baseline scenario has been found to be justified.

(ii) *at additionality demonstration (refer section 4.4.3.4 of validation report)*

In this case, variation of return on equity (ROE) has been verified against the benchmark (14%) with the variation of imported coal price, project cost, PLF and O&M cost. DNV has verified and found that the benchmark ROE value is arrived for the following instances:

a) imported coal prices is reduced by 9.43%

b) project cost is decreased by 10.79%

c) O&M cost is reduced by 60% and

d) ROE is lower than 14% (benchmark) even at 100% PLF

While case d) is an improbable case, DNV considers that occurrence of other instances are also unlikely due to the following factors:

a) The global increase in demand of coal will lead to increase in coal prices by the coal exporting countries like Indonesia. Also as per the power purchase agreement, only 45% of the coal cost component is escalable. DNV could also validate the fact that international coal price is on the rising trend (Information on international coal price http://www.businessstandard.com/india/storypage.php?autono=155593). Thus DNV considers that reduction in imported coal prices is an unlikely event.
b) The supercritical power generation technology is new to India and there is a dearth of technology suppliers in India. Hence, decrease in project cost is also unlikely.
c) a 60% decrease in O&M cost is also quiet improbable as noticed from the CERC guidelines where escalation in O&M cost is recommended for tariff determination for thermal power plants (ref. CERC notification dated 22.11.2006).

Comment 9:

The DOE should clarify how it has assessed the chosen baseline to be a plausible baseline alternative, taking into account the statement contained in p. 41 of the Validation Report (i.e. "that in the last 10 years not a baseline single sub-critical coal power plant was implemented by the private sector").

DNV response:

Pre 2003, the power sector in India offered very less freedom and incentives for private investors to invest in this sector. Post Electricity Act 2003, various initiatives were taken to reform the sector and as the sector gradually opened up to private investors as an attractive sector and investments started taking place. Although the sector is still dominated by public sector units, a number of private parties are heavily investing in the sector. These include Reliance Power, Adani Power, RPG Group and the project

proponent itself. Tata Power is implementing coal based thermal power plant with subcritical technology of around 4000 MW capacity in India e.g., 1500 MW in the state of Maharashtra (Annex-IV), 1000 MW in the state of Orissa (Annex-V) and 1000 MW in the state of West Bengal (Annex-VI).

Moreover the statement "in the last 10 years not a baseline single sub-critical coal power plant was implemented by the private sector" as provided during the global stakeholder process, is not strictly correct. The following table depicts the list of private sector investments in the coal based subcritical power generation sector in India. This has been validated from the Central Electricity Authority database.

Name	**Unit No.**	**Commissioning Date**	**Capacity (MW)**	**Investor**	**Fuel**
RAIGARH TPP	4	17-Jun-08	250	JINDAL	COAL
RAIGARH TPP	2	6-Mar-08	250	JINDAL	COAL
RAIGARH TPP	1	8-Dec-07	250	JINDAL	COAL
RAIGARH TPP	3	10-Feb-07	250	JINDAL	COAL
JOJBERA	4	23-Sep-05	120	TATA PCL	COAL
JOJBERA	3	27-Aug-01	120	TATA PCL	COAL
JOJBERA	2	9-Oct-00	120	TATA PCL	COAL
TORANGALLU IMP	1	16-May-99	130	JINDAL	COAL
TORANGALLU IMP	2	16-May-99	130	JINDAL	COAL
BUDGE BUDGE	2	6-Mar-99	250	CESC	COAL

In the last 10 years almost 1870 MW has been implemented in the coal based power generation sector by the private sector. Although this capacity is small compared to the capacity of the proposed project activity, yet it is clear that private investments, although started bit late due to structural constraints of the sector, have taken place in the coal based power generation sector. From the last 10 years data it can also be observed that in the first 5 years (1999-2003) only 750 MW has come up while in the next 5 years (2005-2008) almost 1120 MW has come up. This further substantiates the fact that post 2003 after the coming of the Electricity Act, the power sector opened up to private investors in an investor friendly manner.

Moreover the methodology ACM0013, version 02.1 states that *"Note further that the baseline scenario candidates identified may not be available to project participants, but could be other stakeholders within the grid boundary (e.g. other companies investing in power capacity expansions)."* Other stakeholders would definitely include public sector companies which have always been a dominant player in the Indian power sector. The public sector has added around 19,605 MW in the coal based power sector in the last 10 years.

List of coal based power projects implemented by public sector companies in India in the last 10 years, validated from the Central Electricity Authority database.

Name	Unit No.	Commissioning Date	Capacity	Investor
SIPAT STPS	2	27-Dec-08	500	NTPC
SANJAY GANDHI	5	27-Aug-08	500	MPGPCL
GHTP (LEH.MOH.)	4	31-Jul-08	250	PSEB
SAGARDIGHI TPP	2	20-Jul-08	300	WBPDC
AMAR KANTAK EXT	5	15-Jun-08	210	MPGPCL
BHILAI TPP	1	20-Apr-08	250	NTPC/SAIL
PARAS	2	31-Mar-08	250	MAHAGENCO
KAHALGAON	6	16-Mar-08	500	NTPC
GHTP (LEH.MOH.)	3	3-Jan-08	250	PSEB
BAKRESWAR	4	23-Dec-07	210	WBPDC
SAGARDIGHI TPP	1	21-Dec-07	300	WBPDC
KORBA-EAST	8	12-Dec-07	250	CSEB
BELLARY TPS	1	3-Dec-07	500	KPCL
D.P.L.	7	24-Nov-07	300	DPL
RAYAL SEEMA	4	20-Nov-07	210	APGENCO
YAMUNANAGAR TPP	1	13-Nov-07	300	HPGCL
YAMUNANAGAR TPP	2	13-Nov-07	300	HPGCL
SANTALDIH	5	7-Nov-07	250	WBPDC
MEJIA	6	1-Oct-07	250	DVC
SIPAT STPS	1	27-May-07	500	NTPC
KAHALGAON	5	31-Mar-07	500	NTPC
MEJIA	5	31-Mar-07	250	DVC
KORBA-IV	7	30-Mar-07	250	CSEB
VINDH_CHAL STPS	10	8-Mar-07	500	NTPC
PARLI	6	16-Feb-07	250	MAHAGENCO
RAYAL SEEMA	3	25-Jan-07	210	APGENCO
PARICHA	4	28-Dec-06	210	UPRVUNL
UNCHAHAR	5	28-Sep-06	210	NTPC
VINDH_CHAL STPS	9	27-Jul-06	500	NTPC
PARICHA	3	29-Mar-06	210	UPRVUNL
RIHAND	4	24-Sep-05	500	NTPC
TALCHER STPS	6	6-Feb-05	500	NTPC
RIHAND	3	31-Jan-05	500	NTPC
PANIPAT	8	28-Jan-05	250	HPGCL
MEJIA	4	12-Oct-04	210	DVC
PANIPAT	7	26-Sep-04	250	HPGCL
R_GUNDEM STPS	7	26-Sep-04	500	NTPC
TALCHER STPS	5	13-May-04	500	NTPC
TALCHER STPS	4	25-Oct-03	500	NTPC
KOTA	6	30-Jul-03	195	RRVUNL
SURATGARH	5	30-Jun-03	250	RRVUNL
TALCHER STPS	3	4-Jan-03	500	NTPC
RAICHUR	7	11-Dec-02	210	KPCL
SIMHADRI	2	24-Aug-02	500	NTPC
SURATGARH	4	25-Mar-02	250	RRVUNL
SIMHADRI	1	22-Feb-02	500	NTPC
SURATGARH	3	29-Oct-01	250	RRVUNL
PANIPAT	6	1-Apr-01	210	HPGCL
BAKRESWAR	3	21-Mar-01	210	WBPDC
K_KHEDA II	4	7-Jan-01	210	MAHAGENCO

K_KHEDA II	3	31-May-00	210	MAHAGENCO
BAKRESWAR	2	20-May-00	210	WBPDC
SURATGARH	2	28-Mar-00	250	RRVUNL
VINDH_CHAL STPS	8	26-Feb-00	500	NTPC
SANJAY GANDHI	4	23-Nov-99	210	MPGPCL
UNCHAHAR	4	22-Oct-99	210	NTPC
RAICHUR	6	22-Jul-99	210	KPCL
BAKRESWAR	1	18-Jul-99	210	WBPDC
VINDH_CHAL STPS	7	3-Mar-99	500	NTPC
SANJAY GANDHI	3	28-Feb-99	210	MPGPCL
RAICHUR	5	31-Jan-99	210	KPCL
UNCHAHAR	3	27-Jan-99	210	NTPC

Thus DNV considers that the chosen baseline is a plausible baseline alternative.

Comment 10:

The DOE should further discuss the implications of considering different types of coals for the baseline and project activity scenarios in the calculation of emission reductions.

DNV response:

The entire calculation for emission reduction has been done as per ACM0013, version 02.1. As per the equations 1, 2, 3, 4 and 5 of ACM0013, version 02.1 the baseline emissions have been calculated based on domestic coal and as per equations 1 and 2 of "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", version 02, the project emissions have been calculated based on imported coal. The entire calculation is in line with the methodological guidance available at the time of submission of the project activity to UNFCCC requesting registration. Further, while calculating the project emissions the C% of coal has been used as 61.6%. The NCV corresponding to this C% comes to 5649.8 Kcal/kg which corresponds to an emission factor of 0.0956 tCO_2/GJ. Using this emission factor of coal for calculating the baseline emission factor would have resulted in a baseline emission factor of 0.980 tCO_2/MWh which is higher than the emission factor provided by CEA (0.941 tCO_2/MWh). Thus using the emission factor of coal used in the project scenarios would not have any impact on the emission reductions since as per the methodology, the lower of the emission factors given by the two options would have to be selected for calculating the baseline emissions.

Comment 11:

The DOE should explain how it has validated the monitoring plan as appropriate, considering that the parameter "EFFF,PJ,CO2,y" was not included in section B.7 in the PDD, as required by the methodology.

DNV response:

In calculation project emission, the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02) has been used as stipulated by ACM0013 version 2. This tool provides two options to calculate the project emissions. In the project case Option A has been chosen where the monitoring of quantity of fuel consumed (in mass units) and the % carbon in coal used are required. The tool also recommends Option A as the preferred option. The parameter EFFF,PJ,CO2,y has been excluded in Section B.7 of the PDD as the same is used in Option B. This factor as a whole is not used in the project emission calculations which would be done on an *ex-post* basis.

We sincerely hope that the Board accepts our aforementioned explanations.

Yours faithfully
for DET NORSKE VERITAS CERTIFICATION AS

Michael Lehmann

Technical Director

Climate Change Services