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1472 "Surplus power generation for grid" at Vayyuru, Andhra Pradesh
Project Participant's Responses to the "Request for Review"

11 April 2008
The CDM Executive Board
c/o UNFCCC Secretariat
Martin Luther King Strasse 8
D-53153 Bonn
Germany

Dear CDM Executive Board,

We are hereby submitting our responses to the requests for review of the "Surplus power generation for grid" at Vayyuru, Andhra Pradesh; Project activity 1472. We have provided the necessary details to each of the queries as required by the Executive Board for registering the project activity.

Query 1 of the Request for Review:

The use of a 10-year period of assessment for the investment analysis should be justified in the context of the project activity.

Project Participant's Response to Query 1:

It may be noted that the lifetime of the project activity is 20 years and therefore it is normally appropriate to perform the investment analysis over a 20 year-period. However, investment analysis is performed over a 10-year period due to the following reasons:

The revenue to the project activity depends on the purchase tariff for the electricity exported to grid, which has been determined by the Andhra Pradesh Electricity Regulatory Commission (APERC). APERC, in its Tariff Order (T.O.) dated 20 March 2004 (Annex 1.a[1] - T.O.), has determined the purchase tariff for bagasse based cogeneration plants (pages 22 to 32 of the order). However, APERC has determined and fixed the tariff only for the first 10-years of operation. As stated in the tariff order (T.O. page 60 paragraph vii) and Power Purchase Agreement (PPA – Annex 1.b, page 6, paragraph 2.2), the tariff for the next 10-years would be determined by the APERC at the end of the first 10-year period. In light of the above and considering that any assumption of the tariff applicable beyond 10-years may lead to inaccurate results/investment decision, we have adopted a 10-year period for investment analysis. The residual value of the equipments at the end of 10-years (46% of the capital value) has been accounted in the analysis.

[1] http://www.ercap.org/OtherOrders/Order_RP_84_2003.doc

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This justifies the 10-year period for investment analysis adopted for this project activity. However, to asses the conservativeness of the 10-year analysis period and further substantiate the necessity of CDM funds, an investment analysis for a 20-year period is being furnished (Annex 1.c). In the absence of a purchase tariff for years 11-20, the following tariff is being assumed for this analysis:

Tariff computed for years 11-20:

As indicated in the APERC tariff order, the tariff consists of three components; fixed cost portion, variable cost portion and incentive portion.

- ***Fixed cost portion of tariff:***

The fixed cost portion of the tariff indicated in the tariff order (T.O. page 30, paragraph 46) is on a reducing trend over the first 10-year period. As stated in the tariff order (T.O. page 30 paragraph 45 and page 61, paragraph 82), the fixed cost portion is a front loaded one and is likely to reduce substantially after the first 10 years. However, as a conservative assumption, the fixed cost portion of the tariff for years 11-20 is being maintained at the value applicable for year 10 (INR 0.90 per kWh) without any discounting.

- ***Variable cost portion of tariff:***

The variable cost portion of the tariff is on an increasing trend over the first 10-year period increasing at the rate of 5% per annum (T.O. page 31). The same 5% escalation is adopted for years 11-20. For this project activity, the variable cost portion applicable for first year of operation (2005-06) is INR 1.070 per kWh.

- ***Incentive portion of tariff:***

The incentive is constant for the first 10-year period and the same is being adopted for years 11-20, which is INR 0.215 per kWh (T.O. page 32, paragraph 47).

- ***Summary of Tariff adopted for years 11-20:***

Year of operation (n^{th} year)	Fixed Cost Rs / Unit (A)	Variable Cost Rs / Unit (B)	Incentive for Energy export >55% PLF (C)	Tariff for Energy export<55 % PLF (A+B)	Tariff for Energy export>55 % PLF (B+C)
10^{th}	0.90	1.66	0.215	2.56	1.88
11^{th}	0.90	1.75	0.22	2.65	1.96
12^{th}	0.90	1.83	0.22	2.73	2.05
13^{th}	0.90	1.92	0.22	2.82	2.14
14^{th}	0.90	2.02	0.22	2.92	2.24
15^{th}	0.90	2.12	0.22	3.02	2.34
16^{th}	0.90	2.23	0.22	3.13	2.44
17^{th}	0.90	2.34	0.22	3.24	2.55

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18th	0.90	2.46	0.22	3.36	2.67
19th	0.90	2.58	0.22	3.48	2.79
20th	0.90	2.71	0.22	3.61	2.92

Results summary:

IRR	Without CDM	With CDM	Benchmark Rate of Return
10-years	8.6%	14.2%	14%
20-years	11.2%	15.4%	14%

Sensitivity analysis for 20-year period:

Sensitivity Analysis (% IRR)			
	Normal O&M	+10% O&M	-10% O&M
Normal Gen	11.2%	11.0%	11.4%
+10% Gen	12.4%	12.2%	12.7%
-10% Gen	9.9%	9.7%	10.2%

The investment analysis calculations and input values used have been verified and certified by a Chartered Accountant (CA) and found to be inline with general accounting principles (Annex 1.d – CA certificate for 20-year investment analysis).

Query 2 of the Request for Review:

The source of the input values in the investment analysis should be transparently described and be validated by the DOE.

Project Participant's Response to Query 2:

The inputs values used in the investment analysis have been adopted based on industry standards, historical average data and applicable policies as relevant to result in an accurate estimation of the rate of return from the project. The following table describes the source/basis of each input value used in the investment analysis:

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S.No	Input Value	Source/Basis	Comments
1	Capital Cost: **INR 2100 Lakhs**	Cost Estimation done by KCP Sugars and Industries Corporation Limited (KCP SICL) based on information from equipment vendors. The cost estimate is provided as part of their Cogeneration Project Proposal, page 7. (Annex 2.a – Project Proposal) The actual capital cost incurred is INR 2228 Lakhs. This has been verified and certified by a Chartered Accountant (CA) with purchase orders (Annex 2.b – CA certificate of capital cost)	
2	Power exported (kW): **5500 kW**	Power balance calculated by KCP SICL and provided in the Cogeneration Project proposal (page 6) Net Power generation = 11 MW Sugar plant consumption = 5.4 MW[2] Surplus for export = (11 – 5.4) – (Line and transformer loss 2%) = 5.5 MW = 5500 kW	
3	Number of operating days: **140 days per year** Capacity Utilization factor during operating days: **80%**	This has been estimated based on actual operating data in historical years. The cogeneration plant is designed to operate only when the sugar plant is in operation and therefore its operating days is directly linked with that of the sugar plant.	

Historical operating data*

S.No	Year	Actual days	Cane Crushed	Crushing capacity	Capacity Utilization
		(A)	Tonnes (B)	Tonnes/day (C)	% (B/(A*C))*100
1	1997-98	141	932051	7500	88.1
2	1998-99	182	1047565	7500	76.7
3	1999-00	105	609354	7500	77.4
4	2000-01	108	688821	7500	85.0
5	2001-02	140	974932	7500	92.9
6	2002-03	153	1014957	7500	88.4
7	2003-04	141	997945	7500	94.4
	Total	970	6265625	7500	86.1
	Average	**138.6**			**86.1**

*The above data could be verified with the yearly manufacturing reports submitted to the Government of India.

[2] Based on actual historic consumption of the sugar factory

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		The sugar plant production data for the historical years has been analyzed to calculate the average working days (which are around 138 days) and the capacity utilization factor (86%). Based on the above, the following assumptions have been considered for the financial workings. ***Days of operation:*** 140 days per year ***Capacity utilization during operating days:*** 80%. Though the historic capacity utilization of the sugar plant is around 86%, the same cannot be expected for grid connected power export. A capacity utilization of 80% has been adopted after deducting for grid availability and other factors due to the parallel operation of the plant with the grid. Even if the capacity utilization factor of the project activity is considered equal to that of the sugar plant (of 86%), the IRR increases from 8.6% to 9.5%, which is still lower than the benchmark 14%.	
4	Operation and Maintenance Cost: **3%** of capital cost (2% for Repairs and Maintenance and 1% for Insurance)	As per O&M cost considered in APERC tariff order for bagasse co-generation plants (T.O. page 26)	
5	O&M cost escalation – **4%**	As per O&M cost considered in APERC tariff order (T.O. page 27)	
6	Salaries and Wages: **INR 5.5 Lakhs**	Conservative estimation based on additional manpower required for grid connected operation	The APERC Tariff Order has not considered these two components – Salaries and Wages and Admin Expenses. If these two components are not included in the calculations, the IRR increases by 1% from 8.6% to 9.6%, still lower than the
7	Escalation in Salaries and Wages: **10%**	Conservative estimation	
8	Admin Expenses: **INR 8.0 Lakhs**	Conservative estimation	

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9	Escalation in Admin Expenses: **5%**	Conservative estimation	the benchmark 14%.
10	Rate of depreciation Plant and Machinery: **5.28%** Civil works: **3.34%**	As per Schedule XIV of Companies Act[3] of the Government of India (Annex 2.c – pages 76,77)	The APERC Tariff order has considered a rate of 7.84%. If this rate is adopted, the IRR reduces from 8.6% to 6.4%.
11	Rate of depreciation for Income Tax computation Plant and Machinery: **80%** Civil works: **10%**	As per Income Tax Act of Government of India	
12	Minimum alternate tax – **8.415%**	As per Income Tax Act of Government of India	
13	Income Tax holiday: **10 years**	As per Income Tax Act, a 10 year income tax holiday is allowed for renewable power plants. This benefit has been considered in the calculations at the appropriate time period to maximize the benefits and therefore improve returns from the project.	

Power Purchase tariff:

The purchase tariff considered for the IRR calculations is as per the latest APERC Tariff order that was available (Refer Annex 1.a). Following is the purchase tariff fixed by APERC for bagasse based projects in the above order (pages 22 to 32):

The tariff consists of three components: ***fixed cost, variable cost and incentive***. The sum of fixed cost and variable cost is payable to the quantity of energy exported within the threshold PLF limit

[3] http://www.mca.gov.in/MinistryWebsite/dca/actsbills/actsbills.html

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of 55%. For the energy exported above the threshold PLF, only the variable cost plus an incentive of INR 0.215 per kWh is payable.

Variable cost has been determined till year 2008-09 in the tariff order. For the years beyond 2008-09, the variable cost has been calculated with a 5% annual escalation (As per the escalation levels for the previous years). The consolidated purchase tariff as per APERC tariff order considered for investment analysis is as below:

Year of operation (n^{th} year)	Fixed Cost Rs / Unit (A)	Financial Year	Variable Cost Rs / Unit (B)	Incentive for Energy export >55% PLF (C)	Tariff for Energy export<55 % PLF (A+B)	Tariff for Energy export>55 % PLF (B+C)
1st	1.72	2005-2006	1.070	0.215	2.790	1.285
2nd	1.67	2006-2007	1.120	0.215	2.790	1.335
3rd	1.63	2007-2008	1.180	0.215	2.810	1.395
4th	1.59	2008-2009	1.240	0.215	2.830	1.455
5th	1.55	2009-2010	1.302	0.215	2.852	1.517
6th	1.51	2010-2011	1.367	0.215	2.877	1.582
7th	1.47	2011-2012	1.435	0.215	2.905	1.650
8th	1.43	2012-2013	1.507	0.215	2.937	1.722
9th	1.35	2013-2014	1.583	0.215	2.933	1.798
10th	0.90	2014-2015	1.662	0.215	2.562	1.877

Query 3 of the Request for Review:

Given the time gap between the decision to invest in the project activity and the commencement of validation the DOE should state with what level of assurance it considers that this project activity would not have been implemented without the CDM.

Project Participant's Response to Query 3:

The following chronological sequence of events describes the stages in the CDM process underwent by KCP SICL. The reason for the time gap between the decision to invest in the project activity and commencement of validation is also evident from the below:

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S.No	Event	Date	Reference
1	The Company's Board of Directors give clearance to the initial cogeneration project proposal of setting up a cogeneration plant. It was decided that the actual project implementation may commence depending on the policies (read as purchase tariff) of the Andhra Pradesh Government as and when announced. The Board also authorized the Managing Director (MD), Ms.Irmgard Velagapudi, to do the necessary acts for implementing the project activity as and when appropriate. This is also reflected in our annual report 2001-02 as follows: *"Your Company has already submitted an application to the appropriate authorities for setting up of a 20 MW cogeneration plant at Vuyyuru and are awaiting approvals from the state Government. Further, your Board will process in setting up of this plant depending on policies of Andhra Pradesh Government once it is announced."*	31 Jan 2002	Copy of original Board Notes. (Annex 3.a) Extracts from Annual Report 2001-02, page 15, section V under "Future Plans" (Annex 3.b)
2	However, the actual project implementation is stalled due to tariff uncertainties and lack of funds, which is reflected in our annual report 2002-03 as follows: *"With the existing power tariff policy expiring on 31.03.2004, and on account of uncertainty thereafter, and considering huge outlay of capital expenditure under the present strained circumstances, your Board has decided to defer the implementation of Cogeneration plant for some more time."*	October 2002	Extracts from Annual report 2002-03, page 11 section V 'Future Plans' (Annex 3.c)
3	Mr.K. Kalyanaraman, General Manager (Technical), attends a one-day seminar on "Business opportunities in Green House Gas (GHG) Emission Trading" organized by CDM Consultants at Hotel Park Sheraton, Chennai.	19th Dec 2002	Seminar Registration Form (Annex 3.d). Seminar fee paid through Corporation Bank Demand Draft No. 162826

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4	Mr.K. Kalyanaraman briefs about CDM and emission trading and the matter is discussed in length by the Board of Directors. The prospective emission reduction opportunities in KCP SICL that may be eligible under CDM and potential revenue from carbon trading are discussed in detail. We learnt that CDM consultancy services are being offered by M/s. Green Power Management Services Pvt. Ltd. and decided to employ their services for our prospective CDM projects as and when required. Part of the extracts from the Board meeting minutes state as follows: *"The Board noted that for this purpose, the Company was proposing to sign a Carbon Trading Agreement with M/s. Green Power Management Services Pvt. Ltd., Chennai, at the appropriate time in respect of the Company's following projects:* *i. Ethanol (5% blending with petrol)* *ii.* ***Co-generation with Bagasse*** *iii. Power production from Methane gas* *iv. Bio-fertilizer and Bio-mass: Usage of Bio-fertilizer reduces usage of Chemical fertilizer...."*	30 Jan 2003	Copy of original Board Notes (Annex 3.e)
5	APERC comes out with tariff order for cogeneration power plants and therefore the tariff uncertainty is removed. However, the revised tariff (INR 2.79 per kWh) is significantly lower than the earlier prevailing tariff (INR 3.48 per kWh) making it unviable to implement the cogeneration project.	20 Mar 2004	APERC Tariff order (Annex 1.a)
6	The Cogeneration Project Proposal is revised by the project team considering CDM benefits, which make it viable, and is put forward to the Managing Director (MD). Project proposal is approved for implementation by the MD.	02 Sep 2004 03 Sep 2004	Copy of project proposal approved by MD. (Annex 2.a)

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7	Purchase orders placed for project equipments.	16 Nov 2004	Copy of equipment purchase orders. Verified by the DOE.
8	M/s. Green Power Management Services Pvt. Ltd., expresses wish to exit from CDM consultancy services.	Mar 2005	Copy of letter from M/s. Green Power Management Services Pvt. Ltd., (Annex 3.f)
9	We initiated dialogues with various other CDM consultants for assisting us in the CDM process.	Mar to Aug 2005	Correspondences/proposals from other CDM consultants (Annex 3.g)
10	Appointment of a new CDM consultant	01 Sep 2005	Copy of contract between KCP SICL and CDM consultant (Annex 3.h)
11	Appointment of DOE for Validation as a small-scale CDM project (AMS I.D)	23 Feb 2006	Copy of contract with DOE (Annex 3.i)
12	CDM Global Stakeholder consultation period (as a small-scale CDM project)	02 Mar to 01 Apr 2006	UNFCCC website[4]
13	Our discussion with the DOE after the site visit infer that the project does not fall into the small-scale category (boiler capacity higher than 45 MWh_{th})	Jan 2007	Draft Validation Protocol of DOE, CAR 2, Page 18 (Annex 3.j)
14	Revision of PDD as per ACM0006	Feb to Apr 2007	
15	Appointment of DOE for Validation as a large scale CDM project (ACM0006)	16 Apr 2007	Copy of contract with DOE (Annex 3.k)
16	CDM Global Stakeholder consultation period (as a large-scale CDM project)	02 May to 31 May 2007	UNFCCC website[5]

It may be noted that we were aware of the CDM as early as December 2002 and had initiated the CDM process soon after the decision to implement the project activity. However, our CDM

[4] http://cdm.unfccc.int/Projects/Validation/DB/VN3O7BJTS173IRQ700328LQ43HLLG/view.html

[5] http://cdm.unfccc.int/Projects/Validation/DB/MF0VJLP5AM0QJW74KHCGLTSZA6WTKT/view.html

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process suffered an initial setback due to the premature exit of the initial CDM consultant. The CDM process suffered a further time setback when we had to switch over from the small-scale category to the large-scale category. Thus the time gap between the decision to implement the project and its CDM validation may be justified.

Query 4 of the Request for Review:

The DOE should validate that the project activity complies with the requirement of scenario 14 of ACM0006 v4 that .the existing power plant would continue to operate without significant changes, until it would need to be replaced at the end of its technical lifetime., in particular that the end of the technical lifetime is not within the proposed crediting period.

Project Participant's Response to Query 4:

It may be noted from section A.4.3 of the PDD that the existing power plant (i.e., the pre-project / baseline system) involved five numbers Turbo-Generators (TGs) of total capacity 10 MW, running on steam generated in 2 X 100 TPH boilers. The project involved the replacement of these five low pressure low efficiency TGs with two higher pressure higher efficiency TGs (one 12 MW TG and one 3 MW TG). The boilers were revamped to generate higher pressure steam.

As required by ACM0006, the remaining lifetime of the existing power plant was estimated during the validation process as follows:

Remaining lifetime of the existing power plant:

TGs and boilers are the major components of the power plant and therefore the lifetime of the power plant may be considered to end when one of these components reach their end of lifetime.

The remaining lifetime of the existing TGs and boilers were estimated as follows:

- ***Remaining lifetime of TGs:***

The TGs normally have a useful lifetime of around 20-25 years (i.e., 160,000 hours – 200,000 hours). The remaining life of the existing (baseline) low pressure TGs was assessed by a Chartered Engineer and has been estimated to be around 60,000 hours minimum. The life assessment report from the Chartered Engineer has been submitted to the DOE during Validation.

Based on 140 days operation per year, the remaining lifetime in years may be assessed as follows:

Remaining lifetime in years = 60,000 hours / (140 days X 24 hours) = ***17-18 years (i.e., 2024)***

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- ***Remaining lifetime of boilers:***

The boilers were manufactured and commissioned during the year 1999 and are designed for a service lifetime of 20 years. Thus, the useful lifetime of the boiler may be estimated to be ***till year 2019.*** Certificate from the boiler design and engineering consultant has been submitted to the DOE during Validation.

Since the end of lifetime of the boiler (2019) is earlier than that of the TGs (2024), the same is being adopted as the end of lifetime of the existing power plant (2019). ***The end of lifetime of the existing power plant (2019) is not within the proposed crediting period (2018)*** and therefore complies with the requirement of ACM0006 scenario 4.

Query 5 of the Request for Review:

As the quantity of biomass consumed is to be reported on a wet basis, the NCV reporting should be done in a consistent manner.

Project Participant's Response to Query 5:

The NCV reporting of the biomass residue has been revised in the PDD to be done in a consistent manner as per ACM0006 Version 04. The NCV monitoring on a wet basis has been now included in the revised PDD and has been submitted to the DOE.

Yours truly,

For KCP Sugars and Industries Corporation Limited

(B.R. Jawaharlal)
Authorized Signatory