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Mr. Hans Jürgen Stehr
Chair, CDM Executive Board
UNFCCC

Response to the request for review for the CDM project activity "Shandong Wudi Biomass Generation Project" (Ref. no. 1263)

2007-11-10

Dear Mr. Stehr,

The DOE TUV Rheinland Japan Ltd was informed on 29 October 2007 that the CDM project "Shandong Wudi Biomass Generation Project" (Ref. no. 1263), is under request for review because four requests for review have been received from members of the board.
One of these requests for review contains 9 issues, whereas the other three only refer to the last issue 9.
We would like to provide our response to the issues raised as follows:

Issue 1 raised:

The PP shall clarify their understanding in the PDD that "The estimated emission reduction will be 117,520 CERs per year".

TUV's response:

Please refer to the response provided by the PP.

Issue 2 raised:

Further substantiation of additionality is required.

TUV's response:

The validation team has validated the additionality of the project, which is demonstrated in the PDD by the application of the "Tools for demonstration and assessment of additionality (Version 3), and is further substantiated below:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations.
The validation team has reviewed the various alternatives to power generation and biomass usage described in the PDD. The review has been carried out by means of document review, site observation and stakeholders interviews, where several clarifications were raised, clarified and reported in the Validation Report. Finally, the validation team agreed to the selected baseline scenario, scenario 2, is appropriate.

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Step 2: Investment Analysis

The project generates revenue by selling of electricity, hence in accordance with the approved methodology it is accepted that a benchmark analysis with the use of internal rate of return (IRR) as financial indictor is appropriate. The validation team has reviewed the parameters adopted for the IRR calculations, most of which were adopted from the Feasibility Study Report (FSR) approved by the Shandong Provincial Development and Reform Commission, are sound and reasonable (Annex I). The validation team then checked the IRR calculations, which was also performed in accordance with the FSR and the "*Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*" (Annex II), and confirmed that the calculations are sound and reasonable. Finally, by reviewing the calculated project IRR, which is now updated as 6.36%, against the commonly adopted IRR of 8% in China for power industry in accordance with "*Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*", the validation team concluded that the project is not financially attractive and hence is not a likely baseline scenario.

The sensitivity analysis, with four financial parameters (total investment, tariff, O&M cost and straw price) selected and subjected to variations, was confirmed to be carried out in accordance with the requirements of "*Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*". It was also confirmed that it will be unlikely for the project developer to demand a higher tariff, for two reasons. Firstly, because the tariff is a sensitive issue and is strictly controlled by the government, and secondly because the project enjoys a special tariff of an additional RMB 0.25 / kWh to become RMB 0.595 / kWh according to *Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses* under *Chinese Renewable Energy Law*[1] for the first 15 years, which is already substantially higher than other conventional coal-fired power plants, (RMB 0.345/kWh).

Step 3: Barrier Analysis

The validation team has reviewed the investment, technological, prevailing and price barriers discussed in the PDD.

The validation team agrees with the claim made in the PDD that in China the development of a biomass plant is not financially attractive and would pose a higher investment risk to the project developer. In comparison with developing a coal fired power plant in China, which has a lower investment cost, more operational experience and a more stable supply of fuel, the development of a biomass plant is not financially attractive. First, it is relatively difficult to raise funds in China as it is still a relatively unopened economy compared to other developed countries. Secondly, due to the lower energy content of straw and the problems of possible corrosion during incineration of biomass, the biomass generation plant has a significantly lower output capacity (24MW only), and hence a lower energy efficiency. Comparing with the development of a coal-fired power plant, which enjoyed a higher energy efficiency and cheaper equipment and fuel costs, there is a clear risk to the investment return due to the higher investment costs per kWh for the biomass generation project[2]. Besides, being one of the "first of it's kind" biomass to energy project in China, the lack of proven track record of the technologies (especially the biomass boilers), and the lack of relevant operation and maintenance experience will increase the risk during the operation of the project. This may result in longer shut-down times for maintenance and repair with effects on the generation of electricity than would have expected and hence directly affecting the investment return. Finally, the uncertainties of "green" electric price in China pose a major risk as once the "green" electric price policy disappear, there would not be adequate attractiveness for continue running of the biomass plant because of the low return.

[1] http://www.china.com.cn/chinese/2006/Feb/1118762.htm
[2] http://www.china-straw.com/yingyong/ShowArticle.asp?ArticleID=405

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According to the FSR, pure biomass incineration boilers have not been developed yet in China, with the highlighted technical barriers due to corrosion to the boilers, and for the handling of the ash during the combustion processes. The corrosion is mainly due to the generation of hydrogen chloride and chlorine during combustion of biomass, which reacts with the metal wall of the boilers chemically to form metals chlorides (such as iron chloride) which has a significantly lower melting point (~300°C). The ash resulted from incineration of biomass has a lower melting point and higher viscosity, and hence has the problems of slagging within the boiler, which affects the smooth and safe operation of the boiler. In order to overcome these difficulties, the project employs the specially designed circulating fluidised bed boilers which are yet proven, and a team of specially trained staff for the operation of the plant. However, the lack of relevant successful operation and maintenance experience for similar facility in China will likely increase the risk during the operation of the project. This may result in longer downtime than would have expected.

The validation team has reviewed the stated risks associated with the straw supply system for the project reported in the PDD, which is a newly developed system, compared with the fuel supply system for a coal-fired burning plant, which is more reliable. The validation team confirms that there is little practical experience and system available in China for the collection, transportation, cutting and inputting of the biomass from the local farmers to the power plant boilers, against the need to have a constant input of biomass pellets of appropriate size and moisture for maintaining the necessary temperature and hence running of the boilers. This validation team hence confirms the barrier due to "lack of infrastructure for implementation and logistics for maintenance of the technology" as guided by the Tool for the demonstration and assessment of additionality (version 3).

Step 4: Common Practice Analysis

According to the FSR, the employed circulating fluidized bed boilers are a locally developed technology and the first of it's kind in China, which has been subjected to trial stage only (Annex 3). According to interviews with local government officials (Wudi County Development and Planning Bureau, and Wudi Power Power Supply Company), the project is the first biomass generation plant using local Chinese equipment based on straw in Shangdong Province. The validation team has therefore confirmed that the project is not a common practice as there is very few biomass-fired generation project with an installed capacity similar to the project in China, particularly with the use of the new type circulating fluidised-bed biomass boiler. Further, the project is not a common practice as supported by the apparent fact that there is a lacking of factory that can successfully manufactured direct-combustion boilers as required for the plant.

It is the validation team's opinion that the applied additionality tests, including the benchmark, barrier and common practice analysis have been appropriately conducted and presented in the PDD, and all show the additionality of the project is clear.

Issue 3 raised:

Further clarification is required regarding the benchmark analysis applied. The DOE shall further clarify how they have assessed and validated the values of the parameters utilized and the IRR calculation, including detailed explanation of, inter alia, the following issues:

a. Reduction of 42% in the Power Price in year 18 of the financial projections.
b. Whether the IRR calculation is before or after taxes. The calculation seems to be after taxes while the Excel sheet indicates differently.
c. Treatment of depreciation and amortization, as non tax charges.
d. Income tax calculation, Education Tax" rates and "Public Welfare Fund rate, and the treatment of past losses (in China it is accepted to include the five last years in the consolidation of losses).
e. Projected energy prices which are considered fixed, while the Chinese economy shows

an inter-annual increase in producer prices of approximately 3%.

TUV's response:

Please refer to DOE's responses to Issue 2 which detail how the benchmark analysis is being validated.

Detail responses to the specific issues raised are:

a. The validation team confirms that the reduction of power price in year 18 is due to the expiry of the additional electricity tariff incentives (0.25 RMB) for renewable energy project which is for a period of 15 years only (the first 2 years are project construction period), which is in accordance to *Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses* under *Chinese Renewable Energy Law*[3]. The tariff for the project is RMB 0.595/kWh, and therefore the tariff after the first 17 years is RMB 0.345/kWh which is tariff of coal fired power plants in Shandong Province, representing a reduction of 42% since Year 18.

b. It is confirmed that the IRR calculation is "after taxes". The typo error has been corrected in the revised worksheet.

c. The validation team has reviewed the IRR calculation according to the applied method, the *Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*, which is based on the method applied in the FSR, and confirms that the depreciation and amortization calculations are performed correctly in accordance with the stated requirements. According to the PDD, the financial analysis uses 15 years for depreciation of fixed assets, the rate of amortization is 7.3% of the fixed asset investment, and the period of amortization is 5 years[4], which is also in line with the Chinese taxation laws[5].

d. The validation team has reviewed the IRR calculation according to *the Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*, and confirms that the total cost derived is the sum of depreciation, amortization operation cost and interest, whereas the inflow minus total cost and city and education added cost is the profit. The validation team confirms that the income tax is 33%, the rate of education is 3%, and the rate of public welfare fund is 5%[6]. The public welfare is 5% of the profit after tax. All the parameters applied are based on the FSR, which has been approved by the Shandong Provincial Development and Reform Commission. Regarding the treatment of past losses, as such treatment is not applied in the FSR, hence the previous IRR calculation applied in the last version of the PDD was accepted. Nevertheless, the project participant has been communicated to this alternative as suggested by the member of the Board, and agreed with the consolidation of losses according to the Interim Regulation of Enterprises Income Tax[7]. The project participant has now re-calculated the IRR calculation, and has consolidated the losses of the Year 3, 4 and 5 into the profits of the Year 6, 7 and 8 (less than five years) in the revised the financial model. The approach is that after 3 years losses (Year 3, 4 and 5), the after years profits will be deducted by the 3 years losses first, only when the losses are recovered, the net profit will be charged for the income tax. The proposed project receives profit since Year 8, when the accumulated past losses are recovered then. Reflecting the impacts from the past losses calculation, the recalculated IRR of the proposed project is 6.36%, which is very similar with the IRR in the last version of PDD (6.46%).

e. The validation team has checked and confirmed that the PDD has adopted the results based on Feasibility Study of the proposed project, which has calculated the income of the

3 http://www.china.com.cn/chinese/2006/Feb/1118762.htm

4 Data source: Page 90, 12.2 Financial Analysis, Feasibility Study

5 http://www.chinatax.gov.cn/viewlaw.jsp?code=200309241005301224

6 Data source: Financial Analysis of the Feasibility Study Report

7 Issued by People's Congress in 1993

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proposed project with a fixed energy price as guided by the *Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses under Chinese Renewable Energy Law*. Moreover, as stated above, it is the view of the validation team that it will be unlikely for the project to raise tariff for the following two reasons: on one hand it is because of the tariff is a sensitive issue and is strictly controlled by the government; and on the other hand that the project already enjoys a special tariff of an additional RMB 0.25 / kWh to RMB 0.595 RMB / kWh according to Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses under Chinese Renewable Energy Law for the first 15 years, which is already substantially higher than other conventional coal-fired power plants, which is RMB 0.345 / kWh only. Nevertheless, being one of the key financial parameter for the project, the validation team has seen an increasing trend of straw price which is also confirmed during the site stakeholder interview with local government officials. This is due to the soaring oil price which has driven the use of biomass, such as the production of ethanol from biomass as fuel[8]. This is also supported by the experience of the first biomass demonstration project (with coal generation), which showed that the tariff for straw has been kept on increasing and even reached a rate RMB 400 / tonne[9]. However, unlike the electricity tariff, the tariff for straw is not subject to the same regulatory control by the government which also increase the financial risk for the project.

Issue 4 raised:

The DOE shall further clarify how they have assessed and validated the sensitivity analysis and the range of fluctuations for the key parameters, in particular those related to tariffs, inputs and investment costs. All the cost variables in the sensitivity analysis as practiced are tied to the same projection basis, precluding an analysis of the whole set of cost items and their individual trends.

TUV's response:

The sensitivity analysis, with four financial parameters (total investment, tariff, O&M cost and straw price) selected and subjected to variations of +/-10%, has been reviewed by the validation team during validation and confirmed to be carried out in accordance with FSR and the requirements of "Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects". The range of variations of +/-10% has been selected in the FSR and considered to be appropriate for applying in the PDD.
The sensitivity analysis has indicated that, even with a 10% increase in electricity tariff, and a 10% reduction in total investment, O&M cost and straw price, the IRR of the project is still below benchmark IRR of 8% only in the updated IRR calculations. The results also show that the impact of tariff on IRR is the most significant, which however, is not likely to subject to significant uprise due to government control and the fact that the project has already enjoying a preferential additional tariff of RMB 0.25 /kWh to RMB 0.595 RMB / kWh, which is already substantially higher than other conventional coal-fired power plants, which is about RMB 0.345 / kWh only. On the other hand, there is a higher opportunity for the O&M cost and straw price to go up with the increasing economic growth and when the economic value of the biomass is more and more realized.

Issue 5 raised:

The DOE shall clarify how they have validated the financial benchmark adopted by project

[8] http://www.lrn.cn/invest/energyView/livingEnergy/200709/t20070921_150974.htm

[9] http://www.sdpc.gov.cn/zdxm/t20051229_55135.htm

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proponents.

TUV's response:

The validation team has reviewed the source of the 8% benchmark - *Interim Rules on Economic Assessment of Electric Engineering Retrofit Project*, which is an appropriate benchmark reference for the power projects investment in China and has been commonly adopted for financial evaluation of power projects.

Issue 6 raised:

The PP/DOE shall further demonstrate the conclusions of the barrier analysis. The investment barriers should be further substantiated as they are generic; i.e. the statement in the PDD that "Despite the fact that China possesses rich biomass residues and is facing high demand for electricity, biomass generation power is not considered to be an attractive power generation technology in China comparing to dominated coal fired power generation".

TUV's response:

Please refer to DOE's reply to Issue 2 regarding the barrier analysis.

Issue 7 raised:

The PP shall further clarify the reference to technology risks in investment barriers that seems to be contradictory to the statement in the PDD that "The boiler is the key part project adopts the biomass technology of Taishan Group Co. Ltd, which is advanced domestically manufacturer" ... and "Taishan Group Co. Ltd. has experiences in manufacturing traditional fossil fuel combustion boilers and could well control the risk of safety issues".

TUV's response:

Please refer to the response provided by the PP.

Issue 8 raised:

The technology risks referred to should be further substantiated. Technology development of the boiler is not part of the project and biomass collection is a management issue rather than technology related.

TUV's response:

Please refer to DOE's reply to Issue 2 regarding the barrier analysis.

Issue 9 raised:

Further clarification is required regarding the calculation of the baseline emission factor for the biomass, in particular whether the values used in table B.6.3.1 have been validated in accordance with the approved methodology.

TUV's response:

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The validation team realized that tabled CH4 emission factors usually have high uncertainties and has therefore undertaken a careful review of the values used in the PDD.

The approved methodology ACM0006 stipulates that for determination of the CH4 emission factor, the applicant may undertake either measurements or use referenced default values. Only in the absence of more accurate information, the emission factor of 0.0027 tCH4 per ton of biomass as default value for the product of net calorific value of the biomass residue and CH4 emission factor for uncontrolled burning of the biomass residue is recommended.

In the PDD submitted for validation, the project proponent has applied the lower biomass net calorific value of 0.0148 TJ/tonne obtained from laboratory measurements performed by the Shangdong Coal and Coke Quality Testing Centre on 16 March 2006 (see Annex 4). The measurement report forms part of the project's Feasibility Study. The applied value is conservative as compared to the upper measured value of 0.01635 TJ/tonne. Furthermore, the PDD has applied the maximum conservativeness factor (i.e. 0.73) correctly as further conservative measure.

The IPCC 2006 Guidelines lacking specific values for the emission factor $EF_{burning,CH4,k,y}$, reference was made to Table 1-7 of the Reference Manual of the 1996 Revised IPCC Guidelines, as was referred to in the Baseline methodology ACM0006 ver3. The selected value of 300 kg_{CH4}/TJ was confirmed in this way.

However, the project proponent meanwhile adopted the default parameter of 0.0027 t CH4 per ton of biomass for the product of NCV_k and $EF_{burning,CH4,k,y}$, in order to provide a more conservative estimation on the emission reductions. The PDD has been revised accordingly. The revised amount of estimated CERs is 113,433 tCO_2e per year. This approach and the re-calculation have been confirmed.

In summary, we understand the issues raised in the clarification requests and regret if the previous validation report did not reflect the discussions in sufficient detail. However, we hope that the input by the project participants and this explanation will find acceptance among the members of the Executive Board.

Yours sincerely

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