TÜVRheinland®

Mr. Hans Jürgen Stehr
Chair, CDM Executive Board
UNFCCC

Response to the request for review for the CDM project activity "Henan Zhengzhou Grid Connected Natural Gas Combined Cycle Power Plant" (Ref. no. 1304)

2007-12-30

Dear Mr. Stehr,

The DOE TUV Rheinland Japan Ltd was informed on 17 December 2007 that the CDM project "Henan Zhengzhou Grid Connected Natural Gas Combined Cycle Power Plant" (Ref. no. 1304), is under request for review because three requests for review have been received from members of the board.

One of these requests for review contains 5 issues, whereas the other two only refer to the last issue 5.

We would like to provide our response to the issues raised as follows:

Issue 1 raised:

Further explanation is required on how the 8% benchmark as indicated by the Economic Assessment of Electrical Engineering Retrofit Projects, which has been validated by the DOE, is applicable to this project activity.

TUV's response:

The validation team has reviewed the source of the 8% benchmark - *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* (Annex 1a), which is deemed an appropriate benchmark reference for the retrofit power projects and new power projects investment in China because of the high degree of relevance to the power industry. It has been commonly adopted for financial evaluation of power projects for the approved renewable power CDM projects in China. As highlighted in section 1.11, the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* clearly indicate that the economic benchmarks are regulated for the entire power industry.

The validation team has also identified and validated the regulative document for the benchmarks, titled "*The Economic Assessment Method and Parameters for Capital Construction Project – version 3*" (Annex 1b), which provides the financial benchmark to the capital construction projects including the power industry in China. According to this reference, a benchmark of 10% (after tax) is quoted, which is higher than the 8% benchmark assumed in the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*.
The project's Feasibility Study Report (Annex 1c, hereafter "FSR") also refers to that same document for the application of the financial rules for IRR calculations. The FSR was prepared by Henan Province Power Research and Design Institute, an accredited entity in China for

developing FSR by the Chinese Government. The FSR being approved by the National Development and Reform Committee in 2005, it can be concluded that the parameters applied are valid and plausible.

Based on the above reasons, the validation team hence accepts the 8% benchmark for the power industry as a generally accepted and conservative parameter.

Issue 2 raised:

The DOE shall further clarify whether the income tax and depreciation stipulations in China were verified and how they were applied and then validated in the investment analysis.

TUV's response:

The validation team has reviewed the income tax and depreciation stipulations in China during validation, and confirms that they are in line with the Chinese taxation laws[1], which have also been properly applied in the FSR[2], as follows.

- The relevant income tax stipulations in China are contained in Item 3 of "Interim Regulations on Chinese Enterprise Income Tax", which was issued by the State Council of China on 01 January, 1994 (Annex 2a). The income tax of the Enterprise is calculated on the taxable income, and the income tax rate is 33%. The taxable income is equal to the total amount of annual income of the enterprise minus allowed deductions (i.e., the income-related cost, expense, losses, interest, employee payroll etc.). It was confirmed that this regulation has been applied correctly in the IRR calculations submitted with the request for registration. These parameters have been clearly presented under the IRR worksheets titled "Total Cost and Expense" and "Cash Flow (Total Investment) and their correctness has been confirmed by the validation team.
- The stipulations of depreciation in China are defined in the "Deduction Guideline (Before Tax) For Income Tax in P.R.China in 2000" (Annex 2b). According to this document, the net residual value rate of the fixed assets is 5%, and depreciation period for a period of at least 10 years for generation facilities such as the power plant. The PDD has applied a net residual value of 5% and the depreciation period of 15 years, as also adopted in the FSR. The Validation team also confirms this stipulation to be applied correctly.

The tax and depreciation parameters applied in the PDD (and in the FSR (Annex 2c) as approved by the National Development and Reform Committee) are thus confirmed to meet the relevant taxation laws. The validation team has reviewed the IRR calculations presented in the PDD and confirms their correctness.

Issue 3 raised:

The DOE shall further clarify how they have assessed and validated the sensitivity analysis and why other relevant variables were not considered in the sensitivity analysis

TUV's response:

The validation team has examined the PDD, and considered that the PDD has given due consideration to the parameters that are having a significant impact to the project finance, as explained below.

[1] http://www.chinatax.gov.cn/viewlaw.jsp?code=200309241005301224
[2] Data source: Economic Analysis of the Feasibility Study Report

Factors determining the project income include:

- Annual electricity generation (which in turn depends on the annual operation hours);
- Electricity tariff

Factors that will affect the expenses include:

- Fixed investment costs
- Annual operating costs, with major components of fuel and maintenance costs
- Income tax (in accordance with relevant taxation law)
- City construction and educational taxes (in accordance with relevant taxation law)

For the sensitivity analysis, those financial parameters having a degree of uncertainty (i.e. total investment, annual operating hours and annual O&M cost) have been selected and subjected to variations of +/-10%; the results are presented in the PDD. The calculation has been reviewed by the validation team during validation and confirmed that the sensitivity analysis has been carried out in accordance with the approved FSR. The independent variation of the selected financial parameters in the sensitivity analysis has indicated that, even with a 10% increase in annual operating hours, or a 10% reduction in total investment and O&M cost, the IRR of the project is still below the benchmark IRR of 8%. The validation team hence confirms that the IRR calculation performed is sound and reasonable, and would not likely be subject to large fluctuations and variations.

The impact of other financial parameters such as electricity tariff and the natural gas price are described in Table 1 below:

Table 1. IRR Sensitivity to Financial Parameters of the Project (Tariff and natural gas price)

IRR	-10%	-5%	0%	5%	10%
Tariff (without VAT)	1.34%	3.96%	6.26%	8.35%	10.29%
Natural gas price	8.71%	7.50%	6.26%	4.83%	3.33%

Table 1 shows that the project IRR is sensitive to the electricity tariff (with a 5% increasing in tariff the Project IRR would reach 8%). However, the tariff is strictly regulated by the Government and is therefore unlikely to be subject to significant variation.

Background information:

The process for setting the tariff is as follows: the project owner has to negotiate with the grid company and agree on a tariff. The Central government will then decide and approve the agreed tariff. Once the feed-in-tariff is defined, it will strictly be regulated by the government and can not be changed by the project owner or the grid company without a new approval by the state authority. The feed-in-tariff is therefore not considered in the sensitivity analysis.

Likewise, with a 10% reduction in natural gas price, the Project IRR could reach 8%. However and as presented in the PDD, the Natural Gas Price is commonly expected to increase further in future, rather than decrease. The project IRR will thus remain below the benchmark of 8%[3]. Moreover, according to the Notice of Adjustment of Natural Gas Prices issued by the Chinese NDRC, the price of natural gas used for power generation would be increased by 0.4yuan per m^3 (Annex 3), which is 40% higher than the expected price of 0.9123 RMB/Nm^3 as assumed in the IRR calculation and applied in the PDD.

Consequently, even if these additional two parameters are considered in the sensitivity analysis, the prospective range of variation does not suggest that the benchmark IRR could be achieved without consideration of CDM revenues. The claim that the proposed project activity is financially unattractive is thus confirmed.

[3] *Data Source: "Notice for NG Pricing Reform, and Appropriately Increasing the Natural Gas Price in the Near Future", issued by Chinese NDRC (http://www.sdpc.gov.cn/zcfb/zcfbtz/zcfbtz2005/t20051227_54876.htm)*

Issue 4 raised:

The DOE shall further clarify how they have validated the common practice analysis and provide further evidence that the only other similar project is also considering the CDM.

TUV's response:

According to the FSR (Annex 4a), combined cycle power technology using natural gas (9F grade) is an advanced technology and domestically developed core equipment is not available in China. As a result, the implementation of NGCC plants has to rely on imported equipment and expertise from countries such as Germany, USA or Japan. This has resulted in increased investment costs and hence slow development in China (Annex 4a).

Based on the result of literature review on a paper titled *China's Natural Gas Industry and Gas to Power Generation*[4], it is reported that the total capacity of gas-fired power plants has reached 10,627MW in 2006, and accounts for 1.7% of China's total installed capacity and 2.2% of total installed thermal capacity. This clearly shows that gas fired power generation is not a common practice in China.

According to the China Energy Statistical Yearbook 2006 edition (Energy balance of Henan Province, P.186-189) (Annex 4b), the validation team confirms that until 2005, natural gas power plant is not yet in operation as no natural gas has been used for power generation purpose in the Henan Province of China.

The validation team has further confirmed during site interview with relevant government representative (Mr Zhang, Head of Zhengzhou City Development and Reform Committee) that the project activity is the "first of its kind" in Henan, using natural gas as energy source to tackle growing power demand in peak consumption times.

Further Evidence that the project activity is the first of its kind in Henan Province from a news report from the State Power Information Network released on 4 September 2006 is enclosed as Annex 4c. Based on the above information, the validation team hence confirms that the project activity is not a common practice.

The reported other similar project, the Zhumadian Zhongyuan Gas-Steam Combined Cycle Power Plant in Henan, is currently under CDM validation and can be found at the UNFCCC website at: http://cdm.unfccc.int/Projects/Validation/DB/21665CW6SB89XZXCC790S8AMQCR16N/view.html According to the "Overview of CDM Pipeline" as of 4 December released by the United Nations Environment Programme (UNEP)'s Capacity Development for the Clean Development Mechanism (http://cdmpipeline.org/publications/CDMpipeline.xls), it is found that an additional 16 NGCC projects in China are also undergoing CDM development, which demonstrates that incentives from CDM have been considered as an essential factor for NGCC development in China.

Issue 5 raised:

Further clarification is required on whether all relevant power plant technologies that have recently been constructed or are under construction or are being planned, including those of other investors, were considered as additional baseline scenarios.

TUV's response:

[4] China's Natural Gas Industry and Gas to Power Generation. Chun Chun Ni, Electric Power & Gas Industry Group, Strategy and Industry Research Unit. The Institute of Energy Economics, Japan. IEEJ: July 2007.

The validation team had reviewed the relevant power plant technologies that have recently been constructed or are under construction or are being planned, and wishes to report the results in more detail as follows:

a) Relevant power plant technologies that have recently been constructed

According to the China Electric Power Yearbooks 2004-2006[5], the increases in relevant plant technologies in the Central China Grid during 2002 to 2005 are presented under Tables 2 to 5 and Figure 1. This is used as indications of relevant power plant technologies that have recently been constructed, and include increases in capacities in thermal power, hydropower, nuclear power, wind power and others. It is also found that the increase in the thermal power capacity has substantially out-weighted other types of power during the mentioned period. The validation team confirms that these reported power plant technologies have been appropriately considered during the selection of baseline and presented in the PDD.

Table 2: Installed Capacity of Central China Grid in year 2002

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	5,128.8	15,904.5	8,147.8	4,975.6	3,004.5	6,142.0	43,303.2
Hydropower	MW	2,197.4	2,438.0	7,213.9	6,135.3	1,195.5	11,854.6	31,034.7
Nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind power and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	7,326.2	18,342.5	15,361.7	11,110.9	4,200.0	17,996.6	74,337.9

Table 3: Installed Capacity of Central China Grid in year 2003

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	5,407.8	17,635.5	8,173.3	6,446.7	3,126.2	6,104.0	46,893.5
Hydropower	MW	2,307.4	2,438.0	7,337.2	6,603.1	1,329.8	12,341.5	32,357.0
Nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind power and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	7,715.2	20,073.5	15,510.5	13,049.8	4,456.0	18,445.5	79,250.5

[5] China Energy Statistical Yearbook 2004, 2005, 2006, China Statistics Press.

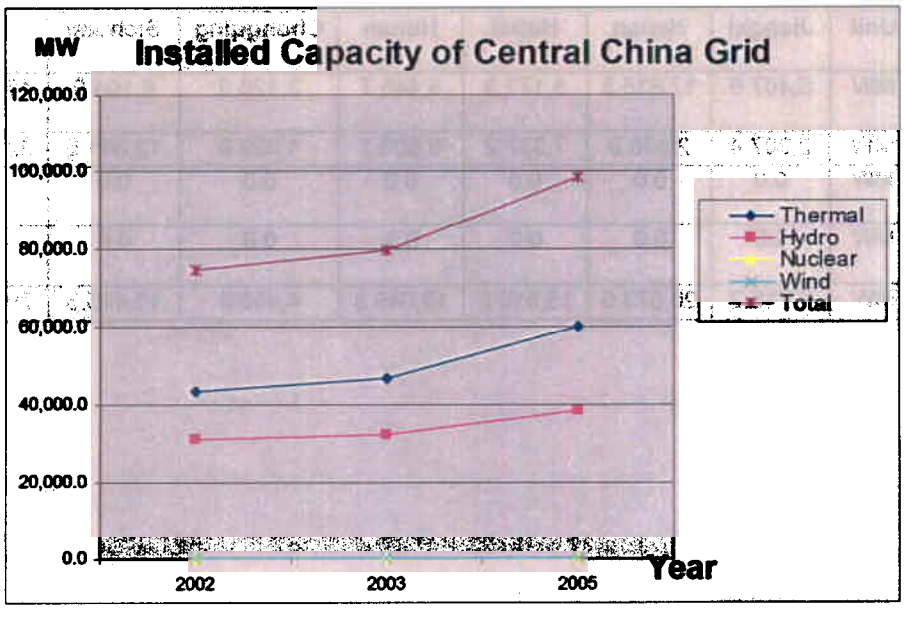
Table 4: Installed Capacity of Central China Grid in year 2005

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	5,906.0	26,267.8	9,526.3	7,211.6	3,759.5	7,496.0	60,167.2
Hydropower	MW	3,019.0	2,539.9	8,088.9	7,905.1	1,892.7	14,959.6	38,405.2
Nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind power and others	MW	0.0	0.0	0.0	0.0	24.0	0.0	24.0
Total	MW	8,925.0	28,807.7	17,615.2	15,116.7	5,676.2	22,455.6	98,596.4

Table 5: Change in Installed Capacity of the Central China Grid (2002 – 2005)

Installed Capacity (IC)	Unit	IC of year 2002	IC of year 2003	IC of year 2005	Increased IC	Weight of Increased IC
		A	B	C	D = C - A	
Thermal power	MW	43,303.2	46,893.5	60,167.2	16,864.0	69.52%
Hydropower	MW	31,034.7	32,357.0	38,405.2	7,370.5	30.38%
Nuclear power	MW	0.0	0.0	0.0	0.0	0.00%
Wind power and others	MW	0.0	0.0	24.0	24.0	0.10%
Total	MW	74,337.9	79,250.5	98,596.4	24,258.5	100.00%
Weight of IC of year 2005	MW	75.40%	80.38%	100.00%		

Figure 1: Change in Installed Capacity of the Central China Grid (2002 – 2005)



b) Relevant power plant technologies that are under construction or are being planned

Regarding those power plant technologies that are under construction or are being planned within Henan, the validation team has reviewed the "Eleventh Five-Year Plan"[6] of China (Annex 5a), which provides framework guidance for the development of energy industry for 2006-2010. That document mentions that thermal power plants, wind power, nuclear power, hydro power, solar power plants and biomass power plants will be continuously developed. The validation team confirms that all of these reported power plant technologies have been considered in the PDD.

Based on the information presented above, the validation team has been able to confirm that "all relevant power plant technologies that have recently been constructed or are under construction or are being planned, including those of other investors, were considered as additional baseline scenarios" and accept that the consideration of alternatives in the PDD be conducted in the present form, where four potential alternatives have been identified and evaluated in the PDD, namely:

1. The project activity not implemented as a CDM project;
2. Power generation using natural gas, but technologies other than the project activity;
3. Other energies for power generation including coal, hydropower, wind power, solar resource, biomass and nuclear power;
4. Import of electricity from connected grids, including the possibility of new interconnections.

Alternative 1 has been identified and investigated as a potential baseline scenario. A benchmark investment analysis has been carried out and presented in the PDD as described in "Step 1" of the Additionality assessment presented in the PDD. The benchmark analysis has resulted a project IRR of 6.26% and therefore shown that the project would not be financially attractive without the incentives from CDM.

Alternative 2: As reported in the Validation Report, the validation team confirms that other technologies using natural gas such as the single cycle technology would typically not render the same type of service and prove even less economical due to inferior energy efficiencies (up to 38%-39.5% efficiency as compared to 54.5-58% efficiency with combined cycle technology). Such technology can therefore not be considered as alternative baseline.

Based on the fact that the project will be used as (seasonal) peak regulation plant, it is considered that all identified alternative baseline scenarios in alternative 3, except the sub-critical or super-critical coal-fired power plants, would not be suitable to achieve similar energy efficiency or provide similar peak load balancing ability as the proposed CDM project activity. This is in line with the "Tool for the demonstration and assessment of additionality", which has stated that the project proponent should "Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity". The validation team hence accepts that hydropower, wind power, solar power and biomass power plants technologies are not further considered plausible baseline scenarios in the PDD.

Finally, the sub-critical or super-critical coal-fired power plants have been evaluated by the validation team and have been accepted as usable for similar peak-regulating function in China[7] (Annex 5b). The selection of the sub-critical or super-critical coal-fired power plants has been further supported by the results of a survey on the newly built thermal power projects during the Tenth Five-Year Plan of China (i.e. 2000-2005). Under the survey conducted by China's DNA[8],the

[6] http://www.ha.xinhuanet.com/add/zfzx/2006-12/08/content_8734248.html

[7] *Data source: "Assessment the Efficiency Issues for China's Power Industry", http://www.21360.cn/Html/cygc/200608/22097.html*

[8] Notification on Determining Baseline Emission Factor of China's Grid

600 MW sub-critical coal-fired power unit has been considered as having the best efficiency, alongside the 200 MW oil/gas based combined cycle power generators. However, according to *China Energy Savings Technology Policy Commitments* which is issued by *Chinese National Development and Reform Commission* and *Ministry of Science and Technology,* newly-built oil-fired power plants are strictly prohibited, and hence not further considered.

The validation team therefore concluded and accepted that only Scenario 3 - the 600MW sub-critical or super-critical coal-fired power plant can be selected as a valid and plausible baseline scenario, since other technological alternatives cannot provide services comparable with the project activity.

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

M. Brinkmann

Dr. Manfred Brinkmann
CDM Program Manager
TÜV Rheinland Japan Ltd.

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf