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Request for review

Dear Sirs,

Please find below the response to the review formulated for the CDM project with the registration number 1609. In case you have any further inquiries please let us know as we kindly assist you.

Yours sincerely,

Werner Betzenbichler
Carbon Management Service

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Issue 1

The PP/DOE should clarify the inclusion of the fuel costs in the investment analysis as the waste gas would have been flared in the absence of the project activity.

AND

Issue 2

The DOE shall confirm how it has validated that the input values of the IRR meet the requirements of EB 38 paragraph 54.

AND

Issue 3

The methodology requires that "among the alternatives that do not face any prohibitive barriers, the most economically attractive alternative should be considered as the baseline scenario. Clarification should be provided why no such comparison has been conducted in the determination of the baseline.

AND

Issue 4

The DOE should clarify how it has validated that the examples mentioned under Sub-step 4b (the Common Practice Analysis on page 18 PDD) meet the requirements of EB38 paragraph 60.

AND

Issue 5

The DOE should clarify how it has validated the obstacles for AISG to obtain loan from bank for new built-projects, especially for this proposed project (page 15 PDD).

AND

Issue 6

Taking into account that MHI independently established its Blast Furnace Gas (BFG) Turbine Combine Cycle (GTCC) power generation technology in the 1980s, including development of BFG dedicated combustors, and has since then delivered numerous systems to iron and steel manufacturers at home and abroad, enjoying a near 70% share of the world's BFG gas turbine market (Japan Corporate News, 27 May 2008), the DOE should clarify how it has validated the claimed technological barriers and why the size of this project (300 MW) makes it fundamentally different from any other earlier implemented combined cycle plants using enriched Blas Furnace Gas.

AND

Issue 7

The DOE should clarify why costs for maintenance are presented as a financial barrier (page 15 and 16 PDD), while such costs are already incorporated in the investment analysis.

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AND

Issue 8

Further clarification is needed on a) the selection of the project boundary, as well as on b) the exclusion of other users of BFG in both the baseline assessment (page 8 PDD) and in step 1a of the additionality assessment (page 10 PDD), taking into consideration that . as occurs at other iron and steel plants in the world - BFG could also be used as fuel by several other production units of an integrated iron and steel plant (e.g. coke ovens, rolling mills etc) and taking into account the fate and remaining life time of the existing captive power generation units of 345 MW.

Referring to Issue 1:

Response by Project Participant

The fuel costs in the investment analysis include both a blast furnace gas (BFG) cost and a coke oven gas (COG) cost. The costs used in the investment analysis are fully consistent with the FSR and have been validated by the DOE.

BFG and COG are waste gases with no economic value and as such would normally be flared with very limited associated cost. However, for utilization they must be collected, processed and distributed. There are a number of costs associated with gas treatment, storage, distribution, maintenance and management and require significant investment with continued costs for operation and maintenance. These are described in more detail below for both BFG and COG and have been confirmed by the Design Institute that undertook the FSR of Anshan CCPP[1]):

These costs must therefore be charged to the project through an internal charging system. It is standard practice for iron and steel companies to have internal charges for the consumers of waste gases in order to cover such costs. The internal charge is a fair and appropriate mechanism to bill the project for costs incurred by other departments. Indeed, these costs are applied to all other departments in the iron and steel company[2].

The following descriptions demonstrate how these costs are derived in accordance with the national regulation on Cost Accounting of the Coking and Chemicals industry[3].

(A).Blast Furnace Gas

BFG contains particulate matter (including heavy metals), carbon monoxide, carbon dioxide, sulphur compounds, ammonia, cyanide compounds, hydrocarbons and polycyclic aromatic hydrocarbons. As such pre-treatment, cleaning and management is required for the safe utilization of this gas. The processes require initial investment as well as ongoing maintenance including the purchase of key utilities such as electricity and water.

[1] Anshan Iron and Steel Group Corporation (Anshan) 300MW Blast Furnace Gas Combined Cycle Power Plant Feasibility Study Report: Supplementary Clarifications
[2] Internal charging list of COG in AISG(April 2006)
[3] P17 and P18, The regulation for cost accounting regulation in Coking and Chemistry industry

The cost of BFG is only calculated in terms of the initial capital cost in collection and distribution and the ongoing maintenance cost of the collection and distribution system. Therefore, The BFG cost applied in the IRR calculation of FSR is 0.016RBM/Nm^3 ([4,5]) This represents the costs of collection, and distribution must be paid by the user of the BFG and they are charged through a cost per m^3 consumed. This cost is consistent with the FSR and the calculation set out in the PDD.

(B) Coke Oven Gas

Coke oven gas contains hydrogen, methane, carbon monoxide, hydrocarbons, sulphur compounds and ammonia. There are many reasons why COG must be pretreated before use as a fuel. Firstly, tar and naphthalene in the raw gas may clog the piping and must therefore be removed.

Also, sulphur and ammonia compounds cause corrosion of the piping and equipment as well as causing secondary emissions of SO2 and must be removed. Desulphurization therefore occurs in two steps as primary and secondary desulphurization. The ammonia must also be removed. All of these processes require utilization and waste treatment of water.

These costs for collection, pre-treatment and secondary treatment must therefore be accounted for. This has been done through the inclusion of a gas cost as none of the investment or operational costs associated with the gas pre-treatment and distribution have been included in the investment analysis presented in the FSR[6] and PDD.

According to the national regulation on Cost Accounting of the Coking and Chemicals industry[7], the COG charge should be calculated as a composite of the coking production cost and the collection and pretreatment cost. Additionally, as required by the CCPP, secondary desulfurization and the COG storage tank for pressure stabilization are needed. These costs must also be included along with the associated maintenance costs.

The total cost for all of these components is 0.56 RMB/ Nm^3 and this may be broken down as follows[8]:

(a)The share of the coking production cost: 0.18RMB/ Nm^3
(b) Collection and pretreatment cost : 0.2912RMB/Nm^3
(c)Secondary desulfurization cost: 0.0532 RMB/Nm^3
(d) Maintenance cost of COG and stabilization system of COG pressure: 0.0356 RMB/Nm^3

These costs have not been double counted since the capital investment in collection, pretreatment, the gas storage tank and pressure stabilization system of the COG are not included in the IRR of Anshan CCPP presented in the FSR and PDD[9]. Accordingly the maintenance and operation cost of those systems are also not included as separate items and this is clearly shown in the material expenditure list in FSR of Anshan CCPP. Furthermore no material utili-

[4] Internal charging list of COG in AISG(April 2004),
[5] Anshan Iron and Steel Group Corporation (Anshan) 300MW Blast Furnace Gas Combined Cycle Power Plant Feasibility Study Report: Supplementary Clarifications
[6] P24,p25 and the detailed the capital cost in FSR of Anshan CCPP
[7] P17 and P18, The regulation for cost accounting regulation in Coking and Chemistry industry
[8] The further explanation for a few issues of Yingkou CCPP
[9] P24,p25 and the detailed the capital cost in FSR of Anshan CCPP

zation in the pre-treatment of waste gas was presented in FSR and applied in the IRR calculation[10] .

The Investment analysis taken from the FSR and presented in the PDD includes only the unit cost of COG at 0.56RMB/m^3.

In order to demonstrate the robustness of the investment analysis, the project participant has also amended the cost of the COG to include only the cost of collection, pretreatment, secondary desulphurization and maintenance in the accounting formula. When this is done the unit cost comes out as 0.38RMB / m^3 including costs (b) to (d) above.

It should also be stated that the price formula set out in the cost accounting principals described above explicitly excludes a profit margin and is entirely cost based. This can also be seen if the cost for COG is compared to a market price. Table 1 below shows that the internal charge for COG is significantly below the market price and indeed there are further references are available to substantiate this[11].

Table 1. Gas Price Evaluation

Gas	Price (RMB / m^3)	CV (MJ/Nm^3)	Price (RMB / MJ)
Blast furnace gas	0.016	3.22	0.005
Coke oven gas (internal cost)	0.56	17.36[12]	0.032
Coke oven gas market price	1.2 to 1.8[13]	17.35	0.0732

When this cost is subsequently applied to the investment analysis the equity IRR comes out at 11.78%, which is still significantly below the benchmark. See attached alternative investment analysis. Furthermore the results of the sensitivity analysis are also shown below.

Table 2. Sensitivity Analysis

	-10%	-5%	0	5%	10%
Total investment	13.30	12.51	11.78	11.10	10.47
Annual generation	9.22	10.52	11.78	12.99	14.16
Annual O&M cost	12.94	12.36	11.78	11.18	10.58

Annual Generation

It can be seen from the table above that when annual generation increases above 5%, the IRR is higher than the benchmark.

As described under question 2 below, it has been clearly demonstrated that the performance expectations for these projects are too high. Question 2 below presents in detail the actual performance of the Jigang CCPP and the reasons for this low performance. As stated, Jigang generates around half of what has been assumed in the FSR for the Anshan CCPP. Moreover, the Jigang project was commissioned in 2004 and registered in 2007 and therefore this perfor-

[10] IRR calculation spreadsheet
[11] National Development and Reform Commission, Sep.7, 2007, www.ndrc.gov.cn/jgjc/jgjc/t20070907_157926.htm (COG price reported as 1.31 RMB / m^3)
[12] Feasibility Study Report of Anshan CCPP
[13] http://www.asprice.gov.cn/gongyong3.asp

mance data comes from year 4 of the project operation. The project has seen consistently low performance in the first four years of operation and these are the most important years of the investment analysis. The Jigang project is very famous in China as it is the first demonstration for this type of project. As such all projects were looking at the performance of this project to evaluate their own. The FSR is based on theoretical data and is therefore optimistic.

Given the understood performance of Jigang CCPP, it is extremely unlikely that the Anshan CCPP would ever increase power generation by more than 5%. Indeed, actual performance data available for this year proves this. This data shows that the project is operating well below the FSR assumptions, see table 3 below. This table shows that the power generation is consistently below the estimated value and is also not stable, as has been seen by the Jigang project.

Table 3. Actual operational data of Anshan CCPP

Power Generation (MWh)	Oc.2007	*Dec.2007*	*Jan.2008*	Feb.2008	Mar.2008
Operational Data	*151,392*	13,584	40,992	34,176	113,280
PDD Assumed Data	*157,500*	*157,500*	*157,500*	*157,500*	*157,500*
Variance	(6,108)	(143,916)	(116,508)	(123,324)	(44,220)
% Variance	-3.88%	-91.38%	-73.97%	-78.30%	-28.08%

These variations and underperformances are widely expected for projects such as this where the fuel supply is not guaranteed and the technology is new. It would therefore be impossible for AISG to assume an over performance of their plant in the decision making process.

Additionally, the project has been sized according to the amount of waste gas available. The project requires 506,600 Nm^3/hour[14] and according to the gas balance in the FSR the available gas is 445,500 Nm^3/hour of BFG and 38,500 Nm^3/hour of COG. Thus the total gas availability is 483,850 Nm^3/hour. As such the unit has been optimized to this average gas availability. Given this availability of the waste gases it would be impossible for the project to exceed the stated operation in the FSR.

Capital Costs

The IRR will also go above the benchmark when the capital cost is lowered by 10%. However, this is extremely unlikely given that in 2003, 2004, 2005 and 2006• the national general growth rate of purchasing prices of raw materials, fuels and power are, 4.8% ,11.4%, 8.3% and 6% respectively. Also in 2003, 2004, 2005 and 2006 the national total price indices of investment in fixed assets are 2.2% and 5.6%, and 1.6%, 1.3% respectively[15]. There is clearly a trend of increasing investment costs. Furthermore, actual imported equipment cost is 206.29 million[16] more than estimate in FSR and therefore the total cost of this project is extremely unlikely to decrease.

<u>Response by TÜV SÜD</u>

The fuel expenditures have been taken from the FSR and contain a price for blast furnace gas (BFG) and coke oven gas (COG).

[14] Anshan Iron and Steel Group Corporation (Anshan) 300MW Blast Furnace Gas Combined Cycle Power Plant Feasibility Study Report:
[15] China Statistic Year Book,2004, 2005,2006,2007
[16] The contract for BFG Firing M701S(F) Gas Turbine Combined Cycle Power Plant of AISG

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The price of the BFG is based on the costs that appear to the gas user for gas treatment, storage, distribution and ongoing maintenance costs.
The price applied by the project is based on these costs. It does not contain any charge for the calorific value of the gas. For this reason the price of 0.016RBM/Nm^3 can be considered applicable for the usage of BFG.
The price of COG gas taken from the FSR is 0,56RMB/Nm³. This price includes 0,18RMB/Nm³ charging for the calorific value of the gas.
We agree that this is not according to international accouting rules. For that reason the coke price was broken down to the collection and pretreatment cost, the desulfurization cost and the cost of COG and stabilization system of COG pressure. The price can then be considered to be 0,38RMB/Nm³, which is an applicable assumption.
The costs assumed to the treatment of the gas have not been included in the O&M of IRR before, therefore a double counting of costs does not occur.

The IRR was recalculated (11,78%) according to the changed fuel costs and is still significantly below the benchmark.
Although the information on Jigang project was not known during decision making for this project, we are of the opinion that performance of Jigang project is much below designed capacity even after four years of operation. And the same uncertainty could be applied for this project. Hence increase of electricity generation by 5% is very unlikely to happen in this project.
The decrease of investment cost is very unlikely for reason stated by the Project Participant.

Referring to Issue 2:

Response by Project Participant

1. Capital Costs:

The capital cost of Anshan CCPP in the FSR and PDD is 1.8619 billion RMB. This includes an estimate of the imported equipment cost of 890.48 million RMB. The actual cost of this equipment is 13.784 billion Japanese Yen plus 37.68 million RMB, which equates to 1.09629 billion RMB[17]. The estimate in FSR and PDD is therefore conservative at 206.29 million less than what has been paid in reality.

The remaining 971.44 million RMB in the FSR is broken down as follows:

Civil Works:	253.72 million
Auxiliary Equipment:	480.33 million
Equipment Installation:	98.10 million
Other expenditure:	139.29 million
Sub-Total Cost:	**971.44 million**

2. O & M Costs
All O&M costs applied in the IRR calculation are taken from the FSR. A full breakdown of these costs has been supplied to the DOE. The costs include utility costs (water, steam, nitrogen and compressed air), other materials (such as chemicals), labor, repair and maintenance, and other administration and overhead costs which include office expenses, training cost, travel cost, sharing cost of the board, payment of national insurance, medical treatment insurance, unemp-

[17] The contract for BFG Firing M701S(F) Gas Turbine Combined Cycle Power Plant of AISG

loyment insurance, housing fund for employees, property tax, payment of environment protection fee and other sundries.

The total annual O&M cost is 166.498 million RMB (excluding fuel costs). This represents less than 9% of the total investment each and is therefore considered to be reasonable.

3. Fuel Costs

Please see response to question 1 above.

4. Power Generation
According to the FSR of the Anshan CCPP project, the 300MW CCPP should generate 1,738,800 MWh per year. This assumes the following:

- 7000 operational hours
- 90% load factor
- 8% auxiliary power utilization (primarily used for the compressor station)

In fact these are very optimistic assumptions. The CCPP is dependent on the waste gases that are produced by the blast furnaces and the coke ovens. As such the volume and quality of the gases at any one time shows very high variation. There are storage tanks to help to compensate for this, but this is not sufficient to see a stable supply of gas.

When the gas supply is at a peak then the project will be able to operate at full load, but when the gas supply is at a trough then the gas supply will operate at partial load. Unfortunately the gas that is surplus in time of peak supply does not all get stored, due to the capacity of the tanks that are optimized for an average supply of gas rather than a peak supply.

The effect of the uncertainty in gas supply is actually very dramatic. It can be seen from the only registered and verified CCPP in China *"BOG and COG Utilisation for Combined Cycle Power CDM Project in Jinan Iron & Steel Works"*, which is a very similar CCPP project also utilizing BFG and COG. Operational data from this project is available on the UNFCCC web site and indeed has been widely known in the industry for some time.

This Jigang CCPP project shows the following results for the first three monitoring periods:

Table 4. Operational Data of Jigang CCPP

Monitoring Period	Days	Rated Capacity (MW)	Net Power Generation (MWh)	Equivalent annual operation hours at full rated capacity = (MWh*365/Days) / (MW*8760) *8760
17 Mar 2007 – 16 May 2007	61	544	226,956	2496
17 May 2007 – 07 Oct 2007	144	544	559,944	2609
08 Oct 2007 – 14 Feb 2008	130	544	493,415	2547

This shows that the equivalent annual operation hours for the Jigang project are around 2500 hours. It is understood that the main reasons for this are underestimated power consumption by the compressor and a very high degree of fluctuation of the waste gases.

For Anshan CCPP a comparable equivalent operation hours at full rated capacity would be calculated as:

7000 * 90% (load factor) * 92% (auxiliary load factor) = 5796 hours

This is almost double the actual operational data of Jigang CCPP and therefore it is not anticipated that for Anshan CCPP that 5796 full load equivalent hours will be achieved. Indeed this is a serious risk for the investment that would outweigh the impact of any small variations elsewhere in the investment analysis.

The figures taken for Anshan CCPP are therefore extremely conservative for the power generation figures. Furthermore, and perhaps more importantly, the investment analysis itself is extremely conservative given this overoptimistic performance data.

4. Power Tariff

The power tariff used in the IRR calculation in the PDD is 0.399 RMB/kWh (excl. VAT). This is the actual power tariff that the project owner pays for power and evidence for this was presented to the DOE during validation on site. The original calculation in the FSR includes a price for sales rather than purchase and this has already been amended. On this basis, the value used in the PDD is conservative.

4. Operational Lifetime

The operational lifetime of the project is 20 years. This is in accordance with the EB39 Annex 35 guidance, when it is stated that "*In general a minimum period of 10 years and a maximum of 20 years will be appropriate*".

5. Income tax rate

The income tax rate is also taken from the FSR for the project. This is the standard rate for income tax for companies in China both now and at the time of writing the FSR (http://www.chinatax.gov.cn/n480462/n480513/n480979/n554139/1003219.html).

Response by TÜV SÜD

Capital Costs:

The purchase agreement of the main equipment has been checked and verified by the DOE. For the remaining costs of 971.44 million RMB the FSR has been carefully checked. The input values can be confirmed by the DOE.

Fuel expenditure:

Please see explanation regarding Issue 1.

Water expenditure:

Usage: 700t/h x 7000h=4,900,000t

Unit cost: 2.52 RMB/t
Water cost: 4,900,000x2.52=12,348,000RMB

The usage value has been compared with Integrated Pollution Prevention and Control (IPPC) values[18] and the water price applied regularly in China.
The above water charges are 15% higher than the assumed water costs. Hence the assumptions in the FSR can be considered conservative.

Material expenditure:

These costs contain costs for steam for the start up of the project, costs for N_2, costs for compressed air. These values are taken from the FSR and have been carefully checked by the DOE. We consider these costs to be within the range for this project type and size.

Employee expenditure:

Total employees: 152
salary/year: 25000RMB/year
benefit: 14% of salary
total labour cost =25000x152x1.14=4,332,000RMB
These values have been taken from the FSR and can be considered to be applicable.

Maintenance expenditure:

These costs are around 6,56% of the total investment and are considered to be in a reasonable range.

Other O&M expenditure:

These costs are related to overhead costs that include management, administration and insurance among others.

Power generation:

The value of 7000 hours was taken from the FSR. That is a standard assumption for Chinese Waste Heat Recovery Projects.
Due to the dependence of the electricity production on steel production process, the value of 7000 hours can be considered applicable and reasonable.

Power tariff:

The tariff of 0,339 RMB/kWh (excl. VAT) has been checked and verified by the DOE.

Operational Lifetime:

A lifetime of 20 years was chosen, which is a conservative approach and incompliance with the EB 39 regulations.

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[18] Best Available Techniques Reference Document on the Production of Iron and Steel; December 2001

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Income tax rate:

The income tax rate of 33% is the standard rate for income tax for companies in China.

Referring to Issue 3:

Response by Project Participant

According to the methodology ACM0004, there are three steps to identify alternatives to the project activity:

1. Identification of alternative baseline scenarios.
2. Excluding baseline options that do not comply with legal and regulatory. requirements or depend on key resources such as fuels, materials or technology that are not available at the project site.
3. Identifying that among the alternatives that do not face any prohibitive barriers, the most economically attractive alternative should be considered as the baseline scenario

Also, according to the methodology ACM0004, the following five scenarios are identified as baseline alternatives for the proposed project:

(1) The proposed project activity not undertaken as a CDM project activity;
(2) The current situation of surplus waste gas being flared and continued purchase of electricity from the Northeast Power Grid;
(3) Existing or new captive power generation on-site, using other renewable energy sources or other resources as coal, gas, and oil, etc;
(4) Other uses of the COG and BFG
(5) A mix of options (2) and (3), in which case the mix of grid and captive power should be specified

Section B.4 of the PDD eliminates (3), (4) and (5) due to prohibitive barriers and a lack of demand for other uses of the COG and BFG. Therefore the only options left to consider are options (1) and (2).

Option (1) is eliminated since it is proven to be economically unattractive and therefore additional. Option (2) is considered to be economically attractive since it is the current business as usual option for AISG. Furthermore, the savings from not purchasing power from the grid are already included in the economic analysis presented in the PDD and it is clearly demonstrated from this that it is not financially attractive to stop purchasing power in favour of investing in the CCPP.

However to further elaborate this point the project participant has prepared a cost comparison of the two options… This has been done through a Net Present Value of the costs of scenarios (1) and (2) over a 22 year lifetime and a subsequent evaluation of the levelised cost of both scenarios.

This is presented below in tables 5, 6 and 7.

Table 5. Discounted Annual Power Generation of AISG

		Reference	0	1	2	3	4	5	6	7	8	9	10
Annual Power Generation (MWh)	A	FSR	-	-	1,642,200	1,642,200	1,642,200	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800
Discount Factor	B	$= 1 / (1 + DR)^n$	1	0.88496	0.78315	0.69305	0.61332	0.54276	0.48032	0.42506	0.37616	0.33288	0.29459
Present Value of Annual Generation (MWh)	C	= A x B	-	-	1,286,089	1,138,127	1,007,194	943,751	835,180	739,094	654,067	578,812	512,233
Total Present Value of Annual Generation (MWh)	D	= Sum (C_i)	10,607,576										
Power Price (RMB/MWh)	E	FSR	399										

		Reference	11	12	13	14	15	16	17	18	19	20	21
Annual Power Generation (MWh)	A	FSR	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800	1,738,800
Discount Factor	B	$= 1 / (1 + DR)^n$	0.26070	0.23071	0.20416	0.18068	0.15989	0.14150	0.12522	0.11081	0.09806	0.08678	0.07680
Present Value of Annual Generation (MWh)	C	= A x B	453,305	401,159	354,993	314,166	278,017	246,040	217,733	192,676	170,507	150,893	133,540
Total Present Value of Annual Generation (MWh)	D	= Sum (C_i)											
Power Price (RMB/MWh)	E	FSR											

Where DR = Discount Rate = 13% and n = year (21)

Table 6. NPV and Levelised Cost of Scenario (1): The proposed project activity not undertaken as a CDM project activity

		Reference	0	1	2	3	4	5	6	7	8	9	10
Capital Cost	F	FSR	930,967,000	930,967,000									
Depreciation	G	FSR			109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000
Amortization	H	FSR			5,340,000	5,340,000	5,340,000	5,340,000	5,340,000	5,340,000	5,340,000	5,340,000	5,340,000
O&M Cost	I	FSR			320,486,516	320,486,516	320,486,516	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280
Residue	J	FSR											
Income Tax saved (@ 33%)	k	= (F+G+H+I-J) x 0.33			143,519,150	143,519,150	143,519,150	146,306,252	146,306,252	146,306,252	146,306,252	146,306,252	146,306,252
Total Cost	L	= F + I - J	930,967,000	930,967,000	176,967,366	176,967,366	176,967,366	182,626,028	182,626,028	182,626,028	182,626,028	182,626,028	182,626,028
Discount Factor	M	$= 1 / (1 + DR)^n$	1	1	1	1	1	1	0	0	0	0	0
Present Value of Total Annual Cost	N	= KxL	930,967,000	823,868,556	138,591,992	122,647,233	108,537,625	99,122,103	87,718,934	77,627,019	68,696,607	60,792,552	53,799,801
Total Present Value of Annual Costs	**O**	**= Sum (L_i)**	2,873,974,736										
Levelised Cost (RMB/MWh)	**P**	**= N / D**	271										

		Reference	11	12	13	14	15	16	17	18	19	20	21
Capital Cost	F	FSR											
Depreciation	G	FSR	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000	109,080,000
Amortization	H	FSR	5,340,000										
O&M Cost	I	FSR	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280	328,932,280
Residue	J	FSR											132,982,000
Income Tax saved (@ 33%)	k	= (F+G+H+I-J) x	146,306,252	144,544,052	144,544,052	144,544,052	144,544,052	144,544,052	144,544,052	144,544,052	144,544,052	144,544,052	100,659,992
Total Cost	L	= F + I - J	182,626,028	184,388,228	184,388,228	184,388,228	184,388,228	184,388,228	184,388,228	184,388,228	184,388,228	184,388,228	95,290,288
Discount Factor	M	$= 1 / (1 + DR)^n$	0	0	0	0	0	0	0	0	0	0	0
Present Value of Total Annual Cost	N	= KxL	47,610,605	42,540,208	37,644,701	33,315,265	29,481,834	26,090,934	23,089,094	20,432,060	18,081,110	16,001,210	7,318,294
Total Present Value of Annual Costs	**O**	**= Sum (L_i)**											
Levelised Cost (RMB/MWh)	**P**	**= N / D**											

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Table 7 NPV and Levelised Cost of Scenario (2): The current situation of surplus waste gas being flared and continued purchase of electricity from the Northeast Power Grid;

		Reference	0	1	2	3	4	5	6	7	8	9	10
Capital Cost	F	FSR											
O&M Cost	G	FSR			655,237,800	655,237,800	655,237,800	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200
Income Tax saved (@ 33%)	H	= G x 0.33			216,228,474	216,228,474	216,228,474	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796
Total Cost	J	= F + G - H			439,009,326	439,009,326	439,009,326	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404
Discount Factor	K	$= 1 / (1 + DR)^n$	1	0.88496	0.78315	0.69305	0.61332	0.54276	0.48032	0.42506	0.37616	0.33288	0.29459
Present Value of Total Annual Cost	L	= J x K	-	-	343,810,154	304,255,413	269,253,200	252,292,978	223,268,781	197,582,087	174,851,733	154,733,744	136,935,272
Total Present Value of Annual Costs	**M**	**= Sum (L_i)**	**2,835,723,412**										
Levelised Cost (RMB/MWh)	**N**	**= M / D**	**267**										

		Reference	11	12	13	14	15	16	17	18	19	20	21
Capital Cost	F	FSR											
O&M Cost	G	FSR	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200	693,781,200
Income Tax saved (@ 33%)	H	= G x 0.33	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796	228,947,796
Total Cost	J	= F + G - H	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404	464,833,404
Discount Factor	K	$= 1 / (1 + DR)^n$	0.26070	0.23071	0.20416	0.18068	0.15989	0.14150	0.12522	0.11081	0.09806	0.08678	0.07680
Present Value of Total Annual Cost	L	= J x K	121,182,068	107,241,715	94,900,388	83,986,099	74,322,213	65,773,927	58,206,439	51,508,189	45,581,564	40,338,243	35,699,205
Total Present Value of Annual Costs	**M**	**= Sum (L_i)**											
Levelised Cost (RMB/MWh)	**N**	**= M / D**											

For comparison of these two scenarios the different tax situations have been considered. This is due to the fact that scenario 1 includes a capital investment and scenario 2 does not. For scenario 1 there is a capital allowance for the depreciation and amortization of the capital cost. For both scenarios 1 and 2 income tax will be due. Income tax is due on net income and in scenarios 1 and 2 this will be different and there is a tax benefit in having higher annual costs i.e. less tax will be paid. In other words net annual income will be less when there are higher annual costs and therefore income tax will also be less. Conversely, when net annual income is higher then so are the taxes, which is the case for Scenario 1.

Tables 6 and 7 above show that the levelised cost of power generation obtained for scenario 2 (267 RMB / MWh) is less than the levelised costs for scenario 1 (271 RMB / MWh).

Whilst this difference is small when you compare the two scenarios there is no risk or indeed effort required to purchase power from the grid, whereas there are enormous risks associated with the investment of a new technology in the industry that is reliant on an unstable fuel source. Therefore the rational decision is to do nothing rather than risk capital on something that does not bring about any additional benefits. As such it can be confirmed that the baseline is indeed purchase of power from the grid and not the proposed project undertaken without the CDM.

Response by TÜV SÜD:

The economical analysis of Anshan Iron and Steel Group Corporation to implement a CCPP project, was based on benchmark analysis during the investment decision in 2004.
The above described "levelized costs analysis" was conducted to answer to this request for review.
In time of the decision making benchmark analysis was conducted based on assumptions including a calorific value based fuel price in the O&M costs. These assumptions lead to the conclusion, that the project would not be feasible and additional subsidies would be needed to implement it.
Development of the project under CDM was decided as a way to receive the additional money to proceed with the project. For that reason CDM was the activator for this project. After excluding calorific value based fuel price in O&M costs, the IRR is still below the benchmark.

The above stated levelized cost analysis has been conducted to fulfil the methologized requirement as stated in the Request for Review. This analysis has been validated and shows that both scenarios have the same levelized cost. In this scenario it is very likely that the project owner would have cjosen to continue purchase from grid since this option does not require high initial investment.

Referring to Issue 4:

Response by Project Participant

EB 38, paragraph 60 states "*The Board clarified that in the context of conducting common practice analysis, project participants may exclude registered CDM project activities and project activities which have been published on the UNFCCC CDM website for global stakeholder consultation as part of the validation process."*

This guidance was not available at the time of submission of this project, but the project participant is able to make the necessary correction to the PDD as required. According to the guidance, three projects registered which are listed as table below would be removed from the analysis.

Table 8. The projects removed list in Common Practice from PDD

	Name of project owner	**Project Name**	**EB Reference / Project Status**	**Link**
1	Jinan Iron and Steel Works Group Company Limited	BOG and COG Utilisation for Combined Cycle Power CDM Project in Jinan Iron & Steel Works	0812	http://cdm.unfccc.int/Projects/DB/TUEV-SUED1166194116.62/view
2	Handan Iron & Steel Group Company Ltd.	Waste gases utilisation for Combined Cycle Power Plant in Handan Iron & Steel Group Co., Ltd	1262	http://cdm.unfccc.int/Projects/DB/TUEV-SUED1185365330.91/view
3	Baogang Iron and Steel (Group) Company Ltd.	Baogang Iron and Steel Blast Furnace Combined Cycle Power plant project	1416	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1200.pdf

The examples selected in common practice are based on the all projects in China with similar sized installations. For the purpose of the evaluation 200MW was taken as the threshold, but in fact the list also represents all projects in China over 100 MW. This criteria was used in order to reflect the different size of investment and associated risk.

Response by TÜV SÜD:

TÜV can confirm, that in the time of submission (06/02/2008), the EB38 requirements have not been published.
At the time of the audit five similar projects in the North East China grid existed. This has been confirmed by Mr. Lan Denian, vice director of Technology and Environmental Protection Department of Steel Association.
Jinan Iron and Steel Works CCPP projects; 544 MW; Shandong Province, was just registered as CDM project
Baogang CCPP; 300MW; Inner Mongolia Province and Handan Iron & Steel CCPP; 100MW; Hebei Province were requesting the approval of the Chinese DNA, to be developed under CDM. Both projects are registered now. That is why they fall out of the scope of the common practice analysis.
The Jilin Tonghua Phase 1 project is also located in that region. It falls out the scope of common practice, because of the capacity range.
Apart from these projects, the "Shanghai Bao Steel Group Corporation project" (please refer to PDD) is situated in that region. This project received government funding. The difference to the 1609 Anshan Iron and Steel Group Corporation Yingkou project is significant.

Referring to Issue 5:

Response by Project Participant

This principal mechanism for demonstration of additionality for this project is through the use of an investment analysis. As such the barrier analysis need not be applied and the project participant agrees to the removal of this section.

Response by TÜV SÜD:

The project participant will rely on the investment analysis. The barrier analysis will be skipped in the revised PDD.
For that reason an answer to this question is not needed anymore.

Referring to Issue 6:

Response by Project Participant

This principal mechanism for demonstration of additionality for this project is through the use of an investment analysis. As such the barrier analysis need not be applied and the project participant agrees to the removal of this section.

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Response by TÜV SÜD:

The project participant will rely on the investment analysis. The barrier analysis will be skipped in the revised PDD.
For that reason an answer to this question is not needed anymore.

Referring to Issue 7:

Response by Project Participant

This principal mechanism for demonstration of additionality for this project is through the use of an investment analysis. As such the barrier analysis need not be applied and the project participant agrees to the removal of this section.

Response by TÜV SÜD:

The project participant will rely on the investment analysis. The barrier analysis will be skipped in the revised PDD.
For that reason an answer to this question is not needed anymore.

Referring to issue 8:

Response by Project Participant

a) Selection of the project boundary

i) Determination of GHG emission of the project activity

According to ACM0004, for the purpose of determining GHG emission of the project activity, project participants shall include CO2 emissions from combustion from auxiliary fuels used in the proposed project.

In the Feasibility Study Report of the proposed project, steam is used for generation start-up when the turbine has been shut down. This steam is generated from a mixture of coal and Blast Furnace Gas. Emissions from this source are included in project emission as stated in B.6.3 of the PDD when determining GHG emissions from the project activity

ii) Determination of baseline emission

According to ACM0004, for the purpose of determining baseline emissions , following emission sources should be included

- CO2 emissions from fossil fuel fired power plants connected to the electricity system (i.e. the Northeast China Power Grid).
- CO2 emissions from fossil fuel fired captive power plants supplying the project site facility.

At present, the majority of power used by AISG is imported from the grid (an amount equivalent to that generated by a 795 MW plant). There is a small amount of on-site generation (345 MW) but this power is used internally and is not connected to the provincial grid. AISG remains a net consumer of grid power and therefore the electricity generation of the Project will not displace the electricity generation from the existing captive power plant. Under the project activity, power generation by the project is supplied to the grid and AISG will continue to purchase power back from the grid. The existing on-site captive power generation is not therefore considered part of the project boundary.

iii) Determination of the spatial extent of the project boundary

According to ACM0004, the spatial extent of the project boundary covers:

1. The waste gas sources.

2. The combined cycle generation system with its auxiliary system

3. Existing captive power generating equipment.

   As discussed above, existing on-site captive power is used internally. AISG remains a net consumer of power and this project will supply electricity to the grid. That means the electricity generation of the Project will not displace the electricity generation from the existing captive power plant.

4. The power plants connected physically to the Northeast China Power Grid.

   The Northeast Power Grid is one of the six regional power grids in China, which covers Helongjiang, Liaoning and Jilin provinces according to “Announcement on determination of baseline emission factors of regional grid in China” published by China CDM DNA[19].

The emissions sources which are included for determination of both **baseline** and **project emission** are presented as table below:

Table 9. GHG’s Include in the Project Boundary

	Source	**Gas**	**Included?**	**Justification / Explanation**
Baseline	Northeast Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification according to methodology ACM0004. This is conservative.
		N_2O	Excluded	Excluded for simplification according to methodology ACM0004. This is conservative.
Project Activity	On-site fossil fuel consumption due to the project activity	CO_2	included	May be an important emission source
		CH_4	Excluded	Excluded for simplification according to methodology ACM0004.
		N_2O	Excluded	Excluded for simplification according to methodology ACM0004.
	Combustion of waste gas for electricity generation due to the proposed project	CO_2	Excluded	This gas would have been burned in the baseline scenario.
		CH_4	Excluded	Excluded for simplification according to methodology ACM0004.
		N_2O	Excluded	Excluded for simplification accor-

[19] • Announcement on determination of baseline emission factors of regional grid in China • Ž http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235

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				ding to methodology ACM0004.

(b) the exclusion of other users of BFG in the baseline

i) Other users

The tables below shows gas balance for both of BFG and COG. They illustrate the current gas supply and usage at AISG. It is the surplus gas that is currently flared that will be used by the proposed project. As explained in Question 3 above there is part of BFG reused in the iron-making process, and also some COG has been reutilized in production process and residential users. However, there are no local industry users which have the potential to utilize such an amount of surplus coke oven gas and blast furnace gas.

Table 10. Gas Balance (BFG) of Anshan

Gas Type	Gas Users	Before Constructions		After Constructions	
		Gas Total Amount (m3/y)	Consumed Proportion (%)	Gas Total Amount (m3/y)	Consumed Proportion (%)
BFG	Hot-air furnace for iron-making	23.76 billion	41	23.76 billion	41
	Chemical coke oven		21		21
	No.1Tank and No.2 Tank				4
	Other small users		1		1
	Gas flaring		19		
	Process Heat		13		13
	CCPP				15

Table 11. Gas Balance (COG) of Anshan

Gas Type	Gas Users	Before Constructions		After Constructions	
		Gas Total Amount (m3/y)	Consumed Proportion (%)	Gas Total Amount (m3/y)	Consumed Proportion (%)
COG	Chemical coke oven	2.36 billion	1	2.36 billion	1
	Hydrogen Production		7		7
	Urban civil use		6		6
	Steel Production		1		1
	Fire-resistant materials		4		4
	Ignition Fuel		8		8
	Gas tank of coke-oven				1
	CCPP				13
	Gas mixing and pressuring station		59		59
	Gas Flaring		14		

Furthermore, these tables show clearly that volume of gas available for the CCPP project is sufficient and in line with the gas requirement set out in the feasibility study report. The feasibility study states that 3,263,330,000m^3 / y of BFG and 291,900,000 m^3 / h of COG will be required.

According to the tables above the gas availability for the CCPP running per year equates to 3,564,000,000m^3 / year of BFG and 306,800,000 m^3 / year of COG. There is therefore sufficient gas for the project activity and no gas will be displaced from other uses. There are also no other potential uses of the gas not listed above and therefore other users of BFG and COG are excluded from the baseline.

ii) Other captive power plant

There are 3 captive power plants onsite with a total capacity of 345 MW. The first two (220MW) are out of the official 20 year project lifetime and the third plant (125MW) was commissioned in 2004 and therefore is likely to operate for the duration of the project activity.

When the power plants are shut down they will not be replaced with new coal fired power plant. This is in accordance with the national policy on coal fired power plants[20] and the municipal regulations on clear air in the city of Anshan[21] This has already been demonstrated in the selection of the baseline such that new captive power plant faces prohibitive barriers due to the restriction of SO_2 emissions in Anshan city. For this reason the first two existing captive power plants will be shut down[22]

In reality, when these coal power plants are closed they will not be replaced with any form of captive power, since it is more economic for them to continue to purchase power from the grid as they already do for most of the power that they consume. This has also been confirmed by the levelised cost analysis presented above.

Response by TÜV SÜD:

(a) Determination of the project boundary

According to the methodology project participants shall include the following GHG emissions:

- CO2 emissions from combustion from auxiliary fossil fuels

By considering the emissions from steam production for start-up generation in section B.6.3 in the PDD, this demand of the methodology is fulfilled.

According to the methodology the following emissions shall be included into the baseline

- CO2 emissions from fossil fuel fired power plants connected to the electricity system (i.e. the Northeast China Power Grid).

[20] The notice on speeding up the closure of small scale fuel-fired plants approved by State council, Guaofa No.2 2007

[21] Approval on issues of national acid and SO2 control areas issued by State Council, Guohan No.1998-5

[22] The Notice on shut-down of small scale power generator unit of fuel-fired approved by State Council, Guofa,No.2 2007

- CO_2 emissions from fossil fuel fired captive power plants supplying the project site facility.

The power generated by the captive power plants is only for internal use of AISG.
The project activity will not replace the electricity produced from these plants.
AISG will remain a net consumer of the grid. Therefore the emissions from these plants can be excluded.
The majority of power used by AISG is imported by the North east power grid and therefore is included into the emission calculation (please refer to B.6 in the PDD).
The two requirements of the methodology are both fulfilled.

The spatial extend of the project boundary also fulfils the criteria of the methodology. Baseline and project emissions are clearly presented in table 9 above.

(b) The exclusion of other users of BFG in the baseline

The gas balances in the FSR as well as in the supplementary clarifications made by Anshan Iron and Steel Company have been carefully checked and verified by the DOE. The input values can be considered applicable and a use of BFG and COG other than the benefits stated above can be excluded.

(c) Other captive Power Plant

In total there are three Captive Power Plants installed at the steel plant. Two of them are already operating beyond the planned lifetime of 20years. The third was implemented in 2004. According to national law, coal fired power plants with a capacity below 135 MW are prohibitive[23].
Hence after the shut down of the captive power plants, no further coal plant will be build. Instead the electricity will be purchased from grid, as evidenced by levelized cost analysis. It would be economical to purchase electricity from grid rather than install a waste gas based power plant.

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[23] The Notice on Strictly Prohibiting the Illegal Installation of Thermal Generators with the capacity of 135MW or below issued by the General Office of the State Council, Guo Ban Fa Ming Dian decree No. 2002-6.