CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

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SECTION A. General description of project activity

A.1 Title of the project activity:

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Harbin District Heating Project, Dao Li District

A.2. Description of the project activity:

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The main activity in the project is to substitute energy supply for heating and hot tap water (HTW), today supplied through small-scale, inefficient, coal-fired heat only boilers to supply from a district heating network. The energy supply to the district heating network will come from large-scale, coal-fired heat only boilers.

The objectives of the project are to improve the environmental conditions in the city of Harbin by substituting a large number of small-scale, inefficient, coal-fired boilers and stoves by heat supply from a district heating system. In addition, the objective is to improve the energy efficiency, supply reliability and indoor climate by installing modern district heating equipment including automatic controls. The project has been developed with due consideration to sustainability, transfer of technology and financial/economic implications.

The view of the project participants (ref. the participants listed below) is that the project will contribute to a sustainable development in the city of Harbin.

A.3. Project participants:

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Harbin Huaneng District Heating Company

CMC International Tendering Corp.

Ministry of Finance of The People's Republic of China

DANIDA, Ministry of Foreign Affairs, Kingdom of Denmark (Annex 1 Country participant) (supporting the project through technical assistance and mixed credits)

ABB - Denmark (Contractor responsible for the supply of equipment and commissioning of equipment (substations, pre-insulated pipes, valves, and the SCADA system). The Contract with ABB has not been signed as of the present date (12 August 2004), however, it is anticipated that the Contract will be signed and come into effect within the next two months.

The contact information is further specified in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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Harbin, Heilongjiang Province, The People's Republic of China

A.4.1.1. Host Party(ies):

>>
Harbin Huaneng District Heating Company

A.4.1.2. Region/State/Province etc.:

>>
Heilongjiang Province

A.4.1.3. City/Town/Community etc:

>>
Harbin

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The physical location of the project is in the Dao Li District of Harbin, Heilongjiang Province, The People's Republic of China.

The project area comprises three (3) existing district heating districts in Harbin and the also the former Harbin Automobile Plant.

The physical boundaries are:

District 1: The boundaries are:
East: Anhe Street railway, West: Kang'an Road, North: Songhua River and South: Xinyang Road.

District 2: The boundaries are:
East: Jingwei Street, West: Anhe Street railway, North: Songhua River and South: Fushun Street.

District 3: The boundaries are:
East: Yimian Street, West: Jingwei Street, North: Songhua River and South: Jihong Street.

A.4.2. Category(ies) of project activity:

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Sector: Energy
Category: Energy Efficiency in Heat Production
GHG item: Reduction of Carbon Dioxide (CO_2) emissions

A.4.3. Technology to be employed by the project activity:

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Improved boiler technology and automatic controls, installation of pre-insulated district heating pipes and valves, installation of heating units including automatic controls, and installation of a SCADA system for system optimisation.

The applied technology is well known, well proven and well documented district heating technology. Similar technology has for a considerable number of years been applied by district heating enterprises in Western Europe, and more recently also similar technology has also been installed at several locations in China.

To ensure a sound cooperation between the Contract / Equipment Suppliers and the Purchaser (Harbin Huaneng District Heating Company), the Contract includes provisions for design liaison meetings and training sessions to take place both in Harbin and at the Contractor's home office (Denmark). In addition, the Contract also includes provisions for the Purchaser to participate in various tests of equipment (e.g. test to the SCADA system, performance test of heating units, etc.).

The Purchaser will be deeply involved in the project as the Purchaser will install the supplied equipment. The Contractor will conduct the commissioning and final adjustment of the installed equipment.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

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The proposed CDM project reduces the anthropogenic emission of greenhouse gasses (Carbon Dioxide,) CO_2) by substituting heat supply from small-size, ineffective coal-fired boilers and stoves by supply of heating from a district heating system. The heat supplied to the district heating network is produced at large-size coal-fired boilers with considerably higher efficiency compared to the small-scale boilers. The result of the project is that the overall consumption of coal (and accordingly emission of CO_2) is reduced.

The reduction in CO_2 emission is estimated to be in the range of 616,491 ton/year (2006) to *389,938* ton/year (2015). Reference is made to estimates as indicated in Annex 3 - Baseline Information.

The total reduction in CO_2 emissions is estimated to be *5,032,142* tonnes (2006 through 2015). Reference is made to estimates as indicated in Annex 3 - Baseline Information.

The heat supply from the proposed CDM project will be available for the heating season 2005, and accordingly the proposed CDM project is the key factor for a rapid phasing out of the old, inefficient small-scale boilers. The existing boilers are owned and operated by various owners - a large number are owned by industrial enterprises. The implementation of the project requires cooperation between the existing owners and Harbin Huaneng District Heating Company.

The new heating units substituting the existing boilers are furnished with automatic controls, which in addition will contribute to a reduced energy consumption / appropriate control of the indoor climate at the consumers and subsequently have the effect that less coal shall be combusted, i.e. reduced emission of Carbon Dioxide.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

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The crediting period has been selected to be 10 years and commence by 01 January 2006 and ending by 31 December 2015.

The estimated emission reductions are listed below:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission reduction [ton/year]	616,491	591,318	566,146	540,973	515,801	490,628	465,455	440,283	415,110	389,938

The CO_2 emission reduction in the period 2006 through 2015 is 5,032,142 ton CO_2.

A.4.5. Public funding of the project activity:

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The owner of the project is Harbin Huaneng District Heating Company. The Harbin Lao Li District Heating Project is financed by loans from China Development Bank (subsidized domestic loans), own equity (primarily by selling heating property made redundant by the project), consumer connection charges, and subsidized domestic and foreign loans (Danish Mixed Credit) bank loans.

The Danish Mixed Credit is a soft loan provided in accordance with the OECD Arrangement on officially Supported Export Credits.

The split of the financing is shown in the table below.

Stricture of Finance	**CNY (1,000)**	**USD (1,000)**	**%**
China Development Bank Loan	1,025,000	124,242	57.7
Equity Capital	320,000	38,788	18.0
Danish Mixed Credit	277,000	33,576	15.6
Connection fees	154,000	18,667	8.7
Total	**1,776,000**	**215,273**	**100.0**

The income from sale of CER will be used to reduce the equity share of Harbin Huaneng District Heating Company.

The financial plan for the Harbin Lao Li District Heating Project, as shown above, includes public funding from Denmark, an Annex I Country. As stated in Annex 2, however, this does not result in the diversion

of official development assistance and is separate and not counted towards the financial obligations of Denmark.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

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A new base line methodology is proposed. Reference is made to the Proposed New base line Methodology: Baseline (CDM-NMB) - Energy Efficiency Improvements in District Heating Production and Distribution.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

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The proposed new baseline methodology is specifically designed for assessment of emissions caused by combustion of coal for heating and HTW in urban areas. The conditions prevailing in Harbin (numerous small existing coal-fired boilers, development of new buildings and ongoing replacing exiting boilers by new boilers) match the conditions for which the new base line methodology was designed.

The methodology is targeted on how to estimate the GHG emission reductions for a project activity in which heat supply from a district heating system is alternative to the base line scenario. The situation is exactly matching the situation in Harbin.

B.2. Description of how the methodology is applied in the context of the project activity:

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The stipulations in the proposed new base line methodology are applied for establishing the baseline scenario.

The CO_2 emissions in the base line and the project scenarios for the Harbin project are calculated following the stipulations in the proposed new base line methodology.

The additionality of the project activity is evaluated as described in the proposed new base line methodology.

Selection of justifiable and realistic Base Line Scenario

Based on an evaluation of a) the current regulations (Ref. the Ministry of Construction of the PRC: Decree No. 51 - 1st July 1996) concerning heat supply in the PRC, b) how the heat supply in Harbin has been done until now and c) what is currently the state-of-the-art in heat supply in China, it is most likely scenario that would occur without the project activity is **Alternative 1 - Replacement and Technical**

Enhancement, Existing Supply Concept (ref. the proposed New Base Line Methodology). **Alternative 1 Replacement and Technical Enhancement, Existing Supply Concept** will be the Base Line Scenario.

The justification for selecting **Alternative 1 - Replacement and Technical Enhancement, Existing Supply Concept** (ref. the proposed New Base Line Methodology) is elaborated below.

- Natural gas is not available in Harbin, and the distance to the nearest natural gas transmission pipeline is more than 50 km, i.e. Alternative 03 - Introduction of Natural Gas, Heat Only Boilers is evaluated not to be a realistic option**.** A natural gas transmission pipeline is under consideration for supply of natural gas from Eastern Siberia (Russia) to China. It is highly likely that the transmission pipeline will be routed also to be able to supply Harbin, however, at the present stage it is not possible to predict a date on which the pipeline will be constructed (not to mention be in operation). Accordingly, the natural gas fired base line alternative is not considered a realistic base line.

- The building areas today having no central heating and heated with stoves and furnaces would gradually be converted to central heating based on heat from local coal-fired boilers (i.e. a block heating concept);

- The building today supplied from small coal boiler stations would continue to be supplied from these;

- The new buildings under construction will have central heating based on local coal-fired boilers.

Additionality

The additionality of the project activity is evaluated by application of the stipulations in the Base Line Methodology, i.e. by application of the "Tool for demonstration and assessment of additionality".

Step 0. Preliminary screening based on the starting date of the project activity

The project participants do now request the crediting period to start prior to registration of the project activity. Accordingly, the proposed project activity passes this criterion.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations.

Sub-step 1a. Define alternatives to the project activity

The supply of heat and hot tap water in Harbin could be made in the following alternative manners.

Alternative 01 - Replacement and Technical Enhancement, Existing Supply Concept:
The existing boilers will be kept in operation as long as technically possible, using the same fuel as today. At the end of the technically life span of the existing boiler, new heat only boilers with an efficiency corresponding to the efficiency of typical, new heat only boiler (fuel specific efficiency) will be installed.

For heat supply to new buildings, new heat only boilers with an efficiency corresponding to the efficiency of typical, new heat only boiler (fuel specific efficiency) will be installed.

Alternative 02 - District Heating, Heat Only Boiler Concept (This alternative is identical with the proposed project activity and accordingly will not be included in the further identification of an (alternative) base line scenario):

The existing boilers will be replaced by supply from a district heating pipe network. The replacement will take place in phases in compliance with construction of a distribution pipe network for heating. The heat supply to the district heating network will come from heat only boilers. The fuel used in the heat only boilers will be coal.

For heat supply to new buildings, the heat supply will be made from the district heating network.

Alternative 03 - Introduction of Natural Gas, Heat Only Boilers:
The existing boilers will be replaced by new boilers (with an efficiency corresponding to typical, natural gas fired boilers). The replacement will take place in phases in compliance with construction of a natural gas distribution pipe network.

For heat supply to new buildings, new heat only boilers (natural gas fired) with an efficiency corresponding to the efficiency of typical, new heat only boiler will be installed.

Alternative 04 - Electrical Heating
The existing boilers will be replaced by panels for electrical heating.

Alternative 05 - Solar Heating
The existing boilers will be replaced by solar panels for supply of heating.

Sub-step 1b. Enforcement of applicable laws and regulations

From a regulatory point of view, the Chinese Government is responsible for the general policy on heating, while the local municipal government is responsible for implementing actual heat supply projects. The general Chinese policy states that heat supply for cities in the north of China should be based on district heating, but does not in general specify which heat source should be used to supply the systems. Choice of heat source is done by the Municipal Government - based on a regulation from the Ministry of Construction[1].

Size of boilers for heat supply in Chinese cities

TYPE OF CITY	HEATING AREA IN SQUARE METERS	BOILER SIZE
-	less than 40 000	No regulation
Small	40 000 - 100 000	minimum 3 MW or 4 tons steam
Big &	100 000 - 250 000	minimum 7 MW or 10 tons steam

[1] The Ministry of Construction of the PRC: Decree No. 51 - 1st July 1996

Medium		
Major	more than 250 000	minimum 12 MW or 20 tons steam

It is, however, the policy of the Chinese Government that district heating is justified because it enhances the possibilities in the long perspective to base power production on co-generation.

No existing regulatory regime directly enhances the use of surplus heat or the construction of larger district heating systems. The current regulation inclines the use of heat-only-boilers and put the responsibility of increased sustainability of heating sector development on the Municipal Govemments. Based on the current regulation, the heat supply in Hou Ma should be based on heat-only-boilers with capacities of 12 MW.

According to the above:

Alternative 01 - Replacement and Technical Enhancement, Existing Supply Concept

complies with the applicable legal and regulatory requirements. Other listed alternatives are eliminated from further considerations.

An alternative different from the proposed project activity has been identified, and accordingly the proposed project activity passes this criterion.

It has been chosen to demonstrate the additionality of the project activity through Step 3 Barrier analysis and Step 2 Investment analysis.

Step 2. Investment analyses

Sub-step 2a. Determine appropriate analysis method

The CDM generates financial and economic benefits (other than CDM related income) and accordingly Option I - Simple cost analyses can not be applied. Option II - Investment comparison analysis is applied.

Sub-step 2b. Option II. Apply investment comparison analysis

The cash flow in the project scenario is compared to the cash flow in the baseline scenario (Alternative 1). The applied indicators are the project IRR and the NPV-WACC. For details on the calculations please see below.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to option II and III)

Details on the calculation of the IRR and NPV-WACC are found in the enclosed Attachment B - Project Cash Flow and Attachment C - Alternative 1 Cash Flow.

The following data has been applied in the project scenario and in the baseline scenario (Alternative 1)

- The sale of heat, the heated floor area and the tariff for heat are identical in both the scenarios (i.e. the consumers are receiving the same volume of heat and paying the same tariff). This means that the income from sale of heat is identical in both scenarios.

- The cost of coal and calorific value are identical in the project scenario and the baseline scenario (185 CNY per ton coal, 24.19 MJ/kg) resulting in an energy price for coal of 0.93 USD/GJ.

- Operation costs (excluding cost for coal) are identical in both scenarios, reference is made to the document "Danida, Technical Assistance - Harbin District Heating Company, Final Status Note - June 2002) in which the operation cost for various alternatives have been assessed.

- In the project scenario the investment (CAPEX) is USD 215,272,727, distributed in the period 2003 through 2006. The distribution is identical to the distribution indicated in the document "Ministry of Foreign Affairs, Danida, Harbin Daoli District Heating Project, Project Justification and Financial and Economic Analyses, March 2004"

- In the baseline scenario (Alternative 1) the investment (CAPEX) follows the construction of new buildings and the replacement of existing boilers (a time horizon of 15 years). The investment is calculated as the design thermal rating of the connected consumers multiplied by a unit price for boilers (USD/MW). The unit price is 215,155 USD/MW (design thermal rating of connected buildings). The unit price is calculated based on data in the document "Ministry of Foreign Affairs, Danida, Harbin Daoli District Heating Project, Project Justification and Financial and Economic Analyses, March 2004". It should be noted that the applied unit price includes complete boiler installations (e.g. including land acquisition, buildings and mechanical equipment). In addition the unit price is adjusted for over sizing of rating of boilers (per tradition design engineers select equipment with higher (thermal) rating than calculated by simple adding connected thermal loads). Accordingly the calculated investment in the baseline scenario (Alternative 1) is a conservative estimate.

- In both scenarios an identical interest rate (WACC) for calculation of the NPV-WACC of 6 % p.a. has been applied.

- In both scenarios a time horizon of 13 years (2003 through 2016) has been applied.

In the project scenario the IRR is calculated to **3.9%** and the NPV-WACC to **-13,493,392** (no sale of CERs).

In the baseline scenario (Alternative 1) the IRR is calculated to **12.5%** and the NPV-WACC to **4,440,524**.

Both financial indicators IRR and NPV-WACC are higher in the baseline scenario (Alternative 1) than calculated for the project scenario. Accordingly the project activity can not be considered the most financially attractive.

Sub-step 2d. Sensitivity analysis (only applicable to option II and III)

In the table below the sensitivity of the calculated IRR and NPW-WACC for changes in project parameters are illustrated.

Sensitivity analyses

Changed parameter	IRR, project scenario	NPV- WACC, project scenario	IRR, baseline scenario	NPW-WACC, baseline scenario
Original data, ref. Attachment B and C	3.9 %	USD -13,493,392	12.5 %	USD 4,440,524
Construction cost increase +15% (both scenarios)	1.0 %	USD -41,306,467	87.6 %	USD -15,236,925
O&M incl. fuel cost increase +20% (both scenarios)	0.1 %	USD -43,586,136	140.6%	USD -32,912,937

The analysed changes indicate that the conclusion the both financial indicators IRR and NPV-WACC are higher in the baseline scenario (Alternative 1) than calculated for the project scenario are robust to reasonable variations in critical assumptions.

Accordingly the proposed project activity in Harbin is unlikely to be the most financially attractive.

Accordingly the proposed project activity in Harbin passes this criterion.

Step 3 Barrier analysis

Sub-step 3a Identify barriers that would prevent the implementation of type of the proposed project activity:

The investment cost of the proposed CDM project activity is too high to be justified by normal financial viability criteria as it would be a financial least-cost solution to construct small district heating systems supplied by 12 MW heat-only boilers. This is primarily due to the facts that: a) the suggested project needs imported equipment as opposed to small heat only boilers which are locally produced and very cheap; b) the price of coal in China does not reflect the true economic cost (actual cost of labour and transport, impact on environment etc.) and does not give financial incentive to increase energy efficiency.

Investing in a new large primary system with heat exchanger stations, primary network and control system is financially too expensive compared to other heat supply options, and the project is thus solely justified by its impact on the local and global environment, and will increase sustainable development of the Chinese heating sector.

Another barrier for implementing the project is lack of knowledge. The introduction of western technology and the import of Western European equipment had not been done in Harbin without the support and capacity building, which are part of the present project.

The prevailing practice in Harbin and other cities in the Heilogjiang Province is that district heating is supplied by small coal-fired heat-only-boilers.

The strength of the presented barriers is such that there is virtually no sole financing by municipalities of large district heating systems using western technology and equipment. Only projects like the present project activity partly financed by donor organisations from Annex 1 countries or projects in the Beijing area are - for the above reasons - presently implemented. Without the financing from the Danish Mixed Credit and the income from sales of CER's, the financial closure of the proposed CDM project activity would not have happened.

The sales of CO_2 emissions from the present project will make the project financially viable for the Harbin Municipal Government and release municipal funds which can be used to further improve the living conditions and efficiency of heat supply in the city.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

The alternative:

Alternative 01 - Replacement and Technical Enhancement, Existing Supply Concept

is not affected by the above mentioned barriers for implementing the project activity.

The alternative is cheaper investment wise.

The alternative does not comprise a substantial volume of imported equipment, i.e. the alternative with construction of numerous small, heat only boilers can be based on domestically manufactured equipment.

The heat only boiler technology is a well known technology in China including provincial cities in China and faces no barriers in respect of lack of knowledge.

It has been demonstrated that the proposed project activity faces barriers preventing the implementation of the project activity and that the barriers do not prevent the implementation of the alternative.

Accordingly, the proposed project activity passes this criterion.

Step 4. Common practice analyses

Sub-step 4a. Analyse other activities similar to the proposed project activity:

Improvements to heat supply and construction of new heating systems are occurring in numerous cities throughout China. As an example could be mentioned the South District Heating Project in Urumqi, Xinjinag Province. In this project, a new power plant is under construction for supply of co-generated heat to the southern part of Urumqi, i.e. a heat supply technology which in terms of CO_2 emission reduction is more efficient than the project activity proposed in Harbin.

In other cities, heat supply is based on construction of small boilers, ref. the below mentioned regulations from the Ministry of Construction.

From a regulatory point of view, the Chinese Government is responsible for the general policy on heating, while the local municipal government is responsible for implementing actual heat supply projects. The general Chinese policy states that heat supply for cities in the north of China should be based on district heating, but does not in general specify which heat source should be used to supply the systems. Choice of heat source is made by the Municipal Government - based on a regulation from the Ministry of Construction[2].

Size of boilers for heat supply in Chinese cities

TYPE OF CITY	HEATING AREA IN SQUARE METERS	BOILER SIZE
-	less than 40 000	No regulation
Small	40 000 - 100 000	minimum 3 MW or 4 tons steam
Big & Medium	100 000 - 250 000	minimum 7 MW or 10 tons steam
Major	more than 250 000	minimum 12 MW or 20 tons steam

It is, however, the policy of the Chinese Government that district heating is justified because it enhances the possibilities in the long perspective of basing power production on co-generation.

No existing regulatory regime directly enhances the use of surplus heat or the construction of major district heating systems. The current regulation inclines the use of heat-only-boilers and put the responsibility of increased sustainability of heating sector development on the Municipal Govemments. Based on the current regulation, the heat supply in Harbin should be based on heat-only-boilers with capacities of 12 MW.

[2] The Ministry of Construction of the PRC: Decree No. 51 - 1st July 1996

Sub-step 4b. Discuss any similar options that are occurring:

Projects in which heat supply is based on district heating technology and supply of heat from heat only boilers are undertaken in several places in China today.

The earlier mentioned barrier in respect of lack of knowledge of western district heating technology is not seen in the very large and more developed cities.

In addition, many large cities are competing and proud to be in the lead in respect of technological development, environmental improvements and implementation of advanced imported technology.

The proposed project activity in Harbin passes the criterion as it is clear that similar project activities are undertaken in other cities in China, however, barriers are not having the same impact in other cities as in Harbin.

Step 5. Impact of CDM registration

The impact of the approval and registration of the project activity as a CDM activity will alleviate the identified barriers and thus enable the project activity to be undertaken.

The assumed income from the CDM activity contributes to decision on implementing a project activity which is not a least-cost solution.

The attention to the involvement of representatives from the Danish Government, foreign consultants, experts from Beijing, etc. alleviates barriers for implementing new technology. It becomes interesting and challenging for e.g. the Harbin District Heating Company plant to obtain experience and know-how of modern technology, and the fear of entering into a big, expensive project based on new, western technology is alleviated.

Accordingly, the proposed project activity passes this criterion.

Calculation of Emissions, Baseline Scenario

Ref. above **Alternative 1 - Replacement and Technical Enhancement, Existing Supply Concept (ref. the proposed New Base Line Methodology) describes the Base Line Scenario.**

Step 1: Calculation of annual heat and HTW demand

The procedure is:

Specification of design thermal loads

In Harbin, the capacity of the heating installations is based on the following design thermal ratings:

	Existing	New

	W/m^2	W/m^2
Residential Buildings	63	48
Commercial Buildings	64	55

Estimation of annual heat demand

The specific annual heat demand (GJ/m^2/year) is estimated by multiplication of the design thermal load by the equivalent number of full load hours as indicated in equation (1).

(1) $E_{spec} = DTR * T_{eq.\ full,\ heating} * 3{,}600\ sec/h * 10^{-9}$

where:

E_{spec} :	specific annual heat demand	[GJ/m^2/year]
DTR:	Design Thermal Rating	[W/m^2]
$T_{eq.\ full,\ heating}$:	Equivalent number of full load hours, heating	[h/year]

In Harbin, the average heating season is 4,392 hours per year (183 days). For Harbin, it is assessed that the equivalent number of full load hours, heating is 2,749 (i.e. the annul heat consumption can be estimated by multiplying the design thermal rating by equivalent number of full load hours, heating).

In the Harbin case, the equivalent number of full load hours, heating, corresponds approximately to 63% of the length of the heating season. The above mentioned assumption in respect of the equivalent number of full load hours is the conversion factor giving the same annual heat demand as applied in the document "Harbin Daoli District Heating Project, Project Justification and Financial and Economic Analyses, Ministry of Foreign Affairs, Danida, March 2004".

The annual heat demand (heating) is calculated as indicated in equation (2), i.e. multiplying the specific annual heat demand by the heated floor area.

(2) $E_{d,\ heating} = E_{spec} * A$

where:

$E_{d,\ heating}$:	Annual Heat Demand, Heating	[GJ/year]
E_{spec}:	Specific Annual Heat Demand	[GJ/m^2/year]
A:	Heated Floor Area	[m^2]

In Harbin, the heated floor area is as indicated in the table below. The data for new buildings indicate the planned heated floor area to be constructed by year 2006.

	Existing Buildings Heated Floor Area [m^2]	New Buildings Heated Floor Area [m^2]
Residential buildings	9,660,700	2,663,310
Commercial buildings	4,084,900	1,141,300

At the full development of the project the heated floor area will in total be 17,550,000 m^2

In the attached spread sheet calculation of the base line scenario, the annual heat demand, heating, is calculated for each category of buildings (e.g. existing buildings, new buildings, commercial buildings etc.). The development over time in respect of construction of new buildings is reflected in the base line scenario, i.e. the new buildings are constructed in 2004, 2005 and 2006.

Estimation of annual energy demand for heating of HTW

Supply of HTW is not included in the project activity and accordingly is not considered in the Base Line Scenario.

Step 2: Calculation of Fuel Demand and CO_2 emissions, Baseline

For calculation of the fuel consumption and corresponding CO_2 emission according to the stipulations in the proposed new base line methodology, three parameters are required:

I: The annual average efficiency of the existing boilers
II: The annual average efficiency of new boilers (replacing existing boilers)
III: Time schedule for replacement of existing boilers by new boilers.

In Harbin the following data has been applied:

I: The annual average efficiency of the existing boilers is 50% (old boilers, fair condition)
II: The annual average efficiency of new boilers is 65% (good condition boilers)
III: The replacement of the exiting boilers by new boilers is taking place over a time horizon of 15 years (reference is made to the attached spread sheet calculations, Annex 3 - Baseline Information).

The annual fuel consumption is calculated by dividing the annual heat demand plus the energy demand for HTW by the boiler efficiency.

(4): $E_{fuel,\ baseline} = (E_{d,\ heating} + E_{HTW}) / (?_{baseline}/100)$

where:

$E_{fuel,\ baseline}$:	Annual fuel demand, base line	[GJ/year]
$E_{d,\ heating}$:	Annual Heat Demand, heating	[GJ/year]
E_{HTW}:	Annual Energy Demand for HTW	[GJ/year]
$?_{baseline}$:	Boiler Efficiency, baseline	[%]

From the attached spread sheet calculations it can be seen that the total annual fuel consumption (coal consumption) in Harbin in the base line scenario has a peak of some 19,595,743 GJ/year (year 2006) and decreasing to some 17,210,974 GJ/year (2015).

The corresponding CO_2 emission is calculated by multiplying with the emission factor of 95 kg CO_2 per GJ.

(5): CO_2 emission, baseline = $E_{fuel,baseline}$ * 95 /1,000

where:

CO_2 emission, baseline: CO_2 emission in the base line scenario [ton/year]
$E_{fuel,baseline}$: Fuel (coal) consumption (base line scenario) [GJ/year]

In the attached spread sheet calculation of the base line scenario, the annual fuel consumption is calculated for each category of buildings (e.g. existing buildings, new buildings, commercial buildings etc.). In addition, the development over time in respect of construction of new buildings and replacement of existing boilers is reflected in the base line scenario.

The total fuel consumption is calculated as the sum of the fuel consumptions for the different categories of buildings. The CO_2 emission is calculated based on the total fuel consumption and application of equation (5).

From the attached spread sheet calculations it can be seen that the total annual CO_2 emission in Harbin in the base line scenario has a peak of some **1,861,596** ton/year (year 2006) and decreasing to some **1,635,043** ton/year (2015).

Step 3: Calculation of the fuel demand and the emissions in the Project Activity

The estimation of annual **demand** for heat and HTW

The methodology and applied data to estimate the demand for heat and HTW in the project scenario are identical to the methodology and applied data in the base line scenario, i.e. the demand for heat and HTW exactly equation (1) through (3).

In the project scenario, however, the existing old boilers and stoves are replaced by supply from a district heating system within a short time frame (i.e. the conversion is completed by 2006) and also the new buildings are connected to the district heating system.

In Harbin, all of the heated floor area will be supplied by district heating (new boilers with increased efficiency) by year 2006, ref. the attached Excel sheet, Attachment A - Calculation of Emission Reductions.

Calculation of Fuel Consumption and CO_2 emission, Project Scenario

In the project scenario, a new district heating system will be established, replacing the heat supply from the existing boilers and stoves. The heat supply to the new district heating system will be made by new heat only, coal-fired boilers.

a) Heat supply from heat only boilers

For calculation of the fuel consumption and corresponding CO_2 emission in the project scenario from the heat only boilers, four parameters are required. (The principles and methodology for the estimates are identical to the principles and methodology described for Base Line Scenario, Alternative 02).

I: The annual average efficiency of the existing boilers
II: The annual average efficiency of the district heating boilers
III: The annual average efficiency of the district heating pipe network
IV: Time schedule for replacement of existing boilers by new boilers.

The annual fuel consumption for buildings supplied by individual boilers (existing boilers in the project area) is calculated by dividing the annual heat demand plus the energy demand for HTW by the boiler efficiency.

(19): $E_{fuel, project\ scenario} = (E_{d, heating} + E_{HTW}) / (?_{project\ scenario}/100)$

where:

$E_{fuel, project\ scenario}$: [GJ/year]	Annual fuel demand, project scenario (existing boilers)	
$E_{d, heating}$:	Annual Heat Demand, heating	[GJ/year]
E_{HTW}:	Annual Energy Demand for HTW	[GJ/year]
$?_{project\ scenario}$:	Boiler Efficiency (existing boilers)	[%]

In the project scenario for Harbin, the annual average boiler efficiency of the existing boilers (and stoves) is defined to be 50%, ref. the annual average boiler efficiency for the existing boilers and stoves applied in the base line scenario.

The annual fuel consumption for buildings supplied by the district heating system (by heat only boilers connected to the district heating system) is calculated by dividing the annual heat demand by the boiler efficiency of the district heating boilers multiplied by the district heating network efficiency.

(20): $E_{fuel, DH - HOB, project\ scenario} = (E_{d, heating} + E_{HTW}) / (?_{DH, boilers}/100 * ?_{DH, network}/100)$

where:

$E_{fuel, DH-HOB, project\ scenario}$:	Annual fuel demand, DH system, project scenario	[GJ/year]
$E_{d, heating}$:	Annual Heat Demand, heating	[GJ/year]
E_{HTW}:	Annual Energy Demand for HTW	[GJ/year]
$?_{DH, boilers}$:	Annual Average Efficiency, DH boilers [%]	
$?_{DH, network}$:	Annual Average Efficiency, DH network	[%]

The heat supplied from the district heating, heat only boilers, to the district heating network is calculated as:

(20 a) $E_{DH\ Network, HOB, project\ scenario} = (E_{d, heating} + E_{HTW}) / (?_{DH, network}/100)$

where:

$E_{DH\ Network,HOB,\ project\ scenario}$: Annual heat supplied to the DH network from HOB, project scenario [GJ/year]

$E_{d,\ heating}$:	Annual Heat Demand, heating	[GJ/year]
E_{HTW}:	Annual Energy Demand for HTW	[GJ/year]
$?_{DH,\ network}$:	Annual Average Efficiency, DH network	[%]

The annual average efficiency of the new district heating, heat only boilers, is defined to be 89%, ref. the stipulations in the proposed new base line methodology. The boilers to supply heat to the new district heating network in the Harbin Daoli district heating project will include installation of 6 times 116 MW coal-fired hot water boilers, and 3 times 75 tons steam boilers.

According to the boiler manufacturer, the 116 MW hot water boilers will have an efficiency of 90.3%, and the 75 tons steam boilers will have an efficiency of 89%. An annual average boiler efficiency of 89% applied for all the district heating boilers is considered a conservative estimate.

The annual average efficiency of the new district heating system is defined to be 90%, ref. the stipulations in the proposed new base line methodology

The total fuel consumption (e.g. coal consumption) in the project scenario for heat only boilers is calculated as the sum of the fuel (coal consumption) from the buildings heated by individual boilers and the fuel (coal consumption) for the district heating system.

(21) $E_{fuel,\ HOB,\ total} = E_{fuel,\ project\ scenario} + E_{fuel,\ DH\ -\ HOB,\ project\ scenario}$

where:

$E_{fuel,,HOB,\ total}$: Total annual fuel consumption, HOB, project scenario [GJ/year]

$E_{fuel,\ project\ scenario}$: Annual fuel demand, project scenario (existing boilers) [GJ/year]

$E_{fuel,\ DH\ -\ HOB,\ project\ scenario}$: Annual fuel demand, DH system, project scenario (HOBs) [GJ/year]

In Harbin, the fuel for the existing boilers is coal. The corresponding CO_2 emission is calculated by multiplying with the emission factor of 95 kg CO_2 per GJ. The emission factor is based on indications found on the IPCC home page (1996 IPCC Guidelines Reference Manual). The value is calculated as the carbon emission (26.5 kg per GJ, Table 1-4, typical value ref Grubb 1989). The fraction of coal oxidised is set to 0.98 ref. Table 1-6 and converted to CO_2 by the factor 44/22, i.e. 26.4 x 44/12 x 0.98= 95 kg CO_2 per GJ.

In all calculations in the present PDD the applied CO_2 emission factor for coal is 95 kg per GJ.

The CO_2 emission in the project scenario is calculated as:

(22): CO_2 emission HOB, project scenario, coal $= E_{coal\ HOB,\ project\ sc.} * 95 / 1{,}000$

where:

CO_2 emission HOB, project scenario, coal:	CO_2 emission in the project scenario from coal-fired HOBs, [ton/year]
$E_{coal\ HOB,\ project\ sc.}$	Energy consumption by coal-fired heat only boilers, project scenario [GJ/year]

The total CO_2 emission from the heat only boilers in the project scenario is calculated as the sum of the CO_2 emissions from the heat only boilers fired by coal and the CO_2 emission from the heat only boilers fired by natural gas.

As heat is only produced based on coal, combusted in heat only boilers, CO_2 emissions calculated by equation (22) are identical to CO_2 emissions calculated by equation (24).

Application of equation (22) shows CO_2 emission of 1,245,105 ton CO_2/year (2006 -2015).

Step 4: Calculation of Emission Reductions

By application of equations (31), the emission reductions are calculated. The calculated emission reductions are listed in the table below:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission reduction [ton/year]	616,491	591,318	566,146	540,973	515,801	490,628	465,455	440,283	415,110	389,938

The CO_2 emission reduction in the period 2006 through 2015 is 5,032,142 ton CO_2.

Step 5: Calculation of Emission Reduction Factor

According to the stipulations in the Base Line Methodology, the emission reduction factors are calculated. Stipulations listed under a) Heat supply from heat only boilers shall be applied, i.e.equation (32 a) shall be applied.

The calculated emission reduction factors are listed in the table below:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission red. factor, supply DH network [ton CO_2 per GJ]	0.053	0.051	0.049	0.046	0.044	0.042	0.040	0.038	0.036	0.033
Energy Supply to the District	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666

Heating Network (forecast) [GJ/year]										
CO_2 emission reduction [ton/year]	616,491	591,318	566,146	540,973	515,801	490,628	465,455	440,283	415,110	389,938

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

>>

1) Description of base line scenario

In the base line scenario, the old existing coal-fired heat only boilers and stoves will continue to be in operation for a substantial number of years. As the technical life time is reached, existing boilers will be replaced by new coal-fired heat only boilers with a higher efficiency than the existing boilers. In the base line scenario, it is assumed that the replacement of the existing boilers will take place over a period of 15 years.

2) Description of the project scenario

In the project scenario, the old existing coal-fired heat only boilers are demolished, and heat supply will come from the (new) district heating system. The annual average efficiency of the district heating system is considerably higher than the efficiency of the old existing boilers.

3) Analyses of emission in the base line and the project scenario

The reduction in the emission of GHG (CO_2) is caused by the difference in efficiency in the heat production, i.e. the heat (and HTW) demand is identical in both the base line and the project scenario.

The key factor in the project is that the construction of the district heating system will speed up the replacement of the existing boilers and stoves (with low efficiency) to be supplied by a heat source (district heating) with higher efficiency.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

>>

The project boundary is identical to the buildings planned to be connected to the district heating system in the project scenario. Accordingly, by using the defined project boundary, the fuel consumption can be assessed and compared in the base line scenario and in the project scenario.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

>>

The base line study has been completed by January 2005 by:

Ms. Birgitte Brinch Madsen, COWI, Consulting Engineers and Planners,
Parallelvej 2, DK-2800 Kongens Lyngby, Denmark

and

Mr. Andrew T. Christensen, COWI, Consulting Engineers and Planners,
Parallelvej 2, DK-2800 Kongens Lyngby, Denmark

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
The project activity has started. A contract for supply of substations and SCADA system for the district heating system has been signed, and the initial activities in respect of agreement on detailed design features have commenced (January 2005).

C.1.2. Expected operational lifetime of the project activity:

>>
20y-0m

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/01/2006

C.2.2.2. Length:

>>
10 years, 0 months

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

>>

A new monitoring methodology is proposed. Reference is made to the "Proposed New Methodology: Monitoring (CDM-NMM)". The new monitoring methodology is named: "Monitoring of Energy Efficiency Improvements in District Heating Production and Distribution

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

The application of the monitoring methodology for estimation of the CO_2 emission reduction is considered a feasible, easy and transparent manner to monitor and calculate the emission reductions.

The monitoring methodology implies that data on heat supplied to the district heating system shall be monitored for each of the sources supplying heat to the district heating system. For the Harbin district heating system, this means that energy supply to the district heating system shall be monitored at the:

a) New boiler house 1 (the main heat source)
b) Boiler House No. 36, HeQing Street (peak load boiler house)
c) Boiler House No. 82, HeQing Street (peak load boiler house)
d) Boiler House No. 23, AnXin Steet (peak load boiler house)
e) Boiler House No. ??, Project Area (peak load boiler house)
f) Boiler House No. ??, YiQiJu (industrial CHP, peak load boiler house)
g) Boiler House No. 253, Da Shuijing Street (peak load boiler house)

The selected monitoring methodology exactly matches the conditions prevailing in Harbin, i.e. introduction of heat supply from a district heating system, replacing old, existing heat only boilers.

Based on the above consideration, the proposed new monitoring methodology is found both adequate, practical and justified for monitoring of the CO_2 emissions reduction.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

No data shall be monitored in the base line scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

This option is not applied; reference is made to section D.2.2. below.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

This option is not applied

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

E 1	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 1. Data as listed in the proposed monitoring methodology shall be monitored and archived (e.g. metered energy consumption (GJ) (accumulated value) shall be supplemented with metered data on actual flow (m^3/h), accumulated water flow water flow (m^3), supply temperature (°C), return temperature (°C), differential temperature (°C) and actual load MW. All above data shall be furnished with a time stamp.* *The energy meter shall be able to store data and data must not be lost in case of power failure. The energy meter shall record number of operation hours.*
F 1	*Coal delivered to the new boiler house*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*

Cal 1	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
E 2	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 2 (ref. comments for monitoring and archiving supplementary data as listed above)*
F 2	*Coal delivered to boiler house No. 36*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
Cal 2	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*

E 3	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 1. Data as listed in the proposed monitoring methodology shall be monitored and archived (e.g. metered energy consumption (GJ) (accumulated value) shall be supplemented with metered data on actual flow (m^3/h), accumulated water flow water flow (m^3), supply temperature (°C), return temperature (°C), differential temperature (°C) and actual load MW. All above data shall be furnished with a time stamp.* *The energy meter shall be able to store data and data must not be lost in case of power failure. The energy meter shall record number of operation hours.*
F 3	*Coal delivered to boiler house No 82*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*

Cal 3	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
E 4	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 2 (ref. comments for monitoring and archiving supplementary data as listed above)*
F 4	*Coal delivered to boiler house No. 23.*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
Cal 4	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*

E 5	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 2 (ref. comments for monitoring and archiving supplementary data as listed above)*
F 5	*Coal delivered to boiler house ??*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
Cal 5	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
E 6	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 2 (ref. comments for monitoring and archiving supplementary data as listed above)*

F 6	*Coal delivered to boiler house YiQiJu*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser. Note: Only the proportion of the coal used for supply of heat to the DH network shall be included. For simplicity the coal consumption for supply of district heating is defined to be proportional to the heat supply to the DH system compared to the total heat production from the boilers. The heat supplied by this facility will be less than 1% of the total energy supplied to the district heating system and accordingly the simple way of calculating the coal consumption in a conservative manner is proposed.*
Cal 6	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
E 7	*Heat supplied to the district heating system*	*Energy Meter*	*GJ/year*	*m*	*Continuously*	*100%*	*Electronic (accumulated values shall be archived minimum on daily basis)*	*Heat supplied from boiler house No. 2 (ref. comments for monitoring and archiving supplementary data as listed above)*

F 7	*Coal delivered to the boiler house No. 253.*	*Weight of coal delivered to coal yard (scales applied at coal supplier or the coal yard) ref. records on coal supply*	*ton/year*	*m*	*Continuously*	*100%*	*Electronic / paper*	*Weight of the coal delivered to the boiler house (coal yard) shall be calculated in compliance with the stipulations in the contract between the coal supplier and the purchaser.*
Cal 7	*Calorific value of coal*	*Lab test of coal samples*	*MJ/kg*	*m*	*Samples*	*Samples in compliance with the contract between the coal supplier and purchaser*	*Electronic / paper*	*The calorific value (and other properties) of the coal delivered to the boiler house shall be measured (tested) in compliance with the stipulations in the contract between the coal supplier and the purchaser.*

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

>>

Energy supplied to the DH network, fuel consumption (coal delivered to the coal yard) and calorific value of the coal shall be monitored for all the boiler houses supplying heat to the district heating system, i.e. at 7 locations in Harbin.

The monitoring methodology implies that emissions from the project scenario are not calculated, the methodology applies direct calculation of emission reductions.

Reference is made to Section D.2.4 below

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Leakage is not included in the base line methodology and in the monitoring methodology.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

The CO_2 emission in the base line and the project scenario is calculated by applications of equations (1) through (22), and the CO_2 emission reduction is calculated by application of equation (31). Reference is made to the Proposed New Methodology: Baseline (CDM-NMB) "Energy Efficiency improvements in district heating production and distribution".

The CO_2 emission reduction per supplied energy unit to the district heating system is calculated as:

(32 a) CO_2 emission red. factor, supply DH network = CO_2 emission, reduction / $E_{DH\ network,\ HOB,\ Project\ Scenario}$

where:

CO_2 emission red. factor, supply DH network: The CO_2 emission reduction factor based on supplied energy to the DH network [ton CO_2/GJ]

CO_2 emission, reduction: CO_2 emission reduction, ref. equation (31) [ton/year]

$E_{DH\ network,\ HOB,\ Project\ Scenario}$: Annual Heat Supplied to the District Heating Network from HOBs, project scenario, , ref. equation (20 a) [GJ/year]

In the Harbin project, the factor is calculated based on the total supplied heat to the district heating network, i.e. based on the sum of the heat supplied from each of the boiler houses.

The above listed factor: CO_2 emission red. factor, supply DH network for the Harbin district heating project listed in the table below:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission red. factor, supply DH network [ton CO_2 per GJ]	0.053	0.051	0.049	0.046	0.044	0.042	0.040	0.038	0.036	0.033

The calculation of the emission reductions actually obtained shall be made based on the equation below:

(33) CO_2 emission red., actual = CO_2 emission red. factor, supply DH network * $E_{monitored,\ DH\ network}$

where:

CO_2 emission red., actual: The actual obtained CO_2 emission reduction [ton CO_2/year]

CO_2 emission red. factor, supply DH network: The CO_2 emission reduction factor based on supplied energy to the DH network (ref. table above) [ton CO_2/GJ]

$E_{monitored, DH network}$	The monitored energy supply to the district heating network (one year)	[GJ/year]

$E_{monitored, DHnetwork}$ is the sum of the monitored values (in the relevant time intervals) for each of the boiler houses supplying heat to the district heating network.

(34) $E_{monitored, DHnetwork} = S\ E_{monitored, DHnetwork}(n)$

where:

$E_{monitored, DH network}$	The monitored energy supply to the district heating network (one year)	[GJ/year]
$E_{monitored, DH network}(n)$	The monitored energy supply to the district heating network (one year) for each heat source	[GJ/year]

The emission reduction factors shall be subject to adjustment according to actually obtained annual average boiler efficiency for the boiler supplying heat to the district heating system.

For each boiler house, the annual average boiler efficiency shall be calculated based on monitored heat supply and fuel consumption, ref. Step 6 in the proposed new base line methodology.

Step 6:
Updating of emission reduction factors based on monitored data

The emission reduction factors shall be adjusted according to the monitored data. The principle is that the emissions calculated for the base line scenario are not changed.

The emissions in the project scenario are re-calculated based on actual efficiencies. Step 4 and Step 5 are repeated, and a set of emission reduction factors valid for the specific year is obtained. The actual emission shall be calculated reflecting the actual fuel used (i.e. fuel consumption in terms of coal shall be monitored).

In Harbin, the project activity only involves heat supply from heat only boilers. The calculation of the actual emissions during the project activity shall be updated by application of the actual annual average boiler efficiency for the specific year. The actual annual average boiler efficiency is defined to be:

$\eta_{HOB, actual}$ = Heat Supplied, DH network / Fuel consumed * 100%

where:

$\eta_{HOB, actual}$:	Actual heat only boiler efficiency (annual average) [%]
Heat Supplied, DH network:	Heat supplied to the DH network [GJ/year]
Fuel consumed:	Fuel consumed by the boiler [GJ/year]

In Harbin, the applied value for average annual boiler efficiency (89%) shall be replaced by the actual annual average boiler efficiency calculated for a specific year, and the actual emission reductions factor is calculated. The actual annual average boiler efficiency shall be a weighted factor weighted according to the heat supply from each of the boiler houses supplying heat to the Harbin district heating system.

Comment:
Please observe that only the actual annual average boiler efficiency shall be subject to adjustment for calculation of the actual emission reduction factors. The heat supplied to the consumers shall be **identical** in both the **base line scenario** and in the **project scenario** for correct calculation of the emission reduction factor. The **actual emission reduction** is calculated by multiplying the **actual emission reduction factor** by the **actual volume of heat supplied**.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
E 1	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms, the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms, the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 1	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 1	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

E 2	Low	Ref. above, identical comments for energy metered at each boiler house.
F 2	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 2	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
E 3	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms , the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms , the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 3	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 3	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

E 4	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms , the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms , the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 4	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 4	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

E 5	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms , the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms , the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 5	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 5	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

E 6	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms, the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms, the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 6	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 6	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

E 7	Low	The energy meters shall be recalibrated according to procedures and at a frequency in compliance with national regulations (Chinese regulations) for meter equipment used for billing. The current regulation means that an energy meter is recalibrated with intervals of DDD years. Check and recalibration of a meter can be requested if a party is questioning the accuracy of the metered data. In case the accuracy is proven to be within the accuracy stipulated in the relevant norms , the party requesting the recalibration will bear the cost for the check. In case the accuracy is found to exceed the accuracy stipulated within the relevant norms , the owner of the meter will bear the cost for the check and recalibration. The agreement on how to monitor the energy supplied will also include procedures on how to estimate the energy supplied in case of (temporary) failure of a meter. The system operator shall keep accurate records of actual fuel consumption (e.g. tonnes of coal used), calorific value of combusted coal, replenishment water consumption and internal energy consumption at the boiler houses. The above mentioned data shall be available so that the monitored energy supply to the district heating network can be compared and evaluated in respect of actual fuel consumption.
F 7	*Medium*	*The weight of the fuel supplied to the coal yard is measured with a methodology and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the supplied weight of coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*
Cal 7	*Low*	*The calorific value of the fuel supplied to the coal yard is measured with a methodology, sampling procedure and accuracy as stipulated in the contract between the coal supplier and the coal purchaser. The procedures for quality assurance and quality check of the calorific value of the coal shall follow the stipulations in the contract between the coal supplier and the coal purchaser.*

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

>>

Harbin Huaneng District Heating Company, who is in charge of operating the district heating system including the boiler houses, will be in charge of the monitoring.

Already today, Harbin Huaneng District Heating Company has well established routines in monitoring of the system operation and archiving data for e.g. system analyses, system optimisation, accounting and billing.

The monitoring of heat supplied, fuel consumption and calorific value of fuel at each of the boiler houses will physically be undertaken by operation staff.

The district heating system will be furnished with a SCADA system (System Control and Data Acquisition) system. The SCADA system will comprise a number of RTUs (Remote Terminal Units) and also central control room data from the actual control and coordination of the of the system operation.

The required data (heat supplied) will be extracted from the above mentioned SCADA system. The system is designed in a manner that the actually monitored data will be stored at the RTU (Remote Terminal Units), typically a huge number of data monitored at e.g. a frequency of say once every 10 seconds. The RTUs will be furnished with facilities to extract a more comprehensible report from the huge number of monitored data. A report will typically comprise hourly mean values and also maximum and minimum values.

At regular intervals, the compiled reports are transmitted to the facilities at the central control room where they are stored (electronically archived).

The electronic archive at the central control room will be the data source for retrieving the heat supplied to the district heating network from each of the boiler houses.

D.5 Name of person/entity determining the monitoring methodology:

>>

COWI, Consulting Engineers and Planners, Parallelvej 2, DK-2800 Kgs. Lyngby, Denmark

COWI is consultant to the Government of Denmark

COWI is not a project participant

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

In the project scenario, the CO_2 emissions are:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission [ton/year]	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105

The CO_2 emission in the period 2006 through 2015 is 12,245,105 tonnes CO_2.

E.2. Estimated leakage:

>>

Emission reductions related to leakage are not included.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

>>

The sums of E.1 and E.1 are identical to the values indicted in E.1 as E.2 equals zero.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission [ton/year]	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105	1,245,105

The CO_2 emission in the period 2006 through 2015 is 12,245,105 tonnes CO_2.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

>>

In the base line scenario, the emission of CO_2 is estimated to be as indicated in the table below:

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission [ton/year]	1,861,596	1,836,423	1,811,250	1,786,078	1,760,905	1,735,733	1,710,560	1,685,388	1,660,215	1,635,043

The CO_2 emission reduction in the period 2006 through 2015 is 17,483,190 tonnes CO_2

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

>>

The directly estimated emission reductions due to the project activity are listed in the table below. The estimates are based on application of equation (33).

The stipulated values "Monitored Energy Supply to the District Heating Network (forecast) [GJ/year] are values identical to the values estimated in the project scenario.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission red. factor, supply DH network ton CO_2 per GJ]	0.053	0.051	0.049	0.046	0.044	0.042	0.040	0.038	0.036	0.033
Monitored Energy Supply to the District Heating Network (forecast) [GJ/year]	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666	11,664,666
CO_2 emission reduction [ton/year]	616,491	591,318	566,146	540,973	515,801	490,628	465,455	440,283	415,110	389,938

The CO_2 emission reduction in the period 2006 through 2015 is 5,032,142 tonnes CO_2.

The above CO_2 emission is identical to the values calculated by subtracting the base line scenario values from the project scenario values. As mentioned above, the actual emission reduction factors shall be subject to adjustment calculated based on actually obtained boiler efficiencies.

Actual values for monitored energy supplied to the district heating network shall be applied.

E.6. Table providing values obtained when applying formulae above:

>>

Emission reduction from project activity (supply of 116,646,660 GJ over a 10-year period)

	Year	Baseline [ton CO_2]	Project Activity [ton CO_2]	Emission Reduction [ton CO_2	Energy supplied to DH system [GJ]	Emission Reduction per supplied energy unit [ton CO_2/GJ]
Year 1	2006	1,861,596	1,245,105	553,780	11,664,666	0.053
Year 2	2007	1,836,423	1,245,105	523,100	11,664,666	0.051
Year 3	2008	1,811,250	1,245,105	492,421	11,664,666	0.049
Year 4	2009	1,786,078	1,245,105	461,742	11,664,666	0.046
Year 5	2010	1,760,905	1,245,105	431,063	11,664,666	0.044
Year 6	2011	1,735,733	1,245,105	400,384	11,664,666	0.042
Year 7	2012	1,710,560	1,245,105	369,705	11,664,666	0.040
Year 8	2013	1,685,388	1,245,105	339,026	11,664,666	0.038

Year 9	2014	1,660,215	1,245,105	308,347	11,664,666	0.036
Year 10	2015	1,635,043	1,245,105	277,668	11,664,666	0.033
Total		17,483,190	12,351,050	4,557,063	116,646,660	

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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The information given in this section is based on information found in the document "Harbin Daoli District Heating Project, Appraisal Report, November 2003, Ministry of Foreign Affairs, Danida, J.nr.104.O.30.Kina.45.

The Environmental Impact Assessment for the project has not yet been officially approved by the relevant local authorities. An English-language version of the report is not available, and the information is retrieved from interviews with persons/organisations involved in the preparation of the district heating project in Harbin.

No negative changes to the environmental situation have been reported.

The project brings environmental benefits in the form of:

- improved air quality in the local areas
- reduced emission of GHG
- reduced coal transport related traffic
- reduced noise in the local areas
- reduced land needed for heat generation.

A significant improvement in air quality in the local areas is expected as the existing small boilers are not equipped with any form of flue gas cleaning equipment, and the chimneys are of a height of only 2 to 20 meters.

At the boiler houses to supply the district heating system, flue gas cleaning equipment will be installed (SO_2 and dust), and the chimneys will be of a height of 120 m, i.e. the flue gas from the district heating boilers will be emitted at much higher level in the atmosphere.

By replacing the existing boilers by heat supply from the district heating system, noise emission from the exiting boilers will be eliminated. Many of the existing boilers are installed in the basement of the buildings, and no noise reduction equipment has been installed.

The environmental benefits from the above mentioned appraisal report are listed in the table below.

From the numbers below, it is evident that some data / assumptions / estimation methodology differ slightly from the data / assumptions / estimation methodology applied in the analyses in the present PDD, e.g. in

the present analyses, the reduction in CO_2 emissions reaches a peak of 487,000 tonnes (year 2007) which is less than the value quoted from the Appraisal Report, ref. the table below.

However, updating / revising the estimates on environmental benefits will not change the conclusion that the project entails environmental benefits, only the quantity estimated will be subject to adjustment.

Item	**Quantity**
Coal saving	230,000 tonnes per year
Decrease in ash and cinder	67,000 tonnes per year
Decrease in discharge of fume and dust	7,495 tonnes per year
Decrease in discharge of SO_2	1,545 tonnes per year
Decrease in noise sources	678 stations
Decrease in traffic	24 million t-km per year
Decrease in CO_2-emissions	550,000 tons per year

In the table below, the Harbin authorities' assessment of the improvements to the local quality as a result of implementing the district heating project is listed.

	SO_2 concentration (daily average) [mg/Nm^3]	Particles (daily average) [mg/Nm^3]
2002/2003, heating season	0.043	0.211
2002/2003, summer	0.012	0.10
2006/2007, heating season (DH scenario)	0.037	0.193

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

No negative environmental impacts have been assessed or mentioned by any of the parties.

SECTION G. Stakeholders' comments

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G.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

G.2. Summary of the comments received:

>>

G.3. Report on how due account was taken of any comments received:

>>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Harbin Huaneng District Heating Company
Street/P.O.Box:	
Building:	
City:	Harbin
State/Region:	Heilongjiang Province
Postfix/ZIP:	
Country:	People's Republic of China
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 1-B

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CMC International Tendering Corp.
Street/P.O.Box:	
Building:	
City:	Beijing
State/Region:	
Postfix/ZIP:	
Country:	People's Republic of China
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 1-C

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ministry of Finance of the People's Republic of China
Street/P.O.Box:	
Building:	
City:	Beijing
State/Region:	
Postfix/ZIP:	
Country:	People's Republic of China
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 1-D

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	DANIDA, Ministry of Foreign Affairs, Kingdom of Demark
Street/P.O.Box:	Asiatisk Plads 2
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State/Region:	n.a.
Postfix/ZIP:	DK-1442
Country:	Denmark
Telephone:	+(45) 33 92 00 00
FAX:	
E-Mail:	
URL:	
Represented by:	Marc Normann
Title:	
Salutation:	Mr.
Last Name:	Normann
Middle Name:	
First Name:	Marc
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 1-E

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	ABB Energy and Industry
Street/P.O.Box:	Meterbuen 33
Building:	N.A.
City:	Skovlunde
State/Region:	N.A.
Postfix/ZIP:	DK-2740
Country:	Denmark
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	Per T. Christensen
Title:	
Salutation:	Mr.
Last Name:	Christensen
Middle Name:	Torben
First Name:	Per
Department:	
Mobile:	+(45) 40 25 78 77
Direct FAX:	+(45) 44 50 47 10
Direct tel:	+(45) 44 50 47 01
Personal E-Mail:	per.t.christensen@dk.abb.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The owner of the project is Harbin Huaneng District Heating Company. The Harbin Lao Li District Heating Project is financed by loans from China Development Bank (subsidized domestic loans), own equity (primarily by selling heating property made redundant by the project), consumer connection charges, and subsidized domestic and foreign loans (Danish Mixed Credit) bank loans.

The Danish Mixed Credit is a soft loan provided in accordance with the OECD Arrangement on officially Supported Export Credits.

The split of the financing is shown in the table below.

Structure of Finance	**CNY (1,000)**	**USD (1,000)**	**%**
China Development Bank Loan	1,025,000	124,242	57.7
Equity Capital	320,000	38,788	18.0
Danish Mixed Credit	277,000	33,576	15.6
Connection fees	154,000	18,667	8.7
Total	**1,776,000**	**215,273**	**100.0**

The income from sale of CER will be used to reduce the equity share of Harbin Huaneng District Heating Company.

The financial plan for the Harbin Lao Li District Heating Project, as shown above, includes public funding from Denmark, an Annex I Country. As stated in Annex 2, however, this does not result in the diversion of official development assistance and is separate and is not counted towards the financial obligations of Denmark.

Annex 3

BASELINE INFORMATION

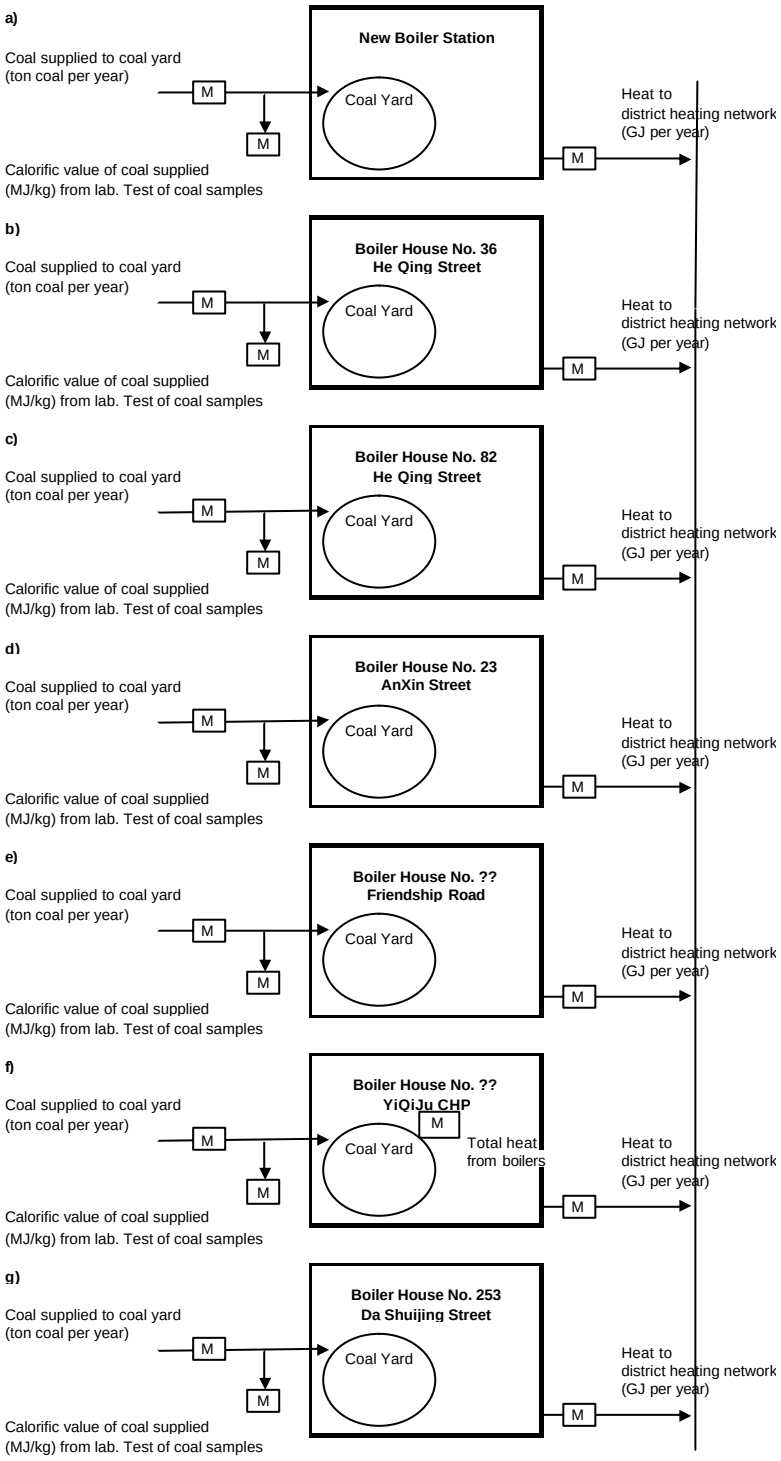
Parameters (Baseline Scenario)	**Source**	**Reference**	**Justification**
E_{spec} : specific annual heat demand	Calculated		
DTR : Design Thermal Rating		Harbin Huaneng District Heating Company	Value applied for design of heating installations
$T_{eq.full,\ heating}$: Equivalent number of full load hours, heating	Calculated		Calculated based on length of heating season
$E_{d,\ heating}$: Annual Heat Demand, Heating	Calculated		

A : Heated Floor Area	Measured	Harbin Huaneng District Heating Company	Value applied for design of heating installations
$E_{fuel, baseline}$: Annual fuel demand, baseline	Calculated		
$?_{baseline}$: Boiler, Stove and Furnace Efficiency, baseline	Default value in NMB	Poland - Coal to Gas Conversion Project, GEF Project Document, Report No: 13054, 1994/10/31	
$CEF_{baseline:}$ CO_2 emission factor for the baseline fuel	IPCC standard value		Specific values for Harbin are not available

Annex 4

MONITORING PLAN

M = Monitored Parameter, Project Activity



The parameters to be monitored are shown on the illustration above. At each of the boiler houses the coal supplied to the coal yard, calorific value (lab test of samples) and the heat supplied to the district heating network is monitored. All values are continuously monitored and annual values are compiled.

The monitored energy supplied to the district heating network ($E_{monitored, DH network}$) is applied in equation (34) and (33) for calculation of the actual CO_2 emission reduction.

The monitored values of fuel (coal) consumption (calculated as the monitored supplied weigh of coal to the coal yards multiplied by the monitored calorific values) together with the monitored value of heat supplied to the DH network ($E_{monitored, DH network}$) is applied in ***Step 6 for updating of emission reduction factors***

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