CONTENTS

A. General description of the small scale project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information of participants in the proposed small scale project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring Information
SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Tangshan Existing Residential Building Retrofitting Project

Version: 01

Date: February 4th, 2010

A.2. Description of the small-scale project activity:

The “Tangshan Existing Residential Building Retrofitting Project” (“the Project”) is located in Tangshan City, Hebei Province, China. It consists of the following compounds:

- No.1 Tangshan Compound (165,000 m²);
- Jidong Shuini Compound (50,000 m²);
- Zhongye Jingtang Living Compound (27,000 m²);
- Zhongtie 16th Living Compound (21,000 m²).

The investor and sponsor is Tangshan Construction Investment Corporation Limited (“the Project Developer”), responsible for the development and implementation of the Project. The main objectives of the Project are improving the energy efficiency of the existing buildings and therefore reducing fossil fuel consumption and CO₂ emissions by retrofitting the building envelope including the windows, the roof and the heating system.

Before the development of this Project, a demonstration project also located in the No.1 Tangshan Compound has been implemented (“the Model Project”). This Model Project has successfully increased the average indoor temperature from 14°C-15°C to 22°C, significantly improving the living standards of the local inhabitants.

The Project will be implemented by the Project Developer through retrofitting the building envelope, the roof, the windows and the heating system of the private residential buildings. After finishing the retrofitting measures, the total energy saving amount will be 13.5 GWh, resulting in the reduction of 20,761 tons CO₂ emission per year.

The implementation of the Project as a demonstration project can boost the development of new ideas and standards regarding energy efficiency in existing buildings in North China. Moreover, it can promote sustainable development in the following fields:

- Reduction of the intensive dependence on energy in the region;
■ Improvement of the indoor thermal environment and the living standard for local inhabitants by increasing the temperature from 14-15°C to 18°C and above;

■ Significant environmental benefits, emissions reduction of SO₂, NOₓ, CH₄, compound dust etc due to reduced consumption of fossil fuel;

■ Compared with a traditional commercial baseline, reduction of greenhouse gas emissions.

A.3. Project participants:

<table>
<thead>
<tr>
<th>Name of Party involved (*) (host) indicates a host Party</th>
<th>Private and/or public entity(ies) project participants (*) (as applicable)</th>
<th>Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>People’s Republic of China (Host)</td>
<td>Tangshan Construction Investment Corporation Limited</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

The detailed contact information is shown in Annex I.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

Tangshan City, Hebei Province, China

A.4.1.1. Host Party(ies):

People’s Republic of China

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

Hebei Province

A.4.1.3. City/Town/Community etc:

Tangshan City

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity(ies):
The Project is located in Tangshan City of Hebei Province. Tangshan City is in the centre of the Bohai Sea Bay, south to Yan Shan and north to Bo Hai, west to Qinhuangdao and east to Beijing and Tianjin. The coordinates of the location are at latitude 36°33′–36°34′ N and longitude 105°37′–105°39′ E. The following figures show the detailed location of the Project.
A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

In accordance with the Appendix B of the “Simplified Modalities and Procedures for Small Scale CDM project activities” (SMP-SSC) published by UNFCCC, the Project belongs to Type II.E.-projects (Energy Efficiency Improvement Projects¹). Since it will decrease the energy consumption and reduce the emissions of GHGs by retrofitting the building envelope, the windows, the ceiling and the heating system.

The detailed measures used by the Project are given below:

1. One additional 100 mm EPS board will be added on the reinforced concrete facade wall; the EPS shall be installed under the frozen earth layer.

2. One additional 80 mm XPS board will be installed on the reinforced concrete roof. The heat transmission coefficient is below 0.26W/m²K;

3. The external windows will be changed into side-hung plastic steel windows. The air tightness grade is in line with the “Graduation and test method for wind resistance performance of windows” (GB/T7107), ensuring that the heat transmission coefficient is below 2.7W/m²K;

4. Completely retrofitting the indoor heating system: Removing the one-pipe loop circle system and installing a two-pipe system, thermostatic valves and temperature control metering equipments, such as heating meters. The detailed measures are as follows:
   
   - Control and metering equipments of each household are located in the floor platform of stair well.
   - Currently, the vertical single-pipe in the heating system in this compound does not allow the customization of the required heat amount by the households as there is no possibility to regulate the heating system. Each household has to pay a lump sum as heating fee per year, without any incentives to save energy; therefore, the heating cost charge system causes a lot of waste of energy. Now, the Project is going to retrofit the indoor heating system. For each household a double-pipe system will be installed. It is a heating system with up-supply and up-return mode. For each radiator, there is an automatic or a manual thermostatic valve; therefore, the indoor temperature can be optionally controlled by each household. All indoor pipes are welded steel pipes. Thermostatic valves are used for water supply pipe, and copper shut-off valves

¹ http://cdm.unfccc.int/Panels/ssc_wg/SSCWG08_repan12_Revisions_AMS_IIE.Efficiency_Buildings.pdf
are used for back water pipes. At each branch terminal automatic deflation valves are installed. Four column cast iron radiators are used as central heating radiators.

5. Reinforcing the balcony and installing additional 80mm EPS boards on the railings.

6. Using thermal insulation unit doors for each building.

7. Installing color steel slope roofs on each building.

The production of energy saving equipment mentioned above does not lead to an increase of greenhouse gas emissions. The project has imported energy saving management services from Germany.

<table>
<thead>
<tr>
<th>Complex Thermal Insulation System</th>
<th>External Window</th>
<th>Roof</th>
<th>Indoor Heating System</th>
<th>Measuring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 cm EPS China (Germany)</td>
<td>Hollow plastic steel side-hung window</td>
<td>Thermal insulation system with 80 cm XPS</td>
<td>Vertical double-pipe system and temperature control valve</td>
<td>Building centralized meter (ultrasonic measurement) + radiator heat distribution meter</td>
</tr>
</tbody>
</table>

The technology and equipments of the Project are imported from Germany.

A.4.3. Estimated amount of emission reductions over the chosen crediting period:

The proposed project adopts a fixed crediting period (10 years), starts from November 1\textsuperscript{st} 2010 to October 31\textsuperscript{st} 2020. The estimated emission reductions over 10 years will be 207,612 tonnes CO\textsubscript{2}e.

\begin{table}
\begin{tabular}{|c|c|}
\hline
\textbf{Years} & \textbf{Estimation of annual emission reductions in tons of CO\textsubscript{2}e} \\
\hline
2010 & 8,035 \\
2011 & 20,762 \\
2012 & 20,762 \\
2013 & 20,762 \\
2014 & 20,762 \\
2015 & 20,762 \\
2016 & 20,762 \\
2017 & 20,762 \\
\hline
\end{tabular}
\end{table}

The crediting period starts from January 1\textsuperscript{st} 2010 to December 31\textsuperscript{st} 2019.
A.4.4. Public funding of the small-scale project activity:

There is no ODA involved in the Project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The Project is not a de-bundled component of a large-scale project activity since the Project Developer does not own or operate any other registered CDM project of similar technology within 1 km of the Project boundary. During the last two years, the Project Developer neither registered nor applied for a CDM project.

SECTION B. Application of a baseline and monitoring methodology

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

The methodology applied to this Project is the Approved Small-scale CDM Baseline Methodology AMS-II.E (Version 10, EB35) “Energy Efficiency and Fuel Switching Measures for Buildings”. For further information regarding the methodology, please refer to the link:

http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

B.2 Justification of the choice of the project category:

The small scale methodology AMS-II.E is applicable to this Project because:

- The Project decreases the energy consumption of the existing buildings by retrofitting external walls, external windows, indoor heating system and building roof, and therefore meets the requirements described in the proposed methodology.
- The energy savings resulting from the Project is estimated to be 13.5 GWh, well below the 60 GWh p.a. – threshold applicable to a small-scale project activity.
Based on this analysis, the Project meets the applicability conditions as stipulated in the chosen methodology.

**B.3. Description of the project boundary:**

The Project boundary includes:

- All 20 buildings in Hebei No.1 Compound, Lubei District, Tangshan City, Hebei Province, China.
- The Hebei No.1 Compound district heating systems and the boilers.

<table>
<thead>
<tr>
<th>Source of Emission</th>
<th>Gas</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before retrofitting</td>
<td>CO₂</td>
<td>Included</td>
</tr>
<tr>
<td></td>
<td>CH₄</td>
<td>Excluded</td>
</tr>
<tr>
<td></td>
<td>N₂O</td>
<td>Excluded</td>
</tr>
<tr>
<td><strong>Project</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After retrofitting</td>
<td>CH₄</td>
<td>Excluded</td>
</tr>
<tr>
<td></td>
<td>CO₂</td>
<td>Included</td>
</tr>
<tr>
<td></td>
<td>N₂O</td>
<td>Excluded</td>
</tr>
</tbody>
</table>

**B.4. Description of baseline and its development:**

The baseline emissions are the emissions which would occur, if the Project was not implemented, i.e. the amount of GHG that would be emitted by the old heating equipments without retrofitting the buildings. Since it has to be assured that the baseline scenario and the Project scenario must have the same service level to the inhabitants\(^2\) (the same indoor temperature), the baseline scenario of the Project is to provide an average indoor temperature of 18°C (which is in line with the minimum national requirements on the indoor temperature during the heating period) without any retrofitting measure.

According to the small scale methodology AMS-II.E, the calculation of the baseline emissions is:

\[
\text{BE}_y = \text{EC}_y \times \text{EF}_{\text{fuel}}
\]

\(^2\) According to the Methodological Tool “Tool for the demonstration and assessment of additionality”, the Project Developer has to identify realistic and credible alternatives available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.
After retrofitting of the buildings, energy can be saved through both the lower energy consumption of the heating system in the winter and of the air-conditioning system in the summer. However, in this Project, only the emission reduction from the energy saving in the heating system during winter time is taken into account, choosing a conservative calculation approach.

| B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity: |

Before the implementation of the Project, the project developer considered the option of additional carbon finance as one important cash flow stream to finance and implement the Project. If the Project could not be developed as CDM project, it would not be considered to be implemented by the Project Developer.

Compared with the baseline scenario, the Project faces a series of barriers.

**STEP 1. Identification of alternatives to the Project consistent with current laws and regulations**

Not necessary as specified in the methodology.

**STEP 2. Barriers Analysis**

This section is designed according to the requirements of EB 35, Annex 34: “Non-binding best practice examples to demonstrate additionality for SSC project activities”.

**Sub-step 2a. Investment barriers:**

Since in this project CDM revenues represent the only revenue stream, we will conduct a simple cost analysis in the following section. The direct costs for energy saving measures\(^4\) of the Project amount to RMB 122.55 Mio, representing RMB 465.9 per square meter or RMB 46,590 for a 100 m\(^2\)-household. Compared to the low income of local inhabitants (the average annual disposable income in Tangshan for each urban resident was RMB 14,235 in 2007, the year of planning this project; the income of residents in this project is quite lower; this can be demonstrated with the limited apartment area of approx. 50 m\(^2\)), this amount is hardly

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3 This can be proven by protocols of management meetings as well as the investment analysis.

4 The Project also contains measures increasing the lifetime of the existing buildings; these costs, however, are not taken into consideration.

5 [http://www.china.org.cn/english/Life/175486.htm](http://www.china.org.cn/english/Life/175486.htm)
affordable for both, the local households as well as the Project Developer\(^6\).

On the other hand, the revenues are mainly due to savings of fuel and electricity; however, these saving amounts remain very low as the prices for fuel and electricity are very low, too. In other words, there is little incentive for local enterprises to conduct any energy efficiency measures in this environment. Although the local government supports this kind of project by providing a subsidiary of RMB 45-55 per retrofitted square metre\(^7\), this amount only represents about 10% of the total investment. This shows the cooperative position, but also the limited financial capacity of the local government. Due to the high costs but low financial revenues of this Project, it faces great barriers to get financed and to be implemented.

The CDM can play an important role to overcome these barriers due to several reasons. First of all, the registration of the Project as a CDM project can lead to more awareness of energy efficiency in buildings in North China. The Project can serve as a demonstration project to promote further energy efficient buildings in the region. Additionally, carbon revenues share about 27%\(^8\) of the revenues thitherto (fuel and electricity savings) or 14% of the total investment amount. Because there is no adequate financial benchmark for this kind of retrofitting project in China, we assume comparing the CER income amount to other projects requesting for CDM registration. Compared to other registered CDM projects in China (like wind farms whose carbon revenues also range about 20%\(^9\)), it becomes clear that the CDM plays a significant role to finance this Project.

**Sub-step 2b. Technical barriers:**

To implement and operate an energy efficiency project successfully, the technological aspect is also very important since the project relies on mature and advanced technology as well as high quality technical support and a reliable domestic spare part manufacturing industry. Currently, this kind of technology is not yet implemented in Hebei Province. As mentioned before, the energy saving management services are imported from Germany due to lacking experience with energy saving products in the building sector, technology support and low innovation capabilities of the Chinese construction industry (which just started with research

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\(^6\) The costs of the Model Project were shared by the government and the local inhabitants. Generally speaking, the government provided subsidies to components which are more expensive than the income due to energy savings, such as windows or radiators. Since in our Project the government is no longer involved, the high costs have to be shared by the Project Developer and the local inhabitants.

\(^7\) This amount will be paid after the successful implementation of the Project.

\(^8\) We assume that the lifetime of the project is 25 years, resulting in revenues from fuel saving to be 25*11 RMB/m\(^2\) and 10*7.7RMB/m\(^2\).

\(^9\) We have chosen the “Inner Mongolia Bayinhanggai” as reference project. In this case, the total investment costs amount to RMB 512.9 Mio, the total CER revenues in 10 years amount to 115 Mio, representing 22.4%.
activities in this field), causing high uncertainty in technology of the Project. The CDM revenues can play an important role in terms of financing the advanced but expensive technology and promote and contribute to the transfer of this kind of technology in Northern China.

**Sub-step 2c. Financing barriers:**

In order to promote energy efficient buildings in China, the Chinese government has promulgated several laws and regulations to subsidize these kinds of projects. The Project is also going to receive RMB 50 per m² from the government; however, compared to the in total investment costs which are RMB 466, this amount is quite limited. Additionally, this subsidy cannot be used as upfront-equity since it will only be disbursed after implementation of the Project. Compared to developed countries which are promoting energy efficient buildings more efficiently (like Germany’s state bank KfW provides discounted loans to public and private entities which are going to retrofit their buildings and make them more energy efficiently), the Chinese regulatory framework is still at the beginning. Despite the lack of promoting laws and regulations, the Project faces barriers to get a loan from the local bank. Furthermore, since the Project has to import technology and equipment from Germany, it has to deal with currency exchange risks; CERs are traded in Euro and therefore can contribute to minimize the currency exchange risks.

**Sub-step 2d. Operation and management barriers**

The buildings included in the Project were built as a first batch of new construction after the Tangshan Earthquake in 1976. Many residents have been living here for a long time and got used to current living circumstances. Therefore, the residents need a long time to use the new installed energy-saving equipments.

In the buildings of our Project, lots of apartments and houses have been sold to their present residents in the late 1990’s, leading to a situation that there might be multiple owners for each building. Some residents have been living in this district for more than ten years. Some owners have invested in decoration rather than in measures reducing the heat energy consumption. Therefore, energy-saving measures in the building envelope might face opposition from some residents since these measures might damage the decoration of the apartments. This increases the difficulties in the operation and management of the Projects. The additional carbon revenues can support the Project Developer paying an adequate amount to the local inhabitants in order to compensate the damages due to the retrofitting measures of the Project.

**Sub-step 2e. Barriers due to prevailing practice**

10 The bank seriously considers the additional finance from carbon revenues and therefore decided to issue the loan requested by the Project Developer.
By the end of 2007, there are 40 Billion m² existing residential building area, and more than 95% of this area is regarded as energy-intensive; in Beijing, the average energy consumption of this area is 22.4 kg standard coal equivalent per m², and equals to the same level as Germany in 1986\textsuperscript{11}. By 2007, energy consumption in Germany is reduced to 9 kg standard coal equivalent per m², still leaving a significant gap\textsuperscript{12}. All these data show that in China energy efficient buildings are not in the main focus of both policy-makers as well as private enterprises.

By now, existing building retrofitting projects are only carried out as demonstration projects in specific cities as Harbin and Tianjin and get support and subsidies from the government\textsuperscript{13}. It is clear that, as analysed above, without any further financial support existing building retrofitting projects can be implemented neither by individuals nor by enterprises. This project is the first one which transfers advanced technologies from Germany without having any previous experience in Hebei Province. Furthermore, it will show the impact of the CDM on existing residential building retrofitting projects and play a leading role in promoting energy efficiency in China.

Taking everything into account, it becomes clear that the Project faces significant barriers to become implemented. Only with additional promotional funding from CER revenues can help the project overcoming those barriers and getting implemented.

**B.6. Emission reductions:**

**B.6.1. Explanation of methodological choices:**

The emission reductions $ER_y$ during a given year $y$ is calculated as follows:

$$ER_y = BE_y - PE_y - L_y$$

(1)

Where:

- $ER_y$: Emission Reductions in the year $y$ [tCO$_2$e].
- $BE_y$: Baseline Emissions from heat displaced by the Project during the year $y$ [tCO$_2$e].
- $PE_y$: Emissions by the Project in the year $y$ [tCO$_2$e].
- $L_y$: Leakage in the year $y$ [tCO$_2$e].
The following steps are to calculate the Baseline Emissions, the Project Emissions and the Leakage Emissions in order to calculate the Emission Reductions caused by the Project. This calculation model is derived from the Chinese Standard for HVAC Design and is applicable for the calculation of baseline heat consumption and baseline emissions\(^{14}\).

**Step 1: Calculation of the Baseline Emissions (BE\(_y\))**

The Baseline Emissions are calculated by the dynamic method from “Code for Design of Heating Ventilation and Air Conditioning” (GB500019-2003). There are three types of buildings in the Project; since they all are in compliance with the same calculation rule, one baseline emission calculation method with different input parameter for each type is used. The detailed calculation process is described below.

\[
BE_y = Q_T \times COEF_{coal} \tag{2}
\]

\[
Q_T = \frac{Q_{B}}{(\eta_B \times \eta_T \times NCV_{coal})} \tag{3}
\]

- \(Q_T\): In total energy consumption in the baseline scenario (kWh)
- \(COEF_{coal}\): CO\(_2\) emission coefficient of Standard Coal (tCO\(_2\)/tce)
- \(Q_B\): In total heat loss before retrofitting (kWh)
- \(NCV_{coal}\): Net calorific value of Standard Coal (kWh/tce)
- \(\eta_B\): Boiler efficiency (%)
- \(\eta_T\): Heat transmission efficiency of pipe network before retrofitting (%)

\[
Q_B = Q_H + Q_{INF} - Q_S - Q_{IH} \tag{4}
\]

- \(Q_B\): In total heat loss before retrofitting (kWh)
- \(Q_H\): In total heat loss from the building envelope before retrofitting (kWh)
- \(Q_{INF}\): In total heat loss from ventilation before retrofitting (kWh)
- \(Q_S\): In total heat gain from solar energy before retrofitting (kWh)
- \(Q_{IH}\): In total heat gain from household indoor activity (kWh)

Sub-step 1a: Calculate in total heat loss from the building envelope before retrofitting (\(Q_H\))

\[
Q_H = K_i \times F_i \times (T_{in} - T_{out}) \tag{5}
\]

\[
Q_H = \sum_{t=1}^{m} Q_{Hi} \tag{6}
\]

- \(Q_{Hi}\): Heat loss from the building envelope before retrofitting (kWh) in the \(t^{th}\) hour

\(^{14}\) The model has used 15\(^\circ\)C as reference temperature to calculate the baseline heat consumption of the Model Project before retrofitting. The calculated amount is very close to the monitored amount of the Model Project.
K_r: Heat transfer coefficient of specific building material r (W/m²K)
F_r: Heat transmission area of specific building material r (m²)
T_m: Temperature inside the building in the tth hour (°C)
T_wm: Temperature outside building in the tth hour (°C)
t: hour of the heating period (3216 hours in total)
m: 1, 2, ..., 3216

Where:
\[ K_r = \frac{1}{R_{Dr}} \]  \hspace{1cm} (7)
\[ R_{Dr} = R_i + R_s + R_r \]  \hspace{1cm} (8)

R_m: The heat flow resistance of the building material r (m²K/W)
R_i: The heat flow resistance of inside building surface (m²K/W)
R_s: The heat flow resistance of outside building surface (m²K/W)
R_r: The heat flow resistance of the building material r (before the retrofitting measures) building floor (m²K/W)

Sub-step 1b: Calculate in total heat loss from ventilation before retrofitting (\(Q_{INF}\))
\[ Q_{INF} = (T_m - T_wm)(C_{\rho} \cdot \rho \cdot N \cdot V) \]  \hspace{1cm} (9)
\[ Q_{INF} = \sum_{t=1}^{m} Q_{INFt} \]  \hspace{1cm} (10)

Q_V: Heat loss through ventilation in the hour t (kWh)
N_r: Times of ventilation before retrofitting (times per hour)
C_\rho: Air specific heat capacity (kWh/kg*K)
V: In total ventilation volume (m³)
\rho: Air density in Tangshan (kg/ m³)

Where
\[ V = 0.5 \times V_b \]  \hspace{1cm} (11)
V_b: Building volume (m³)

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15 In case of multiple envelope buildings, its heat resistance is the sum of all heat resistances of each single tier. In the calculation part of Annex 2, the heat resistance of the retrofitted building will be adopted.

16 In the calculation part of Annex 2, the value after the implementation of the Project will be adopted.

17 Before the proposed project, the building is designed without a building door, therefore the ventilation volume is assumed to be 50% of the building volume.
Sub-step 1c: Calculation of the total solar heat gain from windows before retrofitting ($Q_{Sw}$)

\[ Q_{Sw} = F \times J_{wt} \]  \hspace{1cm} (12)

\[ Q_s = \sum_{t=1}^{3216} Q_{st} \]  \hspace{1cm} (13)

$Q_{Sw}$: Heat gain from windows in hour $t$

$F$: Overall heat transmission area ($m^2$)

$J_{wt}$: Solar radiation intensity load in hour $t$ ($W/m^2$)

Where

\[ F = \sum F_i \]  \hspace{1cm} (14)

$F_i$: Different heat transmission areas ($m^2$)

Sub-step 1d: Total heat gain from household indoor activities ($Q_{IH}$)

\[ Q_{IH} = \sum_{t=1}^{3216} Q_{IH} = \sum_{i=1}^{3216} Q_{pr} + \sum_{i=1}^{3216} Q_{AC} + \sum_{i=1}^{3216} Q_{Lt} \]  \hspace{1cm} (15)

\[ Q_{pr} = n \times H \times X_{r-T} \]  \hspace{1cm} (16)

\[ Q_{AC} = 0.7 \times F_o \times E \]  \hspace{1cm} (17)

\[ Q_{Lt} = 0.6 \times F_o \times L \times X_{r-T} \]  \hspace{1cm} (18)

Where

$Q_{IH}$: Total heat gain from household indoor activity (Wh)

$Q_{pr}$: Heat gain from indoor residents in the hour $t$ (Wh)

$Q_{AC}$: Heat gain from indoor electric equipments and cooking in the hour $t$ (Wh)

$Q_{Lt}$: Heat gain from lightening in the hour $t$ (Wh)

$F_o$: Total indoor area in the building ($m^2$)

$L$: Lightning heat power ($W/m^2$)

\[ \text{The household electrical appliance synchronized usage rate is } 0.7. \]  \hspace{1cm} (18)

\[ \text{The household lightning synchronized usage rate is } 0.6 \]  \hspace{1cm} (19)

\[ \text{For the time the residents are not inside the building, the heat gain is zero.} \]  \hspace{1cm} (20)

\[ \text{For the time the residents are not inside the building, the heat gain is zero.} \]  \hspace{1cm} (21)
In order to calculate the emissions occurred by the Project, we have to use the same method, but other parameters as for the calculation of the baseline emissions. In comparison to the baseline scenario, the indoor temperature as well as the grid efficiency rate and the boiler efficiency rate remain unchanged. Other parameters, like the material thermal resistance rate, are collected from the Model Project.

\[
P_E = \frac{M_{BE}}{\eta_B \times \eta_T \times NCV_{coal} \times COEF_{coal}}
\]

Where:
- \(M_{BE}\): The heat consumption from heat meter after retrofitting (kWh)
- \(\eta_B\): Boiler efficiency
- \(\eta_T\): Heat transmission efficiency
- \(NCV_{coal}\): Net thermal value of Standard Coal (kWh/t)
- \(COEF_{coal}\): The CO\textsubscript{2} emission factor of Standard Coal (tCO\textsubscript{2}/tce)

In the Project, it is supposed that the efficiency of heating pipe network system is 85% and the boiler efficiency is 55%. This assumption is derived from the “Civil Energy Saving Design Standard for Buildings” (JGJ26-95) and therefore conservative.

**Step 3: Calculation of the Leakage (LE\textsubscript{L})**

The leakage of the Project is zero.

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**B.6.2. Data and parameters that are available at validation:**

22 The proposed project assumes 3.5 adult men in each house. But this can reduce the baseline emission. It is conservative according to the CDM principle.

23 In the Project, the time span of residents in the house is assumed to be between 6 pm to 8 am on the second day.

24 In the Project, the time span of lightening is between 6 pm to 12 pm.
### Data / Parameter: NCV<sub>Coal</sub>

**Data unit:** kWh/tce  
**Description:** The net calorific value of coal.  
**Source of data used:** IPCC  
**Value applied:** 8140  
**Justification of the choice of data or description of measurement methods and procedures actually applied:** Adopt the IPCC default value  
**Any comment:**

### Data / Parameter: COEF<sub>coal</sub>

**Data unit:** tCO<sub>2</sub>/tce  
**Description:** The CO<sub>2</sub> emission factor of Standard Coal.  
**Source of data used:** IPCC, page 2.22, Table 2.5  
**Value applied:** 2.77  
**Justification of the choice of data or description of measurement methods and procedures actually applied:** Adopt the IPCC default value  
**Any comment:**

### Data / Parameter: η<sub>B</sub>

**Data unit:** %  
**Description:** Boiler efficiency  
**Source of data used:** “Energy conservation design standard for new heating residential buildings” JGJ26-95  
**Value applied:** 0.55  
**Justification of the choice of data or description of measurement methods and procedures actually applied:** The Industry Standard of China  
**Any comment:**

### Data / Parameter: η<sub>P</sub>

**Data unit:** %
### Description: Heat transmission efficiency

<table>
<thead>
<tr>
<th>Source of data used:</th>
<th>“Energy conservation design standard for new heating residential buildings” JGJ26-95</th>
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</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Data / Parameter:</th>
<th>$F_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit:</td>
<td>m²</td>
</tr>
<tr>
<td>Description:</td>
<td>The heat transformation area of each part of the building</td>
</tr>
<tr>
<td>Source of data used:</td>
<td>On-site measurement</td>
</tr>
<tr>
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</tr>
<tr>
<td>Justification of the choice of data or description of measurement methods and procedures actually applied:</td>
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</tr>
<tr>
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<td></td>
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<table>
<thead>
<tr>
<th>Data / Parameter:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Data unit:</td>
<td>m²K/W</td>
</tr>
<tr>
<td>Description:</td>
<td>The thermal resistance value of the building material</td>
</tr>
<tr>
<td>Source of data used:</td>
<td>Before retrofitting, the data were measured on site; the values after retrofitting are based on calculations.</td>
</tr>
<tr>
<td>Value applied:</td>
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</tr>
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<table>
<thead>
<tr>
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<th>$R_s$</th>
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</thead>
<tbody>
<tr>
<td>Data unit:</td>
<td>m²K/W</td>
</tr>
<tr>
<td>Description:</td>
<td>The thermal resistance for the surface inside the buildings.</td>
</tr>
<tr>
<td>Source of data used</td>
<td>“Code for thermal design of civil buildings” GB50176-93</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Data / Parameter</th>
<th>$R_s$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit</td>
<td>m²K/W</td>
</tr>
<tr>
<td>Description</td>
<td>The thermal resistance for the surface outside the buildings.</td>
</tr>
<tr>
<td>Source of data used</td>
<td>“Code for thermal design of civil buildings” GB50176-93</td>
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<td>Value applied</td>
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<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>Data unit</td>
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</tr>
<tr>
<td>Description</td>
<td>Temperature of outside building</td>
</tr>
<tr>
<td>Source of data used</td>
<td>Measured on site by the local climate authority</td>
</tr>
<tr>
<td>Value applied</td>
<td>See Annex 3</td>
</tr>
<tr>
<td>Justification of the choice of data or description of measurement methods and procedures actually applied :</td>
<td>Measured on site by the local climate authority</td>
</tr>
<tr>
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<td></td>
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<table>
<thead>
<tr>
<th>Data / Parameter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Data unit</td>
<td>h⁻¹</td>
</tr>
<tr>
<td>Description</td>
<td>Number of ventilation</td>
</tr>
<tr>
<td>Source of data used</td>
<td>On-site measurement</td>
</tr>
<tr>
<td>Value applied</td>
<td>1.2 before retrofitting, 0.9 after retrofitting</td>
</tr>
<tr>
<td>Justification of the</td>
<td>Measured and calculated by the local architectural design and</td>
</tr>
</tbody>
</table>
### Data / Parameter: $C_p$

- **Data unit:** Wh/(kg*K)
- **Description:** Specific heat capacity of air ventilation
- **Source of data used:** Thermal Norm for Residential Buildings GB50176-93
- **Value applied:** 0.28

**Justification of the choice of data or description of measurement methods and procedures actually applied:**

The Industry Standard of China

---

### Data / Parameter: $\rho$

- **Data unit:** Kg/m$^3$
- **Description:** Local air density in winter
- **Source of data used:** Meteorological Bureau of Tangshan
- **Value applied:** 1.379

**Justification of the choice of data or description of measurement methods and procedures actually applied:**

Fixed figure in Tangshan

---

### Data / Parameter: $V_b$

- **Data unit:** m$^3$
- **Description:** Volume of the building
- **Source of data used:** Feasibility study of the Project
- **Value applied:** See Annex 3

**Justification of the choice of data or description of measurement methods and procedures actually applied:**

Measured by the construction company.
### Data / Parameter: $J_{el}$
- **Data unit:** W/m²
- **Description:** Solar radiation intensity load each hour (W/m²)
- **Source of data used:** Local weather bureau
- **Value applied:** In Annex 3
- **Justification of the choice of data or description of measurement methods and procedures actually applied:** Measured by a professional company

### Data / Parameter: $n$
- **Data unit:** Number
- **Description:** Number of people in each household
- **Source of data used:** Calculation
- **Value applied:** 3.5 men (adult)
- **Justification of the choice of data or description of measurement methods and procedures actually applied:** This number is due to statistical evaluation of all inhabitants in the 20 buildings which are retrofitted.

### Data / Parameter: $L$
- **Data unit:** W/m²
- **Description:** Lighting power density
- **Source of data used:** "Standard for Lighting Design of Buildings and Lighting Design" GB50034-2004
- **Value applied:** 7
- **Justification of the choice of data or description of measurement methods and procedures actually applied:** The Industry Standard of China.
### Data / Parameter: $H_p$

| Data unit: | $W/m^2$ |
| Source of data used: | “Energy Efficiency of Residential Buildings in Hot Summer and Warm Winter Zone” JGJ75-2003 |
| Value applied: | 4.3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The Industry Standard of China |

### Data / Parameter: $X_r$

| Data unit: | $\%$ |
| Description: | Power gained from residents |
| Source of data used: | Lu Yaoqing: Practical Design Handbook of Heating and Air Conditioning; Chinese Architecture & Building Press. |
| Value applied: | Dynamic changing, see Annex 3. |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Scientific evidence |

### Data / Parameter: $X_{r-t}$

| Data unit: | $\%$ |
| Description: | Heat coefficient gained from residents |
| Source of data used: | Lu Yaoqing: Practical Design Handbook of Heating and Air Conditioning; Chinese Architecture & Building Press. |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Scientific evidence |
### Description:
Heat transfer coefficient of lighting

### Source of data used:
Lu Yaoqing: Practical Design Handbook of Heating and Air Conditioning; Chinese Architecture & Building Press.

### Value applied:
See Annex 3

### Justification of the choice of data or description of measurement methods and procedures actually applied:
Scientific evidence

### Any comment:

<table>
<thead>
<tr>
<th>Data / Parameter</th>
<th>F_{0}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit</td>
<td>m²</td>
</tr>
<tr>
<td>Description</td>
<td>Indoor building area</td>
</tr>
<tr>
<td>Source of data used</td>
<td>Feasibility Study of the Project</td>
</tr>
<tr>
<td>Value applied</td>
<td>In Annex 3</td>
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<tr>
<td>Justification of the choice of data or description of measurement methods and procedures actually applied :</td>
<td>Measured by the construction company</td>
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<table>
<thead>
<tr>
<th>Data / Parameter</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit</td>
<td>day</td>
</tr>
<tr>
<td>Description</td>
<td>Heating days</td>
</tr>
<tr>
<td>Source of data used</td>
<td>“Energy conservation design standard for new heating residential buildings” JGJ26-95</td>
</tr>
<tr>
<td>Value applied</td>
<td>134</td>
</tr>
<tr>
<td>Justification of the choice of data or description of measurement methods and procedures actually applied :</td>
<td>From 15.November until 28.March of the following year</td>
</tr>
<tr>
<td>Any comment</td>
<td></td>
</tr>
</tbody>
</table>

#### B.6.3 Ex-ante calculation of emission reductions:
Because the Project has not yet been implemented, the dynamic simulation method is used to calculate the Project Emissions. The calculation result is as follows.

The baseline scenario of the Project is determined as the follows: All residents use the same equipments and infrastructure without any retrofitting activity with an average indoor temperature of 18°C. The detailed information for the calculation is described from (3) to (18) and in the following table.

Variable values of each apartment in the baseline scenario (buildings of the model project are taken as a reference):

<table>
<thead>
<tr>
<th></th>
<th>QT (kg/m²)</th>
<th>QB (KWh/m²)</th>
<th>QH (KWh/m²)</th>
<th>QINF (KWh/m²)</th>
<th>QS (KWh/m²)</th>
<th>QIH (KWh/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>41.70</td>
<td>158.69</td>
<td>155.21</td>
<td>45.70</td>
<td>-27.42</td>
<td>-14.80</td>
</tr>
<tr>
<td>B</td>
<td>43.68</td>
<td>166.21</td>
<td>153.03</td>
<td>54.43</td>
<td>-26.11</td>
<td>-15.14</td>
</tr>
<tr>
<td>C</td>
<td>52.79</td>
<td>200.89</td>
<td>185.57</td>
<td>54.84</td>
<td>-26.16</td>
<td>-13.36</td>
</tr>
</tbody>
</table>

The Project scenario adopts several parameters from the Model Project and estimates the indoor temperature to be 18°C after retrofitting. By using (3) to (18), the parameters for heat loss, the heat gain and the in total energy consumption (after retrofitting) can be calculated:

Variable values of each apartment in the Project scenario

<table>
<thead>
<tr>
<th></th>
<th>QT (kg/m²)</th>
<th>QB (KWh/m²)</th>
<th>QH (KWh/m²)</th>
<th>QINF (KWh/m²)</th>
<th>QS (KWh/m²)</th>
<th>QIH (KWh/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14.66</td>
<td>55.79</td>
<td>65.11</td>
<td>34.02</td>
<td>-28.65</td>
<td>-14.69</td>
</tr>
<tr>
<td>B</td>
<td>15.70</td>
<td>59.76</td>
<td>61.13</td>
<td>40.83</td>
<td>-27.05</td>
<td>-15.14</td>
</tr>
<tr>
<td>C</td>
<td>17.24</td>
<td>65.60</td>
<td>65.52</td>
<td>41.13</td>
<td>-27.69</td>
<td>-13.36</td>
</tr>
</tbody>
</table>

**B.6.4 Summary of the ex-ante estimation of emission reductions:**

The net emission reduction induced by the proposed project activity in the fixed credit period (November 1st, 2010-October 31st, 2019) is estimated to be 31,642.5 tCO2e.
### B.7 Application of a monitoring methodology and description of the monitoring plan:

#### B.7.1 Data and parameters monitored:

<table>
<thead>
<tr>
<th>Data / Parameter</th>
<th>M_{BE}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data unit:</strong></td>
<td>kWh</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Real heat consumption of the retrofitted buildings.</td>
</tr>
<tr>
<td><strong>Source of data to be used:</strong></td>
<td>On-site measurement</td>
</tr>
<tr>
<td><strong>Description of measurement methods and procedures to be applied:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Any comment:</strong></td>
<td>Project back-up in the next two years after the Project implementation, both in hardcopy and electronic version.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimation of baseline emissions (tCO$_2$e)</th>
<th>Estimation of project activity emissions and leakage (tCO$_2$e)</th>
<th>Estimation of overall emission reductions (tCO$_2$e)</th>
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<tbody>
<tr>
<td>2010</td>
<td>14,385</td>
<td>6,080</td>
<td>8,035</td>
</tr>
<tr>
<td>2011</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2012</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2013</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2014</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2015</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2016</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2017</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2018</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2019</td>
<td>35,961</td>
<td>15,200</td>
<td>20,761</td>
</tr>
<tr>
<td>2020</td>
<td>21,576</td>
<td>9,120</td>
<td>12,457</td>
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<tr>
<td><strong>Total (tCO$_2$e)</strong></td>
<td>359,610</td>
<td>152,000</td>
<td>207,610</td>
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used:

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<tbody>
<tr>
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<td>Details are given in the project monitoring report</td>
</tr>
<tr>
<td>Any comment:</td>
<td>Project back-up in the next two years after the Project implementation, both in hardcopy and electronic version.</td>
</tr>
</tbody>
</table>

### Data / Parameter:
- **Data / Parameter**: D
- **Data unit**: Number
- **Description**: Number of days with heating
- **Source of data to be used**: On-site Measurement
- **Value of data**: 134
- **Description of measurement methods and procedures to be applied**: Details are given in the project monitoring report
- **Any comment**: Project back-up in the next two years after the Project implementation, both in hardcopy and electronic version.

### B.7.2 Description of the monitoring plan:

The Project Developer is responsible for the monitoring of the Project Emissions. The objective of the monitoring plan is to ensure that the Project Developer will be in charge and supervise the monitoring of the Project Emissions during the crediting period.

1. Organisation of the monitoring group

The Project Developer will set up a designated CDM group which is in charge of data collection, supervision, verification and recording. The group director will be trained and supported in CDM issues by CDM specialists. The organization of the monitoring group is as follows:
2. Data Monitoring

According to the AMS-IIE there are two key types of information that must have to be monitored:

(a) The specifications of the equipment which have been replaced;
(b) Energy conservation amount caused by the Project.

Data of the Baseline Emissions are calculated by using the dynamic method. The parameters used in this process, like solar radiation or the hourly temperature in each day is obtained from the local weather bureau. At the same time, the indoor temperature of the baseline scenario is 18°C which is in line with the national regulations.

The Project uses heat meters in the buildings which record the real energy consumption of each household and therefore determines the Project Emissions. The overall emission reductions due to the implementation of the Project can be calculated as the difference between the Baseline Emissions and the Project Emissions. Leakages can be neglected.

3. Monitoring methodology:

Heat meters will be installed in each of the 840 households and record its energy consumption. At the end of month, members of the CDM data recording group will record all these data of energy consumption in each household from the heat meters.

4. Data monitoring and recording

The heat meters will be configured in accordance with the national requirements and standards and have to be approved by the quality supervision institution in charge before going into operation. The Project Developer is committed to carry out necessary training programmes, mainly about the maintenance of the heat meters. The Project Developer will repair the equipments within three days in case of failure for free.
Furthermore, the data collection team will record the data from the meters in each household every month. If the monitored data seem to be abnormal, the team will be responsible to solve this problem immediately. A designated person from authorized by the Project Developer will record the data from the central heat meters which displays overall energy consumption of whole building and compare this with the sum of each household’s energy consumption inside the building, verifying the authenticity of the recorded data from each household and preventing manipulations.

5. Quality control

All monitoring procedures have to be carried out in line with the requirements of the AMS-IL-E. Before the Monitoring of the Project Emissions is going into operation, the staffs have to be trained and educated especially in terms of especially in technical issues, e.g. they are asked to execute all monitoring activities according to the monitoring plan. The key responsible people have to verify the obtained data on a monthly basis, ensuring the authenticity of the recorded data and repair the monitoring equipment in case of failure.

6. Monitoring reports

Monitoring reports have to be conducted on a yearly basis with main focus on the whole monitoring procedure, including the monitoring organization, the instruments, the operation status of the Project, accidents and the collected data.

<table>
<thead>
<tr>
<th>B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)</th>
</tr>
</thead>
</table>

The study of the baseline and monitoring methodology was completed on June 18\textsuperscript{th}, 2008.

The key technicians involved in the study include:

1. Mr. Wang Can, canwang@tsinghua.edu.cn, Tsinghua University, Department of Environmental Science and Engineering, Tsinghua University, Beijing, Telephone: +86 10 62794115.

2. Mr. Andreas Oberheitmann, oberheitmann@tsinghua.edu.cn, Tsinghua University, Department of Environmental Science and Engineering, Tsinghua University, Beijing, Telephone: +86 10 62794115.

3. Mrs. Ma Yuqing, yuqing@tsinghua.edu.cn, Tsinghua University, Global Climate Change Institute, INET, Tsinghua University, Beijing, Telephone: +86 10 62772758.

4. Mrs. Zhang Xiaoling, xzlzhang666@sina.com, Centre of Science and Technology of Construction, No.9 Sanlihe Road Beijing, Telephone: +86 10 58933245.
5. Mrs. Liu Wenling, liuwenling@tsinghua.edu.cn, Tsinghua University, Department of Environmental Science and Engineering, Tsinghua University, Beijing, Telephone: +86 10 62794115.

6. Mr. Wang Haoping, haopingwang@tsinghua.edu.cn, Tsinghua University, Department of Environmental Science and Engineering, Tsinghua University, Beijing, Telephone: +86 10 62794115.

Neither the above individuals nor organizations are Project Participants.

<table>
<thead>
<tr>
<th>SECTION C. Duration of the project activity / crediting period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C.1 Duration of the project activity:</strong></td>
</tr>
<tr>
<td><strong>C.1.1. Starting date of the project activity:</strong></td>
</tr>
<tr>
<td>01/05/2008</td>
</tr>
<tr>
<td><strong>C.1.2. Expected operational lifetime of the project activity:</strong></td>
</tr>
<tr>
<td>25 years</td>
</tr>
<tr>
<td><strong>C.2 Choice of the crediting period and related information:</strong></td>
</tr>
<tr>
<td><strong>C.2.1. Renewable crediting period</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>C.2.1.1. Starting date of the first crediting period:</strong></td>
</tr>
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<td>Not applicable</td>
</tr>
<tr>
<td><strong>C.2.1.2. Length of the first crediting period:</strong></td>
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</tr>
<tr>
<td><strong>C.2.2. Fixed crediting period</strong></td>
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<tr>
<td>10</td>
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<tr>
<td><strong>C.2.2.1. Starting date:</strong></td>
</tr>
<tr>
<td>01/11/2010</td>
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<tr>
<td><strong>C.2.2.2. Length:</strong></td>
</tr>
<tr>
<td>10 years</td>
</tr>
</tbody>
</table>
There is neither water source nor nature reservation or other environmental sensitive area in the surrounding area of the Project. The main adverse environmental impacts can be expected from the construction and operation of the Project. They are in detail:

- During the construction phase: Dust pollution, vehicle exhaust pollution, noise, waste and spoil. These adverse impacts will stop after the implementation of the Project.
- During the operation phase: water pollution, solid waste and noise.

1. Project Construction Phase

1.1 Dust

Initially, air quality impacts are limited to an increased level of dust from the retrofitting construction process. The Project applies several measures to decrease the level of dust, e.g. using the watering dust prevention method. The mixture of concrete on the Project site is strictly prohibited; furthermore, the Project Developer avoids construction work on windy days. In terms of waste treatment, spoil, building waste and other waste material should be collected and moved away.

1.2 Noise

Noise from the construction equipments is another negative impact. To avoid those negative impacts, designated people from the construction company will maintain the equipments on a regular basis. The construction staffs shall strictly follow the operation specifications; noise protection equipment like noise blocks and noise barriers will also be used.

1.3 Solid Waste

Recyclable resources will be recycled and reused after cleaning; unrecyclable waste will be carried away.

2. Operation phase

2.1 Waste water

The daily sewage and rainwater will be together lead into the municipal waste water network and flow to the sewage treatment facilities.

2.2 Noise

The noise will be mainly from water pumps. Noise insulation devices will be installed.
2.3 Solid Waste

The daily solid waste will be also collected and carried to the municipal waste treatment facilities.

In conclusion, adverse environmental impacts caused by the Project are considered to be low. The remaining adverse effects on the local environment and the residents’ living condition can be solved by measures described above.

SECTION E. Stakeholders’ comments

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

From 1st March 2009 until 30th March 2009, the Project Developer conducted a written survey to the local inhabitants local residents which are involved the Project as well as the local government. Opinions are mainly obtained through leaflets and interviews. From 160 allotted questionnaires, 150 were answered and sent back. The questionnaire consists of following questions:

1. General information
   1) Gender (1) Male  (2) Female
   2) Age: (1) - 30  (2) 30-40  (3) 40-50  (4) 50 +
   3) Monthly income:
      (1) less than RMB 5000
      (2) RMB 5000-10000
      (3) RMB 10000-20000
      (4) more than RMB 20000
   4) Education background:
      (1) elementary school
      (2) middle school
      (3) high school
      (4) vocational university or above

2. Optional answer (single choice)
   1) The ideal indoor temperature is?
      (1) 10-15°C  (2) 16-20°C  (3) 20°C and above
   2) The benefits after retrofitting are:
      (1) higher indoor temperature
      (2) improvement of the building appearance
3) The negative effect caused by the retrofitting measures:

   (1) noise from construction
   (2) possible furniture and wall destruction
   (3) fallouts by the construction activities
   (4) environment destruction of the compound
   (5) increase of migrant people
   (6) poor retrofitting quality
   (7) others

4) How do you think about the grade of negative effect caused by the Project:

   (1) It is very severe.
   (2) It cannot be neglected but can be minimized by appropriate measures.
   (3) Almost no influence

5) Overall judgement of the Project:

   (1) The advantages outweigh the disadvantages.
   (2) The advantages are equal to the disadvantages.
   (3) The disadvantages outweigh the advantages.

6) How do you think about the Project?

   (1) support  (2) object  (3) indifferent.

3. Open Questions

1) What method of heating would you adopt to increase the room temperature if you feel cold in the winter?

2) In what time periods do you use to open the windows?

3) How many residents are in your family? What are your main indoor activities?

4) Would you pay a part of the whole retrofitting costs? If so, how much would you pay?

5) Any advices and suggestions?

4. Signature:
   Date:

E.2. Summary of the comments received:

The overall summary based on information provided by the questionnaires is given below:
The responder all support this Project, nobody opposed it.
All responders suppose the Project will enhance the average indoor temperature and therefore the quality of life; furthermore, the Project can reduce the electricity costs.
All responders deem that the Project is has more benefits than disadvantages to the society.
35% of the responders presume that the main pollution sources are noise and dust caused by the construction activities.
In addition, responders expected the project can be carried out normally and be available as soon as possible.

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

The Project Developer very appreciates to get the overall positive opinion about this Project. Furthermore, it takes these recommendations very seriously and will implement all measures stated in the “Environmental Impact Assessment Report” to mitigate the socioeconomic and environmental adverse effects of the Project.
Regarding the concerns about the dust and noise as the main pollution sources, the Project Developer has chosen appropriate measures to mitigate the harmful effects on the inhabitants as well as the workers, like noise protection equipment.
As stated above, the responders of the survey state that the Project will bring more positive than negative effects to the local inhabitants, therefore they mainly support the implementation of the Project. The Project Developer will carry out the Project implementation in line with the local laws and regulations and additionally, keep in contact with the stakeholders to improve the quality of service to them.
### Annex 1

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Tangshan Urban Construction Investment Corporation Limited</th>
</tr>
</thead>
<tbody>
<tr>
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<td>No. 99, Jianshe Beilu, Tangshan City</td>
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<td>Building</td>
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<tr>
<td>City</td>
<td>Tangshan City</td>
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<tr>
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<td>Hebei Province</td>
</tr>
<tr>
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<td>Represented by</td>
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<tr>
<td>Salutation</td>
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<td>Personal E-Mail</td>
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</tbody>
</table>
Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I Parties is involved in this project activity.
Annex 3