CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY: BASELINE (CDM-NMB)
Version 01 - in effect as of: 1 July 2004

CONTENTS

SECTION A. Identification of methodology

A.1. Proposed methodology title:

>> Baseline methodology for district heating rehabilitation, possibly reducing use of in house devices

A.2. List of category(ies) of project activity to which the methodology may apply:

>>
1. Energy industries (renewable - / non-renewable sources)
2. Energy distribution

A new category might be introduced: "Energy efficiency, district heating system reconstruction"

A.3. Conditions under which the methodology is applicable to CDM project activities:

>>
The proposed methodology can be used if the following conditions apply:

- The project rehabilitates an existing district heating system (DHS), which may be deteriorating and therefore be reducing heating services to DHS customers, while DHS customers may replace or supplement reduced DHS heating services with one or several alternative means of providing heat and hot water. The rehabilitation of the DHS may lead to the reduced use of in house devices (IHD), such as individual electric heaters fuelled by gas, oil or electricity.
- No capacity increase: The capacity (according to name plate, in MW) of the boilerhouse(s) to be installed with the project activity and from which CERs are claimed is not higher than the sum of the capacities (according to name plates, in MW) of the boilerhouse(s) and other heating devices (if applicable) that form the baseline situation. A project with expanded capacity cannot claim CERs under this methodology for the capacity that exceeds the old capacity.
- Sufficient information is available about local conditions that impact the operation, use and development of the DHS, about the use of IHD (if applicable), and about technical and investment alternatives to the existing DHS.
- The decision on the future of the DHS is made on the basis of economic or financial considerations taking into account barriers to investment and operation of the current and any future system configuration.
- The methodology is not applicable for new DHS in locations where previously no DHS was operating.
- The project does not result in any significant leakage of CO_2 emissions or an increase of non-CO_2 emissions. Project proponents claim only reductions of CO_2 emissions. If leakage is present or a reduction of other than CO_2 emissions is claimed, the methodology must be supplemented with additional elements.
- The project does project not claim emission reductions from demand side measures.

A.4. What are the potential strengths and weaknesses of this proposed new methodology?

>>
Strengths:
- Comprehensive analysis of investment decisions using quantitative and qualitative data and methods (economic/financial analysis, barrier analysis, consideration of relevant sector policies).
- Broad applicability to a variety of deteriorating DHS systems, particularly in economies that are in transition to a market based economic system.
- Applicability under a variety of conditions: different technologies, consumer behavior, barriers and constraints.
- Use of approved methodological elements: additionality tools, ACM0002.

– Calculation of emission reductions on the basis of differences in baseline and project emission factors and monitored project activity levels following the approved methodologies for power sector projects.
– Compliance with the MethPanel recommendations regarding NM0046.

Weaknesses:
– The methodology does not detect motives and other idiosyncrasies of investors interested in a particular project in a highly uncertain environment.
– The methodology uses assumptions and trend projections which may be difficult to obtain and may be unreliable

SECTION B. Overall summary description:

>>
The following table provides an overview on the steps involved in the new baseline methodology:

Table 1: Outline of new baseline methodology and its reference to consolidated methodologies.

Step	Section in NMB
1. Identification of practical alternatives to the projects technology	Section D.1.; p. 4
2. Determination of the baseline technology	Section D.1.; p. 5
3. Definition of emission factors for saved fuels	Section D.1.; p. 7
4. Definition of emission factors for saved electricity (ACM0002, average)	Section D.1.; p. 8
5. Determination of emission factors for heating technologies	Section D.1.; p. 10
6. Emission reductions calculation and projection	Section D.1.; p. 12
7. Additionality test (Additionality tools)	Section D.3.; p. 13

The methodology does not claim emission reductions from demand side measures.
A detailed step-by-step description of the methodology is provided in Section D.1.

SECTION C. Choice of and justification as to why one of the baseline approaches listed in paragraph 48 of CDM modalities and procedures is considered to be the most appropriate:

>>

C.1. General baseline approach:

☐ Existing actual or historical emissions, as applicable;

☒ Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;

☐ The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

C.2. Justification of why the approach chosen in C.1 above is considered the most appropriate:

>>
Decisions on the future of district heating systems imply in general important investment decisions which are typically done under economic and/or financial considerations. This is why a baseline approach following the Option in Article 48b of the Guidance on the CDM is the most appropriate one. However also other key factors such as fuel availability, technology availability, sector policy and social acceptability should be considered. The methodology recognizes that economic distortions and organizational failure, which may still exist in many reforming economies, have an influence on the decisions of consumers and DHS operators/investors regarding the choice of heating technologies and

heating services. Those issues are treated in the framework of the barrier analysis option of the methodology.

The methodology therefore uses the most appropriate tools to determine the baseline, taking into account the circumstances of the country, the availability of data and the decision criteria of the relevant actors. Financial/Economic analysis is used in so far as reliable market conditions and financial/economic investment incentives prevail. Barrier and policy analysis is used when decision making is primarily constrained by non-economic/financial considerations.

The methodology thus implements approach 48(b) CDM M&P according to which the baseline is the scenario that represents an economically attractive course of action taking barriers to investment into account.

By disclosing and analyzing the elements of a decision about the future of a given DHS, the methodology allows for a transparent and conservative assessment. But it cannot do entirely without expert judgment in making assumptions and assessing the relative relevance of key factors that impact a decision. This is particularly relevant in a situation of limited data availability.

SECTION D. Explanation and justification of the proposed new baseline methodology:

D.1. Explanation of how the methodology determines the baseline scenario (that is, indicate the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases (GHG) that would occur in the absence of the proposed project activity):

>>

The baseline methodology determines the heating technology that would be used in the absence of the proposed project activity and the related baseline emissions factors. On this basis and on the basis of the monitored heat demand baseline emissions will be determined. In the following, a detailed step-by-step description of the methodology is provided.

1. Identification of practical alternatives to the project technology

This list should include all technical alternatives to the projects heating technology that could be implemented in place of the projects technology taking into account the country's and sector's specific conditions. The listing should be limited to practical alternatives given the availability of resources and technologies in the country and the prevailing legal and regulatory requirements[1], including:

- Legal and regulatory requirements regarding air pollution emission levels, pollution through network water leakage etc.
- Legal and regulatory requirements regarding the installation and operation of individual heaters in apartments
- Legal and regulatory requirements regarding safety and security in district heating installations

The listing should include at least the following credible alternatives to the project technology:

- The proposed project technology (i.e. the rehabilitation of the heating boilers and of the distribution network) not undertaken as a CDM project activity

[1] However, if an alternative does not comply with all applicable legislation and regulations, then it may be shown that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread in the country. If this can be shown, then the alternative may be considered further.

- The proposed project technology (e.g. DHS, in house devices) but using different fuels for the district heating system (e.g. heavy fuel oil, light fuel oil, natural gas, biomass, others)
- No district heating and exclusive use of individual heaters fuelled by available fuels (e.g. electricity, light fuel oil, kerosene, natural gas (on line or compressed), LPG, biomass, others)
- Continuation of the use of the current heating technologies (no project activity or other alternatives undertaken), i.e. the continuation of operation of the existing district heating system and the possible use of additional in house devices for heating.

2. Determination of the baseline technology

The determination of the baseline technology can be done in two alternative ways:

Option 1: Barrier analysis

Applicability: In an environment of distorted prices, strong influence of sector policies (or their absence), existence of shortages in the supply of power and fossil fuels, an analysis of investment, technical and other barriers is more appropriate than an economic/financial investment analysis and should be used.

Through the barrier analysis alternatives are eliminated which can not be implemented due to the prevailing barriers. Such barriers may include, among others:

Investment barriers, other than the economic/financial barriers in Step 2 above, inter alia:
- Debt funding is not available for this type of innovative project activities.
- No access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be implemented.

Technological barriers, inter alia:
- Skilled and/or properly trained labour to operate and maintain the technology is not available and no education/training institution in the host country provides the needed skill, leading to equipment disrepair and malfunctioning;
- Lack of infrastructure for implementation of the technology.

Barriers due to prevailing practice, inter alia:
- The project activity is the "first of its kind": No project activity of this type is currently operational in the host country or region.

Provide transparent and documented evidence, and offer conservative interpretations of this documented evidence, as to how it demonstrates the existence and significance of the identified barriers. Anecdotal evidence can be included, but alone is not sufficient proof of barriers. The type of evidence to be provided may include:

(a) Relevant legislation, regulatory information or industry norms;
(b) Relevant (sectoral) studies or surveys (e.g. market surveys, technology studies, etc) undertaken by universities, research institutions, industry associations, companies, bilateral/multilateral institutions, etc;
(c) Relevant statistical data from national or international statistics;
(d) Documentation of relevant market data (e.g. market prices, tariffs, rules);
(e) Written documentation from the company or institution developing or implementing the CDM project activity or the CDM project developer, such as minutes from Board meetings, correspondence, feasibility studies, financial or budgetary information, etc;
(f) Documents prepared by the project developer, contractors or project partners in the context of the proposed project activity or similar previous project implementations;
(g) Written documentation of independent expert judgements from industry, educational institutions (e.g. universities, technical schools, training centres), industry associations and others.

Any alternative technology that would be prevented by the barriers identified above is not a viable alternative, and shall be eliminated from consideration. If only one viable alternative is identified, this is the baseline. If several viable alternative technologies result from the barrier analysis, an investment analysis can be applied on the viable alternatives. In this case, the viable technology with the best financial indicator is the baseline. If an investment analysis is not possible the alternative with the lowest emissions should be selected as the baseline to exclude any possibility to overestimate emission reductions.

Option 2: Economic/financial investment analysis

Applicability: In cases were reliable data on prices and costs are available and normal market conditions prevail an investment analysis should be done to identify the least cost option. The least cost selection of a heating technology should be done on the base of total costs per unit of heat delivered or another suitable financial indicator (IRR, NPV, …).
For the investment analysis, calculate the suitable financial indicator for the proposed CDM project technology and for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but including subsidies/fiscal incentives where applicable), and, as appropriate, non-market cost and benefits in the case of public investors.
Present the investment analysis in a transparent manner and provide all the relevant assumptions in the CDM-PDD, so that a reader can reproduce the analysis and obtain the same results. Clearly present critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).
Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated.
The cost analysis should follow the investors' perspective, i.e. costs and revenues[2] (or benefits) that do not accrue at the decision making level (externalities) are not included in the analysis, so that a *financial* analysis is sufficient for most DHS rehabilitation projects. (If a public project pursues identified political objectives, an *economic* analysis may be more appropriate). The investors in heating services equipment are the district heating company or the municipality (for DHS) as well as the consumers (for individual heaters).

In the following, a straightforward method for determining total unit production cost of heat is provided:

Cost figures may be calculated on the basis USD/GJ of heat services delivered to consumers. The proposed approach assumes that costs remain constant over the lifetime of the project. The calculation must include all construction, operating and maintenance costs. The compared technologies must have the same expected lifetime or calculate costs for the same service period. Assumptions (e.g. discount rate) must be the same for all compared alternatives and should be conservative. This means assumptions should more likely underestimate than overestimate the true production cost of the projects technology,

[2] Cost figures should be adjusted for supplemental income (other than from sales of heat and emission reductions), if this is necessary to obtain cost figures that are comparable between alternatives, e.g. if some alternatives produce and sell a co- or by-product, e.g. electricity by a combined heat and power (CHP) plant.

whereas the true costs of the project alternatives should more likely be overestimated than underestimated, such that assumptions create a bias for the project being least-cost and non-additional.

Under these assumptions, the following straightforward cost method can be used to calculate the production cost for heating services:

First, the capital recovery cost *R* [USD/yr] is calculated. The capital recovery cost is the annual interest costs for an up-front capital investment. It is the amount of money required each year to recover the up-front investment over the project's expected lifetime:

(1) $$R = K_0 \cdot \frac{(1+i)^n \cdot i}{(1+i)^n - 1}$$

where
K_0 is the up-front investment [USD],
i is the discount rate (in real terms) and
n is the expected lifetime [yr].

The total annual costs *TC* [USD] are the sum of the capital recovery cost and of all annual costs:

(2) $$TC = R + C_1 + C_2 + C_3 + C_4 + \ldots$$

where C_1, C_2, C_3, ... are the annual costs such as fuel costs, operation and maintenance cost, overhead costs, etc., as applicable. This costing method assumes that annual costs remain constant over the lifetime of the project, i.e. costs are net of inflationary effects. Corresponding is the discount rate used based on a real rate of interest.

The specific total unit production cost of delivered heat, *LC* [USD/GJ], is defined as:

(3) $$LC = \frac{TC}{HEAT}$$

where *HEAT* [GJ] is the annual amount of heat delivered at the end-user's apartments, including both room heating and hot sanitary water. This cost indicator is then used to compare and rate the different alternative technologies. From this, a list of the proposed project technology and its alternatives results; ranked according to total unit production costs. The technology with minimum total unit costs (or best financial indicator) constitutes the baseline technology.

3. Definition of emission factors for saved fuels

The CO_2 emission factors of the considered fossil fuels (oil products and natural gas) for the baseline and the project technology are based preferably on local data on net calorific value and carbon content available from the fuel suppliers and/or official statistics. In absence of local data, default values from the IPCC guidelines should be used.
The specific emission factor in tons of CO_2 per GJ of heat and/or hot water delivered to customers should be calculated based on annual fuel consumption and on annual amount of heat provided by a specific heating system (DHS or in house devices).

The emission factor for heat provided by a relevant heat source *j* consuming fuel *i* is:

(4) $$EF_{heat,i,j} = \frac{1}{\eta_{i,j}} \cdot EF_{CO2,i} \cdot OXID_i$$

with the specific system efficiency of heat source *j* consuming fuel *i* defined as:

(5) $$\eta_{i,j} = \frac{HEAT_{i,j}}{F_{i,j} \cdot NCV_i}$$

where
j refers to the heat source(s) delivering heat to the consumers (e.g. DHS, individual heaters),
$HEAT_{i,j}$ is the heat (GJ) delivered annually to the consumers (at the consumer's room/location) by source *j* consuming fuel *i* (e.g. $HEAT_{DHS,HFO}$, $HEAT_{DHS,NG}$, $HEAT_{IHD,NG}$, etc.); heat delivered by IHDs that are not affected by the rehabilitation of the DHS (e.g. that are in rooms that will receive no heat services from the rehabilitated DHS) are not included in *HEAT*,
$F_{i,j}$ is the amount of fuel *i* (in a mass or volume unit) consumed annually by the relevant heat source(s) *j*,
NCV_i is the net calorific value (energy content in GJ) per mass or volume unit of fuel *i*,
$OXID_i$ is the oxidation factor of the fuel *i* (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i* (in tCO_2/GJ),

Where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.
For the district heating system, specific emission factors for heat provided include boilerhouse efficiency and distribution network efficiency, taking into account all losses of the entire system up to the point heat is delivered to the rooms, including losses of piping in basements.

If measurements for calculating the efficiency of DHS or individual electric or fossil fuelled heaters (following equation (4)) are not available, DHS and IHD efficiencies $\eta_{i,j}$ may be conservatively estimated based on boiler plate data and other technical data, i.e. estimates should tend to overestimate efficiencies in the baseline case (and therefore underestimate baseline emissions). This extends the applicability of the methodology to geographical areas with less developed institutions/infrastructure and lower data availability.

4. Definition of emission factors for saved electricity

The present baseline methodology provides two options for the determination of the emission factor for saved electricity, EF_{el}, (in tCO_2/MWh), depending on the amount of saved electricity. The following options are given:

(a) For power saving above 15 GWh per annum, the consolidated methodology ACM0002 is used to determine EF_{el}. In applying ACM0002, the baseline scenario is the following: the electricity saved by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. A baseline emission factor for saved electricity is calculated as a combined margin (CM), consisting of the combination of

operating margin (OM) and build margin (BM). The rationale why ACM0002 is applicable to calculate EF_{el} is given in the box below.

(b) For power savings up to 15 GWh per annum, the baseline emission factor for saved electricity EF_{el} is calculated as the weighted average emission (in tCO_2/MWh) of the current generation mix in the (regional) grid. To be conservative and in analogy to the *simplified modalities and procedures for small-scale CDM*, the considered mix of plants should comprise *all* power plants in the grid, including low-cost/most-run resources such as hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

Option (b) may also be used for power savings above 15 GWh if

- it can be plausibly shown that the calculated emission factor using this option is equal or higher than an emission factor which would result from an application of ACM0002 (option (a)).

or

- in cases where the build margin is not relevant due to a lack of new plants construction in recent years. This extends the applicability of the methodology to geographical areas with less developed institutions and lower data availability.

For simplicity, an efficiency of 100% for individual electric heaters is conservatively assumed. Transmission losses in the grid are neglected. This tends to underestimate baseline emissions somewhat and is therefore conservative.

The baseline emission factor for saved electricity EF_{el} is determined ex-ante at the beginning of each seven-year-crediting period.

Box: Why can ACM0002 be used to determine emission factors for saved electricity?

The rehabilitation of the district heating system may decrease the use of individual electric heaters in the apartments. This leads to a reduction of the demand of electricity from the grid and the power plants in the grid reduce their supply (see left bars in figure below), compared to the situation before the project. This situation is analogous to renewable electricity capacity additions (e.g. the construction of a new hydro plant) where demand is unchanged but the capacity addition leads to a reduction of supply from remaining power plants (see right bars in figure below). In both cases, the project results in a reduction of the power generation of the (remaining) power plants (operating margin) and delays (incrementally) the construction of new plants (build margin).

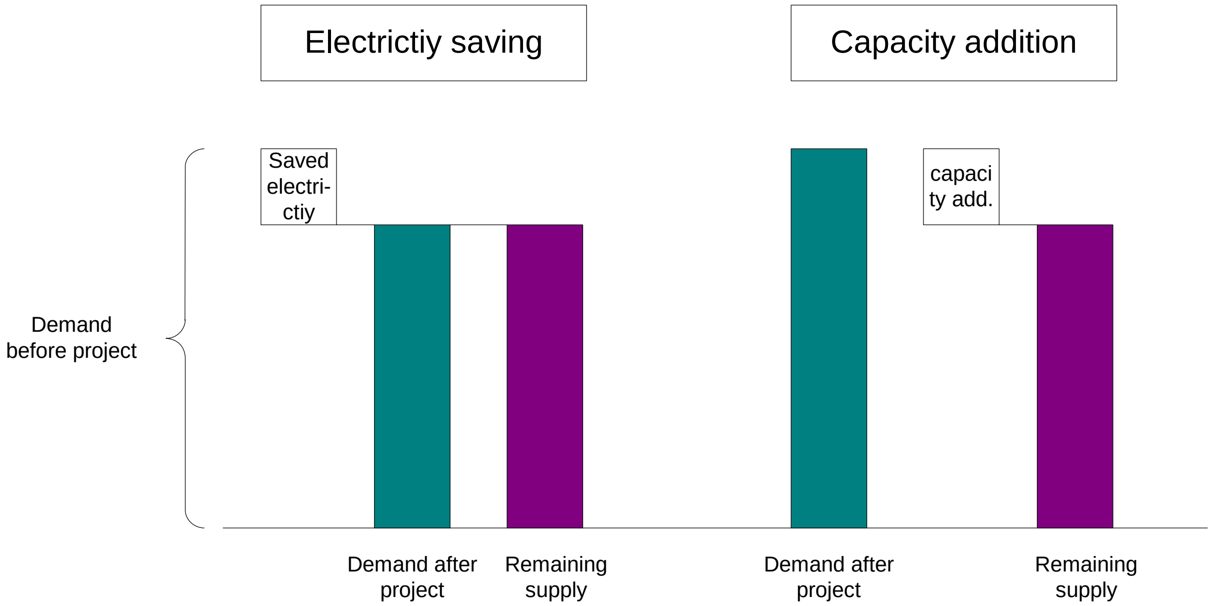


Figure 1: Both electricity saving and renewable capacity additons reduce the amount of power supplied by (remaining) power plants.

Based on this rationale, the approved consolidated baseline methodology ACM0002 "*consolidated baseline methodology for grid-connected electricity generation from renewable sources*" is applicable to determine the relevant emission factor for the amount of electricity saved by the proposed project [in tCO_2/MWh].

5. Determination of emission factors for heating technologies

If heat is only provided by one source the emission factors established in steps 4 or 5 are identical to the emission factors for technologies. If heat within one technology is provided by different sources than a weighted average of the source specific emission factors calculated in steps 4 or 5 must be calculated. The weights are given by the share of the different heat sources in total heat supply:

Sub-step 5.1: Calculate the emission factor for the baseline technology.
For the baseline technology determined in Step 2, the emission factor (in tCO2/GJ) is the weighted average of the emission factors of the different heat sources used by the technology, possibly including

the old/alternative district heating system (including DHS electricity consumption) and possible individual fossil fuelled heaters:

(6) $$EF_{BLS} = \frac{\left[\sum_{DHS,IHD} HEAT_{i,j} \cdot EF_{heat,i,j}\right] + ELEC_{DHS\_BLS} \cdot EF_{el} + HEAT_{el} \cdot EF_{el}}{\left[\sum_{DSM,IHD} HEAT_{i,j}\right] + HEAT_{el} \cdot 3.6}$$

where

Σ sums up the contributions of the heat sources and fuels composing the baseline technology: the old/alternative DHS and the fossil fuelled in house devices.

$ELEC_{DHS\_BLS}$ is the amount of electricity (in MWh) consumed by the old/alternative district heating system annually for its operation (for pumps, control system, water treatment, lighting, etc.).

$HEAT_{el}$ is the amount of heat produced by individual electric heaters (in MWh) annually

3.6 is a conversion factor (1 MWh = 3.6 GJ)

<u>Sub-step 5.2:</u> Calculate the emission factor for the project's technology

The emission factor for the project's technology is the weighted average of the emission factors of the fuels used in the rehabilitated/new DHS, including DHS electricity consumption:

(7) $$EF_{PA,y} = \frac{\left[\sum_{i} HEAT_{DHS,i,y} \cdot EF_{heat,DHS,i,y}\right] + ELEC_{DHS\_PA,y} \cdot EF_{el}}{\left[\sum_{i} HEAT_{DHS,i,y}\right]}$$

where

Σ sums up the contributions of the heat sources and fuels composing the project technology

$HEAT_{DHS,i,y}$ is the heat (GJ) delivered in year y to the rooms by the rehabilitated DHS consuming fuel(s) i (e.g. $HEAT_{DHS,HFO,2007}$, $HEAT_{DHS,NG,2007}$),

$EF_{heat,DHS,i,y}$ is the emission factor for heat provided in year y by rehabilitated DHS consuming fuel i, calculated following equations (4) and (5).

$ELEC_{DHS\_PA,y}$ is the amount of electricity (in MWh) consumed by the rehabilitated/new district heating system in year y for its operation (for pumps, control system, lighting, etc.).

Note: Although the new district heating system renders additonal in house devices (IHD) for heating unnecessary, it cannot be excluded completely that some IHD will still be used after the start of the project activity (PA). However, <u>those</u> IHDs that are used before <u>and</u> after the PA (i.e. IHDs which are not replaced by the project) are excluded from the system boundaries. Although it is difficult to determine ex-ante how much IHD will be used, the use of IHDs will decrease the heat demand from the DHS ($HEAT_{PA\_BLS-HH,y}$), and the resulting emission reduction (equation (8)) will be reduced by the amount of heat from the IHDs.

The use of IHDs after the project implementation may result in a too high share of IHDs in the baseline mix of heat technologies (DHS and IHDs). As the emission factor of the old DHS is usually equal or higher than the emission factor of IHDs, it is conservative to underestimate the contribution of the old DHS in the baseline overall emission factor.

6. Emission reductions calculation and projection

The district heating system rehabilitation project activity mainly reduces carbon dioxide by providing heat to existing district heating customers by means of a rehabilitated and efficient district heating system instead of providing heat to these customers by the old deteriorated inefficient district heating system and/or the use of individual heaters (in house devices) fuelled by fossil fuels and/or electricity identified as the baseline technology (mix).

The emission reduction ER_y (in tCO_2) by the project activity during a given year y is the difference in the emission factor of the baseline technology EF_{BLS} and of the project technology EF_{PA}, multiplied by the actual energy $HEAT_{PA\_BLS\text{-}HH,y}$ delivered to the baseline customers by the CDM project[3] in year y. Baseline customers are those that are physically connected to a rehabilitated (part) of the DHS and were physically connected to the old district heating system before the start of the project activity. The limitation on baseline households ensures that an increase in coverage (compared with the baseline) by the improved DHS is not included in ER calculations.[4]

(8) $$ER_y = (EF_{BLS} - EF_{PA,y}) \cdot HEAT_{PA\_BLS-HH,y}$$

where
$HEAT_{PA\_BLS\text{-}HH,y}$ is the amount of heat (in GJ) delivered in year y to customers that
(a) are physically connected to a rehabilitated (part) of the DHS in the year y, and
(b) were physically connected to the old district heating system before the start of the project activity.
(Only heat delivered to customers fulfilling both conditions (a) and (b) is considered in $HEAT_{PA\_BLS\text{-}HH,y}$.)

D.2. Criteria used in developing the proposed baseline methodology:

>>
The following criteria were used in developing this methodology:

(i) Realistic simulation of choice of heat sources: The methodology provides a realistic simulation of the choice of heat sources based on investment and barrier analysis.

(ii) Applicability: The methodology should also be applicable in geographical areas/regions where the level of institutions and infrastructure is weaker limiting the availability of key data such as data on electricity grid characteristics or data on district heating system, as is the case in many countries with economies in transition.

(iii) Consistency: Extensive use of existing approved consolidated methodologies and tools (additionality tool, ACM0002) to assure consistency with the existing methodological setting.

(iv) EB/Meth Panel guidance: The new methodology is a revision and resubmission of NM0046. The methdology has been redrafted from scratch, building on recent EB guidance and building on the Meth Panel recommendations on NM0046.

[3] This calculation of emission reductions (ER) follows Meth Panel recommendation to the Executive Board on NM0046 (p. 3, Section A.I.c."Others"). It is furthermore in perfect analogy to the approach used in all approved power sector methodologies.

[4] However the methodology is general enough to allow for adaptions of formula to cover also newly connected households.

D.3. Explanation of how, through the methodology, it can be demonstrated that a project activity is additional and therefore not the baseline scenario (section B.3 of the CDM-PDD):

>>

7. Additionality test (additionality tool)

Additionality is demonstrated based on the "Tool for the demonstration and assessment of additionality" as amended by the CDM Executive Board. In the application of the additionality tool, the argumentation may build on the findings in step 2, the determination of the baseline methodology.

D.4. How national and/or sectoral policies and circumstances can be taken into account by the methodology:

>>

Step 2 of the methodology and the use of the approved additionality tools makes sure

- that the considered project alternative(s) are in compliance with all applicable legal and regulatory requirements.
- that revenues from national and/or sectoral subsidies/fiscal incentives are considered in the financial/economic analysis.
- that national and/or sectoral policies (legislation, regulatory information, industry norms, etc.) are taken into account in identifying barriers that would prevent the implementation of the proposed project

D.5. Project boundary (gases and sources included, physical delineation):

>>

The project boundary includes elements of the heat generation and consumption system of which the DHS is a part, possibly including more than one heating technology and fuels (oil, gas, electricity).
Fuel production and transportation as well as production and installation of equipment is outside of the boundaries, since their contribution to overall emission may be neglected.
The spatial extent of the project boundary includes the project site and all regional power plants connected physically to the electricity system that the DHS and the electric individual heaters are connected to.

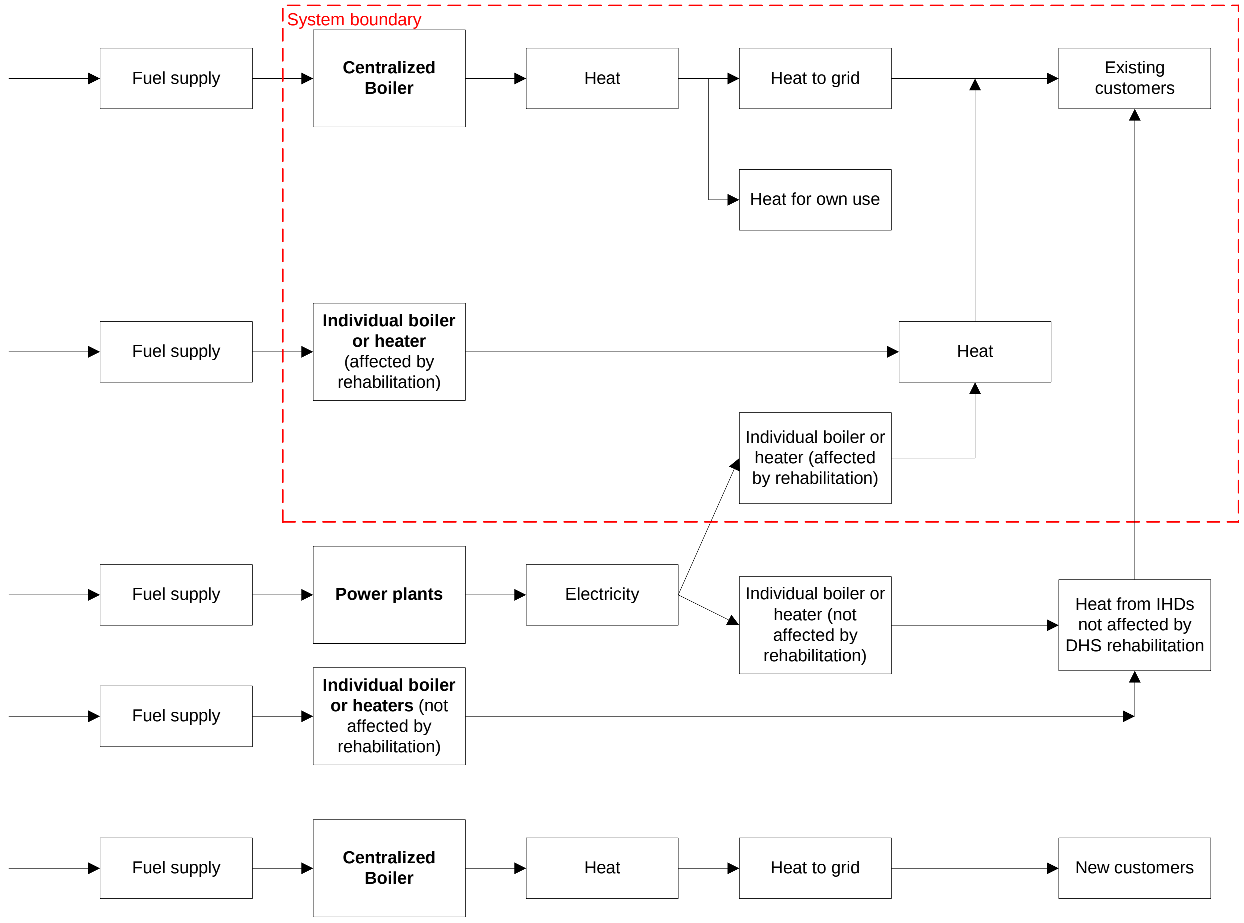
The methodology addresses only CO_2 emissions from heating or power generation activities related to the DHS or by DHS customers. The methodology does not support claims of emission reductions from other sources or other greenhouse gases.

The project boundaries in DHS are usually defined by the DHS' existing customer base and heat production sites, including additional in house devices (IHD; individual electric or NG/oil heaters), that will be connected to a rehabilitated (part) of the DHS by the project. IHD that are not affected by the rehabilitation of the DHS (e.g. that are in rooms that receive no heat services from the rehabilitated DHS) will most probably be operated also after the rehabilitation and are therefore outside the project boundaries.

The methodology does only claim emission reductions related to the improvement of district heating services delivered to its existing customer base (buildings). Potential heating services to new customers (i.e. customers in buildings that have not been connected to the DHS before the start of the project activity) are not considered in the calculation of project emissions and of emission reductions.

Typical boundaries are depicted in the graph below:

Figure 2: Typical project boundaries



D.6. Elaborate and justify formulae/algorithms used to determine the baseline scenario. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>>

See equations (4) to (6) in steps 3 to 5 in section D.1. above.

D.7. Elaborate and justify formulae/algorithms used to determine the emissions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>>

See equations (4), (5), and (7) in steps 3 to 5 in section D.1. above.

D.8. Description of how the baseline methodology addresses any potential leakage of the project activity:

>>

Zero

The net effect of positive and negative leakage of this project cannot be measured or determined qualitatively. In line with the Marrakesh Accords and the CDM Glossary approved by the CDM Executive Board, effects outside the project boundaries that are not measurable are not considered and leakage is therefore not taken into account.

In particular, emissions associated with production and transport of fossil fuels consumed per MJ of heat will decrease in the project case as compared to the baseline scenario, because fuel efficiency of heat

production will be increased by the project and therefore fuel consumption per unit of heat delivered will be reduced. Lifecycle emissions associated with the production of equipment used in the project case are estimated to be negligible.

D.9. Elaborate and justify formulae/algorithms used to determine the emissions reductions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>>

See equation (8) in steps 6 in section D.1. above.

SECTION E. Data sources and assumptions:

E.1. Describe parameters and or assumptions (including emission factors and activity levels):

>>

Baseline emissions are based on measured or estimated fuel consumption, heating system efficiencies, net calorific values, oxidation factors and supplied heat for district heating system and for individual fossil fuelled heaters. Emissions from power consumption in DHS and for electric individual heaters are calculated from measurements or estimates of electricity consumptions and a grid carbon emission factor (AM0002 or small scale grid methodology).

Project emissions are based on monitored fuel use, efficiencies and emission factors.

A detailed list of parameters is provided in Section B.2. in the related new monitoring methodology.

E.2. List of data used indicating sources (e.g. official statistics, expert judgement, proprietary data, IPCC, commercial and scientific literature) and precise references and justify the appropriateness of the choice of such data:

>>

- Data on fuel consumption, efficiency and heat supplied by existing district heating system (DHS): This Data was obtained from DHS operator, site visit and interviews with customers, expert judgement, IPCC.
- Data on fuel/electricity consumption, efficiency and heat supplied by existing in house devices (IHD): Data from fuel/electricity suppliers, site visit and interviews with customers, expert judgement, energy balance building heat model, IPCC.
- Data on fuel consumption, efficiency and heat supplied by project activity DHS: Data from DHS operator, fuel supplier, IPCC.

For full list see related new monitoring methodology (section B.2)

E.3. Vintage of data (e.g. relative to starting date of the project activity):

>>

The baseline determined should use the latest available data. Baseline emission factors are determined ex-ante.

E.4. Spatial level of data (local, regional, national):

>>

Locally determined/measured data should be used wherever possible (e.g. fuel NCV, emission factors, efficiencies).

SECTION F. Assessment of uncertainties (sensitivity to key factors and assumptions):

>>

The application of the methodology can lead to an erroneous baseline scenario in the following situations:

- The set of plausible alternatives is incomplete. To assure their completeness, specific alternatives that have to be considered in the analysis are provided in the description of step 1 in Section D1 above.
- Additionality determination is not conservative. To assure its conservativeness, the approved consolidated "additionality tool" is used.
- The financial/economic analysis is not conservative. To assure their conservativeness, the calculations and assumptions made have to be conservative. I.e. assumptions should more likely underestimate than overestimate the true production cost of the projects technology, whereas the true costs of the project alternatives should more likely be overestimated than underestimated, such that assumptions create a bias for the project being least-cost and non-additional, The additionality tools includes a sensitivity analysis to assure the robustness of the baseline selection.
- Transmission losses in the grid are neglected. This tends to underestimate baseline emissions somewhat and is therefore conservative.

The calculation of emission factors for heat provided by the relevant heat sources in the baseline technology (DHS; in house devices) as defined in equations (4) and (5) in Step 3 may lead to an overestimation of baseline emissions. To prevent such overestimation, estimates and assumptions, if made, have to be conservative and the data, assumptions and models used in the calculations should be transparently described.

SECTION G. Explanation of how the baseline methodology allows for the development of baselines in a transparent and conservative manner:

>>

The baseline methodology is based on the approved *additionality tool*, the *approved consolidated baseline methodology ACM0002* or average grid emissions for the determination of the emission factor of saved electricity. The steps for the selection of the baseline scenario and for the determination of emission factors are transparent and based on the principle of conservativeness. All assumptions are explained and the methodology is biased towards an underestimation of true emission reductions.

\- - - - -