CDM: Proposed new methodology expert form (version 04)

(To be used by methodology experts providing desk review for a proposed new methodology)

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Note to those completing this form, as applicable: Please provide recommendations on the proposed new baseline and monitoring methodologies based on an assessment of CDM-NMB and CDM-NMM and of their application in sections A to E of the draft CDM-PDD, desk reviews and public input. Please ensure that the form is entirely filled and that arguments and expert judgements are substantiated.

A. Evaluation of the proposed new methodologies by desk reviewers:

I. Evaluation of the porposed new baseline methodology:

Title of new baseline methodology:>> Energy efficiency improvements in district heating production and distribution

i. Conditions under which this methodology is applicable to other potential projects (e.g. project type, region, data availability):

The applicability conditions of the methodology are not very clearly described and are partly inconsistent within the proposed methodology. The following issues should be considered, when discussing appropriate applicability conditions:

- The methodology is suggested to be applicable to the **introduction of new district heating (DH) heat systems** that replace thermal energy generation from less efficient heat supply. The DH system may replace thermal energy generation in existing and in new buildings. This appears appropriate.
- The methodology is also suggested to be applicable to the **improvement of energy efficiency** in **existing DH heat systems**. This is not appropriate for the proposed methodology, since the methodology does not contain methodological approaches and equations to address improvements in the distribution (pipeline) system of an existing DH network but rather refers to the introduction of DH. Not all possible configurations for supply-side efficiency improvements (e.g. switch from boilers to cogeneration) are well reflected in equations. Other methodologies may be better suited to cover these cases. In this regard, the use of this methodology for the improvement of energy efficiency in existing DH systems would need substantial further elaborations.
- Heat in the DH system may be generated with **new boilers** are may be extracted from **existing cogeneration plants** or a combination of both. The installation of new cogeneration plants (greenfield projects) is not eligible; however, the methodology indirectly suggests that existing **condensing** power plants may be converted to extraction cogeneration plants. The methodology is also indirectly limited to extraction cogeneration power plants; hence, back-pressure cogeneration systems would NOT be eligible. This is appropriate and consistent with the equations provided.
- Heat in the DH system (project case) may only be generated with **coal** or **natural gas**. This is appropriate, however, it is not clear why the methodology is suggested to be limited to these fuel types.
- Furthermore, the methodology suggests that it is applicable to "project activities in which heat

consumption is identical in the baseline scenario and in the project scenario". This is rather an assumption in the calculation of emission reductions than an applicability condition (the baseline is per definitionem hypothetical). The basic idea of this assumption – to factor out changes in heat demand (e.g. insulation of buildings) – is appropriate but the approach allows gaming (see item 6 below).

- It may be clarified that the methodology is not applicable to **demand-side** energy efficiency measures.

ii. Strengths and weaknesses of the methodology:

Strengths:

- The methodology provides a methodologically thorough approach to calculate marginal emissions from heat extraction cogeneration plants.
- Changes in heat demand due to external factors such as whether conditions or insulation of buildings could in principle be factored out in the calculation of emission reductions.

Weaknesses:

- The methodology has relatively limited applicability conditions (only coal to be used in the existing boilers, no greenfield cogeneration plants, no back pressure cogeneration plants).

iii. Any changes needed to improve the methodology:

a. Minor changes:

- The approach to calculate emissions in the baseline scenario "alternative 02" is incomplete and parameters in equations are not totally consistent.
- Under all project scenarios "alternative 01" and "alternative 03" further guidance is required on the time schedules when boilers are expected to be replaced in the absence of the project activity.
- The project scenarios (b) and (c) are described inconsistently in different parts of the methodology.
- In the project scenario (a), fuel consumption of boilers that are not changed as part of the project activity should not be included in the calculation of emissions. Equation 19 is superfluous.
- Load duration curves should not be used in the project scenarios (b) and / or (c) to determine the share of heat generation with boilers and cogeneration plants. Instead, the actual quantities monitored should be used.
- The approach to determine "thermal design loads" is not thoroughly described and its application can be quite arbitrary.
- Some provisions in the baseline methodology are not consistent with the monitoring methodology, e.g. requirements to check some parameters after 5 years are not mentioned in the monitoring methodology.
- The proposed clustering of buildings is not appropriate. Clear and consistent criteria for any clusters should be provided.
- Delete the provision that "the heat source operating with the highest efficiency shall be allocated the emission reductions".
- Provide additional guidance on the sources, documentation and justification of data to be used (e.g. net calorific values).
- The choice of a load factor of 0.5 for hot tap water appears quite arbitrary and high.
- The procedure to determine the **average baseline efficiency on** pages 14 and 15 is not totally clear and should be better described.
- The default emission factors for boiler efficiencies are not conservative. In many countries, including developing countries, higher efficiencies can be observed.

b. Major changes:

- **Change applicability conditions.** Delete the applicability to existing DH systems or develop a consistent approach for projects improving energy efficiency in existing DH systems.
- **Develop a consistent approach for the determination of the baseline scenario.** The criteria to identify the baseline scenario are very inappropriate and are inconsistent with the procedure in the consolidated additionality tool (which the methodology suggests to use). The proposed three possible baseline scenarios are very limited and do not include a number of reasonable courses of action such as the project activity itself. The criteria to consider natural gas and the consideration of environmental impacts in identifying the baseline scenario are inappropriate.
- **Clearly define the project boundary.** The project boundary is not clearly defined. Gases and physical delineation should be clearly described. Electricity consumption for pumping may be an important source of GHGs but is not at all mentioned in the methodology.
- **Monitor key parameters ex-post in order to avoid gaming.** The *ex-ante* calculation of an average emission reduction factor, without adjustment of key parameters during monitoring, is arbitrary and invites gaming. This refers in particular to the composition and heat demand of the buildings connected to the DH system and the losses of the DH distribution system.
- **Take rebound effects from increased heating comfort into account.** An increased heat demand is usually can usually be observed when very simple heating systems such as coal stoves are replaced by a DH system. Such rebound effects should be taken into account.
- **Reconsider a number of default values which are not conservative:**
    - The default boiler efficiencies appear not to be conservative. Other sources mention higher efficiencies. Measurements with a sample group may be more appropriate than default values.
    - The default value of 10% losses with an indicated range of 10-30% is not a conservative but rather optimistic assumption for the project scenario. Losses of the DH system should be better monitored (see fourth bullet point above).
    - The default value of 200% for the marginal fuel consumption for heat extraction ($\eta_{h,m}$) is not in all cases conservative. Since this parameter is suggested to be verified ex-post during monitoring, no default value would be required at all.
- **Assess uncertainties.**

II. Evaluation of the proposed new monitoring methodology:

Title of new monitoring methodology: Title

i. Conditions under which this methodology is applicable to other potential projects (e.g. project type, region, data availability):

>>See baseline methodology.

ii. Strengths and weaknesses of the methodology:

Strengths:

- All key data is easily accessible since it can be measured directly at the project site by project participants.

Weaknesses:

- The lack of some key data invites gaming.

iii. Any changes needed to improve the methodology:

a. Minor changes:

- Add some QA/QC procedures (cross checks with invoices, etc)

b. Major changes:

- Add key data (inventory of buildings supplied and corresponding baseline information, heat supplied) to the monitoring methodology.
- Develop a methodological approach to take rebound effects from increased heat comfort into account.
- Monitor electricity demand for pumping and determine the CO2 intensity of that electricity.
- Delete the provision that only the most efficient source of heat is used for calculating emission reductions.

B. Details of the evaluation of the proposed new methodology by the desk reviewer:

I. Proposed new baseline methodology *(specify title here):* >> Energy efficiency improvements in district heating production and distribution

(1) Short description of the methodology, including an assessment of which approach from paragraph 48 of the CDM modalities and procedures was used:

a) Describe the methodology:

The proposed methodology is applicable to projects that introduce a district heating (DH) system, substituting heat supply in either existing boilers in existing buildings or new boilers in new buildings. The methodology is also suggested to be applicable to energy efficiency improvements in existing district heat systems. However, the approach followed in the proposed methodology can not necessarily reflect such project types (e.g. increasing insulation of pipelines). Note also that the title of the methodology is confusing, as projects under this methodology (such as in the two PDDs) do not increase energy efficiency in existing DH systems, but rather involve the construction of a new DH system that replaces decentralized thermal energy generation, which in the end may result in an overall efficiency improvement of the heat supply system.

The proposed methodology is quite complex in its calculations of emission reductions. The basic philosophy is to calculate emission reductions in an indirect manner: The methodology proposes to calculate an overall average CO_2 emission reduction factor, which is defined as the achieved CO_2 emission reduction per unit of heat supplied to the DH network. Emission reductions are calculated by multiplying the quantity of heat supplied to the DH network with this average emission reduction factor. Both parameters, the actual heat supplied to the DH network and the average emission reduction factor are adjusted based on monitored data; however, for the average emission reduction factor only the efficiency of the heat generation in the project scenario is updated based on monitored data, while all other parameters are not changed (such as the heat demand of the buildings, the energy efficiency of the supply systems without implementation of the project activity and the energy efficiency of the DH distribution system).

The average emission reduction factor is calculated as follows: The heating demand and the hot water demand of the involved buildings is estimated – not measured – based on

(a) a "design thermal rating" for heating demand and hot water of the buildings in W/m^2 (buildings are clustered in simple groups), and

(b) a simple estimation of the full load operation hours for supply of the heating and hot water demand in h/a (one simplified number for all different buildings).

This heating demand is assumed to be the same in the baseline and the project scenario. Fuel consumption in the baseline scenario is determined by dividing the estimated heat demand by a measured or estimated efficiency of the heat supply system in the baseline scenario. Fuel consumption in the project scenario is estimated by dividing the estimated heat demand with an estimated efficiency of the DH network system and the efficiency of heat generation in project scenario (boiler or cogeneration plants supplying the DH network). Emission reductions are calculated by multiplying the estimated fuel consumption in the

baseline and project scenario with respective emission factors. Emission reductions are divided by the estimated quantity of heat supplied to the DH network, resulting in the average emission reductions factor.

The estimated baseline emissions should not be adjusted during monitoring. Project emissions should be adjusted to monitored data; however, only the efficiency of the heat generation system supplying and the quantity of supplied heat are monitored and adjusted ex-post.

b) State the approach selected:

Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment (48b)

c) Indicate (in summary form) why the approach selected is the most appropriate. Please provide your expert judgement on the appropriateness of the selected approach to the project category:

>>Approach 48b is appropriate since the baseline scenario is determined with the additionality tool among different options.

(2) Basis for determining the baseline scenario:

a) State whether the documentation explains how the baseline scenario is to be chosen and identified:

In principle: yes. The baseline scenario should be identified with the help of the consolidated additionality tool from three scenarios:

Alternative 01: The continuation of the current situation, taking into account the replacement of the existing boilers with more efficient new boilers at the end of their lifetime.

Alternative 02: Construction of a DH system that is supplied with coal-fired boilers.

Alternative 03: Introduction of natural gas and replacement of decentralized coal-fired boilers with natural gas fired boilers.

However, these scenarios are quite limited and the guidance provided on how to identify the most appropriate scenario is not consistent with the consolidated additionality tool. See further comments under d) below.

b) State the basic underlying rationale for algorithms/formulae used (e.g. marginal vs. average basis) (see also section 4 below):

See the description under (1) above.

c) State whether the documentation explains how, through the use of the methodology, it can be demonstrated that a project activity is additional and therefore not the baseline scenario. If so, what are the tools provided by the project participants?

Yes, the methodology suggests using the consolidated additionality tool.

d) State whether the basis for determining the baseline scenario and for assessing additionality is appropriate and adequate:

Determination of the baseline scenario

The determination of the baseline scenario is not appropriate.

Firstly, the three proposed scenarios are too limited and may not include the most likely course of action in the absence of the project activity. For example, other reasonable courses of action may be DH systems with natural gas fired boilers or decentralized boilers fired with diesel. In some countries, the use of thermal solar energy or biomass could be a reasonable course of action. Also, the project activity is not included in the scenarios, as required by the additionality tool.

Secondly, the three scenarios are not consistent with the proposed applicability of the methodology to energy efficiency improvements in **existing** DH systems: There is no baseline scenario for an **existing** DH system (baseline scenario "alternative 02" refers to the introduction of a future DH system).

Thirdly, the criteria whether to consider natural gas (page 9 below) are not very clear. A distance of 50 km does not appear to be a prohibitive barrier to introduce natural gas. In many countries, including developing countries, natural gas is transmitted over very long distances (several thousand kilometres). Instead, the second criterion may be more appropriate, since costs are (next to other factors such as policies) an important aspect. This approach would need to be further specified. "Project costs" are not a clear concept (e.g. use "average levelized heat supply costs during the crediting period" and indicate how key parameters such as discount rates should be chosen).

Furthermore, the methodology suggests that if the methodology is suffering from environmental problems, the baseline scenario is alternative 02. Such a general way to trigger a certain baseline scenario is not consistent with the use of the consolidated additionality tool. In addition, it appears not very logic that investors necessarily take the environmental situation into account if there is no respective regulation in place. The implicit underlying assumption that DH is always introduced if WHO standards are not met is absurd. If this is really the case, we would very soon not have any local environmental problems any more. In addition, not only alternative 02 but also other options may (alternative 03) may be attractive and economically reasonable in case of environmental problems.

Finally, the proposed criterion to apply alternative 03 is as well too limited. Natural gas may in many cases also be introduced if this is not a mandatory legislative requirement.

Assessment of additionality

The use of the consolidated additionality tool is appropriate; however, the proposed three scenarios are too limited and the guidance on the determination of the baseline scenario does not fit with guidance in the consolidated additionality tool.

(3) Assessment of the description of the proposed methodology and its applicability

a) State whether the methodology has been described in an adequate manner:

The methodology is quite complex. The language is good but the description of the methodology is not always consistent and lacks clarity. The following issues can be highlighted:

- **Determination of "design thermal loads".** It is not very clear how "design thermal loads" should be determined (page 12) and how they should be chosen. In particular, if the PDD is submitted at a stage, when the district heat system has not yet been designed, it is quite unclear where and how project participants should obtain this data from. This makes the application of this approach quite arbitrary.
- **Incomplete approach for the baseline scenario "Alternative 02".** The calculation of the baseline fuel consumption for the scenario "Alternative 02" (page 16 and 17) and is incomplete and inconsistent.

  The four parameters (I to IV) suggested in scenario "Alternative 02" are appropriate and required to calculate the fuel consumption under this baseline scenario. However, only two of theses parameters are used in the equations (6 and 7), while equations to consider the efficiency of existing boilers and the time schedule to replace these boilers are lacking. A clear methodological approach how to take the step-wise replacement by DH into account is completely lacking. Thus, part of the baseline would be generation in boilers and part of the baseline supply by the DH system, requiring at least two different equations and not only one for the case of DH supply. Furthermore, the parameter "Boiler Efficiency, baseline" is not consistently used, since in equation (6) it should refer to the boilers supplying the DH system (otherwise the equation does not make sense), while in equation (4) the same parameter refers to the existing decentralized boilers.
- **Lack of guidance on time schedules in the baseline scenarios "alternative 01" and "alternative 03".** Under these scenarios, existing boilers are replaced in phases by new boilers. However, there is no explanation on assumptions that need to be made about when such a replacement would occur in the absence of the project activity (e.g. what technical lifetimes are assumed for the boilers). This keeps the whole approach quite arbitrary.
- **Inconsistencies in the calculation of project emissions.** Apart from the more general problems with the proposed approach (see also item 6 below), there are some inconsistencies in the calculation of project emissions under the scenarios (a), (b) and (c).

  The text is not consistent regarding what is considered as scenario (b). On page 19, the title of project scenario b) in the middle of the page suggests that there is not much difference to scenario (c) (combination of cogeneration and boilers); however, this does not fit with the instructions on equations on the same page, which suggest that scenario (b) is only cogeneration and no use of boilers. The introduction to the calculation of emission reductions on page 22 below is again inconsistent with this latter instruction and suggests that scenario (b) may also involve boilers.

  In scenario (a), several parameters are listed to be used to calculate emission reductions. However, it is unclear why parameters of existing boilers should be used to calculate project emissions, since the project is the introduction of a DH heat system. Existing boilers that are not changed as part of the project activity should be excluded from the calculation of project emissions. Respectively, equation 19 should not be used to calculate project emissions (the parameters are also not monitored).

  In scenario (b), the suggested use of load duration curves (page 22) remains quite unclear and is not needed. Generally it is preferable that the actual distribution of heat generation between heat only boilers and any cogeneration plants is monitored ex-post, instead of estimating the distribution with load duration curves. Note also that heat load duration curves do not necessarily determine the share of heat generated with heat only boilers and cogeneration but they often leave certain flexibility in

designing the shares of the generation portfolio. Finally, the use of load duration curves is also inconsistent with the statement on page 29 and elsewhere that the heat source operating with the highest heat production efficiency shall be used to calculate emission reductions (see item 6 below).

- **Recalculation of emission reductions during monitoring.** The methodology does not clearly describe which parameters should be adjusted ex-post during monitoring. The baseline methodology and the monitoring methodology are not quite consistent in this regard. On page 31, the baseline methodology mentions that data on buildings and boilers should be checked within 5 years from the starting date of the project; however, this is not further specified elsewhere and also not mentioned in the monitoring methodology. In Step 6 it is suggested that only Step 4 and Step 5 are repeated during monitoring. However, also other Steps need to be repeated in order to apply Steps 4 and 5 in a meaningful way.
- On page 29 and elsewhere, it is proposed that for projects involving heat generation with boilers and cogeneration plants the "heat source operating with the highest heat production efficiency shall be allocated the emission reductions". This statement is not very clear. If it is intended to say that the heat source with the highest efficiency should be **used** to calculate emission reductions in equation 33, this is certainly not appropriate since it leads to a significant overestimation of emission reductions. Instead, in equation 33 the share of heat generation with boilers and cogeneration should be weighted accordingly. If the statement intends to say that the revenues from CERs resulting from emission reductions should be allocated to the most efficient plant, then this is not very appropriate, since it would pre-empt any distribution agreements by project participants. In addition, in most cases all plants of DH system are operated by the same company. In this case, the statement would not make any sense.

b) State whether the proposed methodology is appropriate for the referred proposed project activity and the referred project context (described in Sections A - E of the draft CDM-PDD and submitted along with CDM-NMB):

Apart from the major deficiencies of this methodology, the methodology could be applicable to the proposed projects in the PDDs.

c) State whether the application of the methodology could result in a baseline scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity.

Probably not.

Please explain:

As illustrated further in other parts of this document, the methodology can result in a significant overestimation of emission reductions:

- The identification of the baseline scenario is not appropriate (see item 2 (d) above).
- The project boundary is not clearly defined and does not account CO_2 emissions from electricity used for pumping and heat generation (see item 5 (b) below).
- Key parameters are not adjusted ex-post during monitoring, making the determination of emission reductions quite arbitrary (see item 6 (a) to (c))
- Rebound effects from increased heating comfort are not considered (see item 6 (a) to (c)).
- Some assumptions are optimistic or not well justified, leading likely to an overestimation of emission reductions (see several issues under item 6 below).

(4) Assessment of algorithms/formulae and type of data needed:

a) State whether the description of the methodology includes algorithms and generic formulae that can be applied to other potential project activities (if not, the proposed new methodology will be considered as a project-specific methodology):

In principle – apart from the deficiencies of this methodology: yes. (See also applicability conditions.)

b) Explain the spatial scope of data used to determine the baseline and whether the scope is

appropriate:

The main data used in this methodology is basic data from the project site, such as energy quantities and efficiencies. Only emission factors and net calorific values may need to be obtained from external sources. This is appropriate. The main problem is that most of the relevant data is not monitored ex-post.

c) Explain the vintage of data used (in relation to the duration of the project crediting period) and whether the vintage of data is appropriate, indicating the period covered by the data:

Important key data is only estimated with the preparation of the PDD but not any more during the crediting period. This is clearly not appropriate, since some key data, may be rather different in the actual implementation of the project compared with the planning. (Please see also more detailed elaborations under item 6 below and item 3 (a) above).

(5) Definition of the project boundary related to the baseline methodology:

a) State how the project boundary is defined in terms of:

i) Gases and sources

Not clearly described. However, from equations it can be deducted that only CO_2 emissions from fossil fuels consumed for the generation of heat are accounted in the baseline and project scenario.

ii) Physical delineation

Not clearly described.

b) Indicate whether this project boundary is appropriate:

The project boundary is not clearly described. In section D.5 gases are not mentioned and the physical delineation remains vague. In addition, the statement that only emission reductions from the improvement of energy efficiency are gained is wrong, since a significant share of emission reductions may result from the switch of fuels (if natural gas is used for the DH system).

The methodology should address the following:

- The physical delineation should be clearly described. In particular, in the case of the DH system it is unclear, where the project boundary is allocated at the buildings. The heat substations in every building may be included but the heat distribution system within the buildings may be excluded.
- Electricity consumption for pumping may be an important emission source in case of DH systems. Pumping power may account to several percent of the heat supplied. Since the emissions intensity of electricity is usually higher than for the heat generation, CO_2 emissions from this source are usually significant. A methodological approach to estimate these emissions should be included.

The exclusion of other emission sources is appropriate:

- The exclusion of upstream emissions from fossil fuels (mining, transport, etc) etc is appropriate since this a conservative assumption.
- The exclusion of emissions from construction of the pipeline network is appropriate since such emissions are difficult to determine and small compared with achieved emission reductions.

(6) Key assumptions/parameters (including emission factors and activity levels) and data sources:

a) List the implicit and explicit key assumptions. Identify those, if any, which are problematic and explain:

b) State whether the key assumptions are arrived at in a transparent manner:

c) Give your expert judgement on whether the assumptions/parameters are adequate:

>>*Remark: questions a), b) and c) are addressed jointly.*

1. **The *ex ante* calculation of an <u>average emission reduction factor</u>, without adjustment of key**

parameters during monitoring, is arbitrary and invites gaming. As described above, the methodology suggests estimating the CO_2 emission reduction per unit of heat supplied to the DH network with only adjusting the efficiency of heat generation (in boilers or an existing cogeneration plant) of the project activity. In the following, I try to explain the implications of this assumption.

The estimation of several parameters (such as heat and hot water demand) is undertaken in a methodologically relatively simple manner and is relatively uncertain. This refers in particular to the efficiencies of the heat supply systems in the baseline scenario, the estimation of the thermal rating of the buildings, the annual full load operating hours, the efficiency of the DH system and the number of buildings that are expected to be connected to the DH system in future.

The average emission reduction factor is a weighting of the reductions in the different building types. Therefore, for example, an overestimation of heat demand in all buildings would not affect the calculation of this factor and of overall emission reductions, since the activity level (heat supplied to the DH system) is adjusted ex-post during monitoring. In this regard, the proposed approach is able to factor out changes in emissions due to e.g. whether conditions.

However, this approach – not adjusting key parameters – is arbitrary in its application and invites gaming. For example: The boiler efficiency is significantly higher (85%) for new buildings compared to default efficiencies for existing buildings (40% and 50%). Therefore, for the calculation of the average emission reduction factor, a key parameter is how many existing and how many new buildings with what heating surface and heating surface are expected to be connected in the future to the DH system. If many new buildings with large heating surfaces are connected, the average emission reduction factor is respectively lower. Since these parameters are suggested NOT to be adjusted ex-post to the real quantity and surface of new buildings connected, project participants have a strong incentives, to underestimate the number and surface of new buildings to be connected to the DH system. Since the estimation of the number and surface of buildings to be connected in the following 10 years is quite uncertain and highly subjective, the assumption of project participants on this parameter can hardly be verified by the DOE. In practice, the actual development of the number of buildings connected and the heat supplied to these buildings are easily available to the project participants and could easily be collected *ex-post* as part of the monitoring. Every operator of a DH system has such data, since it is required for billing the heat sold.

The same applies also to other parameters, such as the heat demand of buildings. Insulation standards for new buildings in ten years time can hardly be foreseen today and are not verifiable in an objective manner. Project participants would have incentives to be optimistic regarding future insulation standards, since this increases the average emission reduction factor. Similarly, the suggested approach to calculate the heat demand of existing buildings is quite basic and uncertain and leaves a large room to over- or underestimate the heat demand of certain building types in order to maximize the average emission reduction factor. The heat demand of the buildings would be easily available during monitoring from invoices.

Thus, it would not be difficult (also in terms of transaction costs) to avoid strong economic incentives for gaming by requiring project participants to monitor the actual heat supplied to the connected buildings.

Also the efficiency of the DH distribution network (thus losses) should be determined ex-post during monitoring by simply taking the difference between heat supplied to consumers (from invoices) and heat supplied to the district heat system (measured anyhow). Instead, the methodology suggests very complex ex ante calculations or the use of uncertain default factors.

This general problem is further exacerbated by the provision that project participants may choose values "identical or smaller as applied in the technical design [of the DH system]" (e.g. page 12, 13 and 14). Since the choice of these values influences the average emission reduction factor, this provision is an invitation to project participants to adjust the values in order to maximize the average emission factor. Apart from that, generally, guidance is lacking how the parameters should be chosen (see item 6 d-f below).

In summary, the ex-ante calculation of an average emission reduction factor without adjustment of key parameters for the baseline creates incentives to overestimate emission reductions. Data to adjust these parameters ex-post are easily available and should be collected as part of monitoring. The final

calculation of emission reductions should be based on the actual composition and heat demand of buildings connected to the DH system.

2. **Rebound effects.** By introducing a DH system and replacing inefficient decentralized heating systems, the project activity improves the comfort of heat supply. Improving the comfort of heat supply regularly leads to an increase in heat demand of the buildings. This has been observed in the transition countries in Eastern Europe, when coal fired stoves have been replaced by boilers or DH heating systems. With very simple heat supply systems with little comfort, such as stoves, the habitants of buildings usually accept significantly lower temperatures in the apartments. The introduction of automatic heating systems (boilers, DH) regularly involves an increase in the average temperatures in the buildings, increasing the heat demand. The methodology does not take into account this effect by assuming that heat demand is the same in the baseline and the project scenario.
3. **Clustering buildings.** The methodology suggests clustering buildings in groups when calculating the baseline emissions and the average emission reduction factor. Generally, this may be appropriate. However, the suggestion to cluster buildings to e.g. "existing buildings, new buildings, commercial buildings" (e.g. page 16) is not appropriate, since these building types may have quite different characteristics. If clustered, there should be clear criteria for relatively homogeneous groups: For example, clustering buildings with similar boiler efficiencies in the baseline scenario could be a reasonable approach.
4. **Lack of guidance on assumptions on boiler lifetime.** In the scenarios "Alternative 01" and "Alternative 03", project participants need to take into account how existing boilers will be replaced in the absence of the project activity. This is generally appropriate. However, there is only very few guidance (e.g. page 31) how this should be undertaken (e.g. what time a boiler is assumed to continue to operate in the absence of the project activity). Since these assumptions influence the calculation of emission reductions considerably, further guidance should be provided. For example, data on the typical age of the existing boiler stock, manufacturer's information on the technical lifetime or depreciation times could be used to estimate a representative average boiler lifetime. For more details see Herold et al. (2003).
5. **Calculation of marginal fuel consumption from heat extraction from cogeneration plants.** The calculation of the marginal fuel consumption due to heat extraction from an extraction cogeneration plant is appropriate (Cv value). This methodology is also documented in different publications. It may be helpful to provide some additional guidance to project developers how to determine the key parameter Cv. A simplified straightforward estimation of this parameter is possible with relatively basic engineering data, which is available for all plants, as follows:

$$C_v = \frac{\text{Electric efficiency in condensing operation - Electric efficiency with maximal heat extraction}}{\text{Thermal efficiency with maximal heat extraction}}$$

Although this equation is a simplification, it provides a quite accurate picture of the average Cv value. (This equation can also be deviated from equations 26a, 26b and 26c in the proposed methodology.) With this equation, the use of default values could be avoided.

d) Indicate which data sources are used and how the data are obtained (e.g. official statistics, expert judgement):

e) Give your expert judgement on whether the data used are adequate, consistent, accurate and reliable:

f) State possible data gaps:

Note: Questions d), e) and f) are addressed jointly below.

The methodology generally lacks more detailed guidance, where project participants should obtain data from. Guidance could also be more explicit (such as on page 30) that project participants should document and justify their choices in a transparent manner. Some statements such as that values should be "in compliance with state-of-the-art practices in the country" are not very specific. Effectively, also the application of the methodology in the PDD nearly completely lacks detailed explanations on the choices of parameters. The IPCC GPG may be helpful to provide guidance on the choice of emission factors, net calorific values, etc.

Furthermore, examples on the choice of parameters in the baseline methodology are not always very

consistent:

- The choice of a **load factor** of 0.5 for **hot tap water** appears quite arbitrary and high (page 14). Lower values are observed in other countries with similar climate.
- The determination of the average **baseline efficiency** on pages 14 and 15 is not totally clear and not conservative. Firstly, the methodology suggests to determine an average weighted value but no guidance is provided how efficiencies from single measurements should be weighted and extrapolated (weighting by heat demand of the buildings would a reasonable approach). Secondly, it is not clear, how many measurements should be conducted (sample group) and how boilers should be selected in a representative manner. Thirdly, the difference between approaches a) and b) on page 15 is not clear. The DIN 1942 practically provides guidance how to measure boiler efficiency; however such guidance should also be used if historic data is used to calculate efficiencies (approach a)). It would also be useful to provide some more guidance on how to measure boiler efficiency (direct or indirect method). See for example Herold et al. (2003). Furthermore, the suggested default values appear relatively low (thus not conservative). New condensing boilers may achieve seasonal efficiencies of 100% (or even more) relative to the net calorific value (though it is clear that condensing boilers may not be available in some countries). For example, the Environmental Manual (EM) / GEMIS references efficiencies in the range from 60% to 72% for small boilers in the Czeck Republic, Poland and Hungary prior to transition to a market economy (the methodology suggests 50%, referenced from a GEF project in Poland) and 50% to 67% for stoves (the methodology suggests 40%). It is also unclear, why the same efficiency is assumed for "poor" and "fair" condition of coal boilers with "few/none" remaining life years. Finally, default values would also need to be provided for other fuels than coal, since the scenario ("alternative 01") is on page explicitly not limited to the use of one fuel type. It may also be helpful to clarify that the suggested emission factors refer to net (and not gross) calorific values. A different and more reliable approach may be to require project participants to conduct measurements at least for a sample group. If measurements are not required, default emission factors should be conservative.
- **Optimistic choice of default values for DH losses.** The methodology suggests default values for the losses in the DH system. In general, these values should preferably be determined ex-post, based on measured (see above). If default values are used, they should be conservative. The methodology indicates the range of losses with 10 to 30%. This is appropriate for most networks (some may be worse or even better). A default loss rate of 10% (= efficiency of 90%) is suggested for both baseline and project emissions. In both cases, this is stated to be a conservative assumption. This is true for the calculation of baseline emissions but not for the calculation of project emissions. In case of project emissions, a conservative value would be at the higher end of losses (e.g. 30% losses or 70% efficiency respectively). Anyhow, monitoring of the actual losses is preferable.
- **Default value for the marginal fuel consumption for heat extraction ($\eta_{h,m}$).** The methodology suggest a default value of 200% as a conservative value for the marginal fuel consumption for heat extraction ($\eta_{h,m}$).

  The introduction of a "conservative" default value is a bit confusing, since the baseline methodology as well as monitoring methodology provide equations (equations 26a, 26b and 26c) to monitor and calculate $\eta_{h,m}$ during monitoring. A default value seems not necessary if the parameter is monitored (which is in fact better).

  Apart from that, the suggested default value of 200% for $\eta_{h,m}$ is not for all cases conservative. The table below illustrates different values of $\eta_{h,m}$ for different plant configurations, calculated with the equation provided above.

	Old coal power plant	Modern coal power plant	Modern combined cycle power plant
Electric efficiency in condensing opertion (no heat extraction)	35%	45%	58%
Electric efficiency with maximal heat extraction	20%	35%	43%
Thermal efficiency with maximal heat extraction	55%	50%	45%
Cv	0.27	0.20	0.33
Marginal fuel consumption for heat extraction	128%	225%	174%

(7) Assessment of uncertainties:

a) State whether the methodology includes an assessment of uncertainties regarding:

i) The basis for determining the baseline scenario:

No.

ii) Algorithms/formulae:

No.

iii) Key assumptions:

No.

iv) Data:

No.

b) State whether the uncertainties presented are reasonable:

Nothing is presented.

(8) Leakage:

a) State how the baseline methodology addresses any potential leakage due to the project activity:

No leakage emissions are accounted.

b) Indicate whether the treatment for leakage is appropriate and adequate:

No. A potentially significant source of leakage are rebound effects from the increase of heat comfort as a result of the project activity (see second item under 6 (a) to (c)).

(9) Transparency and "conservativeness":

a) Indicate whether the baseline methodology was developed in a transparent way:

The methodology mostly explains its assumption in a reasonable way. Sometimes issues lack clarity and are not sufficiently elaborated, making the application of the methodology arbitrary.

b) State whether the baseline methodology is conservative:

The methodology is not conservative, in particular with respect to

- the default losses of 10% for the DH system in the project scenario.
- the assumption that heat is supplied in the project scenario with the most efficient heat source (page 29);
- the choice of default efficiencies for boilers in the baseline scenario (page 15, see explanations above under item 6);
- the default value of 200% for the marginal fuel consumption for heat extraction ($\eta_{h,m}$);
- the exclusion of pumping power from the project boundary (see item 5 above).

(10) Potential strengths and weaknesses of the proposed baseline methodology *(please explain)***:**

Strengths:

- The methodology provides a methodologically thorough approach to calculate marginal emissions from heat extraction cogeneration plants.
- Changes in heat demand due to external factors such as whether conditions or insulation of buildings could in principle be factored out in the calculation of emission reductions.

Weaknesses:

- The methodology has relatively limited applicability conditions (only coal to be used in the existing boilers, no greenfield cogeneration plants, no back pressure cogeneration plants)

(11) Other considerations, such as a description of how national and/or sectoral policies and circumstances have been taken into account *(please explain)***:**

National and sectoral policies are generally taken into account. They should be considered better in the determination of the baseline scenario (which is generally inappropriate).

(12) Applicability of the proposed methodology across project types and regions *(please indicate)***:**

The applicability conditions are generally a bit limited but the methodology could in principle (if several key issues are modified) be applied to other regions.

(13) Any other comments:

a) State whether any other source of information (i.e. other than documentation on this proposed methodology available on the UNFCCC CDM web site) has been used by you in evaluating this methodology. If so, please provide specific references:

- IPCC 2000 GPG
- Herold, A. / Schneider, L. / Vizcarra, N.: Improving Energy Efficiency in Peruvian Boilers with the CDM. Feasibility Study for a Bundled CDM Project. Berlin, January 2003.
- Environmental Manual / GEMIS Version 4.1. Download at: http://www.oeko.de/service/gemis/en/index.htm

b) Indicate any further comments:

II. Proposed new monitoring methodology *(specify title here):* >>Monitoring of Energy Efficiency Improvements in District Heating Production and Distribution

In respect of the proposed new monitoring methodology, evaluate each section of CDM-NMM to the draft CDM-PDD. Please provide your comments section by section:

(1) Brief description of new methodology:

Describe new methodology:

The methodology proposes to monitor basically three parameters:

a) the heat supplied to the DH network,

b) the fuel consumption in boilers and the cogeneration plant,

c) the electricity generated and fed into the grid.

From these parameters, the efficiency of heat supply is calculated and the average emission reduction factor is recalculated, according to equations 26 (a) to (d) in the baseline methodology.

The general approach is described in the baseline methodology.

(2) Key assumptions/parameters:

a) List the implicit and explicit key assumptions. Identify those, if any, which are problematic and explain:

b) State whether the key assumptions are arrived at in a transparent manner:

c) Give your expert judgement on whether the assumptions/parameters are adequate:

Note: These questions are answered jointly.

The monitoring methodology does merely contain other key assumptions or parameters than the baseline methodology. Note that these are discussed in detail in the baseline methodology.

The main issue is that key data to avoid gaming is not monitored (see item 6 of the baseline methodology). Furthermore, rebound effects due to increased heating comforts may need to be monitored. Key data that are lacking include:

- an inventory of the actual buildings connected, containing for each building information how the heat supply would occur in the baseline scenario (e.g. until what date an existing boiler would have continued to operate, what efficiency can be assumed for that boiler, etc),
- the annual heat supplied to each building (e.g. from meters / invoices),
- the quantity of electricity used for pumping,
- data required to determine the CO_2 emissions intensity of the electricity used for pumping (e.g. assuming that electricity is provided by the cogeneration plant),
- data required to estimate rebound effects from increased heating comfort.

Finally, it is not appropriate that the most efficient heat supply option is used to calculate project emissions, since this assumption would lead to a significant overestimation of emission reductions (see baseline methodology, item 6, for more details).

One minor issue: The monitoring methodology assumes that heat is supplied by 3 to 15 boiler houses. This seems a bit limiting, since some DH networks are supplied by only one boiler house or plant.

(3) Data sources and data quality:

a) Indicate which data sources are used and how the data are obtained (e.g. official statistics, expert judgement):

The data used are mostly energy quantities from the boiler house(s). They are obtained by normal metering procedures (heat quantity, electricity quantity, fuel supplied).

b) Give your expert judgement on whether the data used are adequate, consistent, accurate and reliable:

The data that is listed is appropriate and sufficiently accurate.

c) State possible data gaps:

See above item 2.

(4) Assessment of the description of the proposed methodology and its applicability:

a) State whether the proposed methodology has been described in an adequate manner:

The monitoring methodology mostly repeats text from the baseline methodology. The applicability conditions are not consistent with the applicability conditions of the baseline methodology.

b) State whether the proposed methodology is appropriate for the referred proposed project activity and the referred project context (described in Sections A - E of the draft CDM-PDD and submitted along with CDM-NMM):

Apart from the deficiencies mentioned above: yes.

c) State whether this proposed monitoring methodology is compatible with the proposed baseline methodology described in CDM-NMB of the draft CDM-PDD:

In principle yes.

(5) Leakage *(please elaborate, if appropriate)***:**

Not addressed. Rebound effects (increased heat demand as a result of the project activity) should be considered and factored out (see baseline methodology).

(6) Quality assurance and control procedures *(please explain)***:**

QA/QC procedures focus on the measurements procedures. It would be helpful if other QA/QC procedures, such as cross-check data with invoices etc, would be added. Some information is quite vague (e.g. on net calorific values).

(7) Potential strengths and weaknesses of the proposed monitoring methodology *(please explain)***:**

Strengths:

- All key data is easily accessible since it can be measured directly at the project site by project participants.

Weaknesses:

- The lack of some key data invites gaming.

(8) Applicability of the proposed methodology across project types and regions *(please indicate)***:**

See baseline methodology.

(9) Any other comments:

a) State whether any other source of information (i.e. other than documentation on this proposed methodology available on the UNFCCC CDM web site) has been used by you in evaluating this methodology. If so, please provide specific references:

No.

b) Indicate any further comments:

Signature of desk reviewer Date: 02/05/2005	
Information to be completed by the secretariat	
F-CDM-NMex doc id number	
Date when the form was received at UNFCCC secretariat	
Date of transmission to the Meth Panel and EB	
Date of posting in the UNFCCC CDM web site	