CLEAN DEVELOPMENT MECHANISM

ACM0023

Large-Scale Consolidated Methodology

Introduction of an efficiency improvement technology in a boiler

Version 01.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	Improvement of the boiler efficiency through introduction of efficiency improvement technology
Type of GHG emissions mitigation action	Energy efficiency. Switch to more-energy-efficient technology

2. Scope, applicability, and entry into force

2.1. Scope

2. The methodology applies to project activities where the thermal efficiency of a boiler is increased as a result of an introduction of efficiency improvement technology and where increased thermal efficiency leads to reduction in GHG emissions from fuel combustion.

2.2. Applicability

3. This methodology applies to project activities that involve introduction of efficiency improvement technology into a boiler resulting in increased thermal energy efficiency of the boiler with consequent reduction in GHG emissions.

4. The applicability conditions included in the tools referred in this methodology apply. However, under this methodology, the “Tool to determine the baseline efficiency of thermal or electric energy generation systems” is applicable to the boilers of a cogeneration systems. In that case the only production of thermal energy originating from the project boilers shall be considered. In other words, the spatial extent of the project boundary encompasses the boilers and excludes the electricity generation components.

5. The methodology is applicable under the following conditions:

   (a) The boiler has an operating history of at least three years prior to the implementation of the project activity;

   (b) The efficiency improvement technology to be used under the project activity was not used at the project facility on a commercial basis prior to the implementation of the project activity (test trials not exceeding a duration of no more than 90 days, however are permitted for the purpose of assessing the potential of project specific energy efficiency improvement);

   (c) The type of fossil fuel used by the project during the crediting period was also used during the most recent three years prior to the implementation of the project activity, except, where applicable, any auxiliary fuel consumption (e.g. for start-ups) which shall not exceed three per cent of the total fuel consumption (measured on an energy basis);

(d) No emission reduction credits can be claimed at and beyond the end of the lifetime of boilers.

6. This methodology is only applicable if the application of the procedure to identify the baseline scenario results in the continuation of the current practice for thermal energy generation as the most plausible baseline scenario.

2.3. Entry into force

7. The date of entry into force of the revision is the date of the publication of the EB 75 meeting report on 4 October 2013.

3. Normative references

8. This consolidated baseline and monitoring methodology is based on elements from the following approved baseline and monitoring methodology and proposed new methodology:

(a) "AM0054: Energy efficiency improvement of a boiler by introducing oil/water emulsion technology";

(b) "NM0363: Energy efficiency improvement through on-line fire side cleaning technology applied to fossil fuel fired energy generation systems in existing energy and other industries".

9. This methodology also refers to the latest approved version of the following tool(s):

(a) "Tool for the demonstration and assessment of additionality";

(b) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";

(c) "Tool to determine the baseline efficiency of thermal or electric energy generation systems"

(d) "Tool to determine the remaining lifetime of equipment".

10. For more information regarding the proposed new methodologies and the tools, as well as their consideration by the Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM) please refer to <http://cdm.unfccc.int/methodologies/PAmethodologies/index.html>.

3.1. Selected approach from paragraph 48 of the CDM modalities and procedures

11. "Existing actual or historical emissions, as applicable".

4. Definitions

12. The definitions contained in the Glossary of CDM terms shall apply.

13. For the purpose of this methodology, the following definitions apply:

    (a) **Efficiency improvement technology** - includes chemical technologies that improves efficiency of a boiler. In some cases efficiency improvement technology includes the equipment used to add the chemicals into a boiler. List of technologies includes:

        (i) Oil/water emulsion technology;

        (ii) Fire side cleaning technology;

        (iii) Coal catalyst technology.

    (b) **Project facility** – industrial facility where boiler(s) is/are installed.

5. Baseline methodology

5.1. Project boundary

14. The spatial extent of the project boundary encompasses the equipment used to prepare for the use the efficiency improvement technology and the boiler.

15. In case of the cogeneration system, equipment dedicated to the generation of electricity (e.g. turbine, generator) shall be excluded from the project boundary.

16. Only CO_2 emissions are considered for estimating the baseline and project emissions. Baseline emission sources include fossil fuel consumption and project emission sources include fossil fuel consumption, efficiency improvement technology, and electricity consumption. Table 2 provides an overview of emission sources included in or excluded from the project boundary.

Table 2. Emissions sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Combustion of fossil fuels to produce energy	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification, this is conservative
		N_2O	No	Excluded for simplification, this is conservative
Project activity	Combustion of fossil fuels to produce energy	CO_2	Yes	Main emission sources
		CH_4	No	Negligible, excluded for simplification
		N_2O	No	Negligible, excluded for simplification

Source		Gas	Included?	Justification / Explanation
Project activity	Use of efficiency improvement technology	CO_2	Yes	Main emission sources
		CH_4	No	Negligible, excluded for simplification
		N_2O	No	Negligible, excluded for simplification
Project activity	Consumption of the electricity	CO_2	Yes	Main emission sources
		CH_4	No	Negligible, excluded for simplification
		N_2O	No	Negligible, excluded for simplification

5.2. Determination of the remaining lifetime of equipment

17. The remaining lifetime of the equipment should be determined using the latest version of the "Tool to determine the remaining lifetime of equipment".

5.3. Identification of the baseline scenario

18. Project participants shall apply the latest approved version of the "Tool for the demonstration and assessment of additionality" with the following additional guidance to identify the baseline scenario:

5.3.1. Step 1 of the "Tool for the demonstration and assessment of additionality": Identify plausible alternative scenarios

19. Alternatives include, but are not limited to the following scenarios:

    (a) Continuation of the current practice;

    (b) The proposed project activity is not implemented as a CDM project.

5.3.2. Step 2 of the "Tool for the demonstration and assessment of additionality": Barrier analysis

20. In cases where efficiency improvement technology was used for test trials, barrier analysis is not applicable.

Step 3 of the "Tool for the demonstration and assessment of additionality": Investment analysis

21. If the barrier analysis is not conclusive, then an investment analysis shall be carried out in order to identify the economically most attractive alternative in accordance with Step 2 of the latest approved version of the "Tool for the demonstration and assessment of additionality".

22. This methodology is only applicable if the most plausible baseline scenario identified above is the continuation of the current practice for energy generation.

5.3.3. Additionality

23. The demonstration of additionality should be conducted using the latest approved version of the "Tool for the demonstration and assessment of additionality".

24. In cases where efficiency improvement technology was used for test trials, barrier analysis is not applicable.

25. The efficiency improvement technology may lead to an increase in availability (e.g. operating hours per year) and/or capacity (e.g. output per hour) and the actual output demand. These factors shall be accounted for in the assessment of additionality.

5.4. Baseline emissions

26. Total baseline emissions from all boilers are determined using the formula:

$$BE_y = \sum BE_{i,y} \qquad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions during the year *y* (t CO_2e)
i	=	Boiler type i
$BE_{i,y}$	=	Baseline emissions from boiler *i* during the year *y* (t CO_2)

27. Baseline emissions from boiler *i* are determined based on the efficiency of a system prior to the implementation of the project activity andemission factor(s) of the fossil fuel(s) that are limited to the level of historical fuel consumption. Baseline emissions are determined using the formula below:

$$BE_{i,y} = min\left\{\left[\sum_j \frac{EF_{PJ,i}}{\eta_{BL,i,j}} \times SG_{i,j,y}\right], \left[\left(F_{hist,i} \times NCV_{hist,i} \times EF_{BL,i}\right)\ \right]\right\} \times OXID_i \qquad \text{Equation (2)}$$

Where:

$BE_{i,y}$	=	Baseline emissions from boiler *i* during the year *y* (t CO_2)
$EF_{PJ,i}$	=	Emission factor of the fossil fuel used in the boiler *i* in year *y* (t CO_2/TJ)
$SG_{i,j,y}$	=	Energy generation by boiler *i* and corresponding to the load point *j* in year *y* (TJ)
$\eta_{BL,i,j}$	=	Efficiency of the boiler *i* (dimensionless)
$F_{hist,i}$	=	Historical annual consumption of fossil fuel in boiler *i* prior to the implementation of the project activity, calculated based on the mean annual fuel consumption in boiler *i* in most recent three calendar years prior to the implementation of the project activity

(mass or volume units)

$NCV_{hist,i}$ = Net calorific value of fossil fuel used to generate thermal energy in boiler *i* prior to the implementation of the project activity, calculated for the same period as selected for the determination of the historical annual consumption of fossil fuel (TJ/mass or volume units)

$EF_{BL,i}$ = Carbon emission factor of fossil fuel used in the boiler *i* in most recent three calendar years prior to the implementation of the project activity (t CO_2/TJ)

$OXID_i$ = Fraction of carbon in the fossil fuel that is oxidized to CO_2 in the combustion process without using the energy efficiency technology

j = Load point as per the "Tool to determine the baseline efficiency of thermal or electric energy generation systems"

28. The fraction of carbon in the fossil fuel that is oxidized to CO_2 should be determined at the maximum live continuous rating of the boiler as determined from the recent three calendar years, just prior to undertaking regular preventive maintenance, including boiler soot and tube cleaning. The test shall be conducted by an independent entity such as the equipment supplier, sectoral experts/consultants etc. and the results of the oxidation tests shall be validated by the DOE. The oxidation factor is calculated based on the carbon in particulate matter in the flue gas and the carbon in the fuel, as follows:

$$OXID_i = 1 - \frac{PM \times (1 - w_{ash})}{FC_{OXID} \times D_{i,OXID} \times w_{C,i,OXID}} \quad \text{Equation (3)}$$

Where:

$OXID_i$ = Fraction of carbon in the fossil fuel that is oxidized to CO_2 in the combustion process without using the efficiency improvement technology

PM = Quantity of particulate matter that is in the flue gas during the measurement to determine the oxidation factor (mass unit)

FC_{OXID} = Quantity of fossil fuel that is fired in the boiler during the measurement to determine the oxidation factor (volume unit)

w_{ash} = Ash content of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor (mass fraction)

$w_{C,i,OXID}$ = Carbon content of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor (mass fraction)

$D_{i,OXID}$ = Density of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor (mass per volume unit)

29. The baseline efficiency ($\eta_{BL,i,j}$) shall be determined in accordance with only Option B of the latest version of the "Tool to determine the baseline efficiency of thermal or electric energy generation systems".

5.5. Project emissions

30. Project emissions include the emissions associated with: (i) the consumption of fossil fuel in the boilers; and (ii) the efficiency improvement technology.

31. Project emissions are calculated as follows:

$$PE_y = \sum_i PE_{i,y} \quad \text{Equation (4)}$$

and

$$PE_{i,y} = PE_{f,i,y} + PE_{fct,i,y} + PE_{EL,i,y} \quad \text{Equation (5)}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2e)
$PE_{i,y}$	=	Project emissions from boiler *i* in year *y* (t CO_2)
i	=	Boiler within the project boundary
$PE_{f,i,y}$	=	Project emissions from fossil fuel combustion in the boiler *i* in year *y* (t CO_2)
$PE_{fct,i,y}$	=	Project emissions from combustion of the efficiency improvement technology in boiler *i* during the year *y* (t CO_2)
$PE_{EL,i,y}$	=	Project emissions from consumption of electricity due to the project activity in boiler *i* during the year *y* (t CO_2)

32. Project emissions from fossil fuel combustion in boiler *i* is determined using the below formula:

$$PE_{f,i,y} = max\left\{\left\lfloor F_{i,y} \times NCV_{i,y} \times EF_{PJ,i}\right\rfloor, \left\lceil \sum_j \left(\frac{EF_{PJ,i}}{\eta_{PJ,i,j}} \times SG_{i,j,y}\right)\right\rceil\right\} \quad \text{Equation (6)}$$

Where:

$PE_{f,i,y}$	=	Project emissions from fossil fuel combustion in boiler *i* in year *y* (t CO_2)
$F_{i,y}$	=	Annual consumption of fossil fuel in boiler i in year *y* (mass or volume units)
$NCV_{i,y}$	=	Net calorific value of fossil fuel used to generate energy in boiler *i* in year *y* (TJ/mass or volume units)
$EF_{PJ,i}$	=	Emission factor of the fossil fuel used in boiler *i* in year *y* (t CO_2/TJ)
$\eta_{PJ,i,j}$	=	Efficiency of boiler *i* determined during the project campaign (dimensionless) as described in the paragraph 33 below

33. The project efficiency($\eta_{PJ,i,j}$) shall be determined during the 'project campaign' when the stable efficiency level is reached, but not later than 90 days after the first use of the efficiency improvement technology on the commercial basis (implementation of the project activity). The project efficiency($\eta_{PJ,i,j}$) shall be determined in accordance with only Option B of the latest version of the "Tool to determine the baseline efficiency of thermal or electric energy generation systems". No changes to the equipment and to the control algorithms of the boiler are allowed between the baseline campaign and the project campaign.

34. Project emissions from combustion of fire side cleaning technology in boiler *i* is determined using the below formula:

$$PE_{fct,i,y} = F_{fct,i,y} \times w_{C,fct} \times \frac{44}{12}$$ Equation (7)

Where:

$PE_{fct,i,y}$ = Project emissions from combustion of the efficiency improvement technology in boiler *i* during the year *y* (t CO_2)

$F_{fct,i,y}$ = Quantity of the efficiency improvement technology utilized in boiler *i* during the year *y* (mass or volume units)

$w_{C,fct}$ = Mass fraction of carbon in the efficiency improvement technology

35. Project emissions from consumption of electricity due to the project activity in boiler *i* shall be determined using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

5.6. Leakage

36. No leakage is applicable under this methodology.

5.7. Emission reductions

37. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ Equation (8)

Where:

ER_y = Emission reductions during the year *y* (t CO_2e)

BE_y = Baseline emissions during the year *y* (t CO_2e)

PE_y = Project emissions during the year *y* (t CO_2e)

5.8. Changes required for methodology implementation in 2nd and 3rd crediting periods

38. Refer to the latest approved version of the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

5.10. Data and parameters not monitored

39. In addition to the parameters listed below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter table 1.

<table>
<tr><td>Data / Parameter:</td><td>$EF_{BL,i,}$</td></tr>
<tr><td>Data unit:</td><td>t CO_2/TJ</td></tr>
<tr><td>Description:</td><td>Carbon emission factor of fossil fuel used in the boiler i in most recent three calendar years prior to the implementation of the project activity</td></tr>
<tr><td>Source of data:</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>Values provided by the fuel supplier of the power plants in invoices</td><td>If data is collected from power plant operators (e.g. utilities)</td></tr>
<tr><td>Regional or national average default values</td><td>If values are reliable and documented in regional or national energy statistics/energy balances</td></tr>
<tr><td>IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td></td></tr>
</table></td></tr>
<tr><td>Measurement procedures (if any):</td><td>-</td></tr>
<tr><td>Any comment:</td><td>-</td></tr>
</table>

Data / Parameter table 2.

Data / Parameter:	**$F_{hist,i}$**
Data unit:	mass or volume units
Description:	Historical annual consumption of fossil fuel in boiler *i* prior to the implementation of the project activity, calculated based on the mean annual fuel consumption in boiler *i* in most recent three calendar years prior to the implementation of the project activity
Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 3.

<table>
<tr><td>Data / Parameter:</td><td>$NCV_{hist,i}$</td></tr>
<tr><td>Data unit:</td><td>TJ/mass or volume units</td></tr>
<tr><td>Description:</td><td>Net calorific value of fossil fuel used to generate thermal energy in boiler i prior to the implementation of the project activity, calculated for the same period as selected for the determination of the historical annual consumption of fossil fuel</td></tr>
<tr><td>Source of data:</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>Values provided by the fuel supplier of the power plants in invoices</td><td>If data is collected from power plant operators (e.g. utilities)</td></tr>
<tr><td>Regional or national average default values</td><td>If values are reliable and documented in regional or national energy statistics/energy balances</td></tr>
<tr><td>IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td></td></tr>
</table></td></tr>
<tr><td>Measurement procedures (if any):</td><td>-</td></tr>
<tr><td>Any comment:</td><td>-</td></tr>
</table>

Data / Parameter table 4.

Data / Parameter:	**PM**
Data unit:	mass unit
Description:	Quantity of particulate matter that is in the flue gas during the measurement to determine the oxidation factor
Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	**FC_{OXID}**
Data unit:	volume unit
Description:	Quantity of fossil fuel that is fired in the boiler during the measurement to determine the oxidation factor

Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	w_{ash}
Data unit:	mass fraction
Description:	Ash content of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor
Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	$w_{C,i,OXID}$
Data unit:	mass fraction
Description:	Carbon content of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor
Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	$D_{i,OXID}$
Data unit:	mass per volume unit
Description:	Density of the fossil fuel that is fired in the boiler during the measurement of the oxidation factor
Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 9.

Data / Parameter:	**TRIAL**
Data unit:	mass or volume unit
Description:	Quantity of the efficiency improvement technology utilized at the project facility for test trial

Source of data:	Facility records
Measurement procedures (if any):	-
Any comment:	DOE should check the contract between the project proponent and the provider of the efficiency improvement technology to confirm that technology was used for test purposes

6. Monitoring methodology

6.1. Monitoring procedures

40. Describe and specify in the CDM-PDD all monitoring procedures, including the type of measurement instrumentation used and the responsibilities for monitoring and QA/QC procedures that will be applied. Meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with relevant standards. If such standards are not available, use national standards. If a national standard is not available, then use international standards.

41. All monitoring shall be attended to by appropriate and adequate personnel, as assessed by the project participants. All data collected as part of monitoring shall be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data shall be monitored if not indicated otherwise in the tables below. All measurements shall be conducted with calibrated measurement equipment according to relevant industry standards.

42. The monitoring provisions in the tools referred to in this methodology apply.

43. The monitoring methodology requires monitoring the use of the efficiency improvement technology. Emission reductions can be claimed only in case the efficiency improvement technology is applied on a regular basis according to the recommendations of the producer of the efficiency improvement technology. For example, if technology is to be applied on a weekly basis and one application is missed, emission reductions shall be discounted for two weeks - one week before the missed application and one week after.

6.2. Data and parameters monitored

Data / Parameter table 10.

Data / Parameter:	**$F_{i,y}$**
Data unit:	mass or volume units
Description:	Annual consumption of fossil fuel in boiler *i* in year *y*
Source of data:	Facility records
Measurement procedures (if any):	Volume or mass flow meters, for solid fuel weight bridges
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchase quantities and stock changes
Any comment:	-

Data / Parameter table 11.

<table>
<tr><td>Data / Parameter:</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Data unit:</td><td>TJ/mass or volume units</td></tr>
<tr><td>Description:</td><td>Net calorific value of fossil fuel used to generate energy in boiler i in year y</td></tr>
<tr><td>Source of data:</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data sources</th><th>Conditions for using data source</th></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>(b) Measurement by the project participants</td><td>If (a) is not available</td></tr>
<tr><td>(c) Regional or national default values</td><td>If (b) is not available</td></tr>
<tr><td>(d) IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines of National GHG Inventories</td><td>If (c) is not available</td></tr>
</table></td></tr>
<tr><td>Measurement procedures (if any):</td><td>For (a) an (b): measurements should be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency:</td><td>For (a) and (b): the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For (c): Review appropriateness of the values annually.
For (d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures:</td><td>Verify if the values under (a), (b), and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b), and (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards</td></tr>
<tr><td>Any comment:</td><td>-</td></tr>
</table>

Data / Parameter table 12.

Data / Parameter:	**$EF_{PJ,i}$**
Data unit:	t CO_2/TJ
Description:	Emission factor of the fossil fuel used in the boiler *i* in year *y*

Source of data:	The following data sources may be used if the relevant conditions apply: **Data sources** / **Conditions for using data source** (a) Values provided by the fuel supplier in invoices / This is the preferred source (b) Measurement by the project participants / If (a) is not available (c) Regional or national default values / If (b) is not available (d) IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines of National GHG Inventories / If (c) is not available
Measurement procedures (if any):	For (a) an (b): measurements should be undertaken in line with national or international standards

Monitoring frequency:	For (a) and (b): the emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
	For (c): Review appropriateness of the values annually.
	For (d): Any future revision of the IPCC Guidelines should be taken into account

QA/QC procedures:	-
Any comment:	-

Data / Parameter table 13.

Data / Parameter:	**$SG_{i,i,y}$**
Data unit:	TJ
Description:	Energy generation by boiler *i* using the fuel and corresponding to the load point *j* in year *y*
Source of data:	Facility records
Measurement procedures (if any):	-
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	As per internal QA/QC procedures of the facility
Any comment:	-

Data / Parameter table 14.

Data / Parameter:	**$F_{fct,i,y}$**
Data unit:	mass or volume units
Description:	Quantity of the efficiency improvement technology utilized in boiler *i* during the year *y*

Source of data:	Facility records
Measurement procedures (if any):	-
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	As per internal QA/QC procedures of the facility
Any comment:	The DOE shall check whether the efficiency improvement technology is applied according to the recommendations of the producer and discount monitoring period if necessary

Data / Parameter table 15.

Data / Parameter:	$w_{C,fct}$
Data unit:	mass fraction
Description:	Carbon content of the efficiency improvement technology that is utilized in boiler *i* during the year *y*
Source of data:	Technology manufacturer
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

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Document information

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