CDM-SSCWG44-A12

Information note

Call for public input on: “Options and approaches to determine emissions reduction from energy efficiency improvement in industrial motor-system”

Version 01.0

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. Decision CMP/.8, paragraph 35 encourages the Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM) to continue its work on the simplification and streamlining of methodologies, with the aim of reducing transaction costs for all project activities and programme of activities, especially those in regions underrepresented in the CDM.

2. The Board at its seventy-fifth meeting while approving the revised methodology “AMS-II.D: Energy efficiency and fuel switching measures for industrial facilities” further agreed that the SSC WG may initiate work to develop top-down methodologies covering technologies for specific industrial application (e.g. motor drive system) with standardized approaches for baseline-setting (EB 75, paragraph 67).

3. The SSC WG at its 43rd meeting agreed to start with a top-down development of methodology covering the industrial motor system based on its high greenhouse gas mitigation potential.

4. In this context, the SSC WG at its 44th meeting initiated discussions and agreed to launch a call for public input on initial ideas in terms of options and approaches to determine emissions reductions on account of energy efficiency improvement in industrial motor-system, as contained in annex 12 of the report of the SSC WG 44.

2. Purpose

5. The purpose of the call is for wider stakeholder consultations on various options and approaches discussed in this document to estimate emissions reductions on account of energy efficiency improvement in industrial motor-system. The public inputs will be taken into account when preparing the top-down draft methodology to be recommended to the Board at a future meeting.

3. Key issues and proposed solutions

6. Motor systems such as compressors, pumps or fans are widely used in industrial facilities and account for more than 60 per cent of the electricity consumed in the industrial sector (UNIDO, 2013) and for more than 30 per cent of all electricity use (IEA, 2009). To date, only few CDM projects [less than 10] that involve energy efficiency in industrial motor systems are registered.

7. The top down development of methodology related to energy efficiency improvement in industrial motor-system (e.g. pumps, fans, and compressor) aims to facilitate development of CDM projects in the area by providing simplified approaches with various options for baseline settings and monitoring requirements while maintaining environmental integrity.

4. Impacts

8. Not applicable (call for public input).

5. Proposed work and timelines

9. The SSC WG will take into account input received through this public call when preparing the top-down draft methodology to be recommended to the Board at a future meeting.

6. Budget and costs

10. No budget implication.

7. Recommendations to the Board

11. Not applicable (call for public input on top-down development of methodology mandated by the Board (EB 75, paragraph 67).

8. References

(a) UNIDO, 2013, Energy efficiency in electric motor systems: Technical potentials and policy approaches for developing countries, United Nations Industrial Development Organisations;

(b) IEA. 2009. Energy technology transitions for industries, International Energy Agency;

(c) AMS-II.D: Energy efficiency and fuel switching measures for industrial facilities;

(d) AMS-II.C: Demand-side energy efficiency activities for specific technologies.

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1. Issues on which feedback is requested

The SSC WG is seeking public input on the various approaches/options presented below to determine emission reductions due to energy efficiency improvement in industrial-motor system as well as input on other areas that are related to such a new methodology as commenters may wish to present.

2. The following are few specific questions/areas on which comments/suggestions are requested (but not limited to):

(a) The appropriateness of various modules and respective approaches to estimate emission reduction- its simplicity, accuracy and level of conservativeness;

(b) The document lists various methods to determine baseline and project energy consumptions. Are the methods provided is sufficient? If not, what further description of the methods would you suggest?

(c) The SSC WG is also considering the option to limit the applicability only to existing facilities for the sake of simplicity. Do you see a merit in this limitation?

(d) Please provide suggestions on baseline parameters that can be standardized for baseline determination and applied globally such as (energy consumption per unit output) pertaining to specific applications in a conservative manner. Provide references and possible data sources where such values can be obtained;

(e) Suggestions on specific technology/measures that can be deemed automatically additional (positive list) with specific criteria and the rational (e.g., based on global market penetration, investment cost etc.). If possible, provide references and possible data sources where such values can be obtained;

(f) Suggestions for defining the monitoring requirements (including accuracy, data collection intervals and options for sampling) that can be conservatively and reliably applied, but at reasonable cost, for documenting energy use, operating hours and product quantity/quality in baseline and project scenarios;

1.1. Technology/measures

3. The approaches/options to determine emission reductions provided in this document are related to energy efficiency improvement in industrial-motor system. Electrical motors and mechanical appliances (e.g. mechanical pump, compressor, fan) together constitute an industrial motor-system.

4. The approaches discussed below are intended to cover following technology/measures:

(a) Replacement of existing motors with new and efficient ones;

(b) Replacement of inefficient fan, pump, compressor and other appliance with new and efficient ones;

(c) Introduction of technology/measures to improve the overall efficiency of systems involving installation of speed/frequency control devices such as variable speed or frequency drives (VSDs or VFDs), replacement of inefficient throttling devices and avoiding wasteful mechanical transmissions;

(d) Any combination of (a), (b) and (c).

5. The possible interventions of technology measures are further categorized into three modules (see table 1 below). The approaches to determine emission reductions for each module are then discussed in the following sections accordingly.

Table 1: Possible interventions of technology measures are further categorized into three modules

Technology/Measures	Module
Replacement of inefficient motor(s) with new and efficient ones (introduction of energy efficient motors only)	Module 1
Replacement of motor appliance(s) (e.g. pump, fan, compressor, etc) only (introduction of energy efficienct mechanical appliances only)	Module 2
Replacement of motor(s) and their appliance(s) (introduction of energy efficient motors along with mechanical appliances i.e., improvment in energy efficieny in overall motor-system)	Module 2
Installation of VSD/VFD only (improvment in energy efficieny in overall motor-system through replacement of inefficient throttling devices and avoiding wasteful mechanical transmission)	Module 3
Installation of VSD/VFD along with repalcement of inefficient motor with new and efficient ones (improvment in energy efficieny in overall motor-system through replacement of inefficient motors as well as throttling devices and avoiding wasteful mechanical transmission)	Module 3

1.2. Baseline scenario

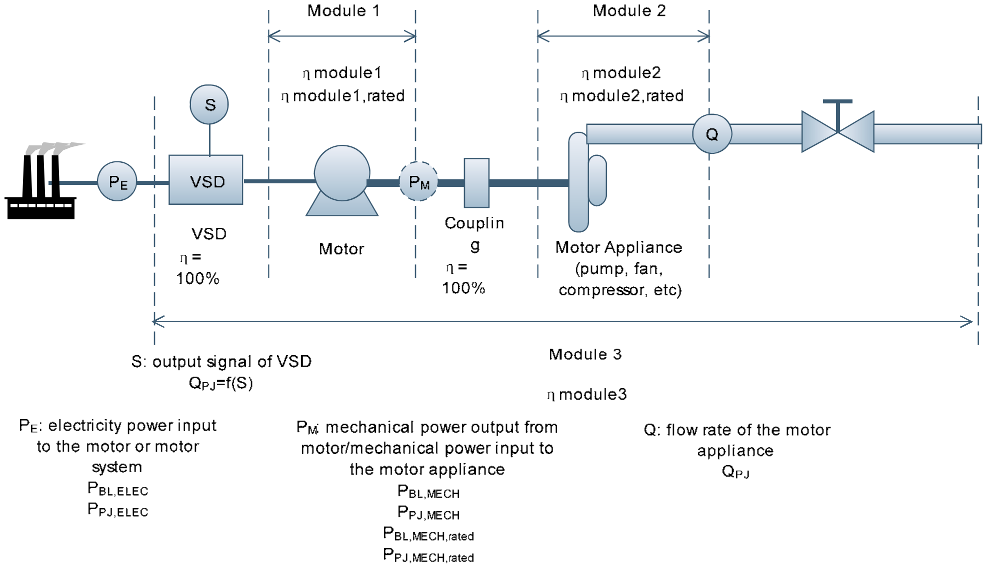
6. The baseline scenario is assumed to be the continuation of the current practice and consists of energy consumption (or energy consumption per unit of production) that would have occurred in the absence of the project activity for the existing motor or motor-system that is replaced, modified or retrofitted.

7. The emissions reductions accrue only up to the estimated remaining lifetime of the baseline motor system (i.e. the time when the affected baseline system would have been replaced in the absence of the project activity). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline emissions (*BE*) are assumed to equal project emissions (*PE*) and no emission reductions are assumed to occur

1.3. Approaches and options to determine emission reductions

8. The figure below show types of technology/measure and corresponding parameters under each module that would be used to determine emissions reduction.

Figure 1. Types of technology/measure and corresponding parameters under each module that would be used to determine emissions reduction



Note: The efficiency of VSD devices and mechanical coupling between motor and motor appliance are considered as 100 per cent for conservativeness.

Module 1 (replacement of inefficient motor with new and efficient motor)

1.3.1. Emissions reductions calculations

9. Module 1 is for motors with constant rate of energy consumption. The constant load condition is demonstrated by monitoring or using the historical records of energy consumption data for a one-year period prior to the project implementation. The data recording interval is monthly or less, i.e. a minimum of 12 data points. Data is considered to demonstrate a constant rate of energy consumption if 90 per cent of the energy consumption values (non-zero values) are within ±10 per cent of the annual mean.

10. The following two options can be used to determine emissions reductions:

11. **Option 1:** this option is limited to the cases where project replaces exiting motors with new and efficient ones but with similar sizes. For projects involving replacement of oversized motors with correct sized motors, option 2 below is applied.

$$ER_y = \sum_{i}^{n} \frac{(EC_{i,PJ,y})}{(1 - l_y)} \times \Delta\eta \times EF_{CO2}$$ Equation (1)

Where

EC_{i,PJ_y}	=	The amount of electricity consumption by project motor(s) *i* (MWh) monitored during the crediting period
n	=	Number of motor systems which consumes electricity in baseline scenario
ly	=	Applies only in the case of grid electricity savings. Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the motor systems are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. The reliability of the data used (e.g. appropriateness, accuracy/uncertainty, especially exclusion of non-technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable

$\Delta\eta$ = Efficiency gain due to improved energy efficiency of project motors as compared to baseline motors i.e., $\frac{\eta_{PJ}-\eta_{BL}}{\eta_{BL}}$

Take default values for $\Delta\eta$ as follows:

Rated motor output	$\Delta\eta$
motor < 1 kW	0.06
1 kW < motor < 10 kW	0.05
10kW < motor < 50 kW	0.03
motor > 50 kW	0.02

$\Delta\eta$ values are approximate values estimated as the algebraic difference of the values corresponding to IE4 (Super premium standard) and IE2 (high standard) 4 pole 50 Hz motor.[1]

Source: Based on data provided in IEA. 2011. Energy-Efficiency Policy opportunities for Electric Motor-Driven Systems (page 23)

Note: This default value can be applied only if the project motors implemented are of IE2 standard or higher (IEC 600034-30/31) or equivalent else option 2 is applied

EF_{CO2} = Baseline emission factor of the electricity displaced. In case of grid electricity, emission factor is calculated in accordance with methodology “AMS-I.D: Grid connected renewable electricity generation” (t CO_2e/MWh).

For project activities that saves both grid and captive electricity the baseline emission factor should reflect the emissions intensity of the grid and the captive plant in the baseline scenario i.e. the weighted average emission factor for the displaced electricity is calculated using historical information immediately three years prior to project implementation. In cases where historical information is deemed not suitable to determine the relative proportion of these two sources used in the baseline (e.g. the available data is not reliable due to various factors such as the use of imprecise or non-calibrated measuring equipment) then the most conservative emission factor for the two energy sources shall be used

12. **Option 2:** this option is based on actual energy consumption values and not applicable to new construction (Greenfield projects).

13. The emission reduction due to the project activity in year *y* is calculated as follows:

[1] It is assumed IE2 as a reference standard for conservativeness as it is evident that the standard class motors (IE1) have higher penetration rate in developing countries (IEA. 2007. Tracking industrial energy efficiency and CO_2 emissions (page 223).

$$ER_y = \sum_{i}^{n} \frac{(EC_{i,BL} - EC_{i,PJ,y})}{(1 - l_y)} \times EF_{CO2}$$ Equation (2)

Where:

ER_y	=	Emission reduction in year *y* (t CO_2e/year)
$EC_{i,BL}$	=	The amount of electricity consumption by baseline motor(s) *i* (MWh) determined as per paragraph 14 below
EC_{i,PJ_y}	=	The actual amount of electricity consumption by project motor(s) *i* (MWh) monitored during the crediting period

14. The amount of electricity consumption by baseline motor(s) can be based on full one year of average historical electricity consumption data (immediate prior to project implementation) or determined from baseline measurement campaign. The measurement campaign shall be carried out (before or in parallel with the project implementation) on the baseline motor system, covering the period sufficient to capture the entire operating conditions i.e. it covers a time sufficient period to capture the range of the independent variables expected to be, or actually, encountered during the crediting period. In the case where direct metering of electricity consumption by motors is not possible, electricity consumption can be determined based on power demand (kW) and operating hours using the procedure such as the below:

(a) The electrical power demand (kW) of baseline equipment is determined based on spot-measurement and/or short-term monitoring data.[2] For large populations of motors, the spot-measurement and/or short-term monitoring data can be taken on a representative sample of motors;

(b) The operating hours of the baseline motors in year y can be determined using surveys by continuous measurement of usage hours of baseline equipment for a minimum of 90 days. For a large population of baseline motors: (a) Use a representative sample (sampling determined by a minimum 90 per cent confidence interval and 10 per cent maximum error margin); (b) apply correction for seasonal variation, if any; and (c) ensure that sampling is statistically robust and relevant, i.e. the selection of the motors to be analysed for operating hours has a random distribution and is representative of target population (size, location). For sampling, the "Standard for sampling and surveys for CDM project activities and programme of activities" shall be followed;

(c) For project activities where it can be demonstrated that the operating hours would not vary due to project implementation, for example, fixed scheduling of the operation of motor-system in the baseline and in the project, it can be assumed that operating hours during the project are equal to the operating hours in the baseline.

[2] Short-term monitoring compensates for small, short-term rapid fluctuations in power in an otherwise constant process. Short-term monitoring should be conducted for a period of at least six hours.

Module 2 (Replacement of motor appliances (fan/pump/compressor system)

1.3.2. Emissions reductions calculations

15. The emission reduction due to the project activity in year *y* is calculated as follows:

$$ER_y = \frac{(EC_{BL,y} - EC_{PJ,y})}{(1 - l_y)} \times EF_{CO2} \quad \text{Equation (3)}$$

Where:

EC_{i,BL_y}	=	The amount of electricity consumption in baseline determined as per procedure described under paragraph 16 below (MWh)
EC_{i,PJ_y}	=	The amount of electricity consumption in project determined as per procedure described under paragraph 24 below (MWh)

1.3.2.1. Calculation of baseline electricity consumptions

16. The baseline electricity consumptions in year y are calculated as follows:

$$EC_{BL,y} = \sum_{i}^{m} n_i \times EC_{BL,i,j} \quad \text{Equation (4)}$$

Where:

$EC_{BL,i,j}$	=	Electricity consumption (kWh) associated with baseline motor appliance *i* in hour *j* in year y determining as per the procedure described under paragraph 17 below
n_i	=	Number of motor-system *i*
i	=	Type of motor system

17. The average electricity consumption in year *y* associated with baseline motor appliance *i* can be determined using one of the following two options:

18. **Option 1:** Manufacturer performance curve **(shaft power-flow rate output)**[3]

$$EC_{BL,i,j} = \sum_{j=1}^{8760} P_{BL,MECH,i,j} \times k \div \eta_{BL,module1,i} \quad \text{Equation (5)}$$

[3] Note: this option is not applicable to the compressor system.

Where:

$\boldsymbol{P_{BL,\mathrm{MECH},i,j}}$	=	Average shaft power of baseline motor appliance *i* (which is the function of $Q_{PJ,\mathrm{MECH},i,j}$) in hour *j* in year *y*, and determined as per paragraph 19 below (kW)
$Q_{PJ,\mathrm{MECH},i,j}$	=	Actual output flow rate of motor-appliance *i* in hour *j* in year *y* monitored during the crediting period (m^3)
k	=	Correction factor in case the actual fluid is different from the one used to determine the performance curve by the manufacturer. $k = \rho_{PJ,i,j,y}/\rho_{0,i}$ $\rho_{PJ,i,j,y}$ is the density of the actual medium (kg/m3), measured yearly. $\rho_{0,i}$ is the density of the testing medium (kg/m3), obtain from the manufacturer
$\eta_{BL,\mathrm{module1,i}}$	=	Rated name plate full-load efficiency from manufacturer or determined using efficiency measurements following the latest international standards (IEEE 112 or IEC 60034-2) or equivalent national standards
j	=	Hour *j* in project year y determined following the procedure provided in paragraph 42/43 below

19. The average shaft power of baseline motor-system *i* is determined ex ante using the “Shaft Power-Flow rate” performance curve (i.e. N-Q curve) and the associated best-fit model (reflecting the correlation between the shaft power and output flow rate) for each baseline motor-system *i* provided by the manufacturer in following form.

$$P_{BL,i} = f_i(Q)$$

The performance curve/model of each type of motor appliance *i* is transparently documented in the PDD.

20. **Option 2**: On-site performance test (Efficiency versus power)

$$EC_{BL,i,j} = \sum_{j=1}^{8760} P_{PJ,ELEC,i,j} \times \eta_{PJ,system,i} \div \eta_{BL,system,i}$$ Equation (6)

Where

$\boldsymbol{P_{PJ,\mathrm{ELEC},i,j}}$	**=**	Measured actual input power to project motor system *i* in hour *j* in year *y*
$\eta_{BL,\mathrm{system,i}}$	=	Overall efficiency of the whole motor-system (electric motor and motor appliance), determined prior to the implementation of the project activity using paragraph 19 below
$\eta_{PJ,\mathrm{system,i}}$	=	Overall efficiency of the whole motor-system, determined after the implementation of the project activity using paragraph 29 below
j	=	Hour *j* in project year *y* as determined following the procedure provided in paragraph 44/45 below

21. Regression analysis is conducted to establish the correlation between overall efficiency vs power input for baseline and project motor-system using relevant standard test procedure (international/national).

$\eta_{BL,system,i} = f_i(P_{ELEC,i})$, prior to the implementation of the project activity.

$\eta_{PJ,system,i} = g_i(P_{ELEC,i})$, after the implementation of the project activity.

Relevant test standards or equivalent, for example: ASME-PTC 8.2 for centrifugal pumps, and ASME-PTC 11 for fans can be followed.

22. In order to utilize the regression model to baseline electricity consumption, the t-test associated with relevant independent variables has to be at least 1.645, for a 90 per cent confidence. The regression model is documented with a complete report indicating, key assumptions, how the independent variables were selected and basis for including these variables and rejecting others, the regression results final sample results, and predicted efficiency values with respect to power consumptions.

23. The overall efficiency of the motor system (project and baseline) is determined as follows:

$$\eta_{system,i} = \frac{output}{input} = Q \times \Delta H \div P_{ELEC}$$ Equation (7)

Where:

Q	=	Is the output flow rate of the motor appliance
ΔH	=	Is the total pressure difference between motor appliance inlet and output
P_{ELEC}	=	Is the power input associated with the motor appliance

Note: all the parameters above are measured and determined during the performance tests.

1.3.2.2. Calculation of project electricity consumptions

24. The project electricity consumptions are determined using one of the following options corresponding to the options selected under baseline calculations:

25. **Option 1: Manufacturer performance curve**

$$EC_{PJ,i,j} = \sum_{j=1}^{8760} P_{PJ,MECH,i,j} \times \mathrm{k} \div \eta_{PJ,module1}$$ Equation (8)

Where:

$\boldsymbol{P_{PJ,MECH,i,j}}$	**=**	Average shaft power (kW) of project motor appliance *i* in hour *j* in year *y*, determined as per paragraph 26 below
k	=	Correction factor in case the actual fluid is different from the one used to determine the performance curve by the manufacturer, refer to *k* value for baseline electricity consumption
$\eta_{PJ,module1,\mathrm{i}}$	=	Rated name plate full-load efficiency from manufacturer or it is determined using efficiency measurements following the latest international standards (IEEE 112 or IEC 60034-2) or equivalent national standards

26. The average shaft power of project motor-appliance i is determined using the N-Q performance curve provided by the manufacturer:

$P_{PJ,i} = f_i(Q)$

Note: average flow rate is determined by monitoring flow rate at each hour *j* in project year *y*. The average shaft power is determined using the performance curve.

The performance curve of each type of motor appliance *i* is transparently documented in the PDD.

27. **Option 2**: Direct measurement

$$EC_{PJ,i,j} = \sum_{j=1}^{8760} P_{PJ,ELEC,i,j} \quad \text{Equation (9)}$$

or directly measured by energy meter

Module 3 (Application of VSDs/VFDs)

1.3.3. Emissions reductions calculations

28. The emission reduction due to the project activity in year y is calculated as follows:

$$\mathrm{ER_y} = \frac{(\mathrm{EC_{BL,y}} - \mathrm{EC_{PJ,y}})}{(1 - \mathrm{l_y})} \times \mathrm{EF_{CO2}} \quad \text{Equation (10)}$$

Where:

$EC_{BL,y}$	=	The amount of electricity consumption in baseline determined as per procedure described under paragraph 29 below (MWh)
$EC_{PJ,y}$	=	The actual amount of electricity consumption in project determined as per procedure described under paragraph 41 below (MWh)

1.3.3.1. Calculation of baseline electricity consumptions

29. The baseline electricity consumption is determined using one of the following three options:

30. **Option 1** (**Performance measurement**):[4]

$$EC_{BLy} = \sum_{i}^{m} n_i \times \sum_{j}^{8760} P_{BL,ELEC,i,j} \quad \text{Equation (11)}$$

[4] Note: This option is not applicable to Compressor system:

Where:

$P_{BL,ELEC,i,j}$	=	Average input power (kW) to baseline motor system *i* in hour *j* in year *y*, determined as per paragraph 31 below

31. The correlation between average power input to the baseline motor-system i and the flow rate is established ex ante using regression model.

$$P_{BL,i} = f_{BL}(Q_i)$$

32. The flow rate Q is either measured by flow rate meter directly or translated to equivalent flow rate from the calibrated input/output signal from VSD/VFD where such provisions are provided.

33. Following two alternatives are available to conduct regression analysis:

a) **Alternative 1** (historical data): This option can be used if hourly data on historical energy consumption and flow rate is available for full one year immediately prior to the implementation of the project activity;

b) **Alternative 2** (Baseline measurement campaign): The measurement campaign is carried out (before or in parallel with the project implementation) on the baseline motor system. The measurement shall cover all the possible output flow rate range under the project scenario. If there is more than one baseline motor system within the same type i, measurement can be carried out on sampling basis. The standard “Sampling and surveys for CDM project activities and programme of activities” for the purpose of sampling shall be followed.

Note: Guidelines related to regression analysis provided under paragraph 22 above is applied.

34. **Option 2: Specific energy consumption**

35. The baseline is calculated by using energy consumption per unit of output (e.g. KWh per Nm^3 compressed air or per ton flow) in the baseline multiplied by the output in project year *y*. This option does not cover new construction (Greenfield project).

36. This option is only applicable where the baseline energy use and emissions are only a function of finished product production rates (e.g. number of finished products produced per year or batch) and that the baseline energy use and emissions per unit of production does not vary from an average value by more than +/-10 per cent.

37. The baseline emissions are calculated as follows:

$$EC_{BL,y} = \sum SEC_{BL} \times Q_{PJ,i,y} \quad \text{Equation (12)}$$

Where:

SEC_{BL}	=	Specific energy consumption per unit output in the baseline (for motor system of group *i* as calculated using paragraph 38 below. A group is a collection of motor system sharing similar sizes, functions, schedules, outputs or loads (MWh/Nm^3 compressed air)

$Q_{PJ,i,y}$	=	Total quantity of output monitored in project year *y* in group *i* in units of weight or volume (kg or m3)

38. The average specific energy consumption is calculated as follows:

$$SEC_{BL} = \left(\sum EC_{BL,i}\right) \div Q_{Hy}$$ Equation (13)

Where:

$EC_{BL,i}$	=	Average annual baseline electricity consumption of motor system of group *i* (MWh)
Q_{Hy}	=	Average annual quantity of output in baseline in units of weight or volume, kg or m^3

The calculation of SEC_{BL} is based on data recorded at a fixed interval over a period of at least 12 continuous months. Examples of the recording interval are hourly, daily. SEC_{BL}values must be reported with 10 per cent or higher precision at the 90 per cent confidence level.

39. In the event that project output in year *y* is greater than the average historical output[5] the value of the output in year *y* is capped at the value of the historical average output level. For example, if $Q'_{PJ,i,y}$ is the total amount of product produced by the project element process in year *y* (uncapped), then $Q'_{PJ,i,y} = Q_{PJ,i,y}$ for $Q_{PJ,i,y} < Q_{Hy}$, and $Q_{PJ,i,y} = Q_{Hy}$ for $Q_{PJ,i,y} > Q_{Hy}$.

40. **Option 3:** In the specific case of the project activity that involves only the introduction of VSDs/VFDs in existing motor system i.e., all other components/process output of the existing system continue remains the same, the following procedure is used to determine the baseline energy consumption:

    (a) Directly measure the electricity consumption during the project year *y* with VSD/VFD turned off for the period sufficient to capture the entire operating conditions i.e. it covers a time sufficient period to capture the range of the independent variables expected to be, or actually, encountered during the crediting period.

1.3.4. Project emissions

41. The project electricity consumptions (including electricity consumed by VSD devices) can be determined using one of the following options corresponding to the options selected under baseline calculations.

42. **Option 1** and **Option 2**: The project electricity consumption will be determined using direct measurement of electricity consumption.

43. **Option 3:** Directly measure the energy consumption with VSD turned ON for the period sufficient to capture the entire operating conditions i.e. it covers a time sufficient period to capture the range of the independent variables expected to be, or actually, encountered during the crediting period.

[5] A maximum of ±10 per cent variation is permitted.

1.3.5. Measurement of operating hours during the project

44. Operating hours of project motors are continuously measured.

45. Where many motors with similar operating patterns are being replaced, operating hours can be determined based on sampling following the “Standard for sampling and surveys for CDM project activities and programme of activities”. Examples of such motor groupings are supply fan motors, exhaust fan motors, and boiler circulating pump motors. Each group type should have similar use patterns and comparable average operating hours. These aspects shall be demonstrated in the PDD.

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Document information

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