CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY: BASELINE (CDM-NMB)
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CONTENTS

SECTION A. Identification of methodology

A.1. Proposed methodology title:

>> Fuel switching from naphtha to natural gas in power plant project without extension of capacity and lifetime of the facility.

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

>> The project activity is considered under Sectoral Scope 1 (Energy industries (renewable - / non-renewable sources) as per CDM-ACCR-06.

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

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- The local regulations/ programs do not constrain the facility from using higher GHG intensive fuels like coal or any other fuel and fuel switching is purely voluntary activity;
- This methodology is applicable to a project activity where a switch from one fuel to another involves additional capital investments and the risk the fuel price variability
- The facility would not have major efficiency improvements during the crediting period or any integrated process changes except whatever is required for the fuel switch; and
- The project activity does not increase the capacity of final outputs and lifetime of the existing facility during the crediting period (i.e. this methodology is applicable up to the end of the lifetime of existing facility if shorter than crediting period).

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

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Potential Strengths

1. Data Level- all project data will be from actual verifiable site project records, that is easy to obtain, cost effective to use and reliable.
2. Transparency – due to the nature of data source, the emission reduction calculation is transparent.
3. Replicability – due to simple nature of the emission reduction processes involved, the replicability of the methodology to various situations in a country or region is high.

Potential Weakness

1. Project non-viability – Project non-viability – the methodology does not consider the economic costs to assess continued viability of the project activity if the cost of natural gas rises to prohibitive levels in the future.

SECTION B. Overall summary description:

>> For generation of electricity, several types of fuels with varying degrees of GHG intensity could be used. In this methodology, a power plant has been considered where the project proponent has chosen to replace a higher GHG intensive fuel (naphtha) with a lower GHG intensive fuel (natural gas).

The project activity involves development, design, engineering, procurement, financing, construction, ownership, operation and maintenance of appropriate facilities to switch from naphtha to natural gas as primary fuel including laying of appropriate gas pipelines and appurtenances, and modifications in turbine, as necessary.

The project activity results in replacement of one fuel with another, and hence, the baseline involves emissions due to combustion of naphtha. In order to calculate the baseline emissions, the following procedure should be adopted:

Step 1. Calculate the total load hours that the power project was operational based on average plant load factor.

Step 2. Calculate average annual electricity produced based on the above plant load factor and installed capacity of power plant.

Step 3. Calculate the annual heat energy consumed from combustion of naphtha based on total load hours (step 1) and hourly naphtha consumption rate.

Step 4. Calculate the annual carbon dioxide emissions from naphtha based on the annual heat energy consumed (step 3) and emission factor for naphtha (IPCC default value is adopted, since in most cases specific power plant emission factors are not expected to be available).

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

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C.1. General baseline approach:

- **Existing actual or historical emissions, as applicable;**
- Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;
- The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

C.2. Justification of why the approach chosen in 3.1 above is considered the most appropriate:

>> We follow elimination process to arrive at suitable approach.

The approach- *the average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category*- is not applicable as such project activities may be limited in number and availability of data in public domain is doubtful.

The approach- *Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment*- is not suitable because, in the countries where such CDM activities are likely to be undertaken, the data in public domain to establish economically attractive course of action may not be available and also baseline will be less objective and transparent.

The **'existing and historical emissions, as applicable'** at an operating power plant where the fuel switch will take place – is suitable. The data availability and objectivity of baseline establishment will be high. However, elements of second and third approach could be brought in to establish the applicability

(A.3) and additionality (D.3) . The project will continue to generate and deliver the same quantum of electricity with the new fuel and will thus not impact the grid to which it is connected.

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

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

>> In the absence of the project activity, the following two cases may occur:

- power plant continues to generate power using naphtha, and
- power plant switches to a cheaper fuel and more GHG intensive fuel like coal.

In either of the two cases mentioned above, more GHG emissions are expected than in the case of the project activity. However, the second case involves a change in technology requiring additional funds, and hence the first case (continuing use of naphtha) would be the most reasonable baseline scenario (since no changes or additional costs will be incurred).

In such a baseline scenario, a power plant is expected to continue generating electricity at its average baseline rate and plant load factor over the crediting period. Since, no additional power will be generated by switching to a new fuel (i.e., natural gas) and no efficiency improvements are expected or planned due to such fuel switching, no additional power will be available to supply elsewhere. Hence, the project activity will not have any impact on power generation elsewhere outside the current project boundary. As such, the baseline scenario involves only replacement of one fuel with another.

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

>> In developing the proposed methodology, option 48(a) of modalities and procedures for a clean development mechanism has been chosen, that details applicability of **existing actual and historical emissions option** for CDM projects. The methodology follows a similar approach to an approved methodology (AM0008) called "Industrial fuel switching from coal and petroleum fuels to natural gas without extension of capacity and lifetime of the facility".

However, the proposed new methodology is different than the approved methodology mentioned above (AM0008) based on the individual scope of their applications. In the proposed methodology, the switchover to a new fuel involves additional capital investments and risk of fuel price variability while in the approved methodology, use of existing fuels (coal and/or petroleum fuels) is clearly less expensive (at the time of project activity) than use of the new fuel (natural gas).

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

>> Within the scope of the proposed methodology, additionality could be demonstrated by using CDM Meth panel guidelines[1], through the following steps:

[1] As per "Draft consolidated tools for demonstration of additionality". The validity of the proposed methodology is subject to approval of the 'draft additionality tool' in its present form or in any revised form.

Step 0 Preliminary screening of projects started after 1 January 2000 and before 31 December 2005.

If the project has been initiated within the period mentioned above, evidence should be publicly provided that the CDM incentive was seriously considered in the decision to proceed with the project activity. Such evidence should be based on (preferably official) documentation showing that the CDM incentive played a role in the decision-making process. If such evidence is not available then the project is not additional.

Step 1 Demonstrating that the project activity is not mandated under current laws and regulations.

The project activity needs to demonstrate that use of higher or lower GHG intensive fuels is not mandated under current laws/ regulations and the project activity is not the only option permitted by the regulations/ laws. In case the project activity is the only option mandated by the law/ regulations then the project is not additional.

Step 2 Identification of alternatives to project activity consistent with current laws and regulations.

Identify alternatives to the project activity that the laws/ regulations permit, then proceed to step 3.

Step 3 Investment Analysis.

An investment comparison analysis using a financial indicator (such as IRR, NPV, cost benefit ratio, levelized cost of electricity generation or Rs./kWh values) can be applied to check whether there is at least one identified alternative that is better for investment than the project activity.

If yes, proceed to Step 5 or else Step 4.

Step 4 Barrier Analysis

- ✓ ***Investment-*** the project activity may involve additional and significant investments for switchover to a new fuel and altered technology;
- ✓ ***Technological-*** the technology for switchover may be new to a country scenario;
- ✓ ***Prevalence-*** the project activity may not be widely practiced in a country scenario; and
- ✓ ***Other Barriers-*** there could be unavailability of adequate common infrastructure for transportation of natural gas to a project location.

The above barriers may prevent the project sponsor from undertaking the project activity if there is no sufficient incentive for overcoming these barriers.

If the project activity has to cross one or many of the above barriers, then proceed to step 5.

If the project activity does not meet the criteria in steps 3 and 4, then the project is not additional.

Step 5 Common Practice Analysis

It needs to be checked that in the country or region where the project activity is located, not many similar fuel shift projects constituting fives times the power generation proposed by the project activity have taken place in the recent three years.

If the project activity is a common practice, then it is not additional. Otherwise proceed to step 6.

Step 6 Impact of CDM Registration

The CDM registration could encourage other power plants using naphtha or coal in the country or region to switchover to natural gas using the benefits of the CDM revenue. If yes, the project is additional.

Based on the above analysis, it needs to be demonstrated that the project activity is not a baseline scenario and thus is additional.

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

>> Any restrictions on use of particular types of fuel in power generation as per the national or sectoral policies would determine the applicability of the methodology, including the environmental impacts due to use of such fuel.

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

>> The project boundary includes the following:

- all physical facilities constructed/ erected on account of the project activity;
- all physical facilities and geographical areas of relevance to the project activity and under the management control of the Project Partners/ Sponsors;
- at least major activities and facilities one step upstream and one step down stream of the facilities set up as part of the project activity, if these are under control of the Project Partners/ Sponsors;
- all direct on-site emissions related to the project activity and linked to generation of electricity; and
- direct off-site emissions where feasible or may be treated appropriately under leakages, involving emissions upstream and downstream of the project, which are directly influenced by the project activity.

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

>> The baseline scenario for the project, which is eligible to use this methodology, is that the current fuel (naphtha) is continued to be used in the existing facility at least up to the end of the crediting period without any retrofit, which extends its capacity or lifetime, or improve its fuel efficiency.

The annual baseline emissions *BEy* (tonne of CO_2 equivalents during a year *y*) is expressed as:

BEy = (Qn * GCVnb * EFn_IPCC) * (4.18 / 1000)……………………….(1)

where:

Qn,	=	Historical annual consumption of naphtha (e.g., Tonnes)
GCVnb	=	Gross Calorific Value of naphtha in the baseline scenario (e.g., Kcals/Kg)
EFn_IPCC	=	IPCC default emission factor for naphtha (e.g., Ktonnes CO_2 /Tj)

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

>> The annual project emissions *PE(ng)y* (tonne of CO_2 equivalents during a year *y*) due to use of natural gas is calculated through a similar procedure as used for baseline emission calculations:

PE(ng)y = (Qg * GCVg * EFg_IPCC) * (4.18 / 1000)……………………….(2)

where, the factors used are analogous to those used for baseline emission calc ulations:

Qg,	=	Actual annual consumption of natural gas (e.g., SCM)
GCVg	=	Gross Calorific Value of natural gas during project scenario (e.g., Kcals/SCM)
PLFp	=	Plant Load Factor (actual annual data in %)
EFg_IPCC	=	IPCC default emission factor for natural gas (e.g., Ktonnes CO_2 /Tj)

If in any project, a partial substitution occurs for initial few years of switched-over operation (i.e., both naphtha and natural gas are used), then the total project emissions will also include emissions due to use of naphtha, based on equation (1) mentioned earlier. In that case, the project emission contribution from naphtha can be calculated based on the following analogous equation to (1) as:

PE(n)y = (Qy * GCVn * PLFp * EFn_IPCC) * (4.18 / 1000)……………………….(3)

where:

Qy,	=	Actual annual consumption of naphtha (e.g., Tonnes).
GCVnb	=	Gross Calorific Value of naphtha during project (e.g., Kcals/Kg)

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

>> The baseline scenario involves transportation of naphtha through tankers that would result in related emissions. During the project activity, natural gas would be transported through pipeline and hence fugitive emissions will be negligible. Thus, to be conservative in emission calculations, leakage emissions have been assumed to be zero.

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

>> The annual emission reductions will calculated using equations (1), (2) and (3), as applicable:

ERy = *BEy - PE(ng)$_y$ - PE(n)y*……………………….(4)

SECTION E. Data sources and assumptions:

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

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- natural gas is adequately available for power generation in a country or regional scenario;

- during the project activity, natural gas would be transported through pipeline, and fugitive emissions will be negligible as compared to the baseline/ project emissions;

- IPCC default emission factor for naphtha and natural gas is applicable to a country situation where the project would occur; and

- there are no additional economic benefits on account of the project activity.

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

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Key Parameters	**Data Sources**
Historical annual consumption of naphtha	Past records maintained at the power plant where the project activity takes place.
Gross Calorific Value of naphtha	Past records maintained at the power plant where the project activity takes place.
Plant Load Factor	Past records maintained at the power plant where the project activity takes place.
Emission factors for naphtha and natural gas	IPCC provided default values.
Annual consumption of natural gas	Annual records to be maintained at the power plant.
Gross Calorific Value of natural gas	Annual records to be maintained at the power plant.

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

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- All data pertaining to use of naphtha will be of 3 years vintage, unless existing power plant is of a lesser vintage; and

- all data due to use of natural gas will be 1 year old and pertain to previous years recorded values.

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

>> The data required for the application of the proposed methodology will have the following spatial levels:

Local:	• Data for power generation using naphtha or natural gas will be local data generated at the power plant considered under the project activity.
Global	• IPCC Emission Factors for naphtha and natural gas.

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

>> One or more of the following uncertainties could be associated to the project activity, wherever applicable, and need to be assessed and addressed adequately in the project design document (PDD) while performing the additionality checks:

- ✓ Likely changes in regulations or policies at country level requiring use of any other type of fuel instead of natural gas.

- ✓ Costs of natural gas may rise to prohibitive levels due to increases in the global market making the project activity unviable in the future.

- ✓ Likely change in the supply/ demand situation for natural gas.

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

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Transparency

1. The data to be used for emission reduction calculations will be actual and verifiable data from the power plant records of the project sponsor.

Conservatism

1. The baseline scenario involves transportation of naphtha through tankers that would result in related emissions, while during the project activity, natural gas to be transported through pipeline will have negligible fugitive emissions. Thus, to be conservative in emission calculations, leakage emissions have been assumed to be zero.

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