## Comments and Suggestions for Improvement for

## ACM0013: Consolidated baseline and monitoring methodology for new grid connected fossil fuel fired power plants using a less GHG intensive technology

Submitted by CDM Watch

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**COMMENT:**

This request aims to address a methodological shortcoming in the current version of ACM0013. The methodology uses as baseline emission factor the lower value between a) the identified baseline technology and b) an emissions benchmark determined based on a defined set of power plants. **In contrast to other methodologies, ACM0013 does not account for the vintage of data used to establish the emissions benchmark. The request addresses this issue by adjusting the baseline efficiency used for the time vintage between the period considered for establishing the benchmark and the start of commercial operation of the project plant. The adjustment is based on the autonomous technological improvements observed in the sector.**

### Vintage of data used in ACM0013

Option B in the methodology ACM0013 compares the performance of a proposed CDM project with an emissions benchmark. In practice the data vintage between the CDM project plant and the reference plants used to establish the emissions benchmark can be considerable, for the following reasons:

1) CDM projects using the methodology ACM0013 typically have a lead time of two to four years between the decision on the technology to be employed (which is the start of the project activity given that the CDM project activity is the use of a more efficient technology) and the commissioning of the plant.
2) The emissions benchmark is established based on power plants “that have been constructed in the previous five years”. It is not fully clear how this provision should be interpreted. It could include power plants that a) started commercial operation during this time period or b) that started and completed construction during this period. **In practice, project developers appear to have so far interpreted this provision as plants that started commercial operation within the last five years, meaning that this includes power plants for which the investment decision on the technology was taken up to nine years previously.**
3) The current version of the methodology also contains a provision which requires that the plants considered for the emissions benchmark should have operated for a full year during the last year of the five year period. **In practice, this restricts the calculation of the benchmark to plants that started commercial operation in the first four**

**years within the five year reference period, and excludes plants that only started commercial operation in the fifth year of the reference period.**

4) Data on the actual fuel consumption of power plants only becomes available after the end of the reference year. **In practice, the delay in data availability may be anywhere from several months up to 2 years in some cases.**

The overall effect of these provisions on the vintage of data used to establish the benchmark is illustrated in the following hypothetical example:

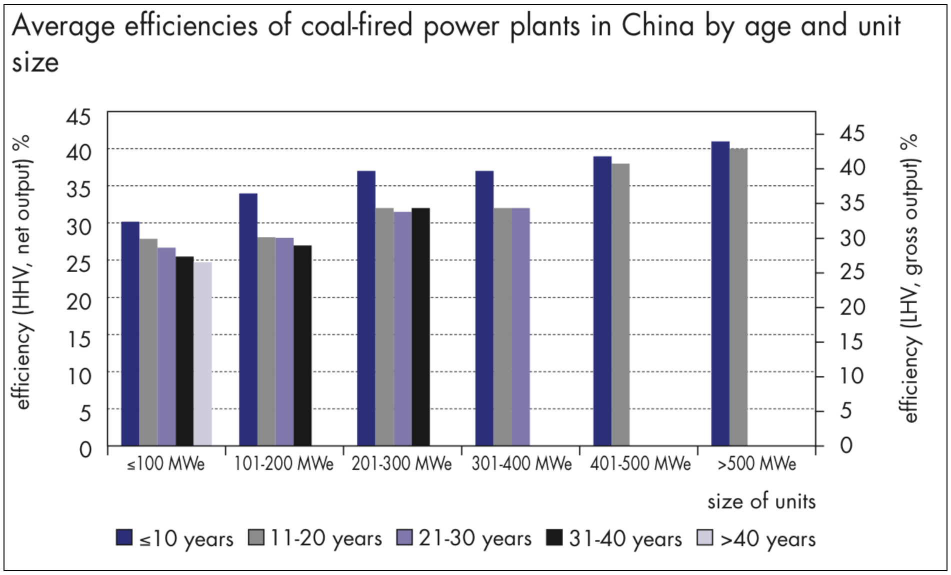
- Start of commercial operation of the CDM project: 2013
- Decision on the technology employed by the CDM project and request for registration: 2010
- Five-year period for which data is available: 2004 – 2008
- Start of commercial operation of plants used for the benchmark: 2004 – 2007
- Decision on the technology employed by the plants used for the benchmark: 2001 - 2004

This shows that the typical data vintage between the CDM project and the reference power plants used to establish the emissions benchmark is 6 to 9 years.

## Technological innovation in the sector

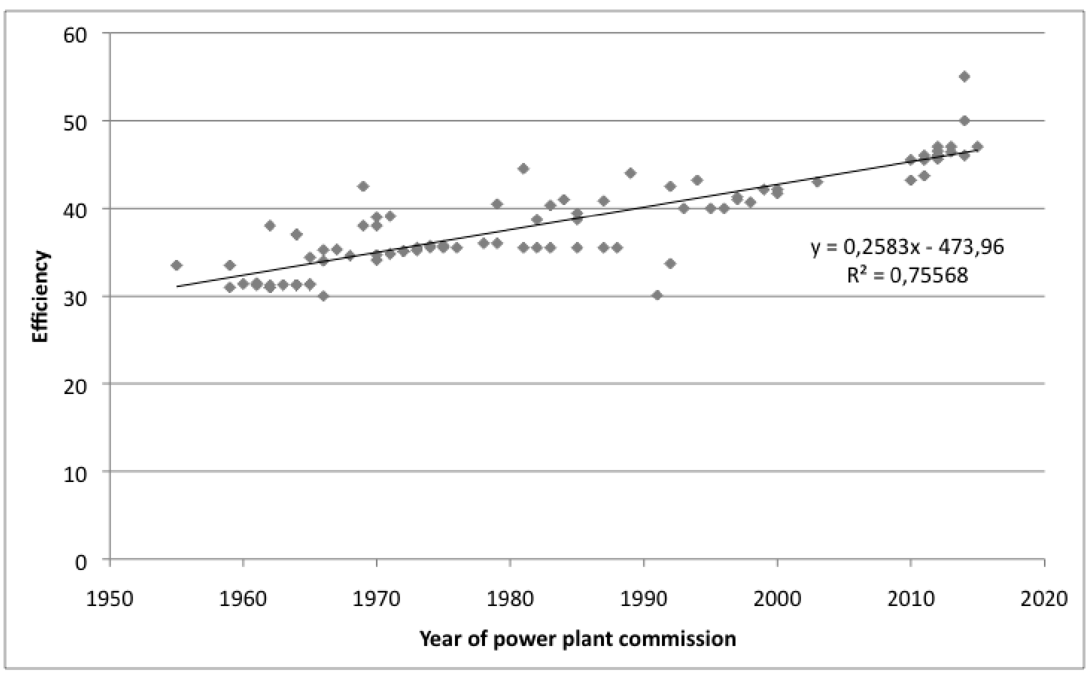
Over the past decades, the efficiency of new fossil fuel fired power plants has improved considerably. Similarly, energy forecasts also assume that the efficiency of new power plants will continue to improve, due to the development of new materials allowing for higher pressures and temperatures in steam and gas turbines but also due to new processes, such as the gasification of coal (see, for example, IEA 2008a and van den Broek et al. 2009). Historical data on power plant efficiency improvements is summarized below:

- The figure below from IEA (2008b, page 51) illustrates the efficiency improvements achieved in coal fired power plants in China. The figure shows that power plants between 100 and 400 MW, constructed in the last 10 years are 5-6% more efficient than power plants constructed in the ten years previously. This results in efficiency gains of 0.5% to 0.6% per year for power plants built in the most recent decade. The figure also shows that the improvements vary with the size of power plants and over time.




- The IEA (2005, page 18) reports that "under ideal conditions, modern coal-fired power plants are capable of achieving efficiency levels of more than 40% on a higher heating value basis. This is about a 30% improvement on plants built in the 1950s and 1960s." This corresponds to an average annual efficiency improvement of about 0.23% (assuming that the efficiency improved by 30% to a level of 40% over a period of 40 years).

- The figure below illustrates the efficiency of newly constructed coal power plants in Germany (Oeko-Institut 2010). A regression analysis shows that efficiency gains were 0.26% per year over a period of about 50 years. This is largely in line with the estimate in IEA (2005) for industrialised countries.



- Van den Broek et al. (2009) systematically derived technology learning curves for different fossil fuel power technologies, by applying and extending a model developed at Carnegie Mellon University. The results for the technologies without $CO_2$ capture and storage are illustrated in the table below and an annual average improvement of power plant efficiency is derived from this data.

| Technology | Efficiency (%) | | | Derived annual average improvement (%) | |
|---|---|---|---|---|---|
| | 2001 | 2010 | 2020 | 2001 - 2009 | 2010 - 2020 |
| Natural gas combined cycle | 56 | 61 | 63 | 0,56 | 0,20 |
| Pulverized coal | 45 | 47 | 49 | 0,22 | 0,20 |
| Integrated gasification combined cycle | 39 | 42 | 47 | 0,33 | 0,50 |

The sources quoted above suggest that the historical average annual efficiency gains depend on a number of factors, such as the technology, the country, the fuel type and the time period considered. However, they are in all cases significant and range between about 0.2% and 0.6% per year.

References

IEA (2005): Reducing Greenhouse Gas Emissions. The Potential of Coal
IEA (2008a): Energy Technology Perspectives
IEA (2008b): Cleaner Coal in China
Oeko-Institut (2010): Database on German power plants
Van den Broek, Hoefnagels, Rubin, Turmenburg, Faaij (2009): Effects of technological learning on future cost and performance of power plants with CO2 capture. In: Progress in Energy and combustion Science 35 (2009) 457-480

**PROPOSAL:**

We proposed that the methodology be revised, introducing an adjustment to the baseline efficiency used to determine the emissions benchmark. This would account for autonomous technical improvement that likely occurred in the time between the investment decisions made for the reference plants used for the calculation of the benchmark and the investment decision made for the proposed project activity. This would furthermore be consistent with other methodologies that use an emissions benchmark to determine baseline emissions, such as AM0070 and the proposed new methodology NM0302.

**Revisions are illustrated in the draft revised methodology attached to this comment**. (Note that the blue marks correspond to changes recommended in a proposed revision recommended by the Methodologies Panel at its 45th meeting which had not yet been approved by the CDM Executive Board at the time of submitting this request. The yellow marks correspond to the changes proposed in the context of this request.)

In the context of ACM0013, the adjustment of the baseline efficiency for the vintage of data is important for two reasons:

- ACM0013 allows claiming emission reductions based on relatively small differences in efficiency between the project plant and the baseline emissions benchmark. Ignoring the data vintage and the autonomous technical improvement that have occurred during the considered time period can have a considerable effect and undermine the integrity of the methodology. This is also important in the light of the large size of some new plants and the potential volume of electricity generated by projects.
- The data vintage between the CDM project and the reference power plants used to establish the benchmark is considerable with typically 6 to 9 years.

By determining the baseline emissions benchmark based on the top 15% performers, the methodology aims to reward the top performing plants for using a more efficient technology. However, because data vintage and autonomous technical improvement are not taken into account, most new BAU fossil fuel fired power plants can potentially qualify for emission reductions, as the emissions benchmark is based on plants that were commissioned 6 to 9 years earlier than the project plant. Such a dated emissions benchmark might in some cases not even reflect the efficiency of common state-of-the-art power plants and is not conservative, as required by the modalities and procedures for the CDM.

Our proposed revision amends the equation for calculation of the baseline emissions intensity in option 2 by adjusting the efficiency. The efficiency adjustment is based on the average annual efficiency improvements of new plants that are commonly observed in the sector and the actual data vintage faced by the proposed project activity.

The project proponents would still have two options for determining the annual efficiency improvements: they can either use historical data in the host country or the applicable geographical area or they can use a default value. This approach, including the two options, is based on the approved methodology AM0070.

As in AM0070, the proposed methodology requires historical data from a ten year period to be used to derive the autonomous efficiency improvements. Shorter periods may be less representative to capture a longer term trend; longer periods may not capture well more recent trends. While AM0070 uses only two single years - the most recent year and the year which is 10 years earlier – the current proposal is based on a regression analysis. The regression analysis is based on the efficiencies of all power plants commissioned in the ten year period and not only on the efficiencies of power plants commissioned in the first and last year of the period. This increases the sample size. If only two years were used, this could include very few plants which might not be representative.

The possibility to use a reasonably conservative default value, also based on AM0070, ensures that this new provision does not limit the applicability of the methodology if the relevant historical data is not available. The default value of 0.5% is derived based on the sources quoted above and represents for most technologies and countries a conservative value.

**The details of the proposal are contained in the draft revised methodology submitted along with this request.**

We also propose a few editorial changes to the methodology:

- It clarifies that the power plants included in the sample for the benchmark should include power plants that started commercial operation within the relevant period (it was previously unclear what was meant by the assertion that they were “constructed” in this period).
- It clarifies that the period in practice only comprises four years and not five years, as the methodology requires that one year of operation data should be available in the fifth year.
- For some parameters, the sub-index v for the reference year were added, as they were missing.