Update of the Guidance Document of the Gothenburg Protocol with information on Black Carbon

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Mandate of the Working Group of Strategies and Review

Report of the WGSR on its 49 th session from 12 to 16 September 2011

III c "Requested the Expert Group on Techno-economic Issues to consider the available information on black carbon emission source categories and abatement measures contained in the report of Expert Group on Black Carbon (informal document No. 4 for the twenty-eighth session of the Executive Body) and other reports and assessments on black carbon ***for inclusion as relevant in the guidance document on best available techniques for stationary sources for the reduction of particulate matter emissions;***

Report of the Executive Body on its twenty-ninth session
(f) ***Continue to explore further work on black carbon, in cooperation with other technical bodies of the Convention***

Comments received

Chapters of the guidance document updated with information on black carbon reduction techniques sent to the EGTEI experts for comments:

Answers received from:

André PEETERS WEEM, InfoMil / Nl Environment
Anja NOWACK, Umweltbundesamt
David MARSHALl and David MAC CABE, Clean Air Task Force
Paul ZEPF, EUROMOT
Belen BRAVO, EUROFER
Pete ROBERTS, CONCAWE
Vagner MARINGOLO, CEMBUREAU

Role of the guidance document on control techniques for sulphur, NOx, VOCs and dust from stationary sources

The guidance document provides information on control techniques for sulphur, NOx, VOCs and dust from stationary sources (including the solvent content of products)

It is aimed at providing support to Parties to achieve their commitments

The guidance document, although not mandatory, has to follow the provisions of the protocol

Structure of the guidance document on control techniques for sulphur, NOx, VOCs and dust from stationary sources

Developed by EGTEI in 2008/2009, available on the Convention web site

Structure of the guidance document on control techniques for sulphur, NOx, VOCs, dust from stationary sources (including the solvent content of products) based on an activity approach

- Chapter 1: Introduction
- Chapter 2: General issues for the 4 pollutants
- Chapter 3: General issues for sulphur emissions
- Chapter 4: General issues for NOx emissions
- Chapter 5: General issues for VOC emissions
- Chapter 6: General issues for dust
- Chapter 7: Sectoral chapters (42 activities covered) Chapter 7.1 relates to small combustion plants < 1 MWth, Chapter 7.2 relates to combustion plants from 1 to 50 MW...

Update by EGTEI of the following chapters of the guidance document

The guidance document has been completed for the following chapters:

- ✓ Chapter 1 : on definitions, to be coherent with the text of the new Gothenburg Protocol, black carbon definition added, main sources of BC cited
- ✓ Table of pollutants covered per activity
- ✓ Chapter 6: general issues for dust to include Black Carbon
- ✓ Chapters 7.1, 7.2, 7.3: combustion installations from domestic installations (7.1) to large installations
- ✓ Chapters 7.4: refineries with inclusion of information for flares which were not covered previously
- ✓ Chapters 7.6 to 7.9 related to ferrous and non ferrous metal processing
- ✓ Chapters 7.10 to 7.14 related to mineral industry (cement, glass…)

Update by EGTEI of the following chapters of the guidance document

The guidance document has been completed on the following chapters:

- ✓ Chapter 7.15 pulp production
- ✓ Chapter 7.42 new stationary engines

Comments

David MARSHALL (CATF):

BC control options should be discussed in the context of PM2.5, not dust or PM generally. **In general BC is very small, … , and the control techniques for BC overlap more with PM2.5 than the coarser modes which dominate TSP**. Therefore, the phrase "(including black carbon (BC))" should be inserted following "PM2.5"

EGTEI proposal : modify the title and if necessary other parts of the guidance if necessary :

Guidance document on control techniques for emissions of sulphur, NOx, VOCs, dust (including PM2,5 and Black Carbon) from stationary sources

Instead of "dust and black carbon"

Comments
Chapter 1: Introduction

•The control options of black carbon (BC) considered as carbonaceous particulate matter that absorbs light.
•In the context of this Protocol, dust and TSP have the same meaning. As can be seen from chapter 6 abatement techniques for dust in general, provide also a high removal efficiency for PM2.5 and PM10 as well as for BC.

Proposal from David MARSHALL (CATF) which can be accepted
• Not always true, … the 2nd sentence should be replaced with:

"As can be seen from chapter 6, abatement techniques for dust in general also provide high removal efficiency for PM10, **and in some cases, PM2.5**. **However, some measures will reduce coarse particles much more efficiently than finer particles such as PM2.5 and BC; therefore, specific measures targeting PM2.5 and BC are necessary**."

Comments
Chapter 1: Introduction

Proposal from David MARSHALL (CATF):

Emissions from **oil and natural gas production and processing operations (both onshore and offshore) need to be addressed**. These are important emission sources of VOCs, and in the case of flaring, BC.
In addition, emissions from ***existing*** **stationary gas and diesel engines should be addressed,** as they are significant sources of NOx and PM (especially including BC) emissions; 7-42 addresses only new engines.

EGTEI proposal:
Crude oil processing operations are represented by refineries
Suggest to WGSR to add these two chapters in a future update of the guidance:
Oil and gas production
Existing stationary engines

Comments
Chapter 1: Introduction

Proposal from David MARSHALL :
•List BC as a specific example of a pollutant/GHG interaction. Therefore, we suggest adding the following (or something similar) at the end of the paragraph: **'For example, reductions of BC, especially in areas that may impact the Arctic or alpine regions, can reduce climate warming. And measures that improve the efficiency of combustion will generally reduce both BC and CO2.** "

EGTEI proposal:
The role of the guidance document is not to describe pollutants and their effects but to focus of the description of techniques.

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

Besides this size dependent classification, dust is also differentiated according to its origin into primary and secondary dust. According to its source, dust has different chemical compositions. Primary dust is composed of salts (nitrates, sulphates, carbonates...), of elemental carbon (EC), of black carbon (BC), of organic carbon (OC) and trace elements such as heavy metals.

Suggestion of David MARSHALL (CATF):
We suggest dropping references to Elemental Carbon (EC). EC is a term used to describe (in a more specific way) one chemical form of Black Carbon. …. So, we suggest referring only to BC, not EC.

Definition of organic carbon should be provided

Suggestions accepted by EGTEI

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

Contradictory information of OC/BC ratio: …for example, the average OC/BC ratio among global sources of diesel exhaust is approximately **1/1** (page 30)

Comments EUROMOT :
In Euromot's opinion this is not correct. On page 16, of the CIMAC Black Carbon Paper …it reads: "the lowest **organic matter to black carbon ratio** required to produce neutral effect on top-of-atmosphere direct forcing **is 15/1** for any region." Notably, in Figure 4 and 5 of the CIMAC Black Carbon Paper the OC/BC ratio for LFO is lower than for HFO. Additionally, **with HFO, the OC/EC ratios is typically higher than 15**.

Comments David Marshall
The diesel ratio is about 1/4 OC/BC, not 1/1. ….

Information on this issue could be remove due to lack of coherent data

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

Chapters 6.3 to 6.5 describe reduction techniques from fuel switching, fuel cleaning, primary and secondary reduction techniques

Suggestion of David MARSHALL:
Subsections 6.3 through 6.5 **must identify more clearly and directly measures to reduce BC in order to provide parties with the necessary guidance to allow them to prioritize BC reduction measures** in the context of meeting the PM requirements in the Gothenburg Protocol …

Recommendations are addressed to Parties in the Gothenburg Protocol to develop emission BC inventories, first step to prioritize measures.
This msg should be in the main text of the protocol rather than in the guidance document, since it is a policy message rather than a technical info .

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

Table 8 (page 40) provides PM reduction efficiencies according to different size of particles

Suggestion of David Marshall:
Include removal efficiencies for BC, if available, or point out (in a footnote) that because most BC is within the fine or submicron size catories, the removal efficiencies for fine and especially submicron particles can be used as a rough proxy for BC removal efficiencies.

Suggestion accepted

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

Fuel switching : The heavy black smoke emitted by some marine vessels (which burn … "bunker fuel") is evidence of substantial BC emissions. (page 35)

Suggestion of EUROMOT:
"In Euromot's opinion this sentence is incorrect and should be removed. Please refer to the low FSN numbers cited on page 13 of the CIMAC Black Carbon paper. Please note that visible FSN numbers typically range 0.3 and upwards. (http://www.cimac.com/workinggroups/Index1-working-groups-exhaustemission.htm)

Suggestion accepted.

Comments
Chapter 6: general issues for dust (including PM2.5 and BC)

BC emission reduction techniques

Suggestion of André Peeters Weem (INFOMIL): (page 38)
Oxidation can be a useful technique to break down organic matter, including BC. Thermal and catalytic oxidation should be added as technique to control emissions of BC.
Text idea: 'Organic matter like BC can be incinerated. This oxidation takes place in a thermal oxidation step in an off-gas burner, or in a catalytic oxidation installation. The reduction efficiency of these installations is more than 99%.`

Could André provide additional information on this application of oxidation to reduce BC

Comments
Chapter 7.1: combustion installation < 1 MW

Comments from André Peeters WEEM

general remark: has the availability of ceramic filters and ceramic oxicat installations been assessed? Can this be discussed at the EGTEI meeting?

EGTEI proposals:

Check with the report of Thomas NUSSBAUMER on small combustion installations and Gaston THEIS from Switzerland.

Comments
Chapter 7.6: coke oven furnaces

Page 77 rewording by EUROFER

Coke ovens are a significant source of BC in developing countries according to references [4], [5]. It is not the case in western countries.

Monitoring data are very scarce and the emission factor used in GAINS [6] ~~seems~~ are overestimated (0.75 kg BC/t coke produced) compared to dust emissions of ovens equipped with BAT and thus not reliable at this stage of knowledge. Diffuse dust emissions could contain an unknown share of black carbon. ~~Any~~ Mmeasures reducing diffuse dust emissions ~~will~~ could consequently reduce black carbon emissions.

EGTEI proposals:

Not use emission factors (EF) due to too high uncertainty (available EF soon in the guidebook EMEP/EEA)

Suggestions EGTEI : Measures reducing diffuse dust emissions which **can remove PM2,5**, could consequently reduce black carbon emissions

Comments
Chapter 7.7: iron and steel production

Page 79 comments EUROFER

Remove all emission factors

EGTEI proposals:

Not use GAINS data.

Presently the EMEP EEA guidebook if being revised,

There will be information of emissions.

Comments
Chapter 7.42: new stationary engines

DPF (page 243)

Diesel Particulate Filters (DPF) used on heavy duty vehicles and small off road engines are in development for larger stationary engines. For instance, the California Air Resources has identified the DPF as a verified technology for stationary engines.

Comments of André Peeters Weem (NL) and Anja Novack (DE):
Particulate filters are state of the art for medium-sized engines (Anja)

DPF are beyond the development stage. Please replace 'are in development' by **'can also be used on** ' . References: johnson Matthey (http://ect.jmcatalysts.com/emission-control-technologies-stationary-engines), CARB fact sheet:
(http://www.arb.ca.gov/diesel/verdev/vt/stationary.htm),Hug engineering (http://www.hug-eng.ch/en-mobiclean-r.html).

Comments
Chapter 7.42: new stationary engines

Comments of Paul Zeft – EUROMOT (DE):
EUROMOT recommends adding a new section for clarification:

"Particulate traps are used in many diesel cars and trucks running on clean diesel fuel for filtering off particulates/soot . The trap has to regenerate on a regular basis, i.e. the trapped soot must be burnt out. Precious metal catalyst are often used for regeneration. Oxidation catalysts are sometimes used on diesels equipped with EGR for oxidation of CO, HC and Soot. **Both systems are based on precious metal catalysts – fast deactivation and clogging would occur with marine and power plant fuel qualities. Particulate traps are therefore not suitable for bigger stationary engines**"

Comments
Chapter 7.42: new stationary engines

Dust concentration of new stationary engines (page 243)

Dust concentrations lower than 50 mg/Nm3 at 15 % O2 can be achieved with heavy fuel oil with S concentrations lower than 0.5 %, ash concentration lower than 0.01 to 0.02 %, asphaltene content lower than 6%. With heavy fuel oil of low quality (higher sulphur content…), concentrations lower than 75 mg/Nm3 at 15 % O2 can be achieved.

Comments of Paul Zeft – EUROMOT (DE):
"Dust concentrations (**85 to 100 % of MCR engine load, measurement method ISO 9096 or principally similar other measurement method**) lower than 50 mg/Nm3 at 15 % O2 (after engine) can be achieved with heavy fuel oil with S concentrations lower than 1.0 wt-%, ash concentration lower than 0.03 to 0.04 wt-%, and asphalthene content lower than 8 wt-%. With heavy fuel oil of lower quality (higher sulphur, ash, and asphalthene contents) concentrations lower than **75 to 100 mg/Nm3 at 15 % O2** can typically be achieved depending on used heavy fuel oil properties (Note above stated engine loading range and PM measurement method). See also table 6.47 at page 405 of EU LCP BREF."

Working plan

Revision of the guidance document according to comments received

Dead line for inclusion of comments by the technical secretariat:

18 June

Last controls by experts for the 25 June

Guidance document to be sent to the WGSR before end of June