

## EGTEI methodology: Update of costs for LCP

### Draft Minutes of second meeting held at CITEPA on 31 January 2012

Participants:

<b>Name</b>	<b>Organisation</b>	<b>Country</b>
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Ivan JANKOV	EIPPCB	EC
François-Xavier DUSSART	GE	FR
Florian BOEGER	EU turbines	BE

**Excused:** Emmanuel FIANI (ADEME, FR), Pete ROBERTS (CONCAWE, BE), Andreas WECKER (VGB, DE), Staffan ASPLIND (Naturvardsverket, SV), Jean-Guy BARTAIRE (EDF, FR, EGTEI co chairman), Tiziano PIGNATELLI (ENEA, EGTEI co chairman, IT), Roger BRANDWOOD (EON, UK), Daniel LADANG (TOTAL, BE), Heimo FRIEDE (Siemens, DE)

**Diffusion:** As above + persons following the work or who will join the sub group later:

Manuella MUSELLA (European Commission), Kristina PANEK-GONDEK (European Commission), Evelien DILS (VITO, BE), Frans VAN AART (KEMA, NL)

### **Background**

On its 47th Session the Working Group on Strategies and Review (WGSR) of the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP) decided a draft 2011 work plan for the implementation of the Convention. Under “1.7 Techno-Economic Issues” item g) this work plan mandated the Expert Group on Techno-Economic Issues (EGTEI) to: Continue to update its methodology for LCPs.

### **Objectives and scope of the meeting**

The objectives of the meeting were to examine the first proposals made by the secretariat CITEPA and KIT, respectively for SO<sub>2</sub> / PM (CITEPA) and NO<sub>x</sub> (KIT). Representative of EU turbines attended the meeting for the first time. They presented the organisation and work of EU turbines.

Informal discussions on the issue of BREFs were also possible, with the presence of Ivan Jankov from the EIPPC Bureau, in charge of the redaction of the BREF of LCPS with Thierry Lecomte.

A series of topics for discussion were prepared by the secretariat and discussed during the meeting in order to progress in the estimations of costs (slides joined to these minutes).

Comments from KEMA were received too late to be presented at the meeting.

Very rapidly, information was provided by N. Allemand on the last progress in the negotiations of the Gothenburg Protocol, occurred during the Executive Body (EB) meeting of December 2011. An exceptional EB meeting is organised in May 2012 instead of a session of the Working Group of Strategy and Review, in order to finalise the negotiations.

On the EU side, the revision of the National Emission Ceiling and Air Quality Directives is in progress. IIASA has been mandated to run the GAINS model and to provide estimations of emissions in 2020 and 2030 according to different ambition levels. Bilateral discussions will be organised to enable Member States to discuss hypothesis with IIASA and provide information. The PRIMES scenario 2010 should be used. The first version of the Baseline results is expected by mid February. The finalised baseline should be available by the end of the year.

### **Presentation of EU turbines**

The slides of EU turbines are provided with the minutes. EU turbines is engaged in the BREF revision process and is willing to deliver information in due time for that. For the document “Emerging techniques” prepared by Simon Schulte from KIT, EU turbines had questions on the possibility to address information for the process, in what conditions and when. The report is being finalized. EU turbines comments relate on chapters 5.3; 5.4 and 7.1. Those questions and how to provide data have been further discussed with KIT. The presence of EU turbines is well appreciated, as gas turbines will be covered by the study.

### **Comments on item discussed during the meeting**

#### ***Specific comments on slides***

##### ***Slide 8:***

##### **Retrofit factor:**

The retrofit factor depends on space available, deconstruction work, pipes to be erected... It can be very different from plant to plant.

This factor is a variable in the cost methodology which can be modified to have a range of data.

##### ***Slide 10: fuels considered.***

Some low calorific values have to be checked for natural gas. The sulphur content of wood is very low but not zero. It is recommended to use a percentage, even low. Brown coal may have very different sulphur content.

Not only heavy fuel oil (to be noted HF) but also Medium distillates have to be considered (MD) as smaller plants are included in the survey.

##### ***Slide 11: dry waste gas flow rate per unit of energy.***

It could be important to include the latest figures of dry waste gas flow rate per unit of energy at O<sub>2</sub> reference conditions from the EU standard in elaboration. The data presented by EGTEI for boilers with solid fuels, liquid fuels and gaseous fuels are however correct. The dry waste gas flow rate has to be completed for wood. For gas turbines, the figures have to be checked by EU Turbines or are perhaps available in the document cited above.

##### ***Slide 12: real condition waste gas flow rate per unit of energy.***

These parameters can be useful for calculation. Specify if the temperature considered is after the economiser or not.

**Slide 13: chemical engineering plant cost index.**

This factor is used to express costs in € for a past year in € 2011 which will be used in the work on LCP. It has been noted that, when cost data are provided in the literature, they are often expressed in € /MWe. EGTEI uses the MWth. The efficiency is not often provided. In order to solve the problem, average efficiencies can be considered depending on the year considered and fuels (existing plants: 35 % to 41 % for hard coal, 35 % for HF; new plants: 44 % for hard coal). Ivan Jankov is reluctant to use such data due to potential problems due to inconsistency. It is recommended to only take into account recent literature (after 2000) data for investments as the learning process can reduce costs.

**Slide 17 to 20: inclusion of biomass.**

It was proposed to consider co-combustion of biomass with hard coal at rates of 5, 10 and 20 %. The EGTEI report on emerging techniques in installations from 50 to 500 MWth, announces proportions of biomass up to 35 %. EGTEI could consequently also consider this proportion of biomass. Obtaining relevant monitoring data would be useful both for NO<sub>x</sub> and PM. Sweden runs plants using 100 % biomass which are quite large. Questions on NO<sub>x</sub> emissions are numerous due to possible impact of biomass on catalyst life time, reduction of temperature of combustion and lower exhaust temperature.

Information will have to be collected.

**Slide 20: SO<sub>2</sub> reduction techniques to be considered.**

A study from the coal research centre provides information on the number of LFSO and LNSO retrofitted which can be used to decide if LNSO has to be considered by the study. The choice of the technique can depend on the operation time and the load.

Wet gas desulphurisation with lime is too expensive and will not to be considered in the study. Dry injection with hydrated lime or magnesium carbonate is quite simple and can be used for smaller plants depending on the operating time. For smaller plants, FGD DSI (dry sorbent injection) and FGD SDS (spray dryer) are defined as BAT in the BREF LCPs. They should be considered by the study.

**Slide 23: costs encountered in the literature.**

Costs per MWth are not systematically higher for smaller plant according to Ivan Jankov. To avoid impact of learning curve, only considered recent investments (after 2000).

**Slides 25/26: limestone demand.**

There are several ways to express this demand. There is a risk of confusion according to the fact that inlet or outlet SO<sub>2</sub> concentrations can be considered.

When data will be required in the questionnaire, specify the way to express the answers.

**Slide 26: limestone costs.**

The limestone cost in several countries will be collected with the questionnaire. Other reagents will also be considered.

**Slide 28: water consumption.**

If possible, the consumption should consider the humidity of the waste gases (Ivan Jankov could provide information for the calculation).

**Slide 29: byproducts.**

A correction has to be done in the formula for LSFO to take into account the fact that gypsum is hydrated.

Price of gypsum sold depends on its characteristics. It can be sold if it contains at least 95 % of gypsum, less than 5 % of SO<sub>3</sub>, less than 5 ppm of mercury and has no colour. In France this price is approximately 2 €/t for dry gypsum, with a residual humidity of 10 %

The questionnaire will ask this information for different countries.

If it is landfilled, rules can be different from country to country. Cost of landfilling will be collected.

**Slide 30: electricity cost.**

Electricity consumption is divided in two parts. Electricity for fans to overcome the pressure drop and electricity for circulation of water and sorbents, also the mist eliminator. Installed capacity power of all these equipment to be collected.

**Slides 31: wages.**

The number of operators is quite large. It depends on the level of automation.

To be collected through the questionnaire.

**Slide 34: deNOx equipment.**

FGR could be considered.

SNCR is used in USA for some large installations but also for small plants in Europe.

**Slide 35 and 36: suggested emission levels for NOx.**

NOx levels have to be checked with the questionnaire.

**Slide 37: benchmark for SCR on coal power plants.**

SCR efficiency for very new plants is about 92 %, but default values from 85 to 90 %.

Regeneration of catalyst: according to the yearly operation time. 40 to 50 % of the catalyst regenerated in three years.

For biomass, there is a lack of information which requires having questions on this subject in the questionnaire to be developed.

**Slides 39 to 41: next step for NOx.**

Inlet concentrations will be collected through the questionnaire.

For electricity consumption: use the pressure drop instead of an average gross electrical output. Validate the catalyst regeneration frequency (according to Nicolas Caraman, the regeneration frequency is larger than suggested and depends on the ratio SO<sub>2</sub>/SO<sub>3</sub>).

Average data are for large installation. Parameters for smaller plants have to be validated.

For gas turbines, EU turbines could suggest parameters.

***slide 43: deduster***

For oil, ESPs have to be larger than for coal, as the velocity has to be lower. The number of fields depends on the type of coals, sulphur content and ash content. ESPs with 5 or 6 fields need place which cannot be available in all cases.

Bags: lifetime between 4 and 6 years with standard material and 125 °C (a presentation of VGB will be provided).

Ash disposal: ash disposal prohibited. It is provided for the cement industry in France. The cost of the ash sold to the cement industry is about 6 €/t in France (information EDF to be validated)

Number of operators to be questioned.

***Slides 47 and 48: collection of investments.***

The EGTEI secretariat will develop a questionnaire for collection of investment. The questionnaire will include questions presented in the document prepared for the meeting.

**Next steps:**

A questionnaire will be sent by the EGTEI secretariat to collect investments of reduction techniques (SO<sub>2</sub>, NO<sub>x</sub> and TSP) in plants as well as comments or answers to questions presented in the document prepared for the meeting.

**Next meeting:**

**Nice, 11 June 2012**