**EGTEI Methodology**

**Work to update costs for LCP**

SO$_2$, NO$_x$ and PM abatement techniques

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**Aim of the work**

Update the methodology developed by EGTEI in 2005 in order to consider:

- combustion with thermal capacity $> 50$ MW
- solid fuels, liquid fuels, gaseous fuels and biomass co-firing with coal
- Fabric filter and ESP
- Wet flue gas desulphurisation, semi-dry desulphurisation and dry desulphurisation
- Consider primary measures for deNOx, SNCR and SCR
Organisation

- Work started by the end of 2011
- Set up of a sub-group of experts (EDF, EON, CEFIC, ECN, Eurelectric, Concawe, EU turbines)
- 6 EGTEI sub group meetings
- Development of an EXCEL tool to estimate cost for a given plant consuming different fuels and of a document explaining of cost estimate developed

General Cost Methodology

<table>
<thead>
<tr>
<th>Total annual cost</th>
<th>$C_{tot} \left[ \frac{\text{€}}{\text{year}} \right] = C_{cap} \left[ \frac{\text{€}}{\text{year}} \right] + C_{op} \left[ \frac{\text{€}}{\text{year}} \right]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annualisation of investment</td>
<td>$C_{cap} \left[ \frac{\text{€}}{\text{year}} \right] = C_{inv} \cdot \frac{(1+p)^n}{(1+p)^n-1} \cdot p$</td>
</tr>
<tr>
<td>Composition of OPEX</td>
<td>$C_{op} \left[ \frac{\text{€}}{\text{year}} \right] = C_{op,fix} \left[ \frac{\text{€}}{\text{year}} \right] + C_{op,var} \left[ \frac{\text{€}}{\text{year}} \right]$</td>
</tr>
<tr>
<td>Fixed operating cost</td>
<td>$C_{op,fix} \left[ \frac{\text{€}}{\text{year}} \right] = C_{inv}[\text{€}] \cdot f_{D&amp;M} \left[ \frac{%}{\text{year}} \right]$</td>
</tr>
<tr>
<td>Variable operating cost</td>
<td>$C_{op,var} \left[ \frac{\text{€}}{\text{year}} \right] = \sum C^{\text{unit}} \left[ \frac{\text{€}}{\text{year}} \right]$</td>
</tr>
</tbody>
</table>

$P =$ interest rate | $n =$ equipment lifetime | $unit =$ equipment, reagent and electricity consumption, disposal, etc.
Current Implementation

Fuels
- Coal, oil, gas, solid biomass (wood)

Fuel approach
- Detailed and general approach

Plants
- Boilers

Pollutants
- NO\textsubscript{x}, SO\textsubscript{2}, PM

Technologies
- NO\textsubscript{x}: LNB, SCR, SNCR
- SO\textsubscript{2}: wet FGD, lime spray dryer, (dry process to be included)
- PM: FF, ESP

Calculation of boiler outlet emission loads

Emmission load calculation

Approach

- Plant and fuel data input
- Calculation of boiler outlet emission loads
- Setting stack emission goals
- Choice of potential abatement technologies
- Economic assessment
Example cost analysis
- NOx abatement costs (SCR) -

Effect of plant operation (annual capacity factor) on cost composition (left) and spec. NOx reduction cost (right) of an SCR.

Calculation Basis: 1,000 MWh | 80 €/kWth SCR investment | 2% fixed O&M costs | 9% CRF | 80% reduction (400 to 120 mg/Nm³)

Economic assessment of DeNOx technologies

Calculation of boiler outlet emissions
- exemplary case for SO2 -

<table>
<thead>
<tr>
<th>Fuel</th>
<th>C</th>
<th>H</th>
<th>O</th>
<th>N</th>
<th>S</th>
<th>Ash</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerrejon</td>
<td>83.40</td>
<td>4.95</td>
<td>9.47</td>
<td>1.37</td>
<td>0.81</td>
<td>8.41</td>
<td>11.83</td>
</tr>
<tr>
<td>Kleinkopje (RSA)</td>
<td>85.02</td>
<td>4.74</td>
<td>7.33</td>
<td>2.19</td>
<td>0.72</td>
<td>14.49</td>
<td>7.71</td>
</tr>
<tr>
<td>Oak</td>
<td>50.64</td>
<td>6.23</td>
<td>41.85</td>
<td>1.28</td>
<td>0.00</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

Calculation Basis: 500 MWth | Operating hours: 6,000

Economic assessment of DeNOx technologies
**Next steps**

Work delivered to UNECE / WGSR (next meeting end of June 2014)
Work to be delivered before mid may at the latest.
Work also delivered to IPTS Seville in the scope of the revision of the LCP BREF by the end of the year.
In between, circulation of the documents and the EXCEL file for comments
Comments expected by the end of November
Organisation of a meeting with CEFIC to test the methodology for different cases, especially for plant between 50 and 300 MWth

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**Thanks to the EGTEI technical secretariat and experts from the LCP working group**