Improvements of the EGTEI Cost Calculation Tool for Emission Reduction Measures in LCPs

EGTEI Technical Secretariat

10 October 2014

UNECE Convention on Long-range Transboundary Air Pollution

Agenda

- ❑ Current tool and methodology
- ❑ Implementation of new development
- ✓ VBA-Programming
- ✓ EPA-Method for NOx
- ✓ Part Load Operation
- ✓ Use of sodium bicarbonate as reagent for DSI FGD
- ❑ Next Steps

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What is currently available?

- ❑ Methodology for cost estimation of abatement options of SO_2, NO_x and TSP (Total Suspended Particulates) emissions for Large Combustion Plants (LCP) with a thermal capacity larger than 50 MW_{th} (document describing the methodology)
- ❑ Costs defined for plants constituted of boilers only (one boiler linked to a chimney)
- ❑ Coals, heavy fuel oil, natural gas and biomass co-firing with coal
- ❑ EXCEL tool developed (and its user manual):
  - Costs estimated for different regulatory objectives in term of ELVs (Emission Limit Values)
  - Costs being calculated for a plant with characteristics defined by the user

General cost methodology

Fuels	Coal, oil, gas, solid biomass (wood) in co combustion with coal
Fuel approach	Detailed and general approach
Plants	Boilers
Pollutants	NO_x, SO_2, PM
Technologies	NO_x: LNB, SCR, SNCR SO_2: wet FGD, lime spray dryer, dry process (with lime only) PM: FF, ESP

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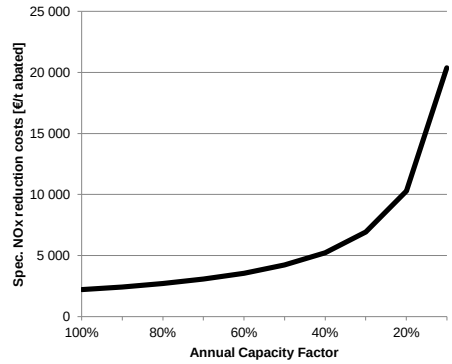
General cost methodology

- Plant and fuel data input
- ↓
- Calculation of boiler outlet emission loads
- ↓
- Setting stack emission goals
- ↓
- Choice of potential abatement technologies
- ↓
- Economic assessment

Type of results obtained



Current tool and methodology

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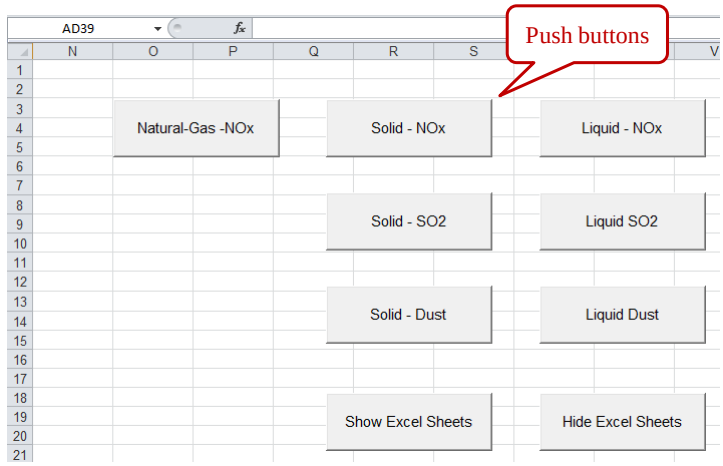
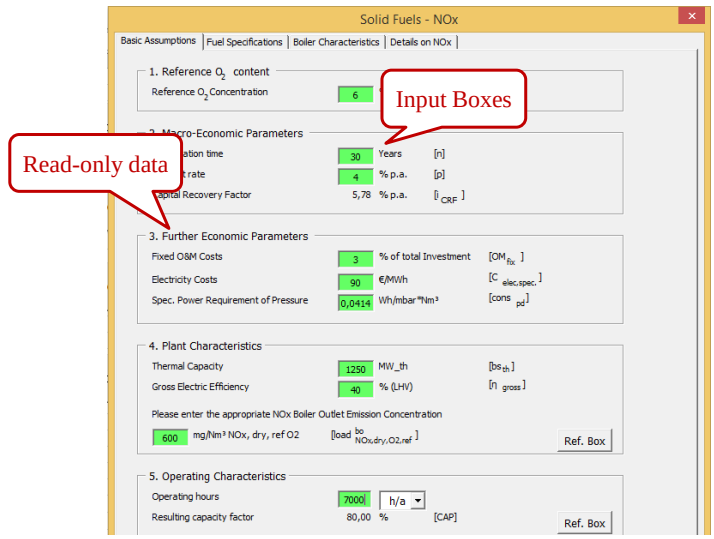
Selection Page



General Design



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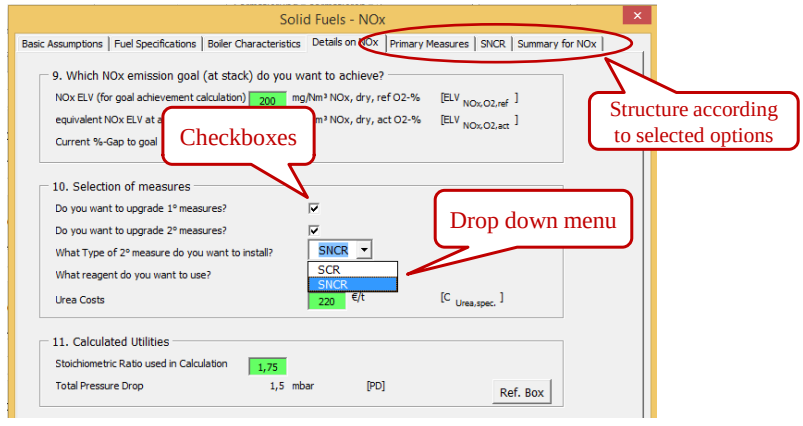
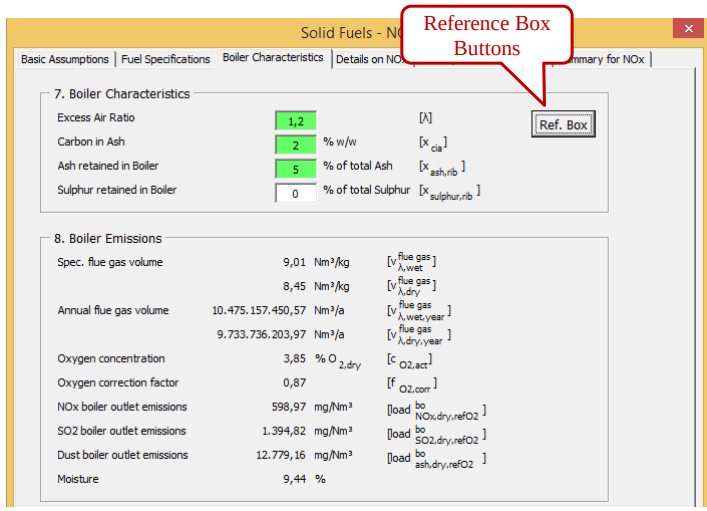
Adaptive Structure



Reference Boxes



VBA Programming

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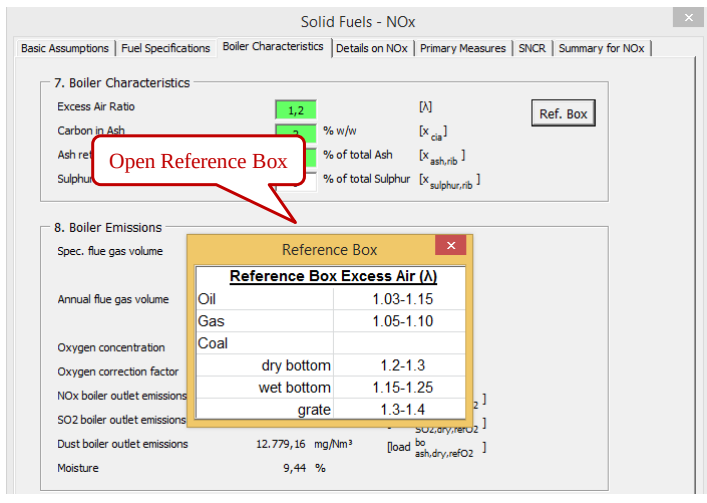
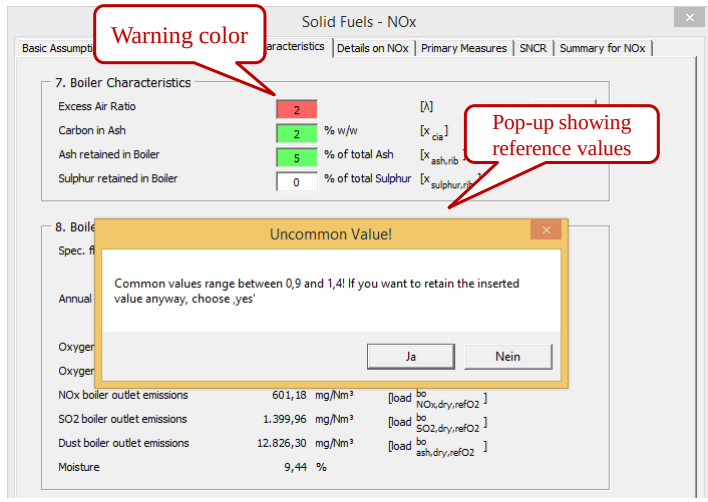
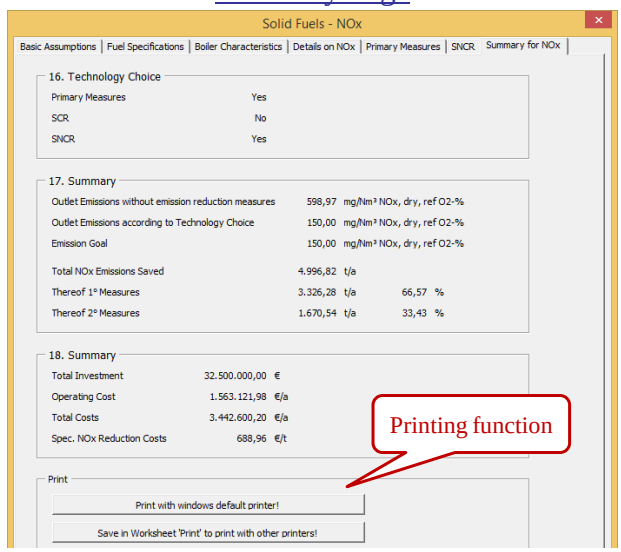


VBA Programming

Implausible Values



Summary Page



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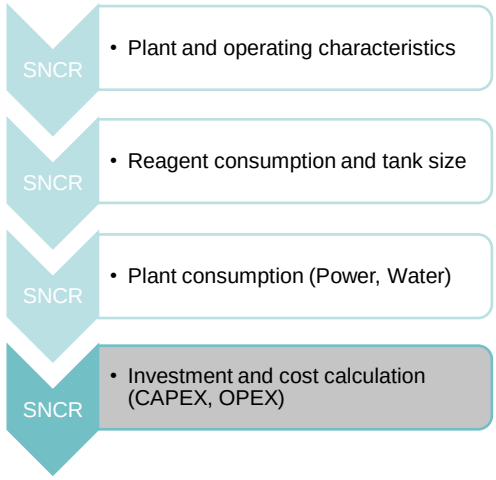
Overview

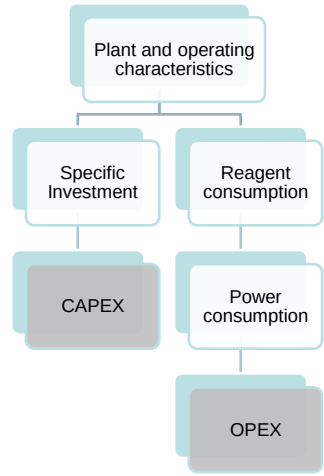
- ❑ US EPA provided a methodology for emission reduction cost calculation *(Reference: Air Pollution Control Cost Manual, US EPA, 2002)*
- ❑ The EPA method is implemented in the EGTEI tool for SO2 and PM and shall also be used for NOx
- ❑ The document addresses SCR and SNCR systems (no 1° measures) within these restrictions:
  - ❑ Only coal fired systems
  - ❑ SNCR with urea as reagent and from 0 to 50% NOx reduction
  - ❑ Minimum boiler size: 75 MWth
- ❑ Methodology is more detailed and complex
  - ❑ More input data is necessary
  - ❑ Accuracy of results may be better (further testing is necessary)
  - ❑ Factors for cost calculation are up to 15 years old and hardly perspicuous
- ❑ Slight Modifications are reasonable to fit the needs of EGTEI

Calculation Scheme SNCR

US EPA Methodology:



EGTEI Methodology:



EPA Method for NOx

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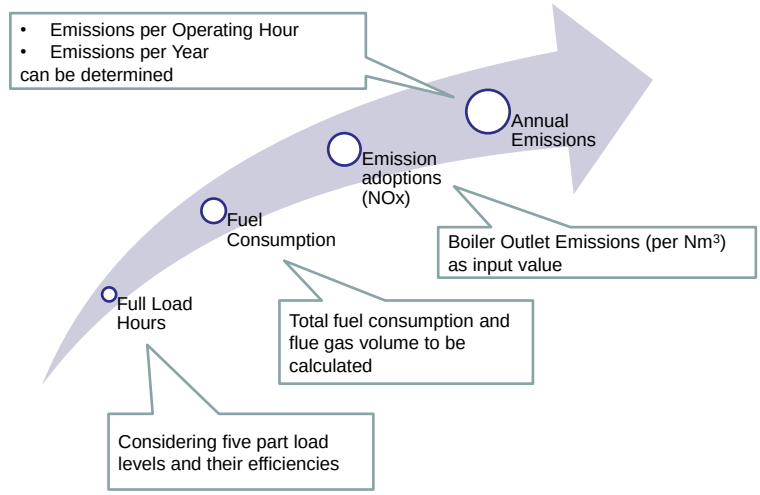
Goals and Achievments

Renewable energies expect rising flexibility of electricity providers

⇒ Part load operation might be necessary

Part Load Operation



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Dry sorbent adsorption : addition of sodium bicarbonate as reagent

- ❑ Different configurations possible
- ❑ Different types of reagent possible: lime, sodium bicarbonate…
- ❑ Assumption for the cost methodology: presence of an ESP to remove fly ashes and addition of a fabric filter to conduct the desulphurisation
- ❑ FF used as a reactor and a system of dedusting
- ❑ Investments due to the installation of the FF and reagent preparation and injection system (assumed to be about 30 % of the FF investment)
- ❑ Operating costs linked to the FF use, reagent consumption and waste treatment. Additional electricity consumption for injection neglected
  - ✓ In the current version: only lime considered
  - ✓ Development made to introduce sodium bicarbonate

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Next Steps

- ❑ Implementation of EPA methodology, part load operation and use of sodium bicarbonate for DeSOx in VBA
- ❑ Updating the technical document and user manual
- ❑ Further testing
- ❑ Promotion of the tool
  - ❑ Visit to IPTS Seville and IIASA
  - ❑ Seminar to promote the tool
  - ❑ Summary for the next EB