UNECE Convention on Long-range Transboundary Air Pollution

Impact of the EGTEI proposed ELVs on Emission Scenarios

Modelling analysis performed by the GAINS_Europe Model

Introduction

In the frame of the UN-ECE Convention on Long Range Transboundary Air Pollution (LRTAP), the Expert Group on Techno-Economic Issues (EGTEI), technical body of the Convention, has been mandated to revised the ELVs in the Annexes IV, V, VI, VIII, to the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) and elaborate a new Annex on dust and a new Annex on solvent content in products.

The work started in April 2008 and was concluded in June 2009.

Introduction

Three options, corresponding to different ambition levels, were proposed by EGTEI, in the new Annexes, leaving the final choice to the negotiation process.

Option 1: ELV1, demanding but technically feasible option with the objective of achieving a high level of reduction. ELV1 is based upon a value ranging between the lower and upper BAT AEL (where available),

Option 2: ELV2, while technically demanding, pays greater attention to the costs of the measures for achieving reduction. ELV2 is based on the upper value of BAT AEL (where available),

Option 3: ELV 3, represents current practices based on the current legislation in a number of Parties to the Convention.

Objective of the analysis

1. Establish a link between the work of EGTEI on ELVs and the Emission Scenarios developed by CIAM
2. Estimate the (additional) Emission Reductions and Costs, if any, to be in line the proposed ELVs. Estimate the "gap" between the Baseline Emission Scenario and the 3 Options.
3. Ultimately, provide the Delegation Experts with additional info to facilitate a choice on the EGTEI proposed Options (ambition levels).

Methodology

Starting from the Gothenburg Baseline National Scenario, detailed output emissions, by technological option, in IIASA GAINS_Europe Model, (SOx, NOx, TSP) a proper Excel Macro has been developed to perform the following tasks:

1. ***Compare the average EF (mg/m3), output of GAINS with the ELVs in the EGTEI Tables, for each source category, (Power Plant and Industrial Boilers Sectors).***
2. ***Identify which source categories are NOT in line with the ELVs, respectively, for the 3 options (ELVs stricter than current average value: average EF > $ELV_{1,2,3}$).***
3. ***Introduce upgrades in implementation of abatement technologies, such as the average EF is line with the 3 options.***
4. ***Re-calculate, for the concerned sectors, the emission reductions (and additional costs from GAINS), at the target year (2020).***

Example of GAINS output

Sector-Activity-Technology	Abbr.	Sectoral activity [Units]	Unabated emission factor kt NOx/Unit	Removal efficiency %	Abated emission factor kt NOx/Unit	Coversion coefficient mg/m3/g/GJ	Abated emission factor mg/m3	Capacities controlled %	Emissions kt NOx
non-IGGC new power plants-Natural gas (incl. other gases)-No control-[10^15 Joules]	PP_NEW-GAS-NOC-[PJ]	1727.347	0.070	0.000	0.070	1.060	74.200	100.000	120.914
non-IGGC new power plants-Gasoline and other light fractions of oil (includes kerosene)-No control-[10^15 Joules]	PP_NEW-GSL-NOC-[PJ]	0.384	0.070	0.000	0.070	3.170	221.900	100.000	0.027
non-IGGC new power plants-Hard coal, grade 1-Selective catalytic reduction on new hard coal power plants-[10^15 Joules]	PP_NEW-HC1-PHCSCR-[PJ]	471.725	0.150	80.000	0.030	2.860	85.800	100.000	14.152
non-IGGC new power plants-Heavy fuel oil-Selective catalytic reduction on new oil and gas power plants-[10^15 Joules]	PP_NEW-HF-POGSCR-[PJ]	71.177	0.100	80.000	0.020	3.170	63.400	100.000	1.424
non-IGGC new power plants-Medium distillates (diesel, light fuel oil)-No control-[10^15 Joules]	PP_NEW-MD-NOC-[PJ]	0.384	0.050	0.000	0.050	3.170	158.500	100.000	0.019
non-IGGC new power plants-Biomass fuels-No control-[10^15 Joules]	PP_NEW-OS1-NOC-[PJ]	123.867	0.065	0.000	0.065	2.860	185.900	100.000	8.051
non-IGGC new power plants-Other biomass and waste fuels-Selective catalytic reduction on new hard coal power plants-[10^15 Joules]	PP_NEW-OS2-PHCSCR-[PJ]	66.373	0.065	80.000	0.013	2.860	37.180	100.000	0.863

NOx Emissions by Control Option

Example of EGTEI table

Fuel type	Thermal input [MWth]	Suggested ELV for NO_x [mg/Nm³][b/]							
		Option 1[1/]			Option 2[1/]			Option 3[1/]	
			Lower BAT AEL	Techniques		Upper BAT AEL	Techniques		Legislation
	>300	New plants: 100 (coal, lignite) 100 (biomass, peat)	Coal (PC): 90 Lignite (PC): 50 Coal, lignite (FBC): 50 Biomass, peat (PC): 50 Biomass, peat (FBC): 50	Combination of Pm (air and fuel-staging, low NOx burner, reburning, etc.), in combination with SCR or combined techniques Combination of Pm (such as air and fuel-staging, low NOx burner, reburning, etc) Combination of Pm (such as air and fuel-staging) Combination of Pm (air and fuel staging, low NOX burner), if necessary SNCR and/or SCR Combination of Pm (air distribution or by flue-gas recirculation), if necessary SNCR and/or SCR	New plants: 150 (coal, lignite) 150 (biomass, peat)	Coal (PC): 150 Lignite (PC): 200 Coal, lignite (FBC): 150 Biomass, peat (PC): 150 Biomass, peat (FBC): 150	Same as for option 1	New plants: 200 (coal, lignite) 200 (biomass, peat)	EU-LCPD:(licence before 2002, <500MW): 600 EU-LCPD:(licence before 2002, >500MW): until 2016: 500; after 2016: 200 EU-LCPD:(licence after 2002): 200 UNECE-GP: 200 EU-IED (permit before 2014): 200 EU-IED (permit after 2014): 150; Lignite (PC): 200

EGTEI Table in Annex V

Assumptions and caviats

Main Assumption: The *average* EF (mg/m3) in GAINS, derived from annual emissions, at the target year, for each source category, is ***comparable*** with the ELVs in the EGTEI Tables.

The *average* EF (mg/m3) is calculated, from GAINS output, as weighted average, taking the technology implementation rates, in each source category, as weight factors.

Test on France IIASA scenarios

PM (TSP) Emissions and technology costs

		Baseline	OPT 3	OPT 2	OPT 1
Exist PP (t_ TSP)	Emissions	446.9	n.c.	n.c.	441.5
New PP (t_TSP)	emissions	156.1	n.c.	n.c.	156.1
Total PP emissions (t_TSP)		603	n.c.	n.c.	597.6
Difference in emissions vs Base (t_TSP - %)		0	0	n.c.	-5.4 (0.9%)
Additional tech costs vs Base (M_Euro)		0	0	0	0,09
Total TSP Emissions 2020 in France (kt)		525.2	525.2	525.2	525.2

Conclusions

Conclusions

The Gains Methodology is powerful tool for Integrated Assessment Modelling of Air Pollution and scenario analysis.

GAINS provides the policy makers with a global overview emissions, technology, costs, effects (human, environment) of alternative option scenarios and comparison among different choices of measure packages.

The sectoral contribution within the option scenarios is highligthed.

The national versions of the GAINS methodology may definitely increase the quality of the results, taking advantage of the national expertise.

Conclusions

The sectoral experts may contribute to the GAINS results through an accurate review of all the parameters involved in the calculations.

The national versions of the GAINS facilitate the discussion with the EU Commission, on national typical issues, to avoid mistakes in the scenario analysis and finally optimizing the achievement of targets and implementation of technologies and related costs.

On the impact side, there is still scope for further research and quality improvement, as well as in the uncertainties related to the model.

Useful Links

http://gains.iiasa.ac.at/gains/EUR/index.login?logout=1
(GAINS_Europe)

http://www.iiasa.ac.at *IIASA Web Site*

http://www.minni.org ***ENEA MINNI Project (GAINS_Italy)***

Thanks for your kind attention !