

Note prepared by Ministry of the Flanders, Environmental Administration
 e-mail: peter.meulepas@lin.vlaanderen.be
 phone +32 2 553 11 36

date: December 2005

FIRST DATA /
 REMARKS AND QUESTIONS ON
DRAFT BACKGROUNDDOCUMENT
“COMBUSTION SECTOR > 500 MWth (version 07/2004)”

[the red text shows the paragraphs of the draft background document to which the Belgian data and remarks refer]

3 EGTEI approach concerning plants having capacities higher than 500 MWth

Remarks on the methodology

EGTEI divides combustion installations into 4 main categories (background documents are developed or being developed for each category according to the CITEPA web-site);

- 50 to 100 MWth
- 100 to 300 MWth
- 300 to 500 MWth
- > 500 MWth

For the installations greater than 500 MWth a draft background document has been ‘finalised’ in which further distinction is proposed between different regulatory classes (max. 6) as described in the LCP directive. We are assuming that this distinction will also be proposed for the large combustion installations smaller than 500 MWth. This approach would lead - in our opinion - to a (too) high degree of fractionation of the combustion sector and of the power plant sector in particular, certainly in Belgium.

Take for example the power plant sector. Currently the power plant sector in RAINS is covered in the category PP, making distinction between PP_EX (WB or OTH) and PP_NEW (2 main categories). This RAINS PP-sector currently covers all types of electricity production plants (conventional power plants, gas turbine installations, stationary engines) and includes also CHP and auto producers. The LCP approach of EGTEI is different. The draft background document on combustion installations greater than 500 MWth seems to focus on conventional power plants - further distinguished into LCP regulatory classes - and do not seem to cover combined cycle gas turbines with capacities greater than 500 MWth (deductible from e.g. the presented unabated emission factors for NO_x: for gas turbines NO_x-EF are much lower). The Belgian power plant sector (excluding renewable and nuclear) in the reference year 2000 gives following picture.

power plant sector	total installed capacity		SO ₂	NO _x
	MWth	MWe		
100 - 300 MWth conventional power plants	455	115,5	965	971
300 - 500 MWth conventional power plants	4308	1547	22152	15551
> 500 MWth conventional power plants	5781	2254	11152	16250
100 - 300 MWth combined cycle gas turbines	262	110	0	398
> 500 MWth combined cycle gas turbines	4650	2465	9	3442
100 - 300 MWth open cycle gas turbines	299	110	0	8
45 MWe re-powering gas turbines		135	0	124
diesel plants	495	184	33	105
power plants with only heat production	332	-	6	33
auto producers and CHP in joint venture (gas turbines, engines, other)			5543	8028
autonomous producers: waste incineration			500	2800
Total SUM emissions PP sector in Belgium			40360	47710

As can be seen in the table above the Belgian power plant sector (using fossil fuels) consists of

- conventional power plants between 100 and 300 MWth
- conventional power plants between 300 and 500 MWth
- conventional power plants greater than 500 MWth
- gas turbine installations smaller than 50 MWth
- gas turbine installations between 50 and 100 MWth
- gas turbine installations between 100 and 300 MW
- gas turbine installations between 300 and 500 MW
- gas turbine installations greater than 500 MW
- stationary engines (gas and diesel)
- waste incineration plants with electricity production.

The table below shows that a large part of the Belgian power plants have capacities lower than 500 MWth and even lower than 300 MWth. For each category different types of installations are in use with (very) different (emission) characteristics (conventional plants, open cycle gas turbines, combined cycle gas turbines, diesel engines, CHP gas turbines, CHP engines, ...).

It is not clear how EGTEI wants to include the power plant sector in the RAINS module, but by not referring to gas turbine installations in the background document on combustion installations greater than 500 MWth, by making distinction between 4 groups of capacities and by further distinguishing between 6 regulatory classes, it seems at first glance that a great level of detail will be necessary to include the PP-sector in the RAINS module according to the EGTEI work (with necessary modifications of the model of course).

Splitting the Belgian electricity production sector into different categories and subcategories (if that is what EGTEI proposes) is actually not a problem for the historical and current years, but may cause problems for the projections years. With future Kyoto and NEC restrictions on the power plant sector and other key playing conditions (fuel prices, CO₂ prices, demand side management) it will be hard to predict at installation level how the power plant sector (installed capacities on fossil fuels, renewables, nuclear) will develop, which installations will be deployed and to what extent they will be deployed. In any case the reported PRIMES projections do not show at this moment this level of detail (e.g. no distinction between capacities and regulatory classes). For countries who do not have developed national projections and rely on the European based PRIMES projections, finding the right keys to split the PRIMES projections could be rather difficult since the PRIMES projections in some cases do not correspond with own estimates of activities and projections. Belgian national projections (up to 2020) were developed with MARKAL. The results are not detailed enough to meet EGTEI 's demand.

In our view the current structure in RAINS for the PP sector is adequate enough to fit the Belgian power plant sector. We would (for future purposes) only suggest to include (CHP) stationary engines as a separate category in the RAINS module. We suggest this because

- stationary engines have much higher unabated specific NO_x emissions;
- stationary engines are not suited for certain abatement measures applicable on larger conventional plants;
- the total installed capacity of stationary engines will significantly increase (in any case in Belgium).

This classification would give 3 main categories in RAINS instead of two:

- PP-EX (Belgium: all existing conventional plants on coal, gas, fuel oil, biomass, waste)
- PP-NEW (Belgium: all gas turbine installations: combined cycle, open cycle, CHP, repower on gas)
- PP-ENGINE (Belgium: all engines on gas, diesel)

Going back to the draft background document on combustion installations greater than 500 MWth, **following questions arise:**

1) It is not exactly clear what EGTEI means with plants greater than 500 MWth. All conventional power plants in Belgium are mono-blocks of ± 125 MWe (about 350 MWth) or ± 280 MWe (about 750 MWth). Each block operates as a separate unit: boiler, turbine, alternator and separate stack. On one site in Belgium, 2 mono-blocks of 350 MWth and a mono-block of 750 MWth will in the near future be grouped together and equipped with DENOX and DESOX and connected to a common stack. At stack level the total thermal capacity will exceed 500 MWth. In the future more DESOX installations and grouping of mono-blocks may follow. Does EGTEI consider the thermal capacity at boiler level or at stack level to distinguish between greater or smaller than 500 MWth? (regarding cost efficiency: DENOX is installed on each block separately, DESOX is installed jointly: this is relevant in considering capacities at boiler or stack level).

2) As mentioned above it is not clear whether besides the conventional power plants also the large gas turbine power plants (Combined Cycle Gas Turbines) with capacities greater than 500 MWth are included.

3) Some conventional plants are equipped with re-powering gas turbines. Does EGTEI proposes do consider these installations separately?

Furthermore we have following **general remarks**:

1) the EGTEI approach is very much fitted to the European situation. EGTEI proposes to make further distinction between the different LCP-D regulatory classes. This approach is less suited for the non-European countries. Most European member states have finalised their work on RAINS for the NEC review, so changes made to RAINS should in first instance take into account concerns of the non-European countries.

2) Nevertheless the CLE scenario for the European member states should not only reflect the obligations of the LCP directive but also of the IPPC directive (BREF note on LCP). BAT levels reported in the BREF note on LCP are often stricter than the emission limit values imposed by the LCP directive (although there were several split views in which the upper limits proposed by industry correspond with the emission limit values of the LCP directive). In the Flemish region stricter emission limit values are imposed on the large combustion plants than demanded by the LCP Directive. Furthermore very strict absolute ceilings are agreed with the electricity sector in the Flemish region. In the Walloon region the situation is different. Distinction according to the regulatory classes as proposed in the background document is therefore less (not) suited for the Belgian situation.

In essence however we do not agree with the LCP approach that EGTEI proposes. We can only support a BAT approach. CLE in the member states should reflect BAT and not only the minimum standards of the LCP directive. The LCP directive also gives the possibility to use national equivalent emission reduction plans instead of ELVs. We believe that this (bubble) approach is not compatible with the BAT approach of the IPPC directive which is an individual plant by plant approach.

3) The EGTEI approach assumes significant modifications of the RAINS structure. Before going forward with the time-consuming exercise EGTEI proposes for combustion plants (obtaining all country specific data and filling in detail the ECODAT database), we would like to see some degree of consensus between IIASA and EGTEI on how RAINS could be modified to fit the level of detail EGTEI recommends. We would like to have a better idea on how EGTEI sees to re-structure / re-categorise the RAINS model for the combustion sector.

4) The EGTEI approach is less aggregated than the current RAINS approach for the power plant sector. A more detailed approach however does not necessarily or automatically leads to better results. More caution is needed to avoid accumulation of inaccurate estimates (more detailed estimates are necessary).

3.1 Energy scenarios

EGTEI asks energy consumption data for 1990 until 2030 for the scenarios BL and CP.

According to recent communications we had with IIASA two energy scenarios will be used for the NEC review:

- the national energy projections (used as main scenario) (Belgian data for PP: see RAINS-web-site)
- the new PRIMES projections (available beginning of 2006) (used for sensitivity analysis)

Both scenarios are CP scenarios. The BL scenarios will not be used in further analysis and are not relevant anymore. Also energy projections from 2000 to 2020 suffice.

3.1.1 Fuels considered

Additional fuel: Belgium uses a large amount of blast furnace gas in the power plant sector.

3.1.2 New and existing plants

See remarks above on LCP approach.

3.1.3 Distinction of regulatory classes

See remarks above on LCP approach.

In Belgium (Flemish region) emission limit values for LCP are largely based on BAT and are stricter than imposed by the LCP directive.

Class 2 plants: for these plants (plants operating less than 20000 hours between 2008 and 2015) emission limit values are imposed in Belgium (Flemish region).

Class 3 plants: not used as category in the Flemish region.

Class 5 plants: the background document mentions that for class 5 plants (plants < 01/07/1987) only the implementation dateline of the application is different from class 4 plants (plants 01/07/1987 - 27/11/2002). We do not fully understand this remark. For both categories the new LCP directive imposes the same ELV to be applied from 01/01/2008 (the ELV's for new plants imposed by the previous LCP directive remain in effect until 01/01/2008).

Class 6 plants: we believe that national plans are not compatible with IPPC (BAT application) (see remarks above)

Following table gives energy consumption data of the existing conventional plants (permitted < 27-11-2002) of the power plant sector for the period 2000 - 2003. Not included are gas turbine installations (large combined cycle gas turbines, re-powering gas turbines for conventional plants, other).

Power plant sector (<u>existing</u> conventional plants)	fuel	2000	2001	2002	2003
		GJ			
Plants > 500 MWth	hard coal	49.400.294	52.734.015	50.623.956	49.298.626
	fuel oil	1.478.503	6.919.768	3.027.682	5.098.328
	natural gas	15.604.568	6.370.860	13.864.226	14.491.301
	other	5.404.060	3.531.614	3.921.931	3.631.725
Plants 300 - 500 MWth	hard coal	57.419.991	39.224.509	42.563.820	40.307.564
	fuel oil	893.280	1.397.394	1.648.791	1.639.151
	natural gas	797.924	1.244.135	792.075	1.623.285
	other	8.303.100	6.510.952	9.949.637	10.183.063
Plants 100 - 300 MWth	hard coal	1.554.915	1.394.149	2.277.983	2.028.436
	fuel oil	615.635	532.468	410.801	576.812
	natural gas	2.224.439	2.201.820	24.570	905.716
	other	3.758.090	3.642.481	3.861.926	3.577.126

other = cokes oven gas, blast furnace gas, bio-mass, waste

3.2 Fuel characteristics

Following table presents lower heat values of some fuels used in Belgium

Fuel	2000 – 2020 (GJ/ton)
Hard coal	25,2
Fuel oil	40,6
Natural gas	46,5
Blast furnace gas	2,5

Following table presents S-contents of some fuels used in Belgium (reference year 2000)

Fuel	% S
Existing conventional plants > 500 MWth	
Hard coal equipped with FGD	0,82
Hard coal not equipped with FGD	0,53
Fuel oil	0,93
Existing conventional plants 300 - 500 MWth	
Hard coal not equipped with FGD	0,53
Fuel oil	0,85

Average S-content of hard coal used: different for plants with FGD and plants without FGD. To be taken into account.

3.3 Unabated emission factors

Conversion factors for conventional plants differ from conversions factors for gas turbine installations.

3.4 Abatement techniques

Current abatement techniques used in Belgium:

- FGD on coal power plants in PP sector (efficiency = 90 - 95 %) (covering 25 to 30 PJ year consumption of coal)
- Use of low sulphur coal in coal power plants not equipped with FGD
- SCR on coal power plants in PP sector (efficiency = 80%) (covering 25 to 30 PJ HC)
- Low NOX burners and other primary NOX reduction techniques on part of the power plants
- Electrostatic filters on all coal power plants in PP sector + injection of SO₃ (efficiency > 99 %)

Planned to be in operation in 2006 in Belgium: more SCR and FGD on coal power plants (on additional 25 to 30 PJ coal).

Efficiencies of NO_x and SO₂ abatement techniques presented in the background document:

Some proposed efficiencies in the back ground document are low compared to our data, the BREF information and the present RAINS figures:

- e.g. for SCR on existing plants EGTEI proposes an efficiency of 75 %. Our own data, the RAINS present data and the BREF data show efficiencies of 80 % and more;
- e.g. for DESOX on existing plants EGTEI proposes an efficiency of 85 % (low). The FGD which has been installed in Belgium on a coal power plant 5 years ago, gives efficiencies between 90 and 95 %. The efficiencies of 90 and 95 % proposed for new plants are also low.

Lowering the efficiencies of these abatement techniques as EGTEI proposes, could have an significant negative impact on target setting and achieving the necessary future environmental objectives set out for us. This is not the way to proceed, we need to be more ambitious.

3.5 Control strategy

The scenario CLE for the member states should reflect BAT and only the minimum emission limit values of the LCP directive. CLE should take into account the BREF note on LCP. See previous remarks.