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DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Environnement

Luxembourg's Initial Report under the Kyoto Protocol

Report to facilitate the calculation of the assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol

Luxembourg, 29 December 2006

Contents

Foreword

This report is Luxembourg's submission to the United Nations Framework Convention on Climate Change (*UNFCCC*) to facilitate the calculation of the assigned amount pursuant to Article 3, paragraphs 7 and 8 of the Kyoto Protocol, and to demonstrate Luxembourg's capacity to account for its emissions and assigned amount during the first commitment period of the Protocol. This report has been prepared by the Ministry of the Environment of the Grand-Duchy of Luxembourg in conformity with the annex to the Decision 13/CMP.1 ('Modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol').

In order to facilitate the calculation of Luxembourg's assigned amount for the first commitment period, national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases (*GHG*) not controlled by the Montreal Protocol are sent together with this report for all years from 1990 to 2004.

In accordance with the annex to the Decision 13/CMP.1, this report is divided into two parts.[1]

Part I contains information on:

- complete inventories of anthropogenic emissions by sources and removals by sinks of GHG not controlled by the Montreal Protocol for all years from 1990, or another approved base year or period under Article 3, paragraph 5, to the most recent year available, prepared in accordance with Article 5, paragraph 2, and relevant decisions of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP);
- the identification of the selected base year for emissions of hydrofluorocarbons (*HFCs*), perfluorocarbons (*PFCs*) and sulphur hexafluoride (SF_6) in accordance with Article 3, paragraph 8;
- the agreement under Article 4, in which the European Community and its 15 Member States, including Luxembourg, have agreed to jointly fulfil their commitments under Article 3;
- the calculation of the assigned amount pursuant to Article 3, paragraphs 7 and 8, on the basis of the inventory of anthropogenic emissions by sources and removals by sinks of GHG not controlled by the Montreal Protocol.

Part II contains information on:

- the calculation of the commitment period reserve in accordance with Decision 11/CMP.1 ('Modalities, rules, and guidelines for emissions trading under Article 17 of the Kyoto Protocol');
- the identification of the minimum values for tree crown cover, land area and tree height for use in accounting of activities under Article 3, paragraphs 3 and 4, together with the information that has been historically reported to the Food and Agriculture Organization of the United Nations or other international bodies, and in the case of difference, an explanation of why and

[1] 'Article' refers to an article of the Kyoto Protocol, unless otherwise specified.

how such values were chosen, in accordance with decision 16/CMP.1 ('Land use, land-use change and forestry');

- election of activities under Article 3, paragraph 4, for inclusion in the accounting for the first commitment period, together with information on how the national system under Article 5, paragraph 1, will identify land areas associated with the activities, in accordance with decision 16/CMP.1;
- identification of whether, for each activity under Article 3, paragraphs 3 and 4, it is intended to account annually or for the entire commitment period;
- a description of the National System – to be set up in conformity with Article 5, paragraph 1 – in accordance with the guidelines for the preparation of the information required under Article 7;
- a description of the National Registry for managing emission quotas for industrial activities, in accordance with the guidelines for the preparation of the information required under Article 7.

Part I

1. Greenhouse gas inventories 1990-2004

During the first quarter of 2006, Luxembourg submitted to both the European Commission and the UNFCCC Secretariat a set of inventories of anthropogenic emissions by sources and removals by sinks of GHG not controlled by the Montreal Protocol – in brief 'GHG inventories' – for the years 1990 to 2003. On 19 May 2006, this set has been slightly revised and the inventory for the year 2004 has been added. However, these inventories contained only a subset of the CRF tables as defined by the IPCC since several background tables were missing. For this reason, an improved set of tables – which is complementing this Initial Report – has been produced during the second semester of 2006. Compared to the previous submission of May 2006, this new set presents slightly reviewed figures for some of the GHG emissions' sources as well as a more comprehensive collection of completed tables.

Table 1, on page 5, summarizes the evolution of GHG emissions in Luxembourg under the Kyoto Protocol for the period 1990-2004. When analyzing this table, one should keep in mind that the IPCC methodology used for compiling GHG inventories is raising some peculiar issues for small countries, in particular because of the 'territory' or 'origin' principle underpinning it. Therefore, GHG emissions structure and development have to be examined bearing in mind that Luxembourg:

- has a widely open economy with an important cross-border workforce. By the end of 2004, around 113 000 commuters from neighbouring countries came everyday to work in Luxembourg and represented about 40% of the salaried employment or a quarter of the resident population. The cross-border employment growth rate has been around an average of 8.4% annually between 1990 and 2004;
- has clearly become a crossroads for international traffic. By its location at the centre of the western European traffic axes, the country faces important road traffic in transit for both goods (freight transport) and passengers (tourists on their way to southern Europe). The strong impact on GHG emissions of this constantly growing traffic in transit is reinforced by the increasing number of commuters that goes hand in hand with the economic development of the country;
- faces a strong population growth, due to immigration. For instance, between 1990 and 2004, population was multiplied by 1.2 (from 380 000 to 452 000 inhabitants);
- has to cope with the potential impact of a single project on its total GHG emissions. As an example, one can mention a gas-vapour turbine of 350 MW operating since mid-2002. This power plant has been allocated more than 1 million tonnes of carbon dioxide (CO_2) in the first Luxembourg's National Allocation Plan (*NAP*). This amount equals to one-third of the total quantity of allowances allocated to the emissions trading sector covered by Directive 2003/87/EC;
- was dependent highly on electricity imports until the nineties. This situation led the country to develop its own resources by giving preference to renewables and energy-efficient techniques. These efforts in promoting electricity production from renewables had, and still has, no effects on the national CO_2 emissions according to the IPCC methodology, as it replaces electricity

which was imported beforehand. Even worse, cogeneration plants, and in general national electricity production based on fossil fuels, even though with energy-efficient technologies (as the gas-vapour turbine mentioned above), has a negative impact on Luxembourg's GHG emissions and its 'Kyoto balance'.

Throughout the period 1990-2004, as table 1 shows, the main greenhouse gas has remained carbon dioxide, which accounts for around 93% to 95% of total GHG emissions (excluding land-use change and forestry – *LUCF*). However, the structure of CO_2 emissions has evolved with an increase in fuel combustion, which accounted for 83% of total GHG emissions (excluding LUCF) for the base year (1990) and climbed up to 88% in 2004.

Road transport, and more precisely 'fuel export' (i.e. fuel sold in Luxembourg but mostly consumed abroad), is one of the culprit for this development. Indeed, in 1990, fuel combustion from the transport sector accounted for 21,5% of total GHG emissions (excluding LUCF). Then, with nearly 7 millions of tonnes of CO_2, this percentage reached 55% in 2004. CO_2 emissions due solely to 'fuel export' amounted to about 1.9 millions of tonnes in 1990 and reached almost 5.2 millions of tonnes in 2004, i.e. roughly a threefold increase (the same comparison shows only a twofold increase for road fuel consumed by the national vehicle fleet). In 2004, 'fuel export' represented 76.5% of CO_2 emissions due to the transport sector and more than 40% of total GHG emissions (excluding LUCF). For 1990, these percentages were, respectively, 71.5% and 14.5% (see table 1).

The small size of Luxembourg, and therefore of its economy, has also striking impacts on GHG emissions developments in other areas than transport. The structure of the economy, the related energy demand and the energy and emissions balances may vary significantly, whether a new economic activity starts its operations or an existing one ceases them. This characteristic explains, for instance, the reduction of emissions pertaining to the industrial sector: with 7.2 millions of tonnes in 1990, CO_2 emissions from industrial processes and fuel combustion in industry accounted for 57% of total GHG emissions (excluding LUCF). They could eventually be reduced to 2.5 millions of tonnes in 1998 – i.e. to 29% of total GHG emissions – mainly after the restructuring of the steel industry took place in the mid-nineties (move from blast furnaces to electric arc furnaces). At that time, GHG emissions of Luxembourg were one third below their base year level.

Several tables and graphs in annex to this report illustrate the developments and characteristics highlighted above.

Table 1 – Luxembourg's GHG emissions and removals 1990-2004

Gg (1000 t.) CO_2 equivalent	1990 (base year)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO_2	12104.44	12382.86	12172.16	12518.85	11622.86	9157.55	9216.78	8569.30	7742.34	8316.24	8827.76	9096.11	10030.68	10486.28	11978.01
	95.41%	*95.47%*	*95.24%*	*95.33%*	*94.97%*	*93.68%*	*93.57%*	*92.95%*	*92.12%*	*92.39%*	*92.84%*	*92.53%*	*93.06%*	*93.22%*	*93.66%*
fuel combustion	10528.80	10856.30	10745.55	11024.54	10309.26	8194.41	8300.64	7728.03	7084.52	7626.17	8109.87	8434.71	9221.33	9739.23	11210.98
	82.99%	*83.70%*	*84.08%*	*83.95%*	*84.24%*	*83.83%*	*84.27%*	*83.82%*	*84.29%*	*84.72%*	*85.29%*	*85.80%*	*85.55%*	*86.58%*	*87.67%*
fuel combustion from transport sector	*2724.47*	*3317.22*	*3574.99*	*3633.52*	*3665.55*	*3452.55*	*3532.57*	*3802.12*	*3984.09*	*4343.90*	*4977.76*	*5222.59*	*5419.96*	*6018.90*	*6986.62*
	21.48%	*25.58%*	*27.97%*	*27.67%*	*29.95%*	*35.32%*	*35.86%*	*41.24%*	*47.40%*	*48.26%*	*52.35%*	*53.13%*	*50.28%*	*53.51%*	*54.63%*
of which, 'fuel export' (share)	71.50%	76.62%	69.13%	69.65%	69.54%	67.38%	67.79%	69.53%	70.16%	71.49%	73.03%	73.36%	73.65%	76.44%	76.44%
industrial processes	1556.59	1507.48	1407.50	1475.13	1294.38	943.86	896.78	821.87	638.36	670.58	698.54	642.24	790.14	727.84	747.81
	12.27%	*11.62%*	*11.01%*	*11.23%*	*10.58%*	*9.66%*	*9.10%*	*8.91%*	*7.59%*	*7.45%*	*7.35%*	*6.53%*	*7.33%*	*6.47%*	*5.85%*
other sources (1)	19.05	19.08	19.11	19.18	19.22	19.28	19.36	19.40	19.46	19.49	19.35	19.16	19.21	19.21	19.22
	0.15%	*0.15%*	*0.15%*	*0.15%*	*0.16%*	*0.20%*	*0.20%*	*0.21%*	*0.23%*	*0.22%*	*0.20%*	*0.19%*	*0.18%*	*0.17%*	*0.15%*
CH_4 (2)	364.14	356.58	347.13	352.17	344.61	353.01	359.31	357.84	357.84	358.89	314.58	353.01	354.27	353.01	348.18
	2.87%	*2.75%*	*2.72%*	*2.68%*	*2.82%*	*3.61%*	*3.65%*	*3.88%*	*4.26%*	*3.99%*	*3.31%*	*3.59%*	*3.29%*	*3.14%*	*2.72%*
N_2O (3)	201.50	213.90	244.90	244.90	254.20	248.00	257.30	275.90	288.30	310.00	319.30	334.80	347.20	362.70	415.40
	1.59%	*1.65%*	*1.92%*	*1.86%*	*2.08%*	*2.54%*	*2.61%*	*2.99%*	*3.43%*	*3.44%*	*3.36%*	*3.41%*	*3.22%*	*3.22%*	*3.25%*
F-gases (4)	16.53	16.53	16.53	16.53	16.53	16.53	16.53	16.53	16.53	16.53	46.60	46.60	46.60	46.60	46.60
	0.13%	*0.13%*	*0.13%*	*0.13%*	*0.14%*	*0.17%*	*0.17%*	*0.18%*	*0.20%*	*0.18%*	*0.49%*	*0.47%*	*0.43%*	*0.41%*	*0.36%*
Total GHG without LUCF	12686.61	12969.87	12780.72	13132.45	12238.20	9775.09	9849.92	9219.57	8405.01	9001.66	9508.24	9830.52	10778.75	11248.59	12788.19
	100.00%	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*
LUCF (5)	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63	-316.63

Source: Environment Agency and Ministry

Notes

(1) the other CO_2 sources are emissions from solvent and other product use (CRF 3) and from waste incineration (CRF 6C).

(2) the methane emissions are converted in CO_2 equivalents by multiplying the emissions by 21, i.e. the global warming potential (GWP) value for methane based on the effects of GHG over a 100-year time horizon.

(3) the nitrous oxide emissions are converted in CO_2 equivalents by multiplying the emissions by 310, i.e. the global warming potential (GWP) value for nitrous oxide based on the effects of GHG over a 100-year time horizon.

(4) the F-gases are those not covered by the Montreal Protocol, i.e. the HFCs, PFCs and SF6 expressed in CO_2 equivalents using the the global warming potential (GWP) values based on the effects of GHG over a 100-year time horizon.
These emissions are estimates based on different sources, amongst which a study conducted end 1999. This explains the break in the serie between 1999 and 2000.

(5) the land-use change and forestry emissions are based on constant estimates of 294.93 Gg of CO_2 for changes in forest and other woody biomass stocks (CRF 5A) and 0,07 Gg of N_2O (i.e. 21,7 Gg CO_2 eq.) for other sinks (CRF 5E).

Comment: IPCC methodology to the detriment of Luxembourg

As indicated above, the IPCC methodology is based on the 'territory' or 'origin' principle. This approach lead to GHG emissions inventories appearing worse than it would have been if the real in and outflows of the country would be correctly reflected in the inventories. If the polluters principle would have been applied, then, in 2004 e.g., GHG emissions would have been 2.54 millions of tonnes of CO_2-eq. lower than indicated in table 1. Indeed, for 2004, electricity imports by Luxembourg – which are not to be accounted for in the national GHG inventories – are estimated having generated 2.63 millions of tonnes of CO_2-eq., whereas emissions from 'fuel export' amounted to 5.17 millions of tonnes of CO_2-eq.

The IPCC methodology also penalizes Luxembourg in its attempts to develop an efficient and 'coal-poor' national electricity production aiming at replacing imported energy. For many years Luxembourg has promoted, both financially and technically, the installation of highly efficient cogeneration power plants. Moreover, a gas-vapour turbine of 350 MW has been built and electricity production from renewables has been noticeably increased. Consequently, since 2003, electricity imports, with an estimated CO_2-eq. emission factor of 0.78 (1000 tonnes of CO_2 per GWh), have been reduced by more than 2000 GWh and substituted by a national electricity production whose mean emission factor is estimated being 0.41. Luxembourg thus improved the European GHG balance by more than 1 million of tonnes of CO_2-eq., whereas, in the same time, its own GHG inventories have been burdened by the emissions generated by the 'coal-poor' and energy-efficient installations it has supported.

2. Identification of the selected base year for HFCs, PFCs and SF_6 in accordance with Article 3, paragraph 8, of the Kyoto Protocol

Article 3, paragraph 8, of the Kyoto Protocol allows Annex I Parties to chose 1995 as a base year for anthropogenic emissions of F-gases covered by the Kyoto Protocol. Following limitations as regards background information for these gases in Luxembourg, emissions values for 1990 and 1995 are identical (see table 1 above). Nevertheless, Luxembourg has now decided to take advantage of the possibility offered by Article 3, paragraph 8, of the Kyoto Protocol and, therefore, chooses 1995 as the base year for the emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

3. Agreement under Article 4 of the Kyoto Protocol

The Kyoto Protocol, under Article 4, provides the option for Parties to fulfil their commitments under Article 3 jointly if acting in the framework of and together with a regional economic integration organisation. The European Community and its Member States at the time of ratification of the Kyoto Protocol on 31 May 2002 (i.e. Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Sweden, United Kingdom of Great Britain and Northern Ireland, and Finland) have agreed to jointly fulfil these commitments. The full text of this agreement is contained in Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework

Convention on Climate Change and the joint fulfilment of commitments thereunder.[2] This text has been notified to the UNFCCC upon ratification by the Community and its Member States. Then, the UNFCCC Secretariat informed the Parties and signatories of the Convention of the terms of this agreement in document FCCC/CP/2002/2.

Thus, base year emissions for the European Community is the sum of the base year emissions of the 15 Member States which were members at the time of ratification of the Kyoto Protocol on 31 May 2002 (*EU-15*). Using information received from the EU-15 in 2006, the European Commission has determined the base year emission level of the European Community and compiled the base year levels of each Member State (for details, see the 'Report to facilitate the calculation of the assigned amount of the European Community pursuant to Article 3, paragraphs 7 and 9 of the Kyoto Protocol – Submission to the UNFCCC Secretariat'). These levels, and the corresponding assigned amounts, have been adopted in Autumn 2006 (Council Decision C(2006)6468 of 14 December 2006).

The Council Decision indicates that Luxembourg's assigned amount is 45 677 304 tonnes of CO_2 equivalent. However, this amount has been derived from our May 2006 submission and, as indicated in the first paragraph of section 1 above, Luxembourg's GHG inventories have been improved during the second half of 2006. As a consequence, the assigned amount recorded in this report (see next section) differs slightly from the one indicated in the Initial Report of the European Community. [3] Nevertheless, Luxembourg is calling for a discussion on its assigned amount (see box on page 8).

4. Calculation of Luxembourg's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol

The assigned amount (*AA*) for Luxembourg is estimated according to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, on the basis of the base year inventory of GHG, i.e. 1990 for all gases. Calculations are made in accordance with Decision 13/CMP.1 ('Modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol') and is validated by the following considerations:

- for the first quantified commitment period of the Kyoto Protocol (2008-2012), Luxembourg has a reduction target of -28% relative to 1990. The Kyoto target for Luxembourg, on the basis of the EU burden sharing agreement, is thus equal to 72%;
- in our latest inventory, the base year emissions for all GHG, including F-gases not covered by the Montreal Protocol, are equal to 12 686 610 tonnes of CO_2 equivalent (see table 1 above). However, the level of CO_2 equivalent emissions used as a basis for calculating Luxembourg's Kyoto reduction target was 13.9 millions of tonnes of CO_2 equivalent (see box on page 8);
- land-use change and forestry, comprising all emissions by sources and removals by sinks under category 5 (CRF 5) of the Revised 1996 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories, does not constitute a net source of greenhouse gas emissions.

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2 OJ L130, 15.5.2002 (see also document FCCC/CP/2002/2).

3 EEA Technical Report No10/2006, Table 7, p. 15.

The proposed AA for Luxembourg is therefore:

12 686 610 t. CO_2-eq. **x** *0.72* **x** *5* **= *45 671 796 t. CO_2-eq.***

or, if one uses the base year emissions that were taken as a basis for calculating Luxembourg's Kyoto reduction target (see box below):

13 908 000 t. CO_2-eq. **x** *0.72* **x** *5* **= *50 068 800 t. CO_2-eq.***

Comment: the base year issue for Luxembourg

In Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder,[4] the various commitments of the Member States were expressed as percentage changes from the base year. It was foreseen that, in 2006, the respective emission levels would be expressed in terms of tons of CO_2 equivalent (see Council Decision C(2006)6468 of 14 December 2006). In this context, Luxembourg made a statement to the Council Conclusions of 4 March 2002 (6810/02) to take into account its special national circumstances and its assumptions concerning its base year emission level. More precisely, the report on the in-depth review of the first National Communication of Luxembourg (doc. FCCC/IDR1/LUX of 17 October 1997) mentioned an amount of 13.9 millions of tonnes of CO_2 equivalent for Luxembourg in 1990. This level of emission was definitely used as the basis for calculating Luxembourg's Kyoto reduction target. Therefore, Luxembourg asks for due consideration of this situation, as well as of the special circumstances described in Part 1, section 1, of this report, when taking a final decision on its assigned amount.

[4] OJ L130, 15.5.2002 (see also document FCCC/CP/2002/2).

Part II

4. Calculation of Luxembourg's commitment period reserve in accordance with Decision 11/CMP.1

According to Decision 11/CMP.1, each Party shall maintain, in its national registry, a commitment period reserve which should not fall below 90% of the Party's proposed AA or 100% of five times its most recently reviewed inventory, whichever is the lowest. Consequently, Luxembourg's commitment period reserve is calculated either as:

$$45\ 671\ 796\ t.\ CO_2\text{-}eq. \times 0.90 = \mathbf{41\ 104\ 616.40\ t.\ CO_2\text{-}eq.}$$

or:

$$12\ 788\ 190\ t.\ CO_2\text{-}eq. \times 5 = \mathbf{63\ 940\ 950\ t.\ CO_2\text{-}eq.}$$

where 12 788 190 t. CO_2-eq. corresponds to the total GHG emissions of Luxembourg (excluding LUCF) for 2004 (see table 1 above): Luxembourg has understood the 'most recently reviewed inventory' as the year 2004.

Luxembourg's commitment period reserve is therefore ***41 104 616.40 t. CO_2-eq.***

or, if one uses the base year emissions that were taken as a basis for calculating Luxembourg's Kyoto reduction target (see box on page 8):

$$50\ 068\ 800\ t.\ CO_2\text{-}eq. \times 0.90 = \mathbf{45\ 061\ 920\ t.\ CO_2\text{-}eq.}$$

Table 2 – Luxembourg's AA and commitment period reserve

GHG emissions for the base year (1990) (t. CO_2-eq.)	target burden sharing agreement (%)	assigned amount 2008-2012 (t. CO_2-eq.)	commitment period reserve (t. CO_2-eq.)	Article 3, paragraph 8, of the Kyoto Protocol
12 686 610.00	72%	45 671 796.00	41 104 616.40	1995
13 908 000.00**	72%	50 068 800.00	45 061 920.00	1995

** as indicated in doc. FCCC/IDR1/LUX of 17 October 1997

5. Selection of threshold values for the forest definition to be used for reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

The following threshold values for the forest definition for reporting under Article 3, paragraph 3, of the Kyoto Protocol (including activities of afforestation, reforestation and deforestation) have been chosen:

- forest land should measure at least 0.5 hectares;
- forest land includes land with minimum tree crown cover of 10 % for trees capable to reach a minim um height of 5 metres in situ.

These definitions are those used in Luxembourg's Forest National Inventory which is in line with the TBFRA2000 methodology and definitions of the FAO.

These definitions would also be applicable for reporting, under Article 3, paragraph 4, of the Kyoto Protocol. However, Luxembourg has decided not to account for net emissions and removals from activities under Article 3, paragraph 4, of the Kyoto Protocol in meeting its obligations for the first commitment period. Indeed, for the moment, there is a lack of reliable data allowing producing realistic estimates of the activities covered under Article 3, paragraph 4, of the Kyoto Protocol. It is particularly the case for wood consumption, which is a key element in this respect.

6. Election of activities under Article 3, paragraph 4, of the Kyoto Protocol

As indicated under section 5, Luxembourg has chosen not to use any activities under Article 3, paragraph 4, of the Kyoto Protocol (forest management, cropland management, grazing land management and revegetation) for meetings its obligations under the first commitment period of the Kyoto Protocol.

7. Identification of the accounting period for each activity under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Luxembourg has chosen to account for the activities under Article Article 3, paragraph 3, of the Kyoto Protocol (afforestation, reforestation and deforestation) for the whole commitment period.

8. Description of Luxembourg's National GHG Inventory System

As regards GHG Reporting, the Ministry of the Environment is responsible for transmitting the inventories (and its associated National Inventory Reports – *NIR*) to the European Commission and to the UNFCCC Secretariat. However, in conformity with the law of 27 November 1980, which created an Environment Agency,[5] the compilation and the maintenance of the national GHG inventories, as well as the drafting of the NIR, are performed by the Air/Noise department of this Agency. All the material, estimates and calculation sheets, as well as the documentation on scientific papers and the basic data needed for the inventories compilation, are stored and archived within the Agency; the Ministry keeping only copies of the inventories (CRF tables) and of the related reports (such as the NIR) in its archives. It is worth noticing that the Environment Agency is also responsible for preparing emission inventories under the Convention on Long Range Transboundary Air Pollution (*CLRTAP*) and the EU emission ceilings Directive.

During the year 2007, and with the possible help of a consultant, it is intended to develop further the national GHG inventory system allowing for a full observance of the obligations of the Kyoto Protocol.[6] This work will be realized concomitantly with the verification and the completion of GHG

[5] The Environment Agency is directly linked to the Ministry of the Environment and works under its supervision.

[6] Decision 15/CMP.1, part II (Reporting of supplementary information under Article 7, paragraph 2, D. National systems in accordance with Article 5, paragraph 1).

inventories to be carried out in line with the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories as well as the IPCC Good Practice Guidance for LULUCF.

Current inventories: main characteristics

Data used to produce the annual air emission (including GHG) inventories are mainly:

- taken from official statistical datasets calculated by the National Statistics Office (STATEC);
- coming from information supplied directly by the operators of industrial or other activities;
- extracted from statistical information received from other ministries (for example Ministry of Economic Affairs and External Trade for energy).

However, some of the information necessary to prepare the inventories is not available in Luxembourg. In these cases, data from other European countries or from the literature were taken as default data.

Inventories have been compiled according to the CORINAIR/EMEP methodology using software tools developed for the European Environment Agency (*EEA*):

- CollectER & ReportER; and
- COPERT III for road traffic emissions.

For some gases or activities, the lack of background data led Luxembourg to rely on (sometimes strong) hypotheses. The main ones are described below:

- F-gases: a first analysis and estimation of the emissions generated by the use of fluorinated greenhouse gas types – HFCs, PFCs and SF_6 – has been performed end 1999 by the Environment Agency and the CRTE (*Centre de Ressources des Technologies pour l'Environnement*). This analysis indicated that there are emission sources or emissions due to applications for both HFCs and SF_6 – but none for PFCs – and provided estimated amounts in CO_2-eq. for the years 1995, 2000 and 2005. On the basis of that study, it had been decided that estimates for the year 1995 would be used for the GHG inventories prior to the year 2000 and that estimates for the year 2000 would be used from that year onwards (this explains the break in the serie between 1999 and 2000 for F-gases in table 1);
- solvent and other product use (CRF 3): the total emissions of Volatile Organic Compounds (*VOC*) due to solvents and other product use has been taken as the starting point for calculating resulting CO_2 emissions. For those activities for which information was available, these emissions of VOC are themselves based on estimates of the various solvent containing products application or consumption in Luxembourg as they were known for the early '90s. On the other hand, for those activities for which no information on consumption or application of solvent containing products were available for Luxembourg, standard consumption estimates of these products for the neighbouring countries or for Europe as a whole have been used;
- LUCF (CRF 5): a first estimate of carbon captured by the forests and other woody biomass in Luxembourg has suggested an amount of 294 930 t of CO_2 per year. This value has been

reported in all the GHG inventories from 1990 onwards since the area covered by forests in Luxembourg has barely changed: 88 620 ha in 1990, 89 740 in 2002 (last available year). As regards emissions of N_2O in the context of LUCF, an estimate has been calculated in the early '90s with the help of the French CITEPA. It concluded to an amount of around 70 t of N_2O, a value that has been reported in all GHG inventories since 1990;

- waste (CRF 6): a value of 10 000 t of CO_2 has been included in each annual GHG inventory since 1990. This value corresponds to the carbon dioxide emissions resulting from the combustion of the non-biomass fraction of municipal waste in the sole incineration plant of the country.

As regards road traffic, air emissions are calculated with the help of COPERT III which deals only with data relating to the national vehicle fleet. In other words, air emissions are based on the estimated actual fuel consumption of the car fleet registered in Luxembourg. However, due to the impact of 'fuel export' in Luxembourg (see section 1 above), CO_2, CH_4 and N_2O emissions, and only those so far, are corrected to reflect this particularity.[7] The correction is based on total road fuel sales data.

Finally, as regards quality control and assessments, it is worth noticing that Luxembourg has not yet developed a fully operational QA/QC system and has not yet performed uncertainty analyses.

9. Description of Luxembourg's National Registry

The national registry will manage the emission quotas for industrial activities, designated in annex I of the law of 23 December 2004, regarding the setting up of a GHG emissions trading scheme in Luxembourg.[8] The registry will also include any legal entities or individuals that did open an account. According to the existing industrial structure in Luxembourg, activities eligible for emission quotas described in annex I of the law of 23 December 2004 are the following (main categories only):

- energy production: combustion units with a calorific power above 20 MW (excluding municipal or hazardous waste incineration), petrol refineries, cokeworks;
- production and transformation of non-ferrous metals: metal ores treatments, cast-iron and steelworks;
- inorganic products: clinkers or lime production, glass and glass fibre production, ceramic products production;
- other industrial activities: paper pulp, paper and paperboard production.

The sole GHG covered by these eligible activities is the carbon dioxide.

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7 Other gases than CO_2, CH_4 and N_2O have not yet been corrected for 'fuel export' due to the lack of information on the characteristics of transit vehicles fuelling in Luxembourg.

8 http://www.legilux.public.lu/leg/a/archives/2004/2103012/2004A37921.html (text in French).

For the whole period running from 1st January 2005 to 31st December 2007, all the units or individuals that have opened an account or that are clearly designated in the first NAP of Luxembourg, are allowed to buy or to sell emission quotas.[9]

The emission quotas transfers (at a national or at an international level) will be recorded in a central repository, which will be in a first phase (2005-2007) linked with the central register of the EC (CITL)[10] and, in a second phase (2008-2012), with the ITL of the United Nations.

The software tool used in Luxembourg for recording the emission quotas and their transfer is the one that has been developed by the French *Caisse des Dépôts et Consignations* (*CDC*). Several other EU Member States also use it. The government has signed an agreement with the Belgian Federal Public Service for Health, Food Chain Safety and Environment in order to jointly set up, maintain and operate Luxembourg's national registry within a consolidated Belgium-Luxembourg system (where Luxembourg's national registry is separated from the Belgian one in a secure way). Consequently, all the technical aspects and procedures of the national registry for Luxembourg are identical to those for Belgium. The agreement foresees that Belgian authorities are responsible for hosting the database, installing the requested software tools and looking after the database, whereas the Environment Agency of Luxembourg will be responsible for managing accounts and users as well as for producing various reports on the use of emission quotas (monitoring).

Luxembourg's national registry has been tested and approved by the European Commission on 5 April 2006.

A more detailed presentation on how emission quotas for industrial activities are managed is available on the web portal of the Ministry of the Environment.[11]

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9 http://www.environnement.public.lu/air_bruit/dossiers/plan_national_allocation_quotas_GES/PNAQ_GES_01_PDF.pdf, pages 25-27 (text in German).

10 The register has been officially activated on 17 May 2006 when the link with the CITL has been put in place.

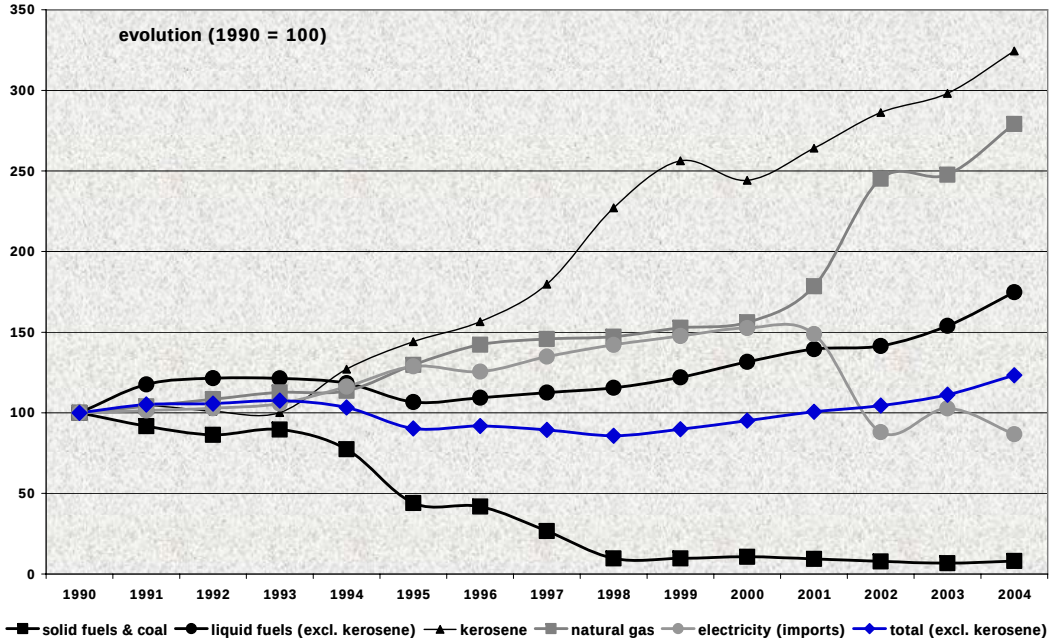
11 http://www.environnement.public.lu/air_bruit/dossiers/registre_national_quotas_GES/index.html (text in French).

Annexes

Annex 1 – Primary energy consumption (excluding air transport) 1990-2004

1000 toe	1990 (base year)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
solid fuels & coal	1198.61	1099.27	1034.88	1073.87	928.05	527.59	501.20	319.20	116.62	115.50	128.26	112.03	94.10	79.94	96.22
	34.32%	*29.92%*	*28.04%*	*28.58%*	*25.74%*	*16.74%*	*15.63%*	*10.23%*	*3.89%*	*3.68%*	*3.86%*	*3.19%*	*2.58%*	*2.06%*	*2.23%*
liquid fuels (excl. kerosene)	1456.42	1711.93	1768.12	1767.28	1723.27	1554.27	1592.53	1638.96	1682.32	1777.20	1916.19	2032.22	2060.74	2241.71	2545.66
	41.70%	*46.60%*	*47.90%*	*47.03%*	*47.80%*	*49.32%*	*49.66%*	*52.50%*	*56.15%*	*56.62%*	*57.67%*	*57.81%*	*56.46%*	*57.74%*	*59.11%*
kerosene	127.60	132.97	128.79	127.72	162.15	183.86	199.82	229.35	289.80	326.99	311.64	337.06	365.19	380.44	413.96
natural gas	477.55	496.86	517.89	537.96	542.83	619.38	679.47	696.24	703.01	729.21	745.47	852.06	1170.77	1183.02	1333.47
	13.67%	*13.53%*	*14.03%*	*14.32%*	*15.06%*	*19.66%*	*21.19%*	*22.30%*	*23.47%*	*23.23%*	*22.43%*	*24.24%*	*32.08%*	*30.47%*	*30.97%*
electricity (imports)	318.22	322.65	327.21	336.34	370.05	409.85	399.29	429.16	452.41	469.72	485.74	473.73	279.92	327.01	276.25
	9.11%	*8.78%*	*8.86%*	*8.95%*	*10.26%*	*13.01%*	*12.45%*	*13.75%*	*15.10%*	*14.96%*	*14.62%*	*13.48%*	*7.67%*	*8.42%*	*6.41%*
waste incineration (with heat	26.84	27.92	28.16	26.94	26.34	25.15	19.40	23.14	26.41	31.62	30.77	28.15	26.72	31.42	34.37
recovery)	*0.77%*	*0.76%*	*0.76%*	*0.72%*	*0.73%*	*0.80%*	*0.60%*	*0.74%*	*0.88%*	*1.01%*	*0.93%*	*0.80%*	*0.73%*	*0.81%*	*0.80%*
wood	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.40	15.40	15.40	15.40	15.40	15.40
	0.43%	*0.41%*	*0.41%*	*0.40%*	*0.42%*	*0.48%*	*0.47%*	*0.48%*	*0.50%*	*0.49%*	*0.46%*	*0.44%*	*0.42%*	*0.40%*	*0.36%*
biogas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.29	1.12	2.02	2.28	3.72	5.00
	0.00%	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.01%*	*0.03%*	*0.06%*	*0.06%*	*0.10%*	*0.12%*
Total (excl. kerosene)	3492.64	3673.63	3691.26	3757.39	3605.54	3151.24	3206.89	3121.70	2995.90	3138.94	3322.95	3515.61	3649.93	3882.22	4306.37

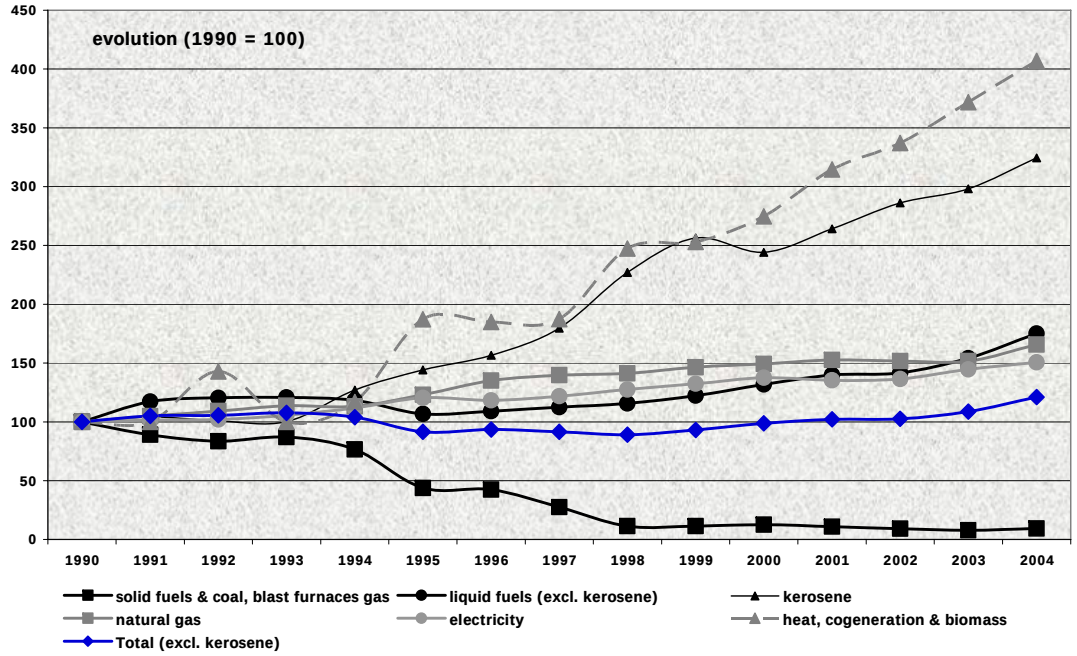
Source: Ministry of Economic Affairs and External Trade, Energy Department and FiFo Köln



Annex 2 – Final energy consumption (excluding air transport) 1990-2004

1000 toe	1990 (base year)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
solid fuels & coal, blast furnaces gas	1021.28	909.03	852.52	888.65	782.74	448.24	434.28	281.20	116.62	115.50	128.26	112.03	94.10	79.94	96.22
	30.84%	*26.13%*	*24.38%*	*24.93%*	*22.72%*	*14.79%*	*14.02%*	*9.28%*	*3.96%*	*3.74%*	*3.92%*	*3.31%*	*2.77%*	*2.22%*	*2.40%*
solid fuels & coal	819.56	736.47	704.10	733.06	651.29	382.99	374.29	248.93	116.62	115.50	128.26	112.03	94.10	79.94	96.22
blast furnaces gas	201.72	172.56	148.42	155.59	131.45	65.25	59.99	32.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
liquid fuels (excl. kerosene)	1453.61	1703.86	1750.48	1755.69	1718.68	1552.32	1585.14	1634.81	1681.99	1776.83	1915.99	2031.88	2060.51	2241.59	2545.48
	43.89%	*48.98%*	*50.06%*	*49.24%*	*49.89%*	*51.21%*	*51.17%*	*53.96%*	*57.05%*	*57.61%*	*58.58%*	*60.02%*	*60.64%*	*62.26%*	*63.45%*
kerosene	127.60	132.97	128.79	127.72	162.15	183.86	199.82	229.35	289.80	326.99	311.64	337.06	365.19	380.44	413.96
natural gas	464.14	487.02	507.24	527.48	525.22	571.29	627.00	648.61	655.32	679.43	692.52	708.62	703.73	704.09	768.93
	14.01%	*14.00%*	*14.51%*	*14.80%*	*15.25%*	*18.85%*	*20.24%*	*21.41%*	*22.23%*	*22.03%*	*21.17%*	*20.93%*	*20.71%*	*19.56%*	*19.17%*
electricity	357.63	363.04	364.75	378.03	400.27	430.70	422.96	435.93	456.15	473.77	491.69	484.32	487.84	517.26	538.50
	10.80%	*10.44%*	*10.43%*	*10.60%*	*11.62%*	*14.21%*	*13.65%*	*14.39%*	*15.47%*	*15.36%*	*15.03%*	*14.31%*	*14.36%*	*14.37%*	*13.42%*
heat, cogeneration & biomass	15.40	15.40	22.00	15.40	18.00	28.84	28.47	28.86	38.09	38.96	42.31	48.45	51.90	57.27	62.66
	0.46%	*0.44%*	*0.63%*	*0.43%*	*0.52%*	*0.95%*	*0.92%*	*0.95%*	*1.29%*	*1.26%*	*1.29%*	*1.43%*	*1.53%*	*1.59%*	*1.56%*
heat & cogeneration	0.00	0.00	0.00	0.00	3.00	13.84	13.07	13.46	22.69	23.56	26.91	33.05	36.50	41.87	47.26
biomass	15.40	15.40	22.00	15.40	15.00	15.00	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40
Total (excl. kerosene)	3312.06	3478.35	3496.99	3565.25	3444.91	3031.39	3097.85	3029.41	2948.17	3084.49	3270.77	3385.30	3398.08	3600.15	4011.79

Source: Ministry of Economic Affairs and External Trade, Energy Department and FiFo Köln



Annex 3 – Energy balance for electric power 1990-2004

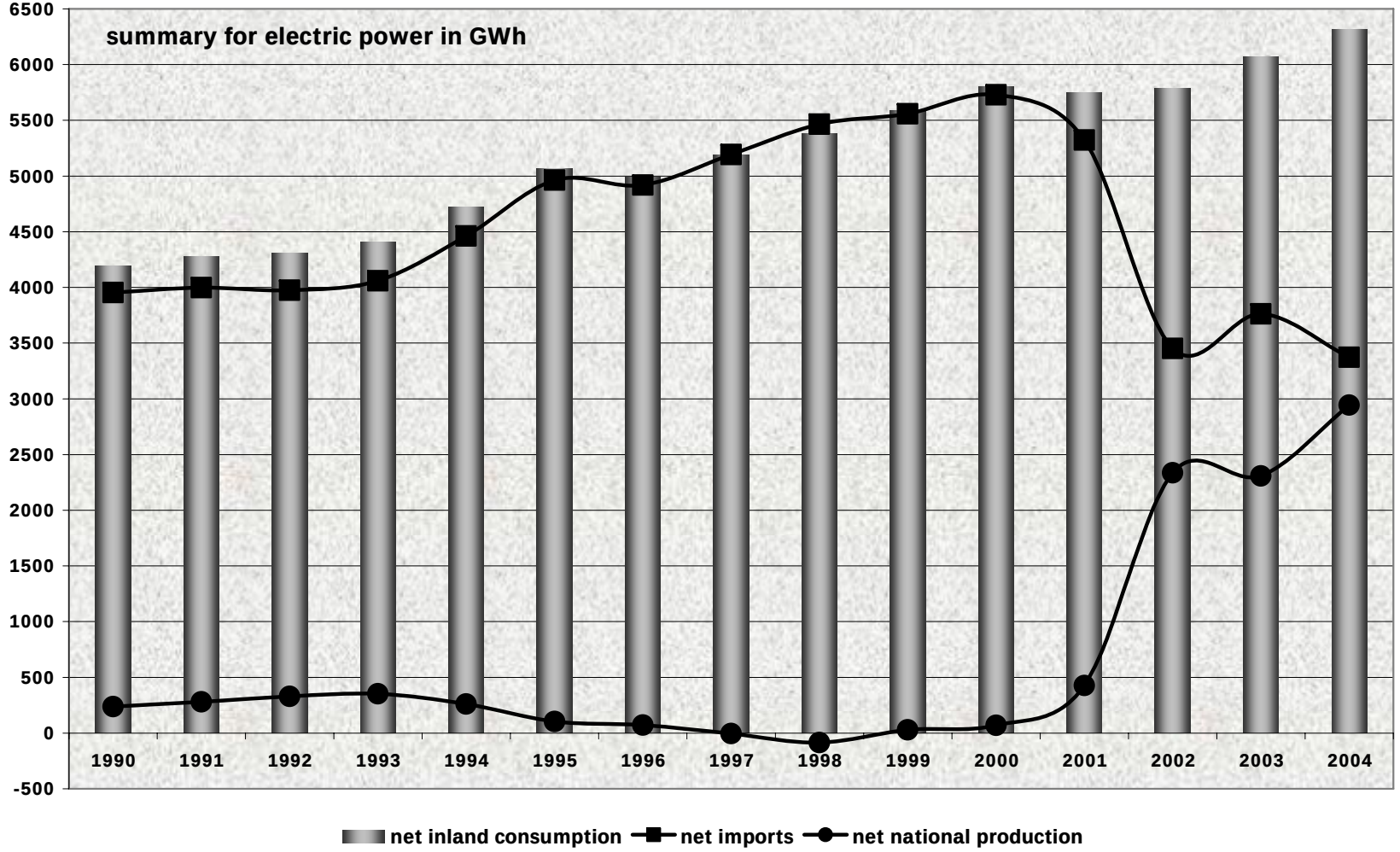
GWh	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
imports	4708.28	4713.87	4517.87	4453.75	5026.76	5707.38	5725.89	6040.48	6388.99	6212.79	6465.87	6389.20	6390.70	6562.18	6505.06
national production	626.24	676.37	662.49	669.79	626.80	537.67	503.77	414.77	343.23	371.12	428.47	842.18	2785.42	2784.39	3372.70
cogeneration	0.00	0.00	0.00	0.00	30.00	99.84	122.35	124.83	198.03	205.15	227.96	321.41	341.50	382.28	421.44
thermic power stations	558.72	622.11	594.14	607.83	505.96	346.53	307.87	205.38	45.38	52.29	51.74	374.43	2312.42	2285.48	2787.37
of which, gas-vapour turbine 350 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*323.03*	*2275.65*	*2237.29*	*2731.06*
hydro-electricity	67.52	54.26	68.35	61.96	90.84	91.30	73.55	81.71	94.75	95.53	119.46	114.39	97.38	73.94	95.64
wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.74	4.61	17.14	24.74	23.70	24.73	26.17	39.40
biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.46	1.01	4.54	8.20	9.30	15.13	20.34
photovoltaic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.08	1.40	8.50
Total	5334.52	5390.24	5180.36	5123.54	5653.56	6245.06	6229.66	6455.25	6732.22	6583.91	6894.34	7231.39	9176.12	9346.57	9877.75
exports	754.92	715.17	542.95	394.41	565.57	744.15	808.06	846.96	924.12	654.97	736.85	1066.79	2939.92	2799.41	3131.58
conversion uses and losses	389.32	395.43	334.28	318.06	364.83	434.15	431.95	418.98	428.05	340.97	359.49	414.82	450.53	475.68	428.98
net inland consumption	4190.27	4279.65	4303.13	4411.08	4723.16	5066.76	4989.66	5189.31	5380.05	5587.98	5798.00	5749.79	5785.67	6071.48	6317.19
Total	5334.52	5390.24	5180.36	5123.54	5653.56	6245.06	6229.66	6455.25	6732.22	6583.91	6894.34	7231.39	9176.12	9346.57	9877.75

Summary in GWh	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
net imports	3953.36	3998.70	3974.92	4059.35	4461.19	4963.24	4917.84	5193.52	5464.86	5557.82	5729.01	5322.42	3450.78	3762.77	3373.47
net national production (1)	236.91	280.95	328.21	351.73	261.97	103.52	71.82	-4.21	-84.81	30.15	68.99	427.37	2334.89	2308.71	2943.71
net inland consumption	4190.27	4279.65	4303.13	4411.08	4723.16	5066.76	4989.66	5189.31	5380.05	5587.98	5798.00	5749.79	5785.67	6071.48	6317.19
net inland consumption in Mio. MJ	15072.91	15394.42	15478.88	15867.20	16989.80	18225.75	17948.41	18666.59	19352.70	20100.64	20856.11	20682.68	20811.76	21839.86	22723.69
net inland consumption in 1000 toe	360.01	367.69	369.71	378.98	405.79	435.31	428.69	445.84	462.23	480.10	498.14	494.00	497.08	521.64	542.75

Source: Ministry of Economic Affairs and External Trade, Energy Department and FiFo Köln

Notes

(1) the net national production is the difference between the national production and the conversion process uses and losses.


summary for electric power in GWh
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
net inland consumption
net imports
net national production