



ECONOTEC
C O N S U L T A N T S

**Study commissioned by the Federal Public Service of Public Health,
Food Chain Safety and Environment on behalf of the National Climate Commission**

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**Reduction of emissions resulting from policies and measures
taken by the Federal Government for the period 2008-2012**

Interim Report

23 March 2009

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1 INTRODUCTION

The objective of the study is to obtain the following results:

1. A table with, for each federal PAM, avoided CO₂-eq emissions for each year in the 5 year period 2008-2012, with a minimum and maximum scenario.
2. A description, for each PAM, of the hypotheses in the calculation of the avoided emission.

In total, 42 federal policy measures¹ have been identified.

A first meeting of the steering group has taken place on 9 January 2009, during which the committee went through the list of federal PAMs to be evaluated and identified the relevant contact persons for obtaining information on the measures.

This intermediate report presents the work done so far, which has consisted in:

- identifying the content of the federal PAMs and the overlapping between PAMs;
- collecting data on the implementation of the PAMs;
- proposing a methodology for estimating the impact of each PAM;
- establishing a proposed set of assumptions for the calculations;
- preparing a few preliminary calculation sheets.

It should be noted that this work is still preliminary and incomplete, and that it might be revised or improved. The aim of the report is to allow a discussion on the principles and assumptions within the steering group.

Terminology

Three concepts of “measure” can be distinguished:

- *national measure*;
- *federal measure*;
- *regional measure*.

Each measure of the National Climate Plan, which is identified by a code such as EP-A02 or EC-B03, is actually a mix of one or more federal or regional measure(s). This mix is called a *national measure*. In this study, only those national measures comprising a federal measure are taken into account. Such a national measure is composed of either one federal measure or one federal measure and one or more regional measure(s).

In this report we will refer to federal measure by the code of the corresponding national measure.

When regional measures are associated with a federal measure in a same national measure, these measures are said to be *linked*.

¹ In this report we will be using indifferently the terms “measure”, “policy measure” or “PAM” (from “policies and measures”).

2 DATA COLLECTION

In a first step, the work has consisted in getting a precise enough description of each federal measure (i.e. the federal part of each national measure), in particular through the related legal references :

- What has been decided?
- Since when is it applicable? (this is important for measures promoting energy saving investments, which have a cumulative effect in time)
- For which period has the measure been decided? (e.g. up to next year or up to 2012?)
- What modifications have taken place since?

It should be noted that the National Climate Plan being an inventory of existing policy measures, the departure date of a measure may, depending on the measure, date back more or less in time.

Also, data has been collected on the implementation of most PAMs, such as:

- budgets allocated;
- number of equipments or investments supported;
- number of EMAS certified public services, number of civil servants concerned;
- size of fuel excises;
- emission factors;
- ...,

as well as on complementary data necessary for the impact evaluations.

This data collection still needs to be pursued in the near future.

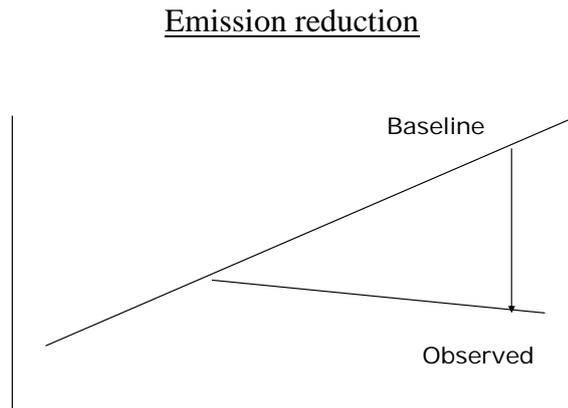
It is important for each federal measure to know whether or not it is linked to 1 or more regional measures. This can influence the CO₂-reduction which will be allocated to the federal measure. For example the fiscal deduction for an investment in renewable energy at federal level overlaps with subsidies given at regional level.

The matrix on the next page shows the relationships between the federal PAMs and the emission reduction technologies per sector, and thereby also the relationships among federal PAMs. This allows detecting where overlapping between different PAMs can occur.

The first column indicates if regional measures are included in the corresponding national measure, while the first row shows which technologies are being supported by regional measures.

3 METHODOLOGY

The impact of a policy measure in terms of emission reduction is defined as the difference between the actual emissions and the emissions that would have taken place had the measure not been implemented (generally called “baseline”), as is illustrated on the figure below.



A difficulty in evaluating this emission reduction arises from the fact that in general the baseline can not be measured precisely, but can only be estimated, on the basis of assumptions. Note that this type of uncertainty is also true for the impact of economic policies on employment or GDP.

Further difficulties hampering the evaluation are pointed out in the next section. The way of addressing these difficulties – which is based on our available experience, notably in the framework of European directive 2006/32/EC, as well as recent literature, such as AEA et al. (2008) and EMEEES (2008, 2009) –, will be presented in the subsequent sections.

3.1 Difficulties encountered

Evaluating the impact of policy measures is an ambitious task, as can be noticed from the following difficulties, which will have to be addressed and may require particular assumptions.

Overlapping measures

The evaluation of the impact of an individual measure must take into account other measures that can contribute to a same effect. This can be the case for other federal measures or regional measures. These other measures are modifying the baseline.

An example of a set of overlapping measures is the following:

- TR-A03: Promotion of bicycle use
 - o fiscal deduction of the allowance paid by employers
 - o lump sum fiscal deduction of the expenses for home-work transport other than with a car
- OB-C03: Promotion of bicycle use in the public sector
 - o fee per km awarded to civil servants going to work by bike
- TRA-02: Improvement and promotion of public transport
 - o includes objectives for bicycle parking places in the management contract of the SNCB group of companies.

A second example is the following :

- EC-B01: Fiscal reduction for energy saving investments by citizens (condensing boilers, heat pumps, roof insulation, solar panels...).
- Regional subsidies for energy saving investments (for similar types of equipments)

There are potentially, 2 types of overlaps (Figure 1). In the first, the emission reductions of a certain PAM are completely incorporated within the emission reductions from another PAM. In the second, only a portion of the total emission reductions of two different PAMS are overlapping.

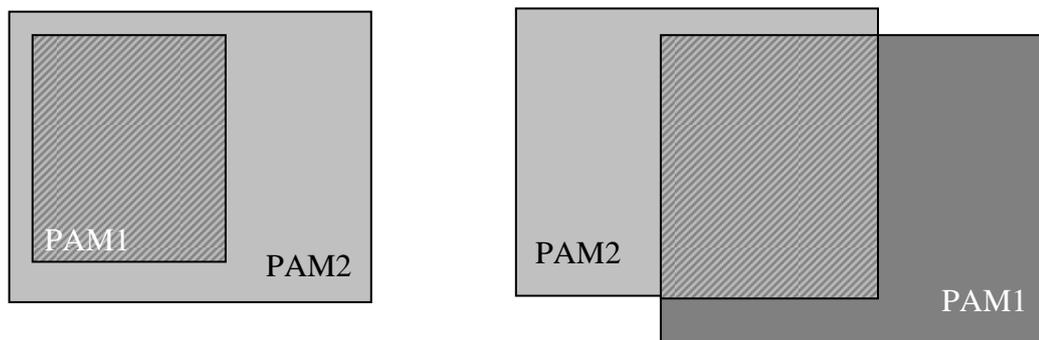


Figure 1. Illustration of two types of overlap of PAMs

Complexity of some of the measures

Certain financial incentives change in time (rate or ceiling of the subsidy, technologies supported...), while there is often a cumulative effect in time.

There are also combined incentives (e.g., fiscal reduction linked to the presence of a particle filter).

Limitation in data availability

There is often a lack in statistical data for an appropriate monitoring of the measure.

Examples are:

- Measure EC-B01 (fiscal reduction for energy saving investments): the available data on number of reductions and corresponding amounts of money are not divided by technology.
- Measure TRA-03 (fiscal deduction for use of a transport means other than individual car): no data by type of transport (bicycle or car pooling) is available.

Measures with indirect impact

Examples of measures with indirect impact, of which the evaluation is not obvious, are:

- information and sensitization campaigns;
- making available diagnostic tools;
- mobility plans;
- fuel certifications.

Emission factor for electricity savings

One parameter that can considerably influence the estimated reductions is the assumption on the emission factor for electricity savings, i.e. the average emission per kWh of the electricity that would have had to be produced if the measure had not been implemented.

If the conventional electricity production can be reduced as a result of either direct electricity savings or the production of electricity from renewable energy sources, the overall emissions are reduced proportionately to the emission factor of the power plants that reduce their production.

Assumptions made for this emission factor in the literature can vary significantly, for example between:

- the average emission factor of electricity production in the country (which in Belgium is relatively low, because of the nuclear electricity generation);
- the average emission factor of electricity production from fossil fuels;
- the emission factor of a marginal plan (e.g. that of a natural gas combined cycle power plant or of a coal power plant).

Other factors requiring hypotheses

There are several other factors, not directly related to the PAM, but that require additional hypotheses. These are:

- the free-rider effect. Examples of measures for which this effect exists are:
 - o the free ticket given to civil servants travelling to work by train;
 - o the fiscal reduction for clean cars;
- the multiplier effect (people making energy saving investments because their neighbours did, however without applying for financial support...);

- the rebound effect (increase in useful energy consumption resulting from the fact that energy savings have made useful energy cheaper);
- the impact of energy prices on the penetration of energy saving technologies or the reduced use of cars.

3.2 General approach

The quality of the evaluations is a function of the available statistical data related to the implementation of the policy measures, as well as of the available time and manpower resources available for carrying out the analysis.

Given the number of policy measures to be considered, a detailed evaluation for each would fall beyond the scope of the present study. As far as possible, we will be using existing studies on the evaluation of particular measures. However, in practice such evaluations are hardly available. Therefore we will in general make our own assessments, sometimes using necessarily simplified, and hence approximate, approaches.

The evaluation will be focused on those measures expected to be the most significant in terms of emission reduction or cost. It should indeed be noted that since the impact of the measures can be very different from one PAM to another, the knowledge of an order of magnitude of the impact of the less significant ones can already be quite useful.

Given the uncertainties on a number of parameters and the hypotheses that will be needed, the analysis is being carried out in a transparent way, with all data sources and assumptions being made explicit, so as to allow changes in parameters if better information becomes available in the future and sensitivity analyses to be carried out. The analysis should not be considered as a final one, but rather as a first step, which could be improved in the future.

More specific points are addressed in the following sections.

3.3 Overlapping measures

Wherever two or more measures overlap, the calculation will be adapted in such a way as to eliminate any double counting of emission reduction impacts. This is done by:

- taking into account the common impact under one of the overlapping measures;
- setting to zero the impact of the measures of which the impact is included under another measure.

3.4 Clustering of measures

In some cases, the impact can be estimated more precisely for two or more measures together than for each of these measures individually.

This is the case of the federal measures stimulating the development of offshore wind energy (measures EP-A01 and EP-A05), where the impact is best estimated from the

installed capacity expected for the years 2008-2012, based on actual projects. In this case the impacted is being estimated for both measures jointly.

This is also the case of fiscal measures supporting investments for which there are regional subsidies. In such cases the impact is evaluated for the different measures together. Where there is a contribution of regional measures, an estimate is made of the federal fraction of the overall impact, the way explained in the next section.

3.5 Allocation of impact between federal and regional PAMs

As far as possible the allocation of an impact between federal and regional measures will be based on quantitative data.

Two cases are considered:

- In the case of financial incentives such as fiscal deduction, fiscal reduction and subsidies, it is suggested that the estimated emission reductions be proportional to the relative amounts of money (amount of fiscal reduction, subsidies) spent for the corresponding measure by the respective federalised entities.
- In the case of fuel taxes for electricity production and the green certificates scheme, it is suggested to allocate the emission reductions proportionately to the relative size of the impact these measures have on the cost of electricity production.

However, in the case of the fiscal reduction for energy saving investments by households (EC-B01), no data is available on amounts by type of energy saving technology. In the still very preliminary calculation presented in appendix (Example 2), the number of fiscal reductions has been allocated between the technologies on the basis of past data for regional subsidies, and the amount of fiscal reduction per household based on the ceilings for both the federal fiscal reduction and the regional subsidies.

3.6 Impact of energy prices

To what extent did the high energy prices of the recent years influence the impact of the federal PAMs?

These high prices have to a certain extent prompted households, public services and companies to reduce their energy consumptions, to buy cleaner vehicles than they would have done otherwise, to make more energy saving investments. But they also had an impact on the baseline emissions for each PAM (the emissions that would have taken place in the absence of the PAM).

To quantify such effects is very tricky (because the number of parameters involved, the anticipation of future price evolutions and the dynamic nature of the process) and falls beyond the scope of this study.

We will assume here that the two effects compensate each other and hence neglect the net effect of the energy prices on the impact of the PAMs.

3.7 Free rider effect

A correction for the free rider effect should in principle be made when the impact on emissions is estimated on the basis of a number of tax reductions or subsidies awarded, if it is likely that a significant number of recipients of the financial support are likely to have made the emission reduction without this support.

In the framework of the EMEEES project, which developed bottom-up methodologies for evaluating energy savings in the framework of European directive 2006/32/EC, it has been suggested that free rider and multiplier effect might compensate each other, especially if the PAM is relatively small.

This assumption seems too rough to be applicable for all federal measures of the National Climate Plan. A specific evaluation of the free rider effect seems to be necessary in particular for the tax reductions for clean cars as well as for the free public transport tickets for home-work travel by civil servants and employees of the private sector.

This correction will be estimated for each of the most relevant measures, on the basis of data on the previous penetration of the corresponding energy saving action.

3.8 Multiplier effect

The multiplier effect is the fact that e.g. people having been led to invest in renewable energy because they heard of financial incentives, but without actually applying for these incentives.

It is suggested to take that effect into account only where its order of magnitude can be evaluated on the basis of quantitative data, for example possibly data on number of regional subsidies applied for.

4 ASSUMPTIONS

This section presents in a table format for each measure:

- a brief description of the federal measure;
- the kind of impact on GHG emissions;
- the impact which it is suggested to estimate;
- the main assumptions that are proposed, in particular concerning the baseline.

It is suggested that the proposed assumptions be discussed by the steering group.

Before that some general assumptions are presented first.

4.1 General assumptions

It is assumed that, in the absence of any other information, the fiscal measures will be maintained at their current level and for the same types of purchases or investments up to the end of 2012.

Given the uncertainty on the impact of some measures (such as information campaigns) a general approach has consisted in giving preference to conservative assumptions, tending to underestimate, rather than to overestimate, the impact of such measures. This has led us in particular to assume a zero impact for a number of marginal measures of which the impact, although very uncertain, can be considered to be comparatively minor.

For measure EC-B01 (tax reduction for energy saving investments by households) no early replacement has been assumed in the current calculations. However, the impact of an early replacement of existing boilers by condensing boilers will also be evaluated.

For modal shifts in the transport sector, the following assumptions are proposed:

- The increase in passenger-km by public transport (railway, urban transport) is assumed to be entirely compensated by an equivalent decrease in passenger-km by car, on the basis of the average number of persons per car.
- Overall emission reduction resulting from the increase in bicycle use is due to the modal shift from car or public transport.
- For car pooling, the emission reductions are those resulting from the shift from individual car to car pooling since 2000.

4.2 Assumptions by measure

We have made a list with all federal PAMs, clustered if necessary, with a proposed methodology or approach with respect to assessing the impact on the CO₂ emission reduction and with the proposed assumptions.

Table 2. List of PAMs with measured impact on emission reductions and the most important assumptions.

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
1	EP-A01	Green certificates	With a view to ensuring the placing on the market of a minimum volume of green electricity, a system GCs and CHP certificates was established, both at the regional and federal levels. Electricity suppliers are obliged to provide a minimum amount of electricity sold from renewable energy sources. A minimum price has been fixed for GCs.	Green certificates system at the federal level: minimum price guarantee	Total impact of offshore wind on CO2 emissions. Lower emissions from electricity production, through replacement of fossil electricity production by offshore wind electricity.	Offshore wind energy replaces electricity from natural gas in CCGT plants. Its penetration will be that of the already planned or approved projects.
2	EP-A02	Financial support for electricity generation from RES	In addition to the Green Certificates scheme, the Belgian authorities have implemented several measures to promote generation from RES. RES and CHP producers enjoy priority access to the grid in all regions. The Federal Government has also taken a number of additional measures which reduce the relative cost of electricity from RES. The regions offer ecology premiums that can be cumulated with the federal measures.	Special excise tax on fossil fuel for electricity production : 15€/t for heavy oil and 8,65€/t for coal. 'Cotisation sur l'énergie/Bijdrage op energie' of 3€/t of coal.	Impact from the replacement of coal by natural gas for electricity production which is induced by the coal price increase	Coal is replaced by natural gas. No impact on the production of electricity from biomass (which is very small in comparison with that of the green certificate system of the Regions). No impact on electricity imports.
3	EP-A03	Stopping the exemption from excise & establishment of an excise duty on energy for coal and heavy fuel oil products	The federal government ended the system of excise duty exemptions for coal, coke, lignite and heavy fuel oil, which were previously exempt from excise duty for electricity. It has been decided in parallel to establish an excise duty (8,65 € / kg in 1000) on coal, coke and lignite to deter their use coal as raw materials for the production of electricity. One consequence of that is a shift from coal power to biomass energy production.	Included under EP-A02	Included under EP-A02	
4	EP-A05	Action Plan for renewable energy and CHP: offshore wind	The federal Council of Ministers set a target of 2000 MW for electricity from offshore wind. An assessed contribution of the grid operator is introduced (financing for network expansion, purchase of certificates). Federal government guarantees project investment in case of interruption by authorities. Regions establish administrative regulations for the implementation of on-shore wind turbines.	The federal Council of Ministers set a target of 2000 MW for electricity from offshore wind. An assessed contribution of the grid operator is introduced (financing for network expansion, purchase of certificates). Federal government guarantees project investment in case of interruption by authorities. Simplification of procedures.	Lower emissions due to replacement of fossil energy by wind energy for electricity production. Included under EP-A01	
5	EP-B01	specific improvement for allocation of emission quotas to power producers	The Belgian allocation plan is the compilation of 3 regional allocation plans. Prior authorization is required for any new installation who develop more than 25MW (also for expanding plants). The criteria are based on: needs, network integration, use of BAT, choice of fuel,... The methods of calculating amounts of allowances vary by region.	Prior authorization is required for any new installation that develops more than 25MW (also for expanding plants). The criteria are based on: needs, network integration, use of BAT, choice of fuel,...	Emission reduction through the choice of a technology with lower CO2 emissions	Replacement of coal power plant by CCGT plant. The impact of this measure will be assessed based on the available information on the projects that needed authorization and the decisions that have been taken.
6	EC-A05	promotion of energy efficiency of electric appliances	The Federal Government supports initiatives to assess the effectiveness of labels to inform consumers correctly. The Flemish Region and the Region of Brussels Capital offer bonuses for buying efficient appliances.	The Federal Government supports initiatives to assess the effectiveness of labels to inform consumers correctly.	Reduction in emissions due to modified choices of appliances as a consequence of clearer labels as a result of the label assessment	Zero impact (the savings are too speculative).
7	EC-B04	Improve the information available to the consumer on the environmental impact of products	The federal government develops methodologies (indicators, standard...) for consumer protection as part of the information on environmental impacts. A revision of the code of advertising environment is also planned.	The federal government develops methodologies (indicators, standard...) for consumer protection as part of the information on environmental impacts. A revision of the code of advertising environment is also planned.	Reduction in emissions due to modified choices of appliances as a consequence of clearer labels as a result of the methodology development	Zero impact (the savings are too speculative).
8	EC-B01	Financial incentives for the rational use of energy (RUE) and RES	Tax deduction and subsidies have been granted for a part of the cost of investments aiming to increase energy efficiency (including the use of renewable energy resources).	Tax reductions for the purchase of energy saving investments, including the use of renewable energy sources.	Emission reduction due to the increased purchase of the energy saving investments concerned.	No early replacement of equipment. Without the measure, the equipment purchased would have been the average new equipment on the market. Different other assumptions, depending on type of energy savings.
		agreement with the banking sector	The regions offer loans for energy-saving work with low interest (until 0%).			

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
9	EC-B02	Specific constraints on boilers	The federal government will set standards for pollutant emissions (NOx, CO and PM) and performance for boilers, stoves and heaters coal. The 3 regions have regulated the maintenance of boilers.	The federal government will set standards on the efficiency of stoves and coal heating systems.	The emission reduction results from the improved efficiency of stoves and coal heating systems.	Zero impact (impact is negligible)
10	EC-B03	Specific RUE aid for unprivileged people	Funds are available for the energy improvement of housing for disadvantaged people via cheap loans.	Funds are available for the energy improvement of housing for disadvantaged people via low interest loans.	Emission reduction resulting from the investments funded by the FRCE/FRGE fund	Emission reduction is proportional to the cumulated amount of money awarded by the fund. If possible, emission reduction factors will be based on previously completed projects.
11	EC-C01	Using a third investor funds in the public sector	FEDESCO (Energy Service Company) will invest in projects for which energy reduction would be profitable, but the investment cost for the owner or building administrator is too high. The savings on the energy bill will first be used to reimburse ESCO and will then benefit the client.	Third party financing of energy saving investments (excluding renewable energy production)	Emission reduction resulting from the energy saving investments funded by FEDESCO	Renewable energy production is excluded here, as it is already the subject of OB-B01. Emission reduction is proportional to the cumulated amount of money invested by FEDESCO for energy savings. If possible, emission reduction factors will be based on previously completed projects.
12	IP-A06	Specific financial measures and ecology premiums	Companies enjoy a tax advantage when they invest in energy saving. As for regions, they distribute bonuses for sustainable energy use.	Tax deduction of 13,5% for energy saving investments by companies (instead of 3,5% for standard investments)	Emission reduction resulting from the energy saving investments benefiting from the tax deduction	Free rider effect is high. Investments have to a large extent been influenced by voluntary agreements of the Regions as well as by high energy prices. PAM has been in effect for a long period.
13	IP-B01	Reducing the use of fluorinated greenhouse gases : HFCs, PFCs	The three regions recently adopted or will soon adopt regulations related to stationary applications containing refrigerant gases (refrigeration, air conditioning and heat pump equipment). They have already adopted regulations aimed at recognition of those responsible for the installation and maintenance of applications containing refrigerant gases and systems to protect against fire containing fluorinated gases or gases that deplete the ozone layer.			
14	TR-A01	Mobility plans at local level	The plans aim to optimize the movement of passengers and limit the use of fossil fuels (adaptation of regulations on management of roads, signage, etc.. that increases the speed of transport and enhance the safety of cyclists).	The federal government makes available for companies diagnostic tools that can serve as a basis for setting up company transport plans.	Extra emission reduction resulting from the availability of federal diagnostic tools for setting up company transport plans	Zero impact (impact is very indirect and there is overlap with financial incentives to promote public transport, carpooling, ... for commuting).
15	TR-A02	Improve and promote public transport	Large infrastructure projects are implemented in cooperation between different authorities (RER, Diabolo project, ...) to strengthen transport capacity and quality of service (enhancing timeliness, safety, accessibility and information to travelers). SNCB must increase annually over the period 2008-2012, the number of passengers transported by 3.8% to achieve a growth of 25% over the period 2006-2012. The pricing policy is also adjusted. The combinations public transport and other means of sweet travel are promote with sensibilization campaign. Adaptation for regional transport companies are in place too (network, speed, access, car-sharing...).	Through Royal Decrees of 29 June 2008, the management contracts of the 3 companies of the SNCB group impose a 3,8% annual growth in the number of passengers transported (to achieve 25% over the period 2006-2012), to be reached through investments in infrastructure to strengthen transport capacity and quality of service (enhancing timeliness, safety, accessibility and information to travellers), the pricing policy (free transport for children < 12 years old and price reductions for other categories of passengers), the promotion of combinations between railway and other soft transport modes through sensitisation campaigns.	Emission reduction resulting from the imposed increase in passengers transported, assuming this increase is due to a modal shift from cars to railway	The increase in passengers transported corresponding to the management contracts objectives is entirely allocated to the federal measure. It is only due to a modal shift from cars to railway. The average distance travelled per passenger-km is the same after the measure Use of average emission factors per passenger-km for cars and railway.

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
16	TR-A03	Promoting the bicycle use	Travel between home and work done by bicycle are immune from taxes and social charges to a maximum of 0,15 €/km. Measures are taken to improve security (bike track, street plan, parking, marking ...) and service (repairs, rentals, access to bus / train / tram ...)	The allowance paid by the employer for home-work travel by bicycle is free of tax and social security charges up to 0,15 €/km (Art. 38 of the Income Tax Code). Besides, home-work travel expenses for using a bicycle are deductible at the lump sum rate of 0,15 €/km (Art. 66bis of the Income Tax Code, applicable from the revenues of 2001). In its management contract, the SNCB holding company committed itself to the promotion of the use of bicycles, in particular through an objective of 78000 parking spaces for bicycles in stations, compared with 59000 in 2008.	Overall emission reduction resulting from the increase in bicycle use due to the modal shift from car or public transport to bicycle since 2000	The total emission reduction towards bicycle riding since 2000 is allocated to this measure. Baseline is weighted average emission by other modes of transport (car, public transport). Includes the impact of measure OB-C03.
17	TR-A04	Promoting multimodal systems for goods	For goods, development of multimodal platforms occur through the improvement of river and rail transport (logistics area, infrastructure, investment, standard, ...).	The Federal government supports the NAIADES program of the European Commission to promote inland navigation. This includes the exemption of taxes on the added value realised by commercial inland navigation. Additionally, environmental conditions are put forward for vessels to further decrease environmental impact of transport over water. The Federal government supports multimodal transport of goods via financial support for transport of goods via rail for distances below 300 km.	Emission reductions from modal shift in transport of goods occurring as a result of the measure	Baseline is the average emission factor of transport via road, expressed as ton km.
18	TR-A08	Free public transport for commuters	The federal and regional policies to promote modal shift encompasses a series of measures like free train service for commuters, extension of the tax deduction for expenses incurred for home-work travel when using alternative transport, etc...	To achieve free public transport by train to and from work for all employees, the Federal government has decided in 2008 to prolong the 80/20 system for private sector employees until 2012. In this system, 80% of the season ticket of the SNCB is paid by the employer and 20% is paid by Federal government. The system of free commuting by train for employees of the Federal government has also been extended until 2012.	Overall emission reduction resulting from the increase in passengers transported through the modal shift occurring from cars to railways	The increase in passenger-km by railway is assumed to be entirely compensated by an equivalent decrease in passenger-km by car, on the basis of the current average number of persons per car. Based on the number of free season tickets, the impact of this PAM can be determined. Includes the impact of measure OB-C02 (partly) and is included under measure TR-A02.
19	TR-B01	Promotion of car-pooling	The advantage of carpooling is to limit the vehicle traffic and as a result congestion. This system is supported fiscally. Parking spaces are specially designed for this purpose.	Home-work travel expenses for using carpooling are deductible at the lump sum rate of 0,15 €/km, up to a maximum distance of 25 km (later increased to 50 and 100 km one-way) (Art. 66bis of the Income Tax Code, applicable from the revenues of 2001).	Emission reductions resulting from the shift from individual car to car pooling since 2000.	Car-poolers would have used their individual car as alternative. In absence of the measure the proportion of car poolers would have stayed constant.
20	TR-B03	Promote teleworking	Teleworking contributes to the reduction of road traffic during rush hours (congestion) because the worker stays at home and is especially effective if he lives far away from his workplace. Several projects are ongoing and legal adjustments are yet to implement. Tax incentives are expected to encourage companies.	Tax incentives for teleworking are being considered but have not been decided yet.	X	Zero impact, because no concrete decision on implementation. This measure does not cover OB-C04, which is also on teleworking.
21	TR-B05	Eco-driving	Eco-driving is incorporate in the study of driving licence. Training also go to professional drivers (trucks, bus, cars...)	Actions foreseen are for drivers' licences of categories C or D (professional drivers): introduction of a module on eco-driving in driving schools' programmes; introduction of eco-driving in the qualification tests.		Further information is required.

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
22	TR-C01	Tax deduction on the purchase of clean vehicles	Tax reductions are linked with levels of CO2 emissions when purchasing new clean vehicles. Tax deductions are also possible for company cars.	Since 1 January 2005, the solidarity contribution (a contribution paid by employers for provide a company car) is calculated based on CO2 emissions. Since 2006, the purchase of environmental friendly cars is promoted via a tax advantage. For cars with a CO2 emission of less than 115 g/km, 3% of the purchase price can be recovered via a tax reduction. For cars with a CO2 emission of less than 105 g/km, 15% (with a maximum of 3280 €) of the purchase price can be recovered. Additionally, a tax reduction of 150 € is given since 2007 for new diesel cars equipped with a particulate filter and a CO2 emission of less than 130 g/km and particulate emission of less than 0,005 g/km. Finally, for company cars purchased from 1 January 2007 onwards, the deduction from the corporation tax of all expenses (except fuel) will be between 60 - 90% depending on CO2 emissions. Actions were taken to increase the inspections on emissions of private and company cars.	Difference in emission between cars with low emission and cars with average emission.	Without the measure people would have bought the same category of car. Free-rider effect will be assessed based on sales statistics before and after implementation of the PAM.
23	TR-C02	Promoting the purchase of clean vehicles	Advertisements must mention fuel consumption and CO2 emissions. The Walloon Region has established a bonus/malus system for the purchase or replacement of vehicles more environmentally friendly.	The Federal government takes all necessary actions to implement the Royal Decree of 5/9/2001, which describes the correct representation of fuel usage and CO2 emissions in advertisements. The annual publication "CO2 gids van de auto, rij zuinig ... een troef voor u en de natuur / " provides objective information and allows comparison among all car models available on the Belgian market with respect to CO2 emission, fuel type and consumption and possible tax advantages.		Zero impact. We assume that this measure does not have an additional impact to TR-C01, so emission reductions caused by cleaner cars are assigned to TR-C01.
24	TR-D01	Tax exemption of biofuels	The Federal Government has authorized the financing of certain quantities of bioethanol and biodiesel to be mixed with fossil fuels. Pure rapeseed oil has also tax exemption under certain conditions. The production of biofuels is subject to a specification which sets environmental criteria. The minimum share of biofuels in the market is set at 5.75% for 2010.	The objective of this measure is to guarantee a minimal amount of biofuels on the Belgian market of 5,75% in 2010. The Federal government has decided a tax exemption for certain amounts of bioethanol and biodiesel, to be mixed with fossil fuels. Since 10 March 2006, pure vegetable or plant oil is also free of taxes. Pure rapeseed oil also has a tax exemption, but only if the producer sells directly to the end user of when rapeseed oil is used for vehicles in public transport. E85 biofuel (85% bioethanol and 15% fossil fuels), which is not regulated, can be used via a separate distribution network only accessible to end users explicitly involved in a specific project. The production of biofuel is described in a guideline, determined by the law of 10 June 2006, concerning criteria related to environment (energy efficiency, greenhouse gas balances), agriculture (use of pesticides and fertilizers), proximity (shortest distance between production biomass and production unit), etc. (see Ag-D04)	Difference in emission between fossil fuels and biofuels, for the total expected penetration of biofuels.	The entire penetration of biofuels will be ascribed to this measure. The baseline is the average emission factor of fossil fuels.
25	AG-C02	Preservation of the ecological stability of forests	The implementation of these policies results in the preservation of land, limiting changes in land use and consequently the loss of soil carbon. Monitoring is provided by including wood certification criteria of sustainability. Certification is part of a logic of buying environmentally friendly.	On 18 November 2005, the Federal government agreed on a circular letter regarding sustainable wood. This circular letter enforces the Federal government to purchase only certified wood from March 2006 onwards. FSC, PEFC and other equivalent certifications are considered suitable. The Federal government has decided on several actions to prevent the import and sales in illegal wood and to increase the control and penalization of this trade. This was done by activating a new contact group FLEGT and structural cooperation between Federal administrations of Environment and Finances.	Emission reduction from land use changes.	Zero impact (the impact primarily takes place abroad). No data available on quantities of certified wood purchased.

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
26	AG-D04	quality standard of solid biofuels	The Federal Government has decided to draft a royal decree on quality standards of pellets.	The demand for solid biofuels has increased. Low quality of solid biofuels however, could reduce the efficiency of biomass boilers. The Federal government has decided to formulate a Royal Decree on quality standards of pellets.		Zero impact (emission from biomass is considered zero for the Kyoto Protocol), so increases in efficiency do not contribute.
27	AG-E01	Monitoring of biomass	Different inventory systems are promoted to better manage resources in biomass in the country.	Federal government has established a national observatory for biomass, in cooperation with the regions, with following assignments: collect (and calculate) all useful information on biomass fluxes in Belgium and between Belgium and other countries; harmonise methodologies for collecting information among the different actors in Belgium; draft an annual biomass balance and report possible problems with respect to availability and collection of statistics. This observatory must also determine the suitability of a national biomass strategy.	Emission reductions from increased usage of biomass.	Zero impact (a possible impact is only indirect, by making available better information for other measures).
28	WA-A01	minimise quantity of waste into landfill	The Federal Government has a system of environmental taxes to discourage disposable packaging and utensils. The regions have drawn up plans for reducing the volume of household waste by promoting reuse, recycling and sorting lines. Biogas is increasingly valued	The objective of this measure is to reduce the volume of non-recyclable waste. From 1 July 2007, the price of non-returnable packaging is increased via a system of different ecotaxes (on plastic bags, plastic and aluminium foil, ...). This will increase the use of reusable packaging and decrease the volume of waste.	Direct impact: reduced emissions from waste incineration. Indirect impact through increased recycling (fuel consumption for transport, for cleaning...).	Zero impact (the savings are too speculative).
29	SE-A01	Climate change awareness	The population is sensitive to climate change by many media channels (website, brochures, radio spot, ...). Investigations are conducted and the results are taken into account to guide future action.	Federal government communicates via brochures and guides, campaigns in media and a website www.klimaat.be / www.climat.be. These communication channels are used to spread information on climate change, situation in Belgium, decisions of Federal government and concrete actions that may interest general public.	The impact on emissions lies for a great deal in the fact that it makes the other federal PAMs more effective. In that sense it is an indirect impact, which is difficult to quantify in isolation.	Zero impact. The emission reduction is included under the other federal measures (e.g. EC-B01 and TR-C01) of which it increases the awareness. The impact on behaviour is neglected.
30	SE-A02	REG and promotion of renewable energy applications (ou Outils de communication et module de consommation de CO2)	The federal government and the regions have made available to consumers some Internet sites, brochures and campaigns to make more sustainable purchases linked to CO2 emissions. In the field of construction, aid and existing premiums are included. Information points also exist.	Consumers are informed on the CO2 impact of goods through two important channels. 1) The Federal government publishes annually information on CO2 emissions, fuel use, ... of cars. 2) On the website www.energievreters.be the energy consumption and CO2 emission of electrical appliances and other products (wars, insulation, ...) can be calculated; and a selection is given of the cleanest and most efficient models, based on a set of personal criteria. Building and renovation professionals have access to a portal, hosted by the Federal government, with useful information on legislation, premiums, ...	The impact on emissions lies for a great deal in the fact that it makes the other federal PAMs more effective. In that sense it is an indirect impact, which is difficult to quantify in isolation.	Zero impact. The emission reduction is included under the other federal measures (e.g. EC-B01 and TR-C01) of which it increases the awareness. The impact on behaviour is neglected.
31	SE-A03	Environmental Care at School (MOS project)	Teaching tools for schools have been developed. Training for teachers are in place. Students can achieve concrete projects to improve the energy performance of their school.	In January 2007, the Federal government and WWF launched the educational project "In de weer voor het klimaat"/ "Le climat, c'est nous", designed for primary and secondary school teachers and students.	The impact on emissions lies for a great deal in the fact that it makes the other federal PAMs more effective. In that sense it is an indirect impact, which is difficult to quantify in isolation.	Zero impact. The emission reduction is included under the other federal measures (e.g. EC-B01 and TR-C01) of which it increases the awareness. The impact on behaviour is neglected.
32	SE-A07	Action to support local initiatives	The various governments provide financial support to local initiatives mainly in projects related to energy (events related information, training and demonstration).	Financial support for local initiatives to increase public participation and awareness on climate change.	The impact on emissions lies for a great deal in the fact that it makes the other federal PAMs more effective. In that sense it is an indirect impact, which is difficult to quantify in isolation.	Zero impact. The emission reduction is included under the other federal measures (e.g. EC-B01 and TR-C01) of which it increases the awareness. The impact on behaviour is neglected.
33	SE-A08	Urban Policy	Large cities concentrate particular problems specific to their development and needs for energy and transport which require a targeted approach.	In 1999, Federal government created a specific policy for large cities to develop a harmonised development of cities that contribute to the economic growth of the nation.	No evidence of a positive impact on emissions	Zero impact (no evidence of a positive impact on emissions).
34	OB-A01	sustainable public procurement	A catalog of sustainable procurement (with more than 10 categories) is available on the Internet for public markets (federal initiative). It covers office supplies, computers, vehicles... The regions also have their own guidelines.	Via the website http://www.guidedesachatsdurables.be/ , the Federal government recommends the purchase of products which are environmentally friendly and produced in socially accepted circumstances.		Zero impact. The main emission reductions are included under other federal measures (e.g. OB-C07) and are too speculative.

No.	Name of national measure	Description of national measure	Description of federal part of the national measure	Estimated impact on emissions	Assumptions	
35	OB-A02	optimization of catering on the basis of sustainability criteria	A pilot project to promote sustainable food at a Federal canteen is underway. The aim is to encourage sustainable procurement in this sector too.	A pilot project to promote sustainable food at a Federal canteen is underway. The aim is to encourage sustainable procurement in this sector too.	X	Zero impact (as far as the climate is concerned, the measure concentrates on foot miles, which essentially happen abroad). Also, the project is only a pilot one.
36	OB-A03	Establishment of an environmental management system	The federal government has decided to certify EMAS all its own services and the other public services (as SNCB). In Brussels, environmental management is also developed via the eco-dynamic enterprise label (see SE-C05).	The federal government has fixed as objective that by 2007 all public services should be EMAS certified. EMAS certified entities set themselves objectives on the reduction of their energy consumption and an increasing use of bicycle and public transport for their employees. Besides, the management contracts of the SNCB group of companies foresee the establishment and implementation of an environmental policy plan.	Emission reductions resulting from the reduced energy consumption and from the modal shift towards the use of bicycle and public transport for the EMAS certified public services	Zero impact. The impact of EMAS certification is partly covered by measures EC-C01, OB-C02 and OB-C03. The impact of the part not covered by other measures is, given the small number of employees in the currently certified public services (8 public services which represent less than 2000 employees), neglected.
37	OB-B01	RUE in public buildings, strictly speaking <i>RUE strictly speaking</i>	The Flemish region has established action plans (2006-2010) for RUE in the buildings. In WR, energy audits aimed at reducing energy consumption by 15% in 2012 (buildings built > 1000m ² before 2000). RBC also made grants available in this context.	None	X	X
		<i>energy production through renewable energy</i>	The federal government offers its roof areas for solar panels, installs solar panels himself and also public enterprises (cf. SNCB). Wind turbines are concerned too. The RW is also planning to make concessions of the public domain for projects of RUE.	In March 2007, the Federal government decided an objective of 1 km ² of photovoltaic panels on roofs of buildings of the Federal government. This will be achieved by 3 measures: 1) roofs will be made available for installing PV panels, 2) Installation of PV panels by government, via FEDESCO (2 M€ will be invested), 3) the three companies of SNCB group have committed themselves to consider building and install renewable energy equipment (e.g. solar or wind) via partnerships.	Lower emissions from electricity production, through replacement of fossil electricity production by renewable energy production (PV panels and wind)	On average ... m ² (corresponding to... kW or ... kWh) are installed yearly. This number will be calculated from the available budget of FEDESCO for PV panel installations. Average emission factor of replaced electricity production is ... g/kWh. Linear trend starting from 10000 m ² in 2008 (Note: Fedesco has announced completed and ongoing projects for 13200 m ² , 1.3 % of its objective).
		<i>buying green electricity</i>	RW and FR already use green electricity suppliers. The government has initiated discussions in this direction.	The Federal government is studying the possibility to buy a certain percentage of green electricity for all the buildings of the Federal administrations.	X	Zero impact, because no concrete decision on implementation
38	OB-B02	Use of the third investor	Via FEDESCO, investment in work in public buildings are made and may be reimbursed based on energy savings generated (see EC-C01)	Via FEDESCO, investment in work in public buildings are made and may be reimbursed based on energy savings generated (see EC-C01)	X	Zero impact (actual impact is included under OB-B01 and EC-C01)
39	OB-C02	Stimulating of alternative use in transport	Free public transport is available to all officials. The use of bicycles is also compensated. Some structures have a service bicycle park. Most government buildings are easily accessible by public transport.	All Federal employees benefit from free public transport, to and from work. Some federal public services have a bicycle park for employees to cover small distances. New buildings are preferentially built or bought near railway stations.	Emission reduction resulting from the imposed increase in passengers transported, assuming this increase is due to a modal shift from cars to public transport	Will be calculated based on number of employees benefiting from free public transport, assuming that it replaces transport by car, with the current average number of persons per car. For train, this is completely incorporated in TR-A08.
40	OB-C03	Promotion of bicycle use	Mileage allowance is granted to officials who use their bicycles between home and work.	Mileage allowance is granted to officials who use their bicycles between home and work.	Overall emission reduction resulting from the increase in bicycle use due to the modal shift from car or public transport to bicycle as a result of the measure	Zero impact (this is completely included in TR-A03).
41	OB-C04	teleworking	Voluntary teleworking has been introduced in the federal public service (400 employees involved in mid-2008). An annual report gives an overall assessment of the system. The WR has launched a pilot scheme linked to a CO ₂ balance.	In a Royal Decree (November 2008) teleworking is allowed for Federal civil servants. 15 Federal civil services have imposed teleworking (situation mid-2008) and about 400 employees are involved.	Emission reduction from a decrease in km commuted. Emission factors are used for both car and public transport	We assume that people teleworking generally use both car and public transport for commuting, similar to non-teleworkers. We assume that they commute further than non teleworkers. Baseline is weighted average of emission factors for commuters (i.e. cars, public transport).
42	OB-C07	Purchase of clean vehicles	The renewal of vehicle fleets of public authorities is subject to environmental criteria included in the purchase specifications. Short or medium term objectives were defined. (see TR-C02/C05)	In 2004, environmental criteria were included in the purchase specifications of vehicles for Federal institutions (including Federal civil services, federal public and scientific organisations). This was put forward in a circular letter, that stipulates that 50% of vehicle fleet must be conform the environmental specifications. February 2008 a revision of the circular letter was requested.	Emission reductions obtained by buying clean cars compared to average, similar sized car.	Baseline is average emission of car from the same category.

5 CALCULATION

5.1 Excel template

As was mentioned in the initial report, for each PAM an Excel template will be used for the calculation of the GHG emission reduction (in terms of CO₂ equivalents) for the 5 years in the period 2008-2012.

A common format will be used for each PAM, to be adjusted based on the specificities and/or available data for the calculation of the emission reduction (it should be noted that both the complexity and the level of detail needed can differ considerably from one measure to the other). Each Excel file will include a description of the hypotheses/inputs needed.

For clustered measures, the reduction is being calculated first at the clustered level, and then an estimate is being made of the allocation between the linked measures, based on assumptions to be discussed in the steering group.

5.2 Examples of calculation

We have made some provisional Excel templates and files for important federal PAMs. We intend to make one Excel file per PAM.

The following two examples are shown in annex:

- Offshore wind energy (EP-A05)
- Rational use of energy in residential buildings (EC-B01).

It should be stressed that, especially for measure EC-B01, the results are still very preliminary, in particular because better data should become available.

6 REFERENCES

AEA, ECOFYS, FhI, ICCS (2008), “Quantification of the effects of PAMs on GHG emissions – Background Report”, February 2008.

EMEEES (2008, 2009), Project reports on the evaluation of energy savings (www.evaluate-energy-savings.eu).

SPF Mobilité (2005), Diagnostic déplacements domicile-travail au 30 juin 2005.

SPF Mobilité (2007), Recensement quinquennal des catégories de véhicules, y compris le nombre de personnes par véhicule et l'évolution du trafic lourd.

SPF Mobilité (2008a), Relevés des kilométrages annuels parcourus en 2007.

SPF Mobilité (2008b), Recensement de la circulation 2007.

7 ANNEXES

7.1 Example 1. Offshore wind energy (EP-A05)

The figures below represent the 4 Excel sheets in the Excel file.

a) Sheet with general information and assumptions:

Offshore wind energy

description of PAM or cluster of PAMs
 Promoting offshore wind energy through several specific measures within EP-A05. There is few overlap with other federal or regional PAMs. All CO2 eq. emission reductions are allocated to this PAM

general information PAM

general information PAM		information sources
start year	2008	
end year	2020	
parameter	MWh electricity produced by offshore windenergy	
objective	2000 MW in 2020	NCP
	846 MW approved before 2008	

assumptions

assumptions		information sources
minimum scenario is 846 MW reached in 2012		
maximum scenario is 846 MW reached in 2010 (proposed timeframe)		
linear increase		
number of hours offshore wind / year :	3250 h	Ampere = 3000 - 3500 h
allocation to federal PAM =	100%	Promoting offshore wind is an exclusively federal PAM
baseline is the mean emission by	STAG power plant	Offshore does not replace existing installations

PAM scenario calculation

EP*Em	
EP	annual energy production by offshore wind energy (in MWh)
EM	CO2-emission by STAG (in tCO2 / MWh)

CO2 emission counterfactual

CO2 emission counterfactual		information sources
coal	1,10 t CO2/MWh	see 'background information'
STAG	0,42 t CO2/MWh	see 'background information'
Belgian mean	0,59 t CO2/MWh	see 'background information'

b) Sheet with calculations, presented in a comprehensible manner and for the period 2008-2012.

The screenshot shows a Microsoft Excel spreadsheet titled 'EP-A05.xls'. The spreadsheet is divided into three main sections, each with a yellow or green background:

Calculations (Yellow background, rows 5-15):

input parameters			
	MW offshore installed		
	MIN	MEAN	MAX
2008	0	0	0
2009	212	317	423
2010	423	635	846
2011	635	740	846
2012	846	846	846
hours offshore wind/y			3250
CO2 em. factor STAG (t/MWh)			0,42
allocation federal PAM (%)			100

calculations (Yellow background, rows 20-27):

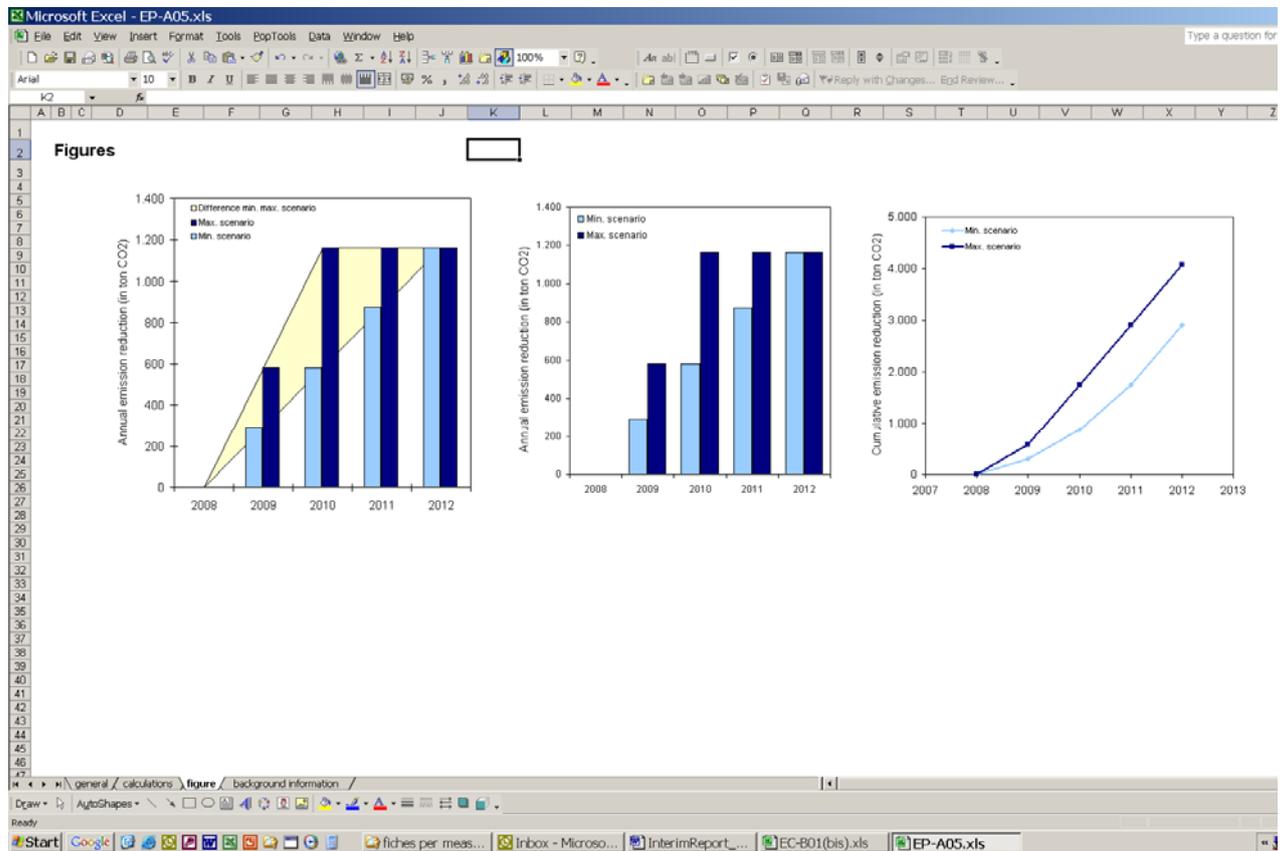
	offshore production (GWh)		offshore emission (ton)		baseline emission (ton)		overall em reduction (ton)	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN (kton)	MAX (kton)
2008	0	0	0	0	0	0	0	0
2009	687	1.375	0	0	291	582	291	582
2010	1.375	2.750	0	0	582	1.163	582	1.163
2011	2.062	2.750	0	0	873	1.163	873	1.163
2012	2.750	2.750	0	0	1.163	1.163	1.163	1.163
sum							2.909	4.072

results (Green background, rows 32-39):

CO2 em reduction by federal PAM (kton)			
	MIN	MAX	MEAN
2008	0	0	0
2009	291	582	436
2010	582	1.163	873
2011	873	1.163	1.018
2012	1.163	1.163	1.163
sum	2.909	4.072	3.490

The spreadsheet interface includes a menu bar (File, Edit, View, Insert, Format, Tools, PopTools, Data, Window, Help), a toolbar with various icons, and a taskbar at the bottom showing the Start button and several open applications like Google, AutoShapes, and InterimReport_...

c) Sheet with figures illustrating the annual emission reductions for 2008-2012, and the cumulative emission reductions for 2008-2012.



d) Sheet with essential background information with sources.

The screenshot shows a Microsoft Excel spreadsheet titled "EP-A05.xls". The active sheet is "background information".

Background information

name project	# turbines	capacity (MW)	annual elec. production (GWh)	building period	start
C-power	60	300	975	2007-2010	2008-2010
Eldepasco	36	216	702	2010-2011	
Belwind	66	330	1072,5	2010-2011	

	emissions (Gg CO2)	net produced (GWh)	em. factor (t CO2/MWh)	source
coal	9.122	8.327	1,10	Belgian CRF tables for 2007 (january 2009), solid fuels
STAG	10.742	25.384	0,42	Belgian CRF tables for 2007 (january 2009), gaseous fuels
Belgian mean	21.862	37.273	0,59	Belgian CRF tables for 2007 (january 2009); total electricity prod, source: Belgian IEA tables electricity and heat 2007 (FOD Economie), total (ex nuclear)

The spreadsheet also shows a taskbar at the bottom with several open applications: Start, Google, and several file windows including "fiches per meas...", "Inbox - Micro...", "InterimReport_...", and "EC-B01(bis).xls".

7.2 Example 2. RUE in residential buildings (EC-B01)

In this case, there is a calculation sheet for each type of investment for which a tax reduction can be obtained. These calculation sheets determine unitary emission reductions, based on assumptions regarding efficiency, size of installation ... Unitary emission reductions are then multiplied by the number of assumed installations and allocated over regional and federal PAMs.

a) Sheet with general information and assumptions.

EC B01 Financial incentives for the rational use of energy (RUE) and RES

description of PAM or cluster of PAMs
Tax deductions and subsidies have been granted for a part of the cost of investments aiming to increase energy efficiency (including the use of renewable energy sources. This PAM overlaps with the regional subsidies,

general information PAM **information sources**

start year	2003 (tax 2004, expenditure 2003)	
end year	2012	
parameter	energy savings and CO2 emission reduction per technology	
	annual number (amount) of subsidies and tax deductions per technology	FOD finances and Regions
objective	Improve RUE in residential buildings	

assumptions **information sources**

for specific assumptions see different calculation sheets	
all applicants of a tax cut also applied for a premium	is needed for allocation between federal - regional PAM
allocation is determined by height of tax cut and premiums, for 2010-2012 data of 2009 is used	
baseline is no energy efficient investments	no significant free rider effect

PAM scenario calculation

general **information source**

calculations are all bottom-up methods	
calculate the unitary energy savings and subsequent CO2 em reduction per technology	
estimate the annual number of investments per technology	FOD finances
multiply the number of investments with the emission reductions	
allocate reductions between regional and federal contribution	

1. condensing boiler

$\Delta E = Q * (1/\eta_{before} - 1/\eta_{after})$ **ISO EN 13790**

2. heat pump

average capacity (kW/h) * working hours (h) * average EF (heating)

3. double glazing

$\Delta E = \Delta Q/\eta$ **ISO EN 13790**

b) Calculation sheet for condensing boilers. Fields in green are assumptions and can be adjusted.

Microsoft Excel - EC-B01(bis).xls

File Edit View Insert Format Tools PopTools Data Window Help

Arial 10

H17 0,95

CONDENSING BOILER

Assumptions energy need

av heat transfer coefficient (W/m²K) 0,78

average loss area (m²) 314 see general information

equivalent degree days 2415 see general information

the baseline is a non-efficient new boiler

E average per house (MJ) 51.115

Assumptions boiler

efficiency η30%	natural gas		heating oil		baseline
	HR+	HR top	optimaz	optimaz elite	
boiler efficiency	0,92	1,07	0,92	1,02	0,89
distribution efficiency - η _d	0,95	0,95	0,95	0,95	0,95
emission efficiency - η _e	0,95	0,95	0,95	0,95	0,95
control efficiency - η _r	0,95	0,95	0,95	0,95	0,95
system efficiency	0,79	0,92	0,79	0,87	0,76

Unitary CO2 emission reduction

replacement old: with new	NG old NG HR*	NG old NG HR top	HO old HO optimaz	HO old HO optimaz elite	HO old NG HR+	HO NG HR top	HO wood	weighted average
% of occurrence	17,7	32,8	49,0	0,5				
CO2 em. factors (kg/GJ)	55,8	55,8	73,3	73,3	73,3	73,3	73,3	
Δ E (Δ primary energy need) (MJ)	2184,3	11268,8	2184,3	8537,5	2184,3	11268,8		
CO2 em reduction (kg)	121,9	629,0	160,2	626,0	160,2	826,3	4911,9	309,7

NG = natural gas
HO = heating oil

NIS
IPCC 1996 default

1. condensing boiler / 2. heat pump / 3. double glazing / 4. roof insulation / 5. thermostats / 6. energy audit / 7. solar thermal / 8. PV / 9. passive house / info tax red

Start Google

EC-B01(bis).xls

c) Calculation sheet for heat pump. Fields in green are assumptions and can be adjusted.

HEATH PUMP

Assumptions heath pump

capacity installation (kWth)	8	estimate
activity (h/y)	2000	estimate
seasonal production factor (COP)	3,5	The seasonal performance factor SPF can be calculated as the ratio of seasonal heati estimate
amount of energy delivered (MJ/y)	57600	MJ

Assumptions baseline

	natural gas HR+	natural gas HR top	heating oil optimaz	heating oil optimaz elite	old
Share of new buildings	0,51	0,26	0,21	0,00	
Performance $\eta_{30\%}$	92%	107%	92%	102%	83%
CO2 em. factors (kg/GJ)	55,8	55,8	73,3	73,3	

VITO
IPCC 1996 default

Unitary CO2 emission reduction

	natural gas HR+	natural gas HR top	heating oil optimaz	heating oil optimaz elite	old	weighted average
primary energy savings (GJ)	62.609	53.832	62.609	56.471	60.169	
CO2 reduction (kg)	3.495	3.005	4.591	4.141		3.589

calculations overall / figures / 1. condensing boiler / **2. heat pump** / 3. double glazing / 4. roof insulation / 5. thermostats / 6. energy audit / 7. solar thermal / 8. PV / 9. passive house / info tax reductions / info ener

d) The overall calculation sheet contains a table with input parameters with the number of tax deductions for each type of investment and the allocation between federal and regional level.

The screenshot shows an Excel spreadsheet titled 'EC B01(bis).xls'. The main content is a table with two parts. The first part is titled 'input parameters (from sheet 'info tax reduction')' and contains a table of 'Number of tax reductions' for years 2003-2012. The second part is titled 'Allocation to federal PAM (%)' and contains a table of percentages for the same years. The spreadsheet interface includes a menu bar, a toolbar, and a taskbar at the bottom.

input parameters (from sheet 'info tax reduction')										
	Number of tax reductions									
	1	2	3	4	5	6	7	8	9	total
2003	2.821	2.232	12.745	75.834	1.178	0	114	47	0	94.971
2004	3.522	2.787	15.913	94.684	1.470	0	142	59	0	118.577
2005	4.223	3.341	19.081	113.533	1.763	0	171	71	0	142.183
2006	4.924	3.896	22.249	132.383	2.056	0	199	83	0	165.789
2007	5.625	4.451	25.417	151.232	2.348	0	227	95	0	189.395
2008	78.810	6.390	78.810	25.560	10.650	0	12.780	0	0	213.001
2009	87.545	7.098	87.545	28.393	11.830	0	14.196	0	0	236.607
2010	96.279	7.806	96.279	31.226	13.011	0	15.613	0	0	260.213
2011	105.013	8.515	105.013	34.058	14.191	0	17.029	0	0	283.819
2012	113.747	9.223	113.747	36.891	15.371	0	18.446	0	0	307.425

Allocation to federal PAM (%)									
	1	2	3	4	5	6	7	8	9
2003	100	0	100	100	100	0	100	0	0
2004	90	34	88	95	100	100	84	100	0
2005	0	0	0	0	0	0	0	0	0
2006	100	100	94	96	100	100	92	100	0
2007	95	74	97	96	99	100	96	100	0
2008	93	61	89	88	98	100	79	100	100
2009	93	62	90	82	98	100	79	100	100
2010	93	62	90	82	98	100	79	100	100
2011	93	62	90	82	98	100	79	100	100
2012	93	62	90	82	98	100	79	100	100

Based on these figures and the unitary gross emission reductions for each type of investment, the gross emission reductions are calculated and subsequently part of the emission reduction is assigned to the Federal PAM.

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calculations (see specific calculation sheets for each technology)

	Mean overall CO2 em reduction (ton)									annual	total
	1	2	3	4	5	6	7	8	9		
2003	874	8009	15395	112843	262	0	26	0		137409	137409
2004	1091	10000	19222	140892	327	0	33	0		171563	308972
2005	1308	11990	23048	168940	392	0	39	0		205718	514690
2006	1525	13981	26875	196988	457	0	46	0		239872	754562
2007	1742	15972	30702	225037	522	0	52	0		274028	1028589
2008	24409	22931	95197	38034	2367	0	2928	0		185867	1214455
2009	27115	25472	105747	42249	2629	0	3253	0		206465	1420921
2010	29820	28014	116298	46464	2892	0	3577	0		227064	1647985
2011	32525	30555	126848	50680	3154	0	3902	0		247663	1895648
2012	35230	33096	137398	54895	3416	0	4226	0		268262	2163910

Results

	Mean CO2 em reductions by federal PAM (ton)									annual	total
	1	2	3	4	5	6	7	8	9		
2003	874	0	15395	112843	262	0	26	0	0	129400	129400
2004	980	3443	16932	133376	327	0	27	0	0	155085	284485
2005	0	0	0	0	0	0	0	0	0	0	284485
2006	1525	13981	25248	188388	457	0	42	0	0	229640	514125
2007	1655	11784	29757	215902	518	0	50	0	0	259666	773791
2008	22588	13973	84655	33597	2318	0	2299	0	0	159429	933220
2009	25172	15788	94720	34471	2577	0	2579	0	0	175307	1108528
2010	27684	17364	104170	37911	2834	0	2836	0	0	192797	1301325
2011	30195	18939	113620	41350	3091	0	3093	0	0	210288	1511613
2012	32706	20514	123070	44789	3348	0	3351	0	0	227778	1739391

general | calculations overall | figures | 1. condensing boiler | 2. heat pump | 3. double glazing | 4. roof insulation | 5. thermostats | 6. energy audit | 7. solar thermal | 8. Pv | 9. passive house | info tax red

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