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COMMISSION STAFF WORKING DOCUMENT

Impact Assessment

Accompanying the document

Commission Regulations

implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters

and

supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling for space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device

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Lead DG: DG ENER

Associated DG: DG ENTR

Other involved services: SG, SJ, DG CLIMA, DG ENV, DG COMP, DG ECFIN, DG INFSO, DG MARKT, DG SANCO, DG TRADE, DG EMPL

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1. SECTION 1: PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Organisation and timing

These actions are priorities of the Action Plan on Energy Efficiency[1] and the Energy Efficiency Plan 2011[2] .

The ecodesign implementing regulation is based on the Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the Commission to set ecodesign requirements for energy-related products[3], in the following abbreviated as "Ecodesign Directive". An energy-related product (ErP) shall be covered by ecodesign implementing measures, or by self-regulation (cf. criteria in Article 19), if the ErP represents significant sales volumes, while having a significant environmental impact and significant improvement potential (Article 15). The structure and content of an ecodesign implementing measure shall follow the provisions of the Ecodesign Directive (Annex VII).

1 COM(2006)545 final.
2 COM(2011)109 final.
3 OJ L 191, 22.7.2005, p. 29.

The energy labelling delegated regulation is based on Directive 2010/30/EC of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products[4]. Pursuant to its Articles 10(1) and (2) a product shall be covered by a delegated act, if it has a significant potential for saving energy, and, where relevant, other essential resources, and products with equivalent functionality are available on the market which have a wide disparity in the relevant performance levels.

The Commission has carried out a technical, environmental and economic analysis in preparation of these initiatives, in the following called "preparatory study". The preparatory study was carried out by external consultants[5] on behalf of the Commission's Directorate General for Energy (DG ENER). The preparatory study has followed the structure of the "Methodology Study Eco-design of Energy-using Products"[6] (MEEuP) developed for the Commission's Directorate General for Enterprise and Industry (DG ENTR). MEEuP has been endorsed by stakeholders and is used by all ecodesign preparatory studies.

On 29 February 2008, 8 July 2008 and 24/25 June 2009 meetings of the Ecodesign Consultation Forum established under Article 18 of the Ecodesign Directive were held in relation to heaters[7]. On 11 April 2011, 29 June 2012 and 6 September 2012 further stakeholder meetings were held in relation to heaters.

Article 19 of the Ecodesign Directive foresees a regulatory procedure with scrutiny under the Treaty establishing the European Community for the adoption of ecodesign implementing measures. If the Article 19 Committee gives a favourable opinion on a draft measure, and neither European Parliament nor Council oppose, the measure can be adopted by the Commission in 2013 with subsequent publication in the Official Journal of the European Union.

Measures implementing the Energy labelling Directive are delegated acts pursuant to Article 290 of the Treaty on the Functioning of the European Union. If a delegated act adopted by the Commission is not opposed by European Parliament or Council, the measure can be published in the Official Journal of the European Union.

1.2. The consultation process for the draft impact assessment

A written Inter Service Consultation on the draft impact assessment took place in July 2011. No comments and recommendations were received from other services but all comments and

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4 OJ L 153, 18.6.2010, p. 1.

5 "Preparatory Study on eco-design of heaters", René Kemna et al.(VHK), final report of 2 July 2007; documentation available on the DG ENER ecodesign website http://ec.europa.eu/energy/demand/legislation/eco_design_en.htm

6 Methodology Report, final of 28 November 2005, VHK, available on DG ENER and DG ENTR ecodesign websites

7 Heaters comprise boilers, micro-cogeneration and heat pumps using liquid fuel, gaseous fuel or electricity, both as space heaters providing space heating and combination heaters providing space and water heating. A micro-cogeneration heater is not placed on the market as combination heater, only as space heater (with a separate water heater or hot water storage tank). NB: Heaters using solid fuels are covered by a separate ecodesign lot 15 on solid fuel small combustion installations.

recommendations for the closely related impact assessment on water heaters were taken into account when writing the draft impact assessment on heaters.

Comments from the Impact Assessment Board on the draft version were related to the relationship with the Energy Performance of Buildings Directive; the applied methodology and data collection; the measurement and calculation methodology; the impact on manufacturers, particularly SMEs, and on exports; the comparison of the proposed measures with similar requirements in third countries; the impact on users. These issues as well as more technical comments have been addressed in the final version of the impact assessment report.

1.3. Transparency of the consultation process

External expertise on heaters was gathered in the framework of the preparatory study. It has been developed in an open process, taking into account input from relevant stakeholders including manufacturers, installers, retailers and their associations, environmental NGOs, consumer organizations, EU Member State experts and experts from third countries. The preparatory study provided a dedicated website where interim results and further relevant materials were published regularly for timely stakeholder consultation and input. The study website was promoted on the ecodesign-specific websites of DG ENER and DG ENTR. Several consultation meetings were held for discussing the preliminary results of the study.

Throughout the preparatory studies, the most closely involved DGs were kept informed of the studies and the positions of industry, stakeholders and MS through the Circa system. Closely involved DGs such as DG ENTR, CLIMA and ENV have been invited to, and attended, stakeholder meetings.

Subsequently systematic consultations were carried out possible ecodesign and energy labelling requirements. During the meetings of the Ecodesign Consultation Forum on 29 February, 8 July 2008 and 24/25 June 2009, for which also the other closely involved DGs were invited, the Commission staff presented "working documents" with suggestions for ecodesign requirements and also an energy labelling scheme for heaters[8], which are based on the results of the preparatory study. All relevant documentation, including stakeholder comments received in writing before and after the meeting are included in the Commission's CIRCA system.

An additional written consultation of the Ecodesign Consultation Forum and at energy labelling expert level was launched in March 2011 on updated working documents for ecodesign and energy labelling measures for heaters, which build on the input/feedback provided during the earlier consultations of the Consultation Forum. The working documents were also shared with the European Parliament, the suggestions for ecodesign were explained and discussed during a meeting of the Ecodesign Regulatory Committee on 11 April 2011 and the suggestions for energy labelling of heaters during meetings of Member States experts and stakeholders on 29 June and 6 September 2012. Furthermore, the European Parliament and the Council were informed on the steps the Commission intended to take prior to the adoption of the delegated energy labelling regulation.

During the meeting of the Ecodesign Consultation Forum of 24 June 2009 it was agreed that an ad-hoc technical working group should finalise the transitional testing and calculation

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8 DG ENER ecodesign website: http://ec.europa.eu/energy/efficiency/ecodesign/forum_en.htm

methods to be used until harmonised standards are available. This working group, consisting of experts of the affected industry sectors, consumer and environmental NGOs and Commission staff, met in December 2009 and in February 2010. The relevant documentation, including the contributions of the experts, is available on the CIRCA system.

The ecodesign regulation and the delegated energy labelling regulation take into account the additional feedback on these working documents.

1.4. Outcome of the consultation process

The positions of main stakeholders on crucial features of the Commission services' working documents can be summarised as follows.

In general it is welcomed to focus the approach on products instead of systems. This implies significant simplifications for the required testing and calculation methods. Also a “modular” approach is introduced for evaluating the energy performance of combinations of heaters with further heaters and/or further products such as controls for indicating the energy performance of the “product packages” in the context of the energy labelling scheme, which is welcomed as well. As far as the scope is concerned, it was suggested to remove the exceptions for equipment with heat output smaller than 4 kW, and it was suggested to use heat output instead of energy input for the purpose of scope definition.

For the product label of heaters there are numerous divergent opinions between Member States and stakeholders, which include the following key elements:

- A single mandatory label whereby all heaters should be labelled with a scale that goes to A^{+++}.
- All heaters should carry a mandatory label with a scale that goes to A^{++}. Alternatively, heat pumps and micro-cogeneration could carry a voluntary label with a scale that goes to A^{+++}. In addition, the labels should display the energy efficiency in percentage.
- Two mandatory labels whereby boilers should carry a mandatory label with a scale that goes to A^{+}; heat pumps and micro-cogeneration should carry a mandatory label with a scale that goes to A^{+++}.

Further comments from Member States and stakeholders were raised as follows. They are taken into account in the ecodesign and energy labelling requirements set out in the proposed regulation, except the request for third-party certification which cannot legally be introduced to reinforce market surveillance:

The **Member States** support in general the suggested content of ecodesign and energy labelling legislation. The level of ambition for ecodesign requirements and the approach for an energy efficiency grading for the energy label based on primary energy consumption were in general considered appropriate. In particular, it was accepted that the level of ambition of ecodesign requirements for energy efficiency should correspond to condensing technology of gas/oil fired boilers. However, it was suggested that, instead of the envisaged two-stage approach to introduce condensing technology of gas/oil fired boilers, the requirements of the second stage should be applicable 2 years after entry into force of the regulation. Regarding greenhouse gas emissions attributable to refrigerant leackages several Member States asked the Commission to remove the suggested bonus for low GWP refrigerants from the energy efficiency requirements due to the non-significant contribution of refrigerants to the environmental impact of heating equipment. In the review of the legislation in five years the significance of refrigerants used in heat pumps should be re-assessed. As far as ecodesign requirements for nitrogen oxides emissions are concerned, it was suggested to further differentiate between technologies, in particular heating equipment using internal combustion engines, and fuels. In addition, the requirements for noise were considered inappropriate for heat pumps with large heat output.

There is also broad support, albeit not from all Member States, that the energy efficiency ranking is gauged such that best condensing technology should be classified as “A”.

The general approach to set mandatory requirements in the framework of ecodesign, and energy labelling legislation is in general supported by **Industry** associations representing heater manufacturers. The "product package approach" of the "dealer energy label" is supported by other associations covering e.g. heating controls as it avoids discrimination of configurations offered by dealers/installers consisting of parts that were placed in the market individually compared with identical configurations placed on the market by a single supplier.

The proposed levels and timing of the ecodesign requirements for energy efficiency are accepted. Furthermore, it was suggested to use third-party certification instead of self-certification in order to reinforce market surveillance. As far as the requirements on emissions of nitrogen oxides and of noise are concerned, it was suggested to increase the limit values for cogeneration technology and for heat pumps, respectively.

Environmental NGOs and consumer organisations in general welcome ecodesign and energy labelling legislation for heaters, and the suggested approach is largely supported. However, is was suggested that the energy efficiency requirements envisaged for the second stage should be effective 2 years after entry into force of the regulation, and the first stage should be skipped.

More detailed descriptions of the outcome of the consultation process can be found in Annex IX.

Information on the many stakeholder and experts' consultations during the preparatory study can also be found on the dedicated webpage http://ecoboiler.org . Furthermore, there have been numerous position papers and notes from Member States, industry associations and NGOs which have been communicated on a permanent basis to all participants in the process through the Circa system, with the rare exception when procedures or confidentiality for business reasons did not allow to do so.

2. SECTION 2: PROBLEM DEFINITION

2.1. Introduction

The underlying problem can be summarised in the following way: cost-effective and energy efficient technologies for heaters do exist on the market, but their market penetration is lower than it could be.

As requested by Article 15 of the Ecodesign Directive, the preparatory studies identified the environmental aspects in relation to heaters. In order to carry out the technical, environmental and economic analysis the preparatory study has considered representative electrical and gas-fired heaters with relevant sizes, which can be subdivided in power ranges (in kW) or described in "size classes" (also called "load profiles") "S", "M", "L" etc. and which characterise the capacity of a heater.

In particular the study has, amongst others, provided the following key elements:

– the amount of electricity/gas needed to provide space heating and sanitary hot water (in the case of combi-heaters);

– the bill of materials, weight, packaging etc.;

– the installed base ("stock") and the annual sales for the period until 2020 and beyond, and the typical life time;

– technologies yielding reduced electricity/gas consumption, including renewable energy sources such as solar water heating and heat pumps, and the costs effects for applying them compared to the current "market average";

– the impact of the characteristics of the building infrastructure such as chimney, drains, draw-off points etc. on the suitability of heater technologies for a given infrastructure.

The structure of the methodology of the technical, environmental and economic analysis is displayed in Annex I.

The study concludes that

– heaters have a significant environmental impact within the EU

– heaters present significant potential for improvement without entailing excessive costs

– the following environmental aspects are relevant:

  – electricity/gas consumption in the use phase;

  – NO_x emissions;

  – Further emissions such as CO and SO_x, which however correlate with energy consumption and/or NO_x emissions, and for which no dedicated requirements are needed.

The study has shown that heaters are a product category which meets the criteria listed in Article 15 §2 of the Ecodesign Directive and Article 10 § 2 of the Energy Labelling Directive, and therefore has to be covered by an implementing measure and delegated act respectively.

2.2. Market failures

The major barrier for the market uptake of heaters with improved environmental performance is market failure due to

– incomplete information, lack of awareness/interest for running costs/cost savings

– lack of incentives and capital for investments

Incomplete information, lack of awareness/interest for running costs/cost savings

– Heaters are a "low-interest" product: the interest and the awareness for the implications of heaters for the expenditure for gas and electricity are limited. Their energy efficiency until now has not been an important purchasing criterion.

– Incomplete information on running costs/cost savings: information on running costs/cost savings is not explicit and can be obtained only with difficulties. This implies, e.g., the following:

  – Even if heaters were a "high-interest" product there is no objective method for assessing the energy efficiency rating and energy consumption of heaters, which would allow a purchasing decision which adequately considers the running costs[9].

  – Therefore currently it is not possible to compare the performance and the expected running costs of heaters, including comparison of different technologies and energy sources, and in particular the expected benefits of using renewable energy sources for water heating.

  – Authorities seeking to promote energy-efficient heaters, e.g. by providing financial incentives, suffer from the lack of an objective energy efficiency rating method. This means that current efforts are aimed at the relatively small new housing market and are characterized by typology-based measures (e.g. x m² of solar thermal panel surface). Improvement options in the replacement market and improvement potential in conventional products or new products with energy input by renewable energy sources are largely not addressed. As a consequence some authorities have adopted just one single efficiency rate for *all* types of heaters when implementing the EPBD.

– Innovative heaters, e.g. with RES input, may be more complex products requiring particular know-how, which may not always be available. Due to the absence of an energy efficiency rating system installers there is little incentive to invest into capacity building/training.

Lack of incentives and financial capacities for investments

– Owners or sellers of property have often little incentives to invest in heaters with improved environmental performance even if the investments are cost-effective, because the running costs for energy are paid by the tenant or buyer of the building, while additional up-front investments in heaters with improved environmental performance compared with heaters with "lower" environmental performance currently can hardly be recovered e.g. by asking for a higher rent.

[9] There are standards for the various heating technologies (all covered by the term "heater" for the purpose of ecodesign and labelling) but in the context of the work for heater measures a methodology had to be developed to make them comparable, regardless of the energy form used (gas, oil, electricity). See also Annex XIV.

- Adapting existing infrastructure to conditions required for operating highly efficient heaters can require high investments, e.g. connecting property to the gas grid or renovations of the exhaust system of multiple apartment buildings necessary for applying condensing technology.

2.3. Related initiatives on Community and Member State level

Both on Community and on Member State level initiatives have been launched which aim at improving the environmental impact of heaters.

- Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings[10], in the following called "EPBD", requires Member States, amongst others, to apply minimum requirements to the energy performance of new and, under certain conditions, existing buildings, and technical building systems, including heating systems. According to Recital (12) of the EPBD Member States should use, where available and appropriate, harmonised instruments, in particular testing and calculation methods and energy efficiency classes developed under the Ecodesign and Energy Labelling Directives when setting energy performance requirements for heating systems. Furthermore, it lays down requirements as regards energy certification of buildings or building units, and regular inspection of certain heating systems, which however is not the same as establishing their efficiency or maintenance.

- The energy performance certificates required by the EPBD aim at providing information to buyers and sellers as regards the energy performance of the building and building units, thereby providing incentives for owners and sellers to invest in energy-efficient installations, including water heating systems.

- The requirements on technical building systems, including hot water systems, aim at optimising the energy use of such systems, in particular if installed in existing buildings.

- But the EPBD does not set harmonised energy efficiency requirements for heating systems, and in particular the most important parts – heat generators – of such systems, and it does not provide energy efficiency classes and testing and calculation methods.

- EU and Member State instruments have been put in place in order to stimulate investments in energy efficient housing[11].

- Council Directive of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels (90/996/EEC)[12] contains an essential requirement related to the rational use of energy, which is not covered by a harmonised standard. Furthermore, electrical heaters are not covered by this Directive.

- Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants[13] (in the following

[10] OJ L 1, 4.1.2003, p.65.
[11] See e.g. recital 18 of the EPBD.
[12] OJ L 196, 26.7.1990, p. 15.
[13] OJ L 309, 27.11.2001, p. 22.

abbreviated as "NECD") limits emissions of acidifying and eutrophying pollutants and ozone precursors from all sources of those pollutants arising as a result of human activities in the territory of the Member States. This Directive is expected to contribute to a limitation of NO_x and SO_2 emissions from heaters to some extent. However, it does not set specific limits for the emission from heaters, and the approach for limiting the relevant emissions from heaters varies amongst Member States.

– Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC[14] (in the following abbreviated as "ESD") provides energy savings targets for Member States and creates the conditions for the development and promotion of the market for energy services, including measures improving the energy efficiency of heaters and the "domestic" input to domestic hot water production. However, it is up to the Member States to select the concrete measures to achieve the energy savings targets, and no harmonised measures specifically targeted at improving the environmental performance of heaters are provided for.[15]

Conclusions

– The most significant aspect for improving the environmental performance of heaters is the energy consumption during use and significant cost-effective energy saving solutions exist on the market.

– Market failures prevent cost-effective technologies leading to energy efficiency improvements from penetrating the market to a satisfactory extend by market forces alone.

– Initiatives at EU and Member State level address parts of the market failures:

  – EPBD, ESD and financial instruments at EU and Member State level address market failures related to lack of incentives and financial capacities for investments

  – NECD is expected to contribute to a reduction of NO_x and SO_2 emissions.

– However, the EPBD, the ESD and the NECD alone are not expected to correct the market failures as related to incomplete information, lack of awareness/interest for running costs/cost savings:

  – EPBD and ESD do not provide for energy efficiency classes and testing and calculation methods.

  – EPBD and ESD do not provide for harmonised minimum performance requirements for the crucial main parts of the technical building system/hot water system, that is, the heat generator and related parts such as controls, that would "guarantee" a certain "minimum level" of improvements.

[14] OJ L 114, 27.4.2006, p. 64.

[15] Directive 2006/32/EC will be repealed from 5 June 2014, except for Article 4(1) to (4) and Annexes I, III and IV that will be repealed from 1 January 2017, by Directive 2012/27/EU of the European Parliament and of the Council on energy efficiency, OJ L 315, 14.11.2012, p. 1.

- As a consequence cost-effective improvement potentials for energy consumption are not realised, and the environmental performance of heaters will not be improved to the desirable extent.

- Furthermore, there is a risk that energy efficiency requirements and emission limits, as well as energy efficiency rankings for heaters which would be set individually by Member States could hamper the functioning of the internal market.

- As a consequence, ecodesign requirements and energy efficiency classes should be set under the Ecodesign and the Energy Labelling Directives, addressing market failures related to incomplete information, lack of awareness/interest for running costs/cost savings.

- Ecodesign requirements for the placing on the market of heaters are complementary to system requirements for heating systems set under the EPBD:

  - Ecodesign requirements for energy efficiency and NO_x emissions provide for harmonised requirements delivering a "guaranteed" level of environmental improvements as related to heat generators, under which the requirements of the MS for systems cannot fall.

  - Ecodesign requirements for the placing on the market of products ensure free circulation of complying products in the internal market, while system requirements should take into account the diversity of situation in the regions of the EU.

  - Energy efficiency classes and testing and calculation methods developed under the Ecodesign and the Energy Labelling Directives should be used for the setting of system requirements, with a view to minimise potential fragmentation of the market as related to the setting of system requirements for heating systems.

2.4. Baseline Scenario

2.4.1. Scenario methodology, Baseline 2005

The assessment contained in this report is largely based on the scenario analysis and modelling that was prepared as part of the preparatory study for Ecodesign heaters (Lot 1) concluded in September 2007[16].

However, there have been some important scenario changes since the preparatory study was completed. Based on the process discussed in §1.3 and 1.4, 4 new scenarios, in addition to the base BaU (Business-as-Usual) scenario, have been developed. These are different from those in the preparatory study, are based on information from relevant stakeholders and use target levels in line with the latest European Commission proposals. The values used in both stock models (CH for heater space heating and COMBI for water heating) are derived from statistics and trends as described in the preparatory studies and the following variables, which are applicable to both models, remain the same in all of the scenarios. This is consistent with

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16 See http://www.ecoboiler.org and http://www.ecohotwater.org for full details of this work and the processes around it.

modelling only the direct impacts of heater efficiency design policies, all other things remaining the same. These scenario changes also took into account effects of other legislation such as the EPBD on the energy efficiency and the effect of the internal market approach in the proposed legislation compared to the possibility and limitations of Member States to realise cost-effective achievement of targets such as greenhouse gas reductions and energy efficiency targets by themselves.

Regarding demand price elasticity, in general, the expected price increase in mass production of 10-15% will be balanced by significantly lower electricity and fuel costs for the consumer with a pay back period of only a few years. In addition, new competing technologies (such as solar technologies, heat pumps and micro-cogeneration) will be covered in the measures on labelling and ecodesign offering alternatives to consumers. Replacement usually happens at failure of an existing appliance ("distress buy" when price tends to be less of an issue). In the future, it is foreseen that replacement will happen more and more often by the support of the building label and heating system inspections under the EPBD. When consumers are actively looking for a better installation and have more time to consider their purchase, pricing and labelling, linked with possible savings on energy costs, will have more effect in influencing the decision. The model is explained in more detail below and in the annexes, notably Annex II. For the background on sales and product replacement projections more information can also be found in the preparatory study on www.ecoboiler.org.

The impact analysis looks at the following scenarios with the NO_x emissions scenario modelling 3 sub-scenarios based on a set of varying acidification pollution measures[17].

- **BaU:** Business as Usual;
- **Min only:** Minimum Energy Efficiency Performance Standards;
- **Min + Lbl:** Minimum Energy Efficiency Performance Standards with reduced efficiency standards for heaters in the 3 lowest size categories combined with EPBD measures and an Energy Labelling regime based on the Ecodesign rating methods;
- **NO_x scenarios:** These incorporate the emission reductions for NO_x limit values but also the extra energy saving that may result from NO_x limits on top of the two previous scenarios.

Note: The COMBI stock model for the water heating function of heaters considers only the BaU, Min+Lbl and NO_x scenarios. A Min only scenario is not considered because of low water heater minimum standards.

The use of a Stock Model calculation means that the outputs are derived from accumulated annual sales and redundancy (replacement) figures for heaters over the period 1990-2020 (with a start-up period 1960-1990), i.e. it is a model of the numbers and types of heaters that are installed and working, taking account of new installations, existing installations and replacement of existing installations over the period.

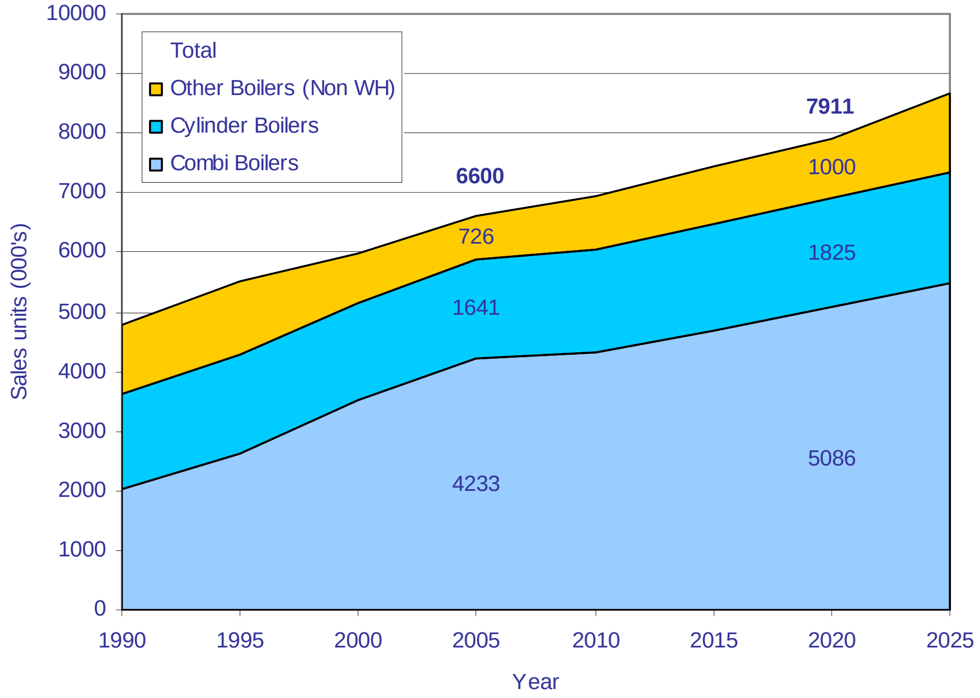
All of the scenarios are modelled on the BRG[18] sales projections from the Task 2 reports and the load trends in the Task 3 reports of the VHK preparatory studies. The scenarios

[17] Targets and timings for all scenarios are taken over from the Commission: Working Document on possible Ecodesign Energy Labelling and Installation requirements for Heaters, Annex I, presented July 8, 2008; see also the Annex (level 3, policy scenarios) of this document.

[18] See http://www.ecoboiler.org for a market analysis report completed by BRG Consult.

themselves are assumed by the model to have no impact on sales and so all scenarios are based on the same sales figures as shown in Figure 2.1.

Figure 2.1: Annual Heater Unit sales 1990-2020 (BRGC)



Total heater unit sales are projected to increase from 6.6m units/year in 2005 to over 7.9m units/year in 2020. Of the heaters sold in 2005 approximately 65% were Combi heaters, 25% Cylinder[19] and 10% of other types without water heating function. These proportions are expected to remain the same until 2020. However, it is estimated that boilers will be replaced by other heaters (micro-cogeneration, heat pumps, solar products, see table 2.1).

Table 2.1: Market share development for heaters 2010 - 2030

Energy class up to	**Heater (used for space heating)**	**2010**	**2020 (Min + Lbl)**	**2030 (Min + Lbl)**
C	Low efficient boilers	36%	5%	3%
A	Condensing boilers	59%	83%	57%
A+	Micro-Cogeneration	0,1%	1%	4%
A++	Heat pumps	4%	7%	21%
A+++	Solar products	1%	4%	15%
	Total sales	**6.9 Mill.**	**7.9 Mill.**	**8.5 Mill.**

19 Cylinder heaters provide domestic hot water via a cylinder. Combi heaters provide domestic hot water instantaneously.

For modelling, the CH stock model will consider all 3 heater types but the COMBI stock model will only consider the Combi and Cylinder types that have a water heating function. The distinction between Combi (COMBI) and Cylinder (CYL) heaters is significant in the COMBI stock model as they operate at different water heating efficiencies, with Cylinder heaters the more efficient of the two.

For both models in the economic calculations, an average energy price in €/ kWh primary energy is derived from:

- Electricity, gas and oil rates per kWh primary energy in the base-year 2005.
- Annual (long-term) price rate increase of the individual energy sources, e.g. 2% for electric; 5.6% for gas, 8.2% for oil;
- Relative share of electricity, gas and oil employed for heaters, e.g. in the BaU scenario the gas share increases from 82% in 2005 to 85% in 2020, Oil falls from 12% to 6% and electric increases from 6% to 9%.

Taking these factors and those described in the following sections into account the models produce the following outputs for each scenario:

- Energy consumption in PJ/yr (conversion 1 TWh= 3,6 PJ);
- Carbon emissions in Mt CO_2 equivalent/yr, using a multiplier based on electricity, oil and gas shares (see below);
- Acidifying emissions (e.g. $NO_\mathbf{x}$, SO_2) in kt $SO_\mathbf{x}$ equivalent/yr;
- Economic parameters: Purchase price, energy expenditure, installation and maintenance costs, payback period and total expenditure in € billion/yr. [2005 Euro, inflation-corrected at 2%/yr];
- Business parameters: turnover for manufacturers, wholesalers and installers;
- Employment parameters: by industry, wholesalers and installers with focus on specific EU employment impacts.

The final outcomes of the stock models are presented at an aggregated level "CH heater or COMBI heater total" in this report, though in the intermediate calculation stages, distinctions are made by the heater size, scale typology and load profile.

Overall the model outcomes are estimated to be ±5-10% accurate.

2.4.2. The CH Stock Model

The CH Stock Model considers the following variables that are applicable to only the space heating function of heaters.

It takes into account the following effects on baseline energy use:

- Growth effects 2005-2020: Increase in number of households (10-12%), increase in floor area (3-5%), increase heating comfort (8-10%);
- Reduction effects 2005-2020: insulation and ventilation measures (30% over 2005-2020), increase heater efficiency through park replacement (5%), extra efficiency through measures (3-5% efficiency points from low-end condensing being 50% of EU-sales in 2010), increase outdoor temperature (1%);
- Overall effect 2005-2020: Ca. 15% decrease in energy use.

These are translated into three values that are used in the stock model calculations. Two of these remain the same for each scenario, they are:

- A "load effect" which accounts for the increased heating comfort, floor area and effect of improved insulation of -1.8% annually. The pivot-point for this load factor is the “net load” value for the base year 2005;
- A "growth effect" which accounts for increasing numbers of households and heater ownership comes from the unit sales projections (see table 2.2) by BRG Consult in Task 2. A “Product Life” parameter is also used to match sales and park data, product life is set to 18 years in the model.

A third value, an "efficiency effect" varies by scenario and is the main variable in the analysis, determining overall energy use and its derived parameters, the efficiency effect for each scenario in the CH model is described in chapter 2.

In the CH stock model, the heater purchase price and maintenance costs have then been adjusted to consider only the space heating function of these heaters. The result of this calculation is that the average weighted purchase price (incl. installation and VAT) is €3 305 per unit[20] for the space heating function only. Average heater unit prices –not corrected for inflation- have remained largely stable for the last decade, meaning they have gone down in real terms.

In the Stock Model calculations, the expected efficiency gains through improved technology are assumed to imply an increase in consumer purchase cost (installation and product price) of € 55 per percentage point of energy efficiency increase above 48%. This is an aggregated figure, derived from the Task 6 analysis and further calculations (see Annex II).

Maintenance costs in the stock model are not scenario-specific and are set at € 180 per year and assumed to follow inflation at 2% per annum[21]. Product lifetime is also fixed, at an overall value of 18 years. Additional technical background is provided in the scenario-specific paragraphs.

2.4.3. The COMBI Stock Model

The COMBI Stock Model considers the following variables that are applicable to only the water heating function of heaters.

It takes into account the following effects on baseline energy use:

- Growth effects 2005-2020: Increase in number of households (10-12%), and increase water heating comfort (8-10%);
- Decrease in average load per unit due to higher share of secondary water heaters[22] (assumed to compensate for increase in ownership[23]). Average efficiency increase through water heater replacement in line with trend (5-7%);
- Overall effect 2005-2020: Ca. 17% increase in energy use.

These are translated into three values that are used in the stock model calculations. Two of these remain the same for each scenario, they are:

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20 Reduction from € 3 645 in preparatory study. See Annex 5.2 for derivation.
21 From VHK preparatory study, Task 5.
22 Secondary water heater is a second water heater just for the kitchen tapping point. Not to be confused with water heaters in secondary homes (holiday homes etc.).
23 Mainly because no specific data is available.

- A "load effect" which accounts for the increased water heating load +0.5% annually until 2020. The pivot-point for this load factor is the “net load” value for the base year 2005;
- A "growth effect" which accounts for increasing numbers of households and heater ownership comes from the unit sales projections (see table 2.4) by BRG Consult in Task 2. A “Product Life” parameter is also used to match sales and park data, product life for heaters water heating function is set to 15 years in the model.

Like for the CH stock model, the COMBI model also has a third value, an "efficiency effect" which varies by scenario and is the main variable in the analysis, determining overall energy use and its derived parameters. In the COMBI stock model, the heater purchase price and maintenance costs have then been adjusted to account for only the water heating function performed by these heaters. The result of this calculation is that the average weighted purchase price (incl. installation and VAT) is €548 per unit. Unit in this case is the cost of the water heating function in a combi type or cylinder heater.

In the Stock Model calculations, the expected efficiency gains through improved technology are assumed to imply an increase in consumer purchase cost (installation and product price) of € 37 per percentage point of energy efficiency increase above 43%. This is an aggregated figure, derived from the Task 6 analysis and further calculations (see Annex II).

Maintenance costs in the stock model are not scenario-specific and are set at € 30 per year and assumed to follow inflation at 2% per annum[24]. An annual product price and installation cost decrease of 2% is also applied in the COMBI model. Additional technical background is provided in the scenario-specific paragraphs in Chapter 2.

2.4.4. Baseline projections for 2020

The relevant figures for the base year 2005 have been developed in the preparatory study, and are displayed in Annex II. The baseline scenario until 2020 is developed under the following conditions.

The end-use energy consumption of heaters in 2005 was estimated by the preparatory study to be 289 Mtoe for the EU25[25]. This corresponds to a primary energy consumption of heaters, if, as agreed with stakeholders and Member States, an average efficiency of 40% for electricity generation, including transmission losses, is used in the case of electric heat pumps. Without taking dedicated measures the following environmental impacts are expected by 2020, compared to 2005:

decrease of energy consumption of heaters (CH and Combi functions) from 12089 PJ to 10688 PJ

decrease of CO_2 emissions from 698 Mt to 617 Mt

decrease of NO_x emissions from 821 kt to 783 kt SO_x equivalent

With dedicated measures the reduction in energy consumption and emissions can be speeded up considerably.

24 From VHK preparatory study, Task 5.
25 Figures for EU-27 are somewhat higher and can be corrected on the basis of GDP.

As explained further in Annex XIV, these assumptions were deemed realistic by the foremost market research specialist in the heater- and water heating- sector based on over 20 years of experience in data collection and processing as well as scenario building and modelling. If there are any uncertainties, they affect the scenarios and sub-options in similar ways and will not influence the relative order of the outcome for policy options. It must be stressed that stakeholders were closely involved in the process and have not disputed the used data or the outcome of the scenarios.

2.5. Least life cycle cost energy efficiency, benchmarks and level of ambition

2.5.1. Least life cycle cost efficiency and benchmarks

The preparatory study has shown that existing cost-effective technical solutions allow for improvement of the energy consumption of heaters.

The improvement potential is compared to the "base case" defined in the preparatory study, which represents an abstract average product.

2.5.2. Level of ambition of ecodesign requirements

According to Annex II of the Ecodesign Directive the level of energy efficiency or consumption should be set aiming at the least life-cycle cost minimum to end-users. However, for heaters the level of ambition cannot always be set at the LLCC point. It has to be ensured that replacement heaters are available on the market for all operating conditions

Taking into account both the LLCC and the constraints related to building infrastructure and the availability of replacement boilers, the following level of ambition was agreed with stakeholders, Member States after the last stakeholder consultation in May 2011 and within the Commission after the inter-service consultation in May 2012 as being appropriate for setting ecodesign requirements:

1. Seasonal space heating energy efficiency 2 years after entry into force

Fuel boiler space heaters with rated heat output ≤ 70 kW and fuel boiler combination heaters with rated heat output ≤ 70 kW, with the exception of type B11 boilers with rated heat output ≤ 10 kW and type B11 combination boilers with rated heat output ≤ 30 kW
The seasonal space heating energy efficiency shall not fall below 86 %.
Type B11 boilers with rated heat output ≤ 10 kW and type B11 combination boilers with rated heat output ≤ 30 kW
The seasonal space heating energy efficiency shall not fall below 75 %.
Fuel boiler space heaters with rated heat output > 70 kW and ≤ 400 kW and fuel boiler combination heaters with rated heat output > 70 kW and ≤ 400 kW
The useful efficiency at 100 % of the rated heat output shall not fall below 86 %, and the useful efficiency at 30 % of the rated heat output shall not fall below 94 %.
Electric boiler space heaters and electric boiler combination heaters
The seasonal space heating energy efficiency shall not fall below 30 %/36 %.*
Micro-cogeneration space heaters

The seasonal space heating energy efficiency shall not fall below 86 %/100 %.*
Heat pump space heaters and heat pump combination heaters, with the exception of low temperature heat pumps
The seasonal space heating energy efficiency shall not fall below 100 %/110 %.*
Low temperature heat pumps
The seasonal space heating energy efficiency shall not fall below 115 %/125 %.*

* As Member States requested only in the stakeholder consultation in May 2011 that minimum requirements should be set to phase out electric boilers, micro-cogeneration and heat pumps with the lowest efficiencies, these minimum requirements have to be introduced after 4 years, with a transitional step after 2 years, to give manufacturers sufficient time to ensure compliance.

2. Water heating energy efficiency of combination heaters (two staged introduction in line with separate impact assessment on ecodesign requirements for water heaters)

Declared load profile	**3XS**	**XXS**	**XS**	**S**	**M**	**L**	**XL**	**XXL**	**3XL**	**4XL**
2 years after entry into force	22%	23%	26%	26%	30%	30%	30%	32%	32%	32%
4 years after entry into force	32 %	32 %	32 %	32 %	36 %	37 %	38 %	60 %	64 %	64 %

Energy labelling for heaters pursuant to the Energy Labelling Directive aims at setting an energy efficiency ranking which

– provides information to end-users and installers on the energy performance of heaters, and promotes heaters with energy efficiency exceeding the ecodesign requirements;

– allows to distinguish between the energy performance of conventional heaters without RES input, while promoting heaters with cogeneration and RES input by clearly indicating the latter as being "best performing";

– provides a transparent ranking system which Member States may use e.g. for providing additional incentives to promote best-performing heaters.

2.6. Legal basis for EU action

The Ecodesign Directive and, more specifically, its Article 16 provides the legal basis for the Commission to adopt an ecodesign implementing measure for heaters. The Energy labelling Directive and, more specifically, its Article 1, provides the legal basis for the Commission to adopt an energy labelling delegated act for heaters.

As discussed in § 2.1, the study has shown that heaters are a product category which meets the criteria listed in Article 15 §2 of the Ecodesign Directive and Article 10 § 2 of the Energy Labelling Directive, and therefore has to be covered by an implementing measure and delegated act respectively.

3. SECTION 3: OBJECTIVES

The preparatory study has confirmed that a cost effective potential for reducing the energy consumption of heaters exist. This potential is not tapped, as outlined above. The general objective is to develop a policy framework which

- ensures that all heaters placed on the market achieve energy efficiency corresponding to the level of ambition discussed in Section 4.7., or better,
- creates incentives for manufacturers to design energy efficient models,
- provides market transparency on energy efficiency of heaters and fosters the awareness for their energy efficiency,
- sets an energy efficiency ranking that can be used by Member States for national initiatives/incentives, e.g. in the framework of the EBPD or ESD, which further accelerate the market penetration of energy efficient models,

thereby

- transforming the heater market towards products with improved energy performance,
- inducing significant reductions of the environmental impact related to energy consumption and NO_x emissions of heaters,
- inducing cost savings for the end-user,
- ensuring the free movement of affected products within the internal market.

Furthermore, the objective is to satisfy the provisions of the Ecodesign Directive, and in particular its Article 15 (5), which requires that ecodesign implementing measures meet all the following criteria:

- there shall be no significant negative impacts on the functionality of the product, from the perspective of the user;
- health, safety and the environment shall not be adversely affected;
- there shall be no significant negative impact on consumers in particular as regards affordability and life cycle cost of the product;
- there shall be no significant negative impacts on industry's competitiveness;
- in principle, the setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers;
- no excessive administrative burden shall be imposed on manufacturers.

4. SECTION 4: POLICY OPTIONS

The rationale for the key elements of the ecodesign and energy labelling regulations is established on the basis of the preparatory study and the input from stakeholders. This is discussed in the second part of Section 4.

4.1. Option 1: No EU action

This option would mean that no EU action would be taken which would target specifically energy efficiency and NO_x emissions of heaters.

– The barriers for realising the potentials to improve the energy efficiency and reduce NO_x emissions of heaters would persist to a large extent, because the EPBD, the ESD and the NECD alone would not lead to an improvement of the environmental performance to a significant extent.

– It is to be expected that Member States would want to take individual, non-harmonised action. This would hamper the functioning of the internal market and lead to high administrative burdens and costs for manufacturers, in contradiction to the goals of the Ecodesign Directive.

– The specific mandate of the Legislator would not be respected.

Therefore this option is discarded from further analysis. As this corresponds with the BAU scenario, the quantitative effects of this option can be found in § 5.7.

4.2. Option 2: Self-regulation

This option is discarded for the following reasons:

– No initiative for self-regulation on heaters pursuant to Annex VIII of the Ecodesign Directive has been brought forward.

A voluntary commitment for a similar product category, water heaters, was not a success and was stopped[26]. Moreover, since 1992 the boiler industry has been working with the Boiler Efficiency Directive[27]. The industry is not only used to EU legislation for its products but has also learned to appreciate the EU wide scope and the harmonisation that resulted from it. As ecodesign and labelling measures for heaters will replace this Directive, industry was not willing to even start contemplating self-regulation.

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[26] See §4.2 of the Impact Assessment for Dedicated Water Heaters.

[27] Directive 92/42/EEC, OJ L 167, 22.6.1992, p. 17.

4.3. Option 3: Energy labelling for heaters only

This option means that an energy labelling scheme for heaters would be set up pursuant to the Energy labelling Directive, without setting ecodesign requirements for heaters. In general two main objectives of labelling schemes are to increase the market penetration of, in this case, energy efficient products by providing incentives for innovation and technology development, and to help consumers to make cost effective purchasing decision by addressing running costs.

This option would imply the following:

– Energy labelling pursuant to the Energy labelling Directive creates market transparency, fosters awareness of consumers and creates incentives for manufacturers for innovation.

– However, a labelling scheme alone does not ensure that cost effective improvement potentials are realised for all products on the market, implying that the full energy and cost savings potential is not captured.

– As in Option 1, Member States could set minimum requirements individually, and the administrative burdens for manufacturers would be higher when compared with the burdens associated with ecodesign requirements.

– The specific mandate of the Legislator would not be respected.

Therefore the option to establish only an energy labelling scheme without setting ecodesign requirements is discarded, but the effects of labelling will be discussed in the scenario analysis.

4.4. Option 4: Ecodesign requirements only

This option means that ecodesign requirements would be set in an implementing measure pursuant to the Ecodesign Directive, without establishing an energy labelling scheme for heaters pursuant to the Energy labelling Directive. This option would imply the following:

– By setting minimum levels for the energy efficiency, which have to be fulfilled by all heaters placed on the market, the "worst performing" heaters would be banned from the market, leading to an improvement of the energy consumption of heaters;

– Information requirements pursuant to Annex I, part 2 of the Ecodesign Directive, which are addressed to manufacturers, could contribute to market transparency, consumer awareness and incentives for innovation.

– However, the retail sector plays a crucial role for providing relevant information to the end-user, and the Ecodesign Directive does not provide the appropriate legal framework for ensuring that the relevant information is available for the end-user when purchasing decision is made.

– Therefore market transparency, consumer awareness and incentives for innovations would be created to a limited extent only, and improvements/innovations of energy efficiency would take place at a lower rate. Therefore the option to establish only ecodesign requirements without establishing an energy labelling scheme is discarded, but the impact of ecodesign requirements as such will be assessed in Chapter 5.

4.5. Option 5: minimum performance requirements and labelling

This option means that ecodesign requirements for heaters would be set in an implementing measure pursuant to the Ecodesign Directive, in combination with an energy labelling scheme for heaters established by an implementing directive pursuant to the Energy Labelling Directive. This option would imply the following:

– Ecodesign requirements ban the "worst performing" heaters from the market by ecodesign, and cost effective improvement potentials are realised for all products on the market, leading to an improvement of the energy consumption and a reduction of the NO_x emissions of heaters.

– The specific mandate of the Legislator is respected.

– The energy labelling scheme creates market transparency, fosters awareness of consumers and creates incentives for manufacturers for innovation.

– However, requirements on technical building systems set in the framework of implementing the EPBD would facilitate the optimisation of the environmental performance of the entire space heating system, including separate requirements for new buildings, replacement and retrofit, thereby further enhancing the improvements expected from improving the environmental performance of the heaters placed on the market alone. These potential savings due to the EPBD would be lost in this option.

As the recast of the EPBD will be implemented this scenario is not realistic and therefore is discarded.

4.6. Option 6: minimum performance requirements in the EPBD framework

This option means that Member States would set minimum energy performance requirements in respect of technical buildings systems, including heaters, which are installed in buildings, in the framework of the EPBD only. Such provision is part of the Commission's proposal for recast of the EPBD[28] (Article 8). This option would imply the following:

– Setting requirements on building systems only does not ensure that cost-effective improvement potentials for all heaters on the market are realised, implying that the full energy and cost savings potential is not captured.

– As in Option 1, Member States could set minimum requirements for the placing on the market of heaters individually, and the administrative burdens for manufacturers would be higher when compared with the burdens associated to ecodesign requirements.

[28] COM(2008) 780 final

– The specific mandate of the Legislator would not be respected.

Therefore the option to set only requirements on technical building systems alone without setting ecodesign requirements is discarded, but the effects will be discussed in the analysis of Option 7.

4.7. Option 7: combination of ecodesign, labelling and EPBD requirements

This option means that ecodesign requirements for heaters would be set in an implementing measure pursuant to the Ecodesign Directive, in combination with an energy labelling scheme for heaters established by an implementing directive pursuant to the Energy labelling Directive, and minimum performance requirements for technical building systems set in the (recast of the) EPBD. This option would imply the following:

– Ecodesign requirements ban the "worst performing" heaters from the market by ecodesign, and cost effective improvement potentials are realised for all products on the market, leading to an improvement of the energy consumption and a reduction of the NO_x emissions of heaters.

– The specific mandate of the Legislator is respected.

– The energy labelling scheme creates market transparency, fosters awareness of consumers and creates incentives for manufacturers for innovation.

– Requirements on technical building systems set in the framework of implementing the EPBD facilitates the optimisation of the environmental performance of the entire space heating system, including separate requirements for new buildings, replacement and retrofit, thereby further enhancing the improvements expected from improving the environmental performance of the heaters placed on the market alone.

– The combination of the three instruments implies that improvements which can be achieved with currently available cost-effective technology are fully captured, while incentives are created to invest into new energy efficient technologies and their market penetration is fostered, thereby ensuring rapid market transformation.

– The functioning of the internal market is ensured by harmonised ecodesign requirements and a harmonised labelling scheme, and administrative burdens and costs for manufacturers are reduced compared to individual Member State action.

The following sub-section contains details of the rationale for the key elements of the corresponding ecodesign and energy labelling regulations, taking into account the provisions of Annex VII of the Ecodesign Directive and Article 12 of the Energy labelling Directive. The rationale is established on the basis of the preparatory study and the input from stakeholders. The ecodesign requirements correspond to sub-option 1 discussed in Section 5, which optimally fulfils the requirements of the Ecodesign Directive.

This option can be sub-divided in two options: one as described above ("Min + Lbl"), and one ("Min + Lbl") with exemption for B1 heaters which are needed for heaters used in apartments in multi-storey buildings with a common chimney, where it is impossible to install small condensing (combi) heaters because of the chimney structure. This exception is widely supported by stakeholders and Member States. Both of these suboptions are assessed in Section 5.

4.8. Key elements of possible policy options

4.8.1. Definition of product scope

The scope of the ecodesign and energy labelling regulations covers central heating heaters, both in their functionality as space heating products and sanitary water heating products. In the latter, they are competing with dedicated water heaters, which are subject to a separate set of regulations and a separate impact assessment.

4.8.2. Ecodesign minimum requirements

Energy Efficiency levels

Ecodesign requirements for the energy efficiency (in percent) of heaters are set which are scheduled to come into force in two stages, as shown in section 2.5.

This schedule aims at providing an appropriate transition period for manufacturers to design/re-design models in order to avoid negative impacts on industry's competitiveness and on the functionality from the perspective of the user (replacement market), in accordance with the criteria for ecodesign implementing measures set out in Section 3.

NO_x emissions

In addition to the energy efficiency requirements, ecodesign requirements will set upper limits for NO_x emissions three years after the regulation has entered into force (GCV: gross calorific value):

(i) fuel boilers using gaseous fuels: 70 mg/kWh fuel input in terms of GCV

(ii) fuel boilers using liquid fuels: 120 mg/kWh fuel input in terms of GCV

and five years after the regulation has entered into force:

(i) micro-cogeneration with external combustion using gaseous fuels: 70 mg/kWh fuel input in terms of GCV;

(ii) micro-cogeneration with external combustion using liquid fuels: 120 mg/kWh fuel input in terms of GCV;

(iii) micro-cogeneration with internal combustion engine using gaseous fuels: 240 mg/kWh fuel input in terms of GCV;

(iv) micro-cogeneration with internal combustion engine using liquid fuels: 420 mg/kWh fuel input in terms of GCV;

(v) heat pumps with external combustion using gaseous fuels: 70 mg/kWh fuel input in terms of GCV;

(vi) heat pumps with external combustion using liquid fuels: 120 mg/kWh fuel input in terms of GCV;

(vii) heat pumps with internal combustion engine using gaseous fuels: 240 mg/kWh fuel input in terms of GCV;

(viii) heat pumps with internal combustion engine using liquid fuels: 420 mg/kWh fuel input in terms of GCV.

Timing and values of the emission thresholds were established based on feedback from Member States as well as stakeholders. In particular, the emission limits for oil-fueled boilers correspond to the targets of a multi-annual programme in the UK that aims at reducing the NO_x emissions from approx. 200 mg/kWh to 120 mg/kWh in the coming years.

Regarding micro-cogeneration and heat pump, values should be fixed according to the state of the art and be more ambitious in a review when this new technology will have matured. For micro-cogeneration and heat pumps the requirements should apply five years after the regulation has come into force. In particular, Member States such as Germany insisted to differentiate internal and external combustion for micro-cogeneration and heat pumps[29].

Sound power level of heat pumps

The sound power level of heat pumps shall not exceed the values set out in the table below:

Rated heat output ≤ 6 kW		Rated heat output > 6 kW and ≤ 12 kW		Rated heat output > 12 kW and ≤ 30 kW		Rated heat output > 30 kW and ≤ 70 kW	
Sound power level (L_{WA}), indoor measured	Sound power level (L_{WA}), outdoor measured	Sound power level (L_{WA}), indoor measured	Sound power level (L_{WA}), outdoor measured	Sound power level (L_{WA}), indoor measured	Sound power level (L_{WA}), outdoor measured	Sound power level (L_{WA}), indoor measured	Sound power level (L_{WA}), outdoor measured
60 dB	65 dB	65 dB	70 dB	70 dB	75 dB	80 dB	85 dB[30]

These requirements would be in line with the new ecodesign requirements for room air-conditioners. Any noise requirement for larger heat pumps could be covered in a revision, in line with noise requirements in ecodesign legislation for larger heat pumps in central heating using hot air and for air-conditioners in the coming years.

[29] The Regulatory Committee on 13 March 2013 voted to postpone requirements on NO_x emissions for boilers using gaseous and liquid fuels from three to five years after publication of the Regulation. In addition, the level of stringency for gaseous fuel boilers was increased from 70 mg/kWh to 56 mg/kWh. The impact of this change on the reduction of NO_x emissions achieved by the Regulation will be limited (less than 1 kton SO_2 equivalent per year in 2020.

[30] The Regulatory Committee on 13 March 2013 voted to increase by 3 dB the maximum allowed sound power level (outdoor measured) for heat pumps with a rated output between 12 kW and 30 kW and between 30 kW and 70 kW, being the limits 78 dB and 88 dB respectively. This modification will not change the impacts of the Regulation.

Refrigerants used in heat pumps

The issue of refrigerants, used in heat pumps, was considered and discussed, but based on information provided by stakeholders and Member States it was considered to make hardly any difference for the outcome of the legislation. Heat pumps will easily achieve the efficiency requirements and a bonus/malus based on refrigerants could even reduce energy and CO_2 savings in some situations under current market circumstances. But it has to be included in a review.

4.8.3. Measurement methods

Mandates for appropriate methods for measuring the energy consumption of heaters were given to the European Standardisation Bodies in the horizontal mandate for Ecodesign measures which was approved on 15 April 2011 by the Regulatory Committee 98/34 responsible for mandates to European Standardisation Organisations. This will take into account existing standards for heaters and standards for the Directive on the Energy Performance of Buildings. It will also build on elements developed together with industry and other stakeholders after extensive technical expert meetings from 2005 till 2011 in the preparatory study and the ad-hoc technical working group for testing and calculation methods, used to define the measurements method. The transitional measurement method will be published in the Official Journal C for provisional use to assist industry, market surveillance authorities and notified bodies (test laboratories certified by Member States) instantly after adoption of the heater measures, until harmonised standards are available. The timeline for the harmonised standard indicated in the Ecodesign horizontal mandate is the 4^{th} quarter of 2014, like for water heaters. This standard is intended to replace the Communication, as soon as it has been submitted by the European Standardisation Organisations under this mandate.

In addition to the existing standards and mandates, further elements requiring standardisation such as measurements of NO_x emissions are also provided in this horizontal mandate for Ecodesign measures.

No appropriate European standard for measuring CO, CxHy, PM_{10} emissions in heaters using gaseous and liquid fuels is available. A draft mandate to the European Standardisation Bodies for a corresponding harmonised European standard will be presented to the Regulatory Committee.

Verification procedure for market surveillance purposes

A verification procedure for market surveillance purposes has to be specified. The verification procedure should eventually be part of the harmonised measurement standards.

4.8.4. Ecodesign information requirements

In order to facilitate compliance checks manufacturers are requested to provide relevant information in the technical documentation referred to in Annexes IV and V of Directive 2009/125/EC.

4.8.5. Date for evaluation and possible revision

The main issues for a possible revision of the ecodesign regulation are

- the appropriateness of setting ecodesign requirements for greenhouse gas emissions related to refrigerants;
- on the basis of the measurement methods under development, the level of the ecodesign requirements for emissions of carbon monoxide, hydrocarbons and particulate matter that may be introduced;
- the appropriateness of setting stricter ecodesign requirements for energy efficiency of boiler space heaters and boiler combination heaters, for sound power level and for emissions of nitrogen oxides;
- the appropriateness of setting ecodesign requirements for heaters specifically designed for using gaseous or liquid fuels predominantly produced from biomass;
- the validity of the conversion coefficient value.;

An assessment of the issues of points should take into account the time necessary for collecting, analysing and complementing the data, including possible modifications following the assessment of the last point, and experiences related and properly assess the technological progress on the one hand, and the need to ensure timely entry into force of a revised measure, if appropriate, on the other hand, a review should be presented to the Consultation Forum 5 years after entry into force of the regulation.

4.9. Key elements of the energy labelling regulation

Scope

In addition to the products in the scope of the ecodesign regulation, the scope of the energy labelling regulation also includes solar thermal equipment, such as solar collectors or solar tanks, and temperature controls.

Suppliers of solar thermal equipment, in particular SMEs, and installer associations have pointed out that energy labelling of heaters that use heat captured from solar radiation should not be restricted to heaters being placed on the market as a "bundle" of the parts using electricity and fossil fuels, and solar thermal equipment. Otherwise the benefits of using solar thermal equipment would be apparent only in "bundles", but not when solar thermal equipment is placed on the market individually. As a consequence, the independent marketing of solar thermal equipment would be disadvantaged vis-à-vis the marketing of "bundles", resulting in a risk of competitive disadvantages for suppliers of solar thermal equipment and installers offering combinations of parts that were placed on the market individually, in particular SMEs.

In order to avoid such competitive disadvantages, the energy efficiency and the energy efficiency class of packages of heaters operated by electricity and fuels with solar thermal parts is to be provided by manufacturers, retailers or installers to the end-user for packages consisting of parts. This fair approach ensures that manufacturers of solar thermal equipment, in particular SMEs, do not have a competitive disadvantage vis-à-vis manufacturers of conventional heaters starting up solar business.

It is also noticeable that more combinations of heaters and supporting equipment such as controls and hybrid boilers, micro-cogeneration and heat pumps appear on the market. Stakeholders, notably from SMEs with new technologies, provided similar considerations for various situations as described above. Therefore it was decided to have a product label for the heater as such (boiler, micro-cogeneration, heat pump) and a package label for the package of different products (boiler/micro-cogeneration/heat pump combined with each other, solar thermal equipment and/or temperature controls).

Dynamic labelling is a key element of the SIP/SCP Action Plan[31]. The label displays the energy efficiency class of the heaters, an energy efficiency ranking and numerical values for relevant parameters. The energy efficiency classes are defined on the basis of the energy efficiency of the heaters. The label is designed such that the "best" energy efficiency classes can, on the basis of the technology available today, be achieved by heaters using innovative cogeneration and input from renewable energy sources (RES). This approach provides incentives for improving the energy efficiency beyond ecodesign requirements and fosters the market penetration of highly efficient technologies with cogeneration and RES. The label is "language neutral", so that manufacturers may provide the complete label together with the individual product, which minimizes the burden for the retail sector, but does not lead to significant costs for manufacturers[32].

The energy efficiency ranking and the layout of the label are shown in Annex VI. Values of class limits are given below.

Seasonal space heating energy efficiency class	**Seasonal space heating energy efficiency** η_s in %
A+++	$\eta_s \geq 150$
A++	$125 \leq \eta_s < 150$
A+	$98 \leq \eta_s < 125$
A	$90 \leq \eta_s < 98$
B	$82 \leq \eta_s < 90$
C	$75 \leq \eta_s < 82$
D	$36 \leq \eta_s < 75$
E	$34 \leq \eta_s < 36$
F	$30 \leq \eta_s < 34$
G	$\eta < 30$

For low-temperature heat pumps add 25 to the values above.

The low class boundaries of the water heating energy efficiency of combination heaters are the same as in the related energy labelling Regulation on dedicated water heaters.

31 COM(2008) 397 final, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, Brussels, 16.7.2008

32 The cost of an individual label is less than 10 Eurocent

From two years after entry into force	3XS	XXS	XS	S	M	L	XL	XXL
A+++	62%	62%	69%	90%	163%	188%	200%	213%
A++	53%	53%	61%	72%	130%	150%	160%	170%
A+	44%	44%	53%	55%	100%	115%	123%	131%
A	35%	35%	38%	38%	65%	75%	80%	85%
B	32%	32%	35%	35%	39%	50%	55%	60%
C	29%	29%	32%	32%	36%	37%	38%	40%
D	26%	26%	29%	29%	33%	34%	35%	36%
E	22%	23%	26%	26%	30%	30%	30%	32%
F	19%	20%	23%	23%	27%	27%	27%	28%
G	<19%	<20%	<23%	<23%	<27%	<27%	<27%	<28%

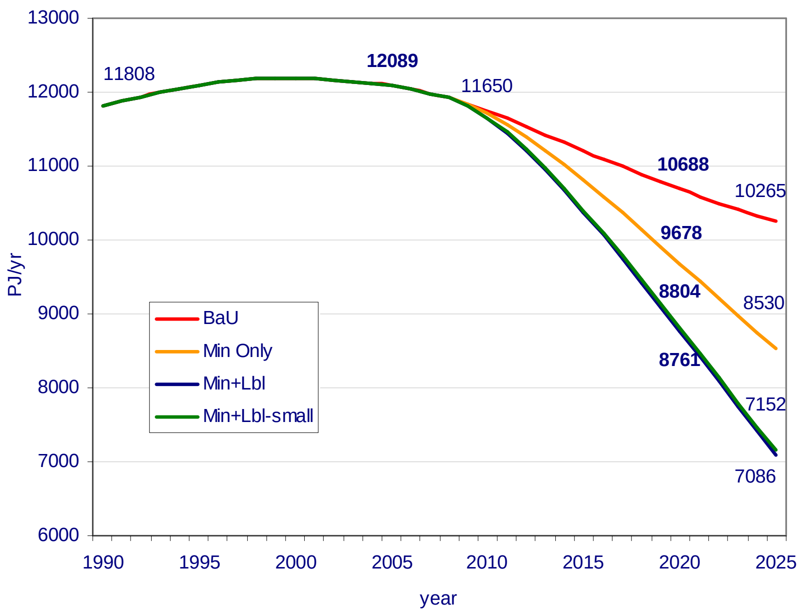
The energy efficiency classes A+++ to G are defined on the basis of the energy efficiency of the heaters and their packages. The best fossil fuel boilers, namely high efficient condensing boilers, are able to reach the energy class A. New and renewable heating technologies are able to reach the top classes A+ to A+++: At the time of entry into force of the energy labelling Regulation, the best micro-cogeneration is able to reach A+, the best heat pumps A++ and heaters combined with solar thermal equipment A+++. This approach provides incentives for improving the energy efficiency beyond ecodesign requirements and fosters the market penetration of highly efficient technologies with cogeneration and renewable energy sources.

5. SECTION 5: ANALYSIS OF THE IMPACTS

5.1. Energy Savings

The aggregated results for energy savings are presented in Figure 5.1. The differences between the scenarios in respect of energy use are clear. All scenarios produce energy savings, but to markedly different extents, BaU produces the least energy savings and the Min+Lbl and Min+Lbl-Small scenarios the highest savings. From an estimated 12 089 PJ/yr energy use in 2005, the BaU scenario achieves a 12% cut by 2020, the Min only a cut of just under 20% and the Min+Lbl and Min+Lbl-Small a 27% cut. These last two scenarios are consistent with achieving the EU 20 by 2020 goals and Min only is very close to the 20% level.

Figure 5.1 Aggregated Results - Heater Energy Scenarios 1990-2025 in PJ/yr

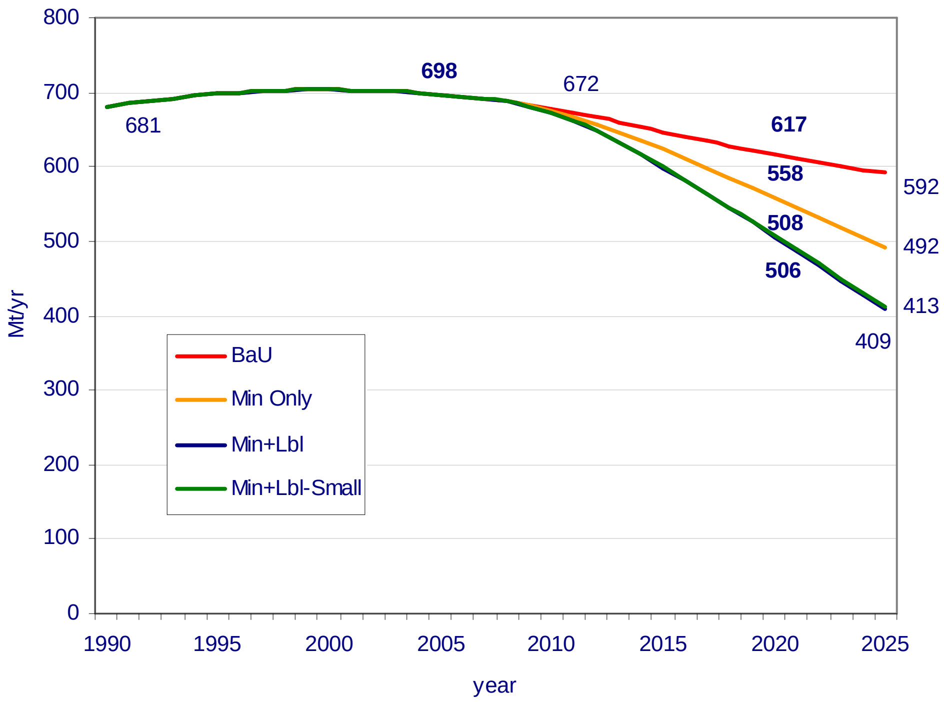


5.2. Environmental impacts

In 2005 heaters primary energy consumption of 12 089 PJ/yr (ca. 260 Mtoe), resulted in the emission of around 17% of all energy related CO_2 in the EU-27, a total of 698 Mt CO_2 equivalent. In addition heaters were also responsible for around 5% of all acidification pollution emissions in the EU-27 in 2005, around 821 kt SO_x equivalent. The results of the aggregated modelling of GHG emissions are shown in Figure 5.2.

As noted in previous chapters the climate change performance derived from energy use results in identical percentage changes to section 5.1 and so very similar results. Once more all scenarios result in CO_2 equivalent emission cuts, BaU the least at approximately 12% and Min+Lbl the most at over 27%.

Figure 5.2 Aggregated Results - Heater Carbon Scenarios 1990-2025 in Mt CO2 eq./yr [EU-27 energy-related CO2 eq. 2005: 4,109 Mt]

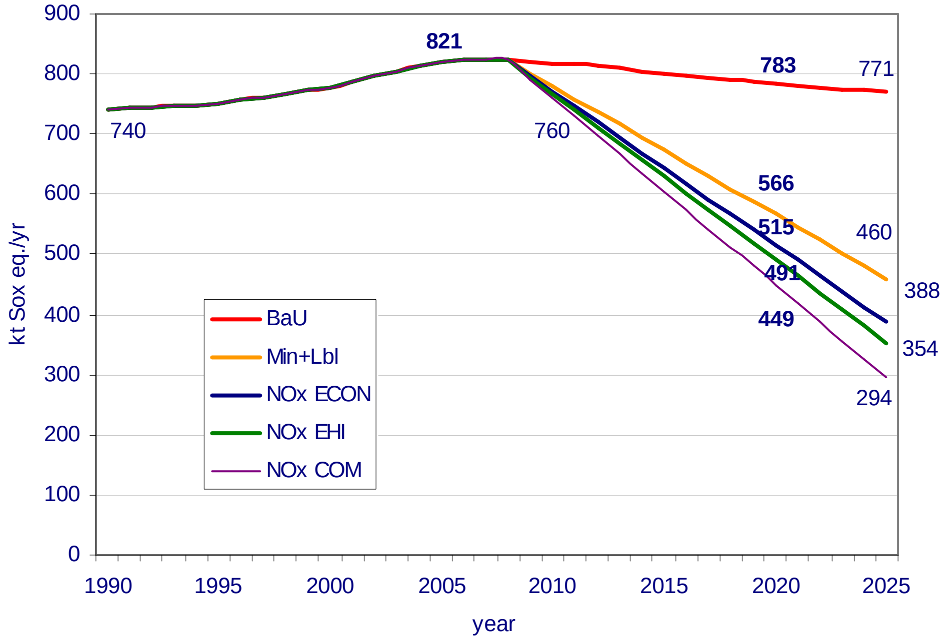


With respect of reducing total EU Energy related CO_2 equivalent emissions the BAU scenario reduction of 81 Mt would represent a 2% decrease on total EU-27 emissions of 4,109 Mt in 2005. The Min only scenario achieves a 3.4% decrease based on the same calculation and the Min+Lbl scenarios a 4.6% decrease. This illustrates the major contribution these policies could make towards GHG emission reduction at the EU level.

The results of the modelling with regard to NO_x emissions are calculated on a different basis to CO_2 emissions and include the 3 different NO_x emissions scenarios based on a Min+Lbl model. The aggregated results of the NO_x emissions scenarios are presented in Figure 5.3. All of the scenarios result in a decrease in NO_x emissions though there are considerable differences in the size of the decrease.

The BaU and Min only scenarios modelled at 175mg NO_x/kWh result in a fall in SO_x eq. emissions of around 38kt/yr or a 5% fall between 2005 and 2020. The three NOx scenarios would reduce emissions even further. The NO_x ECON scenario at 90mg NO_x/kWh results in a cut in SO_x eq. emissions of around 306kt/yr or a 37% fall between 2005 and 2020. The NO_x EHI scenario at 70mg NO_x/kWh results in a fall in SO_x eq. emissions of around 330kt/yr or a 40% fall between 2005 and 2020. Finally the NO_x COM scenario at 35mg NO_x/kWh results in a fall in SO_x eq. emissions of around 372kt/yr or a 45% fall between 2005 and 2020, nearly halving heater NO_x emissions.

Figure 5.3 Aggregated Results - Heater Acidification Scenarios 1990-2025 in kt SOx eq./yr [EU-27 total in 2005: 16.269 kt SOx equivalent, from 11406 kt NOx (*0,7) and 8284 kt SO2]

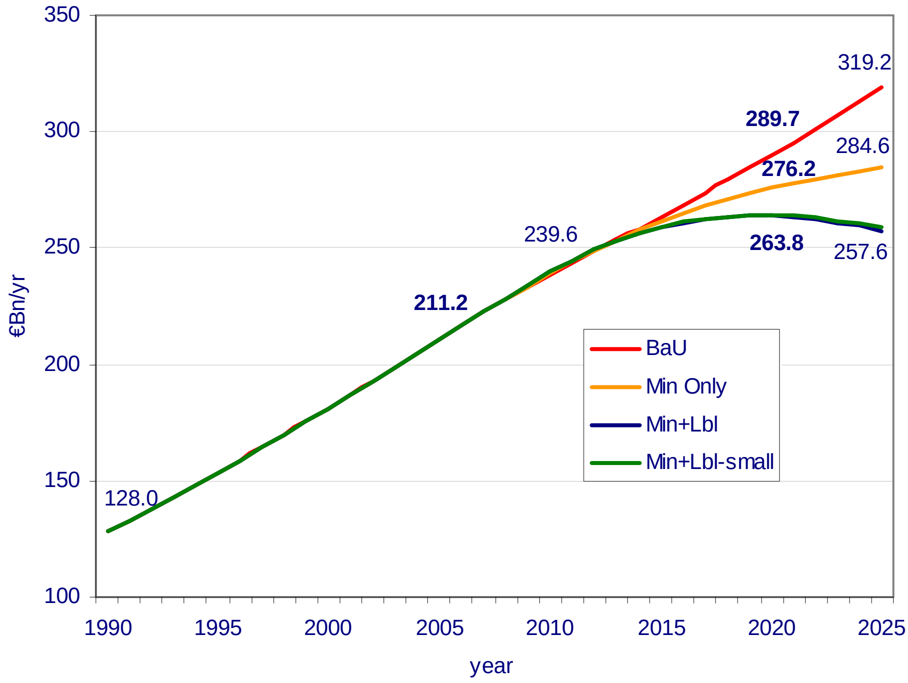


With respect of reducing total EU acidifying emissions the BAU & Min only scenarios reduction would represent only a 0.2% decrease of total EU-27 emissions of 16,269 kt in 2005. The specific NO_x scenarios achieve respective 1.9/2.0/2.3% cuts to the total. These show there are acidification emissions savings to be made through NO_x regulation of heaters though the potential emissions reductions are more limited than for CO_2 emissions. However, the application of NO_x reduction measures has serious impacts upon the affordability and life cycle cost elements for heaters, which are essential principles of the Ecodesign methodology. This is discussed further in section 5.7.3.

5.3. Costs

In 2005 total consumer heater expenditure totalled approximately €211bn. The aggregated results of the impacts of the scenario measures on consumer expenditure are presented in Figure 5.4.

Figure 5.4 Aggregated Results - Heater Expenditure Scenarios 1990-2025 in €bn/yr [Euro 2005, inflation corrected by 2%; Compare: EU-25 residential housing expenditure in 2003 is €1112 bn. and total household expenditure €6791 bn.]



Consumer heater expenditure combines two important elements, capital costs of the equipment (purchase price & installation) and operating costs (energy & maintenance), which are both expected to rise in the future. The balance between the two elements of consumer expenditure in 2005 was 12% for capital costs and 88% for operating costs.

From a starting point of average annual expenditure on heaters of € 211 bn in 2005 each of the scenarios sees expenditure increase and this is due to the increases in capital costs and energy costs described above. The graph shows that in the BaU scenario consumer expenditure will continue to increase and BaU has the highest total consumer costs. The higher efficiencies in the other scenarios lead to lower energy use and these results in slower increases in consumer expenditure. Therefore, although in the short term BaU has a slight cost advantage over the other scenarios, from 2013 Min+Lbl emerges as the least cost scenario. In the Min+Lbl scenarios annual consumer expenditure is projected to peak around 2019 and then begins to decline as energy costs rise and overall heater efficiency increases.

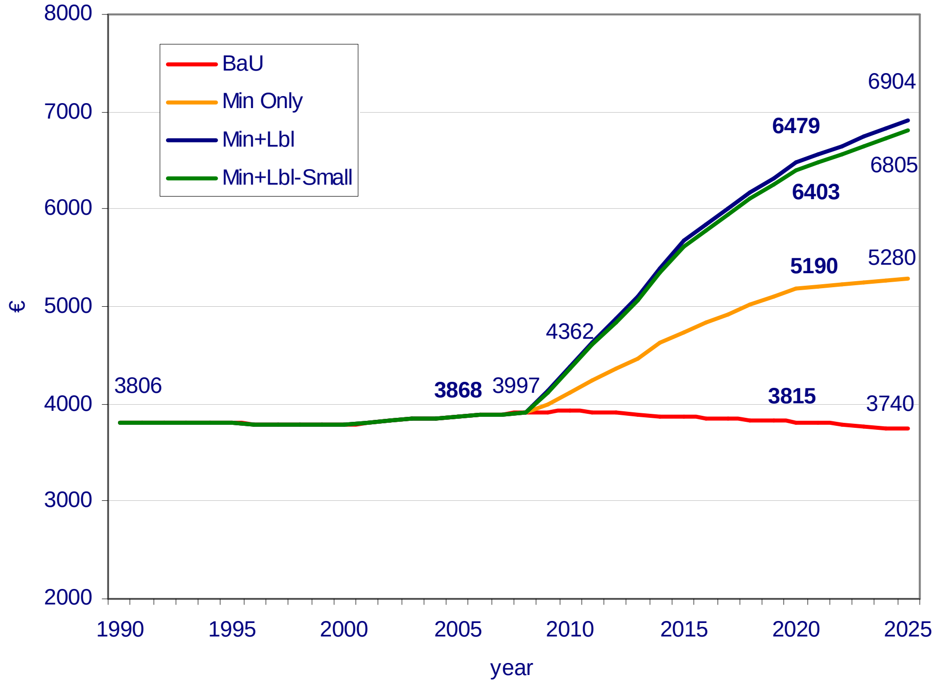
In the BaU scenario annual consumer expenditure increases to € 290 bn, a rise of almost € 79 bn (+37%) from 2005 and in the Min only scenario there is an increase to € 276 bn, a 31% rise. The expenditure in both the Min+Lbl and Min+Lbl-Small increases to around €264bn by 2020 (+25%) though expenditure then peaks around 2019 at the same value and begins to decline thereafter.

The aggregated effect of modelling the product price and installation costs between 2005 and 2020 sees total cost fall slightly in BaU (-1.5%), experience a 34% increase in Min only and over 65% average product price increase for the Min+Lbl and Min+Lbl-Small scenarios as shown in table 5.1 and Figure 5.5.

Table 5.1 Aggregated Results - Total Product cost 2020

		BaU	Min only	Min+Lbl	Min+Lbl-Small
product price	€	2090	2860	3560	3519
installation cost	€	1725	2330	2919	2884
Total New cost	**€**	**3815**	**5190**	**6479**	**6403**
Difference from BaU	€	ref	1376	2665	2589

Figure 5.5 Aggregated Results – Average Heater Unit Cost Scenarios 1990-2025 in € (avg. product price and avg. installation)



This is balanced by the changes in average annual energy costs, in the period 2005-2020 for BaU there is a 21% increase, in Min only an 8% decrease and in the Min+Lbl and Min+Lbl-Small scenarios around a 27% decrease. The additional energy savings of the other scenarios over BaU can be used to calculate a simple payback period that shows how long it takes to recoup the extra costs incurred by the more expensive heater products and installation. As shown in table 5.2 the simple payback period for the Min only scenario is 3.3 years and for the Min+Lbl scenarios is 3.8 years, against an average heater lifetime of 15-18 years. Depending on function, this would translate into a significant saving.

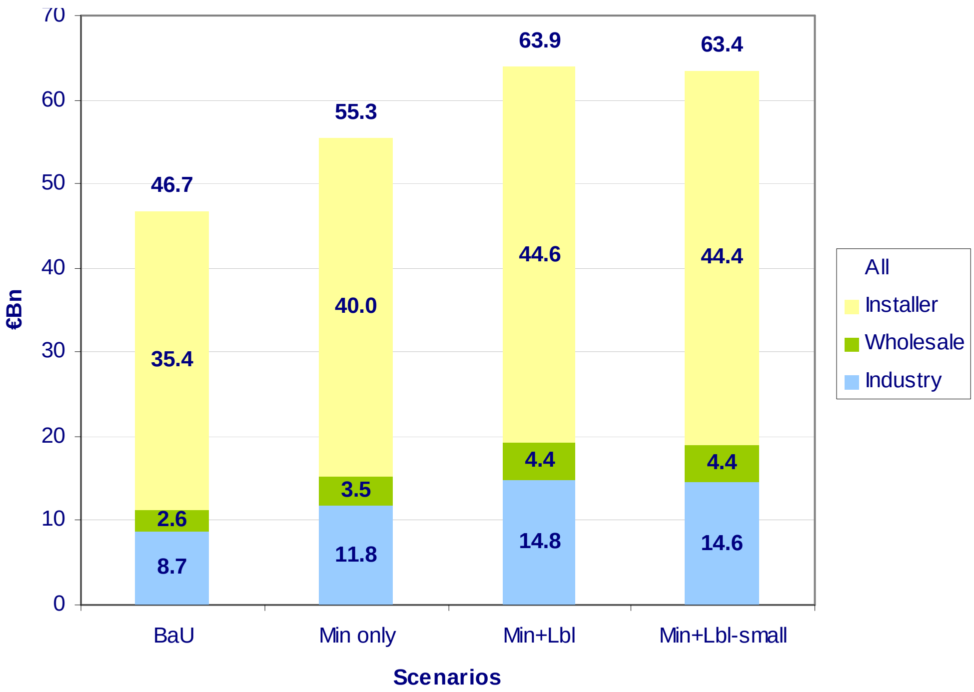
Table 5.2 Energy Costs and Payback Period 2020

		BaU	Min only	Min+Lbl	Min+Lbl-Small
Av. Annual energy costs	€ /yr	1737	1317	1028	1044
Annual Saving on BaU	€	ref	-420	-705	-693
Difference in new costs from BaU	€	ref	1376	2665	2589
Simple Payback Period	yr	ref	3.3	3.8	3.7

5.4. Turnover

In 2005 total heater market turnover was approximately € 38 bn. The aggregated results of the impacts of ecodesign measures on turnover are presented in Figure 5.6. The figure shows that by 2020 turnover increases in all of the scenarios, by around € 9 bn in BaU, € 17 bn in Min only and by € 25-26 bn in the Min+Lbl scenarios. The scenarios with minimum standards see a higher proportion of the increase in turnover (~25%) accrue to industry than BaU (10%) where a greater proportion accrues to installers. This implies that minimum standards will be beneficial to industry in respect of turnover.

Figure 5.6 Aggregated results - Heater Turnover Scenarios 2020, Total Turnove 2005 = €38.2Bn



The figure does not include the impact on energy turnover of the scenarios which is much higher than heater market turnover at €166bn in 2005. All scenarios see an increase in turnover for the energy sector between 2005 and 2020. The increase is highest at €74bn for the BaU scenario and lowest for the Min+Lbl scenario at €31bn. From around 2017 energy sector turnover begins to decline in the Min+Lbl scenario. As the opportunity cost for energy is high, the Min+Lbl scenario offers the better economic outcome.

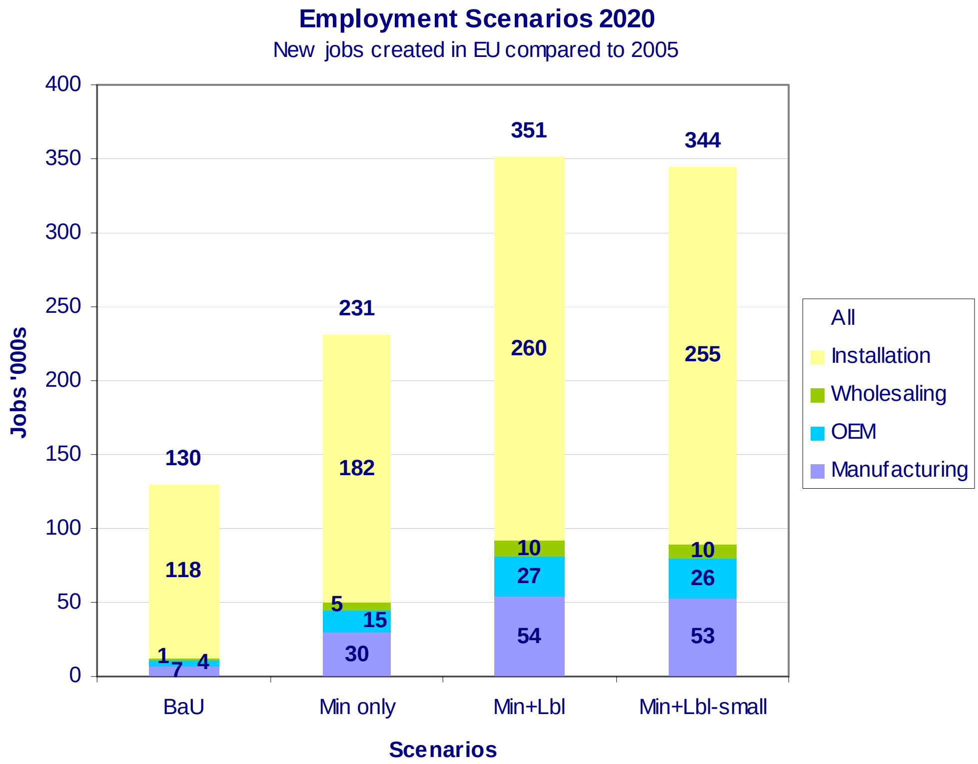
5.5. Employment

The impact of the potential changes in the heater market on job creation and employment is reviewed through the stock models for both the space and water heating function. This section provides the aggregated results and a further independent analysis of the employment impact of the heater scenarios.

The aggregated model results start from a base point of 551 000 jobs in the heater sector in the EU in 2005. The aggregated results of the impacts of ecodesign measures on employment are presented in Figure 5.7.

The figure shows that by 2020 employment increases in all of the scenarios, by 130 000 jobs in BaU, up to over 350 000 jobs in the Min+Lbl scenarios. The scenarios with minimum standards see a higher proportion of the increase in employment (>20%) accrue to industry than BaU (8%) where a greater proportion accrues to installers. This implies that minimum standards will be beneficial to industrial employment at manufacturers and OEM suppliers.

Figure 5.7 Aggregated results - Heater Employment Scenarios 2020

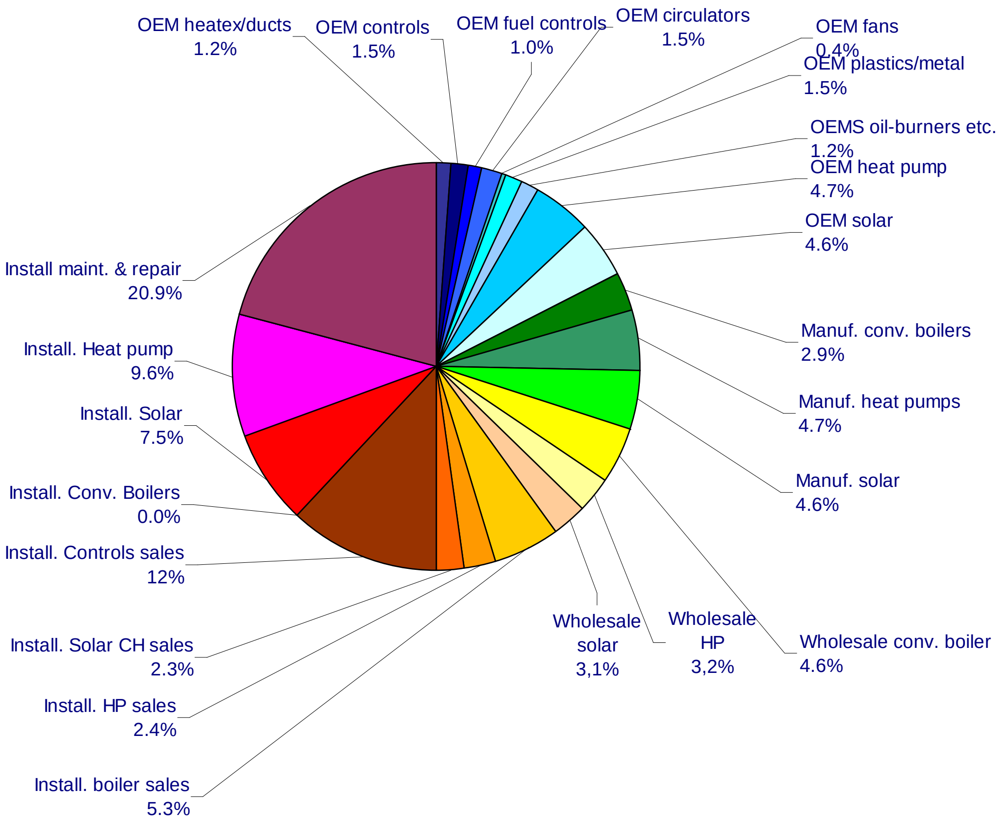


The figure above illustrates that the largest growth in employment will take place amongst installers, accounting for around 90% of the employment growth in BaU and around 75% in Min+Lbl. Wholesaler employment growth is only around 1-3% of the total with the remainder of the growth in industry.

The accuracy of the employment figures produced by the stock models is not high. To validate the accuracy of these employment estimates a separate employment analysis was carried out (see Annex VII).

By reviewing actual data produced by trade associations, Eurostat and other directories such as the number of companies and number of registered installers an estimate of current employment was made. This apportioned 600-700 000 jobs in installation and a further 25 000 jobs in wholesaling in the EU in 2005. Working from this basis and then using the design options and industry estimates from the preparatory study an estimate of 200-250,000 new jobs for the Min+Lbl scenario was produced with a detailed breakdown of jobs, this is shown in Figure 5.8.

Figure 5.8 Heater Employment Estimate 2020, 200-250.000 New Jobs (Min+Lbl scenario)



This figure of 200 000-250 000 new jobs is roughly consistent with the model results and should be regarded as more accurate, still the precision of this estimate is not larger than ± 20%.

The results breakdown into job creation in these approximate proportions:

- OEMs 18% : 35-42 000 jobs, of which > 50% extra-EU;
- Manufacturers 12% : 24 000-30 000 jobs, of which 10-20% extra-EU;
- Wholesalers 10%: around 10-20 000 (difficult to estimate);
- Installers 60%: around 120-150 000 in sales, installation but above all in maintenance and repair. This includes also separate components like controls, chimneys, etc., so in fact a part of the installer jobs should be partitioned to these component manufacturers.

Of further note is the creation of a high proportion of jobs in renewables, with solar and heat pump technologies accounting for a significant share of the new jobs created.

The employment scenarios report net job creation in each sector in the EU, but it is also true that some jobs may be lost within sectors. An example of this is jobs tied to oil-fired boilers. With the proportion of oil-fired boilers expected to decrease over the 2005-2020 period countries with a higher proportion of oil fired boilers than the EU average, such as the UK, could face job losses. This is a particular problem in the UK as many of the oil-fired boilers produced are inefficient and have high NO_x emissions. As ecodesign standards are implemented the additional design requirements will negatively impact companies who cannot afford to innovate to meet the new criteria. Despite the potential for negative employment effects locally the net employment effect at EU level is expected to remain positive and the stricter requirements may raise the competitiveness of EU manufactured heaters internationally.

A geographical consideration of the job creation effect would also be informative but this again is difficult with the information available. As most installers are SMEs (>80%) it could be expected that employment growth in installation would be distributed in proportion to the population and number of households in each member state, with some small variations dependent on climate and other factors. For wholesalers there are some international heater wholesalers within the EU such as St. Gobain (FR) and Wolseley (UK) but much of the wholesale is by regional and national businesses so again the jobs should follow broad population and household trends. Within industry the split is likely to be more asymmetrical with turnover accruing to existing larger manufacturers as they expand to meet the new demand. Accordingly jobs are likely to be created in the locations of current production. If the extra jobs for industry were allocated on this basis then over 85% of the employment increase would accrue to the 5 biggest producers Italy, Germany, France, UK and the Netherlands. This scenario could change if modern technologies such as solar components and micro-cogeneration indeed would take off, as in these areas SMEs are relatively stronger. This is possible as some big utilities have started teaming up with some producers to roll out micro-cogeneration, for example in the UK and the Netherlands.

5.6. Boundary Impacts

In addition to the quantitative impacts covered in the previous section this impact analysis also considers a number of boundary impacts, i.e. impacts which are of a more yes/no nature. The key impacts of this nature are discussed below:

5.6.1. Functionality of Product

The heater products should still do their job just as effectively and functionality will improve in many cases. For example a better insulated household will retain its heat better and hence maintain its temperature more effectively (and at a lower cost, energy and environmental impact).

5.6.2. Health, Safety and Environment

The products will still be expected to comply with all existing health and safety legislation, so there should be no impact here. As presented and discussed in the previous section all of the scenarios will bring benefits in terms of reduced carbon dioxide and acidifying gas emissions.

5.6.3. Affordability and Life Cycle Costs

This issue is covered in detail in the quantitative impacts section on costs above. For the majority of the options the cost to consumers is recovered within a relatively short number of years. As shown in § 5.3, therefore in general there is no need for additional measures to mitigate potential negative effects for users. However, as was found in the sensitivity analysis (see footnote 30 in § 5.9), for a particular group of low-income users a possible negative impact was found that has been taken into account in the proposed measure.

The most important point to note is that the Min+Lbl-Small scenario offers the best option for this criteria as by reducing standards for smaller heaters it also reduces the need for expensive and difficult chimney renovations in larger buildings. One further point of note is that increasing NOx emissions limits beyond a 90 mg/kWh level reduces the affordability of the scenario considerably (also depending on the fuel and technology), which is not in line with the principles of the Ecodesign Directive and its methodology. This shows that the proposed measure is balanced and pays attention to the position of the users.

5.6.4. Industry Competitiveness

In terms of sales into the EU market, EU manufacturers will all be facing the same requirements under the various scenarios. The main exception to this relates to the way in which Member States will choose to implement EPB requirements. There has been a variety of approaches to the implementation of these between Member States. This could result in manufacturers who focus on particular markets having to meet slightly different technical or other requirements (and/or at slightly different times) to those that focus on other Member State markets. It is expected that the recast of the EPBD and the link with Ecodesign in it, will lead to a more harmonised EU approach, supported by best practices and benchmarking.

On a global scale there is also a chance that other geographic markets will adopt different standards to those pursued in the EU. This could oblige manufacturers to produce a variety of models for different markets, which would reduce their economies of scale and affect their competitiveness.

It is very difficult to give an indication of global competition in the field of heaters as there are no reliable global trade statistics publishing the cross border deliveries for the different components for heaters. However, knowing that imports to Europe are at a low level and are likely to be of less advanced heater models, it is reasonable to assume that with higher standards (and with more differentiation into the direction of renewables) most production of heaters will be done in Europe.

The heater market is to a large extent European, but sometimes even nationally or regionally defined. Therefore, in the measures, climate zones and degree days have been incorporated to reflect the European and regional climate situations. European central heating generally takes place with hydronic systems, often in combination with sanitary hot water production, whereas in major third countries other heating and hot water systems are used, for example hot air based systems in U.S. and Canada or local heating and hot water systems in Japan and Australia. As a consequence manufacturers mostly produce for the EU market. Exports to third countries are limited. The proposed requirements are comparable to the ambition level (at the preparatory stage) of central hydronic heating products in South East Asia and China.

Redesign and investment costs for industry

For heaters no concrete data were made available by affected industry that would allow a detailed quantitative assessment of re-design and investment costs. However, affected manufacturers have pointed out that investments are already currently being done in light of the expected measures, and therefore it is estimated that some market transformation has already taken place and it is difficult to estimate which impacts still remain. Examples include heat pump technology, solar thermal technology and micro-cogeneration. Some estimates are made using assumptions which are based on the outcome of the stakeholder consultations, yielding solid qualitative, albeit not always fully quantitative results.

Impact on SMEs

Impact on SMEs (both manufacturers and installers) can be estimated to be positive. The installer label has been welcomed especially by manufacturers of solar thermal components, which are mostly SMEs. The measure allows them to show the benefits of their energy related products. Throughout the ecodesign process industry associations, in which SMEs are represented, have been closely involved and are supportive of the process and the envisaged legislation. SMEs have actively participated in discussions for establishing the calculation methodology and the preparations for the European standard (e.g. on issues like temperature and flow controls, output temperature).

Industry is reluctant to communicate information on the market share of their products. In the "traditional technologies" such as (condensing) gas heaters a major consolidation has taken place in the past decade and hardly any SME exists. SMEs in this sector of the industry are scarce and mostly limited to parts suppliers (OEMs) but more detailed reliable information on this is hardly possible to obtain. There are no indications that the proposed measures would change the market structure. Large companies (around 10, including Vaillant, Remeha, Bosch, Viessmann, Merloni Group and several large Japanese suppliers of mainly heat pumps such as Daikin, Mitsubishi etc.) dominate 80-90% of the market. Smaller 'end-producers' can be found in the waning oil-fired heater industry (especially in the UK) and in the very large size heaters (generally not mass produced items and often not even in the scope of the proposed measures). A reasonable estimate would be around 20 such SMEs with at least some small but still meaningful scale of operation in an EU context.

SMEs are strongly represented in several new upcoming innovative and high-technology sectors such as solar components and micro CHP. These SMEs, around 20 with at least some meaningful sales or ambitions in an EU context, also tend to be reluctant to share disaggregated market information and their prognosis for the take-off of their products in the years to come because of fear of market entrance of the big players in these niches. Nevertheless, the European associations representing these sectors have been closely involved in the preparatory studies and stakeholder consultations and agree with the findings. As industry requires that testing will be done by third parties, the costs as already described in the IA are in principle the same for all manufacturers.

No micro enterprises exist as the R&D costs, the testing demands for safety (e.g. Gas Appliance Directive) and for compliance with building codes and EPBD requirements, and the sales and marketing would lead to too high costs per unit, making the activity uneconomical in a branch with large companies with economies of scale (one of the reasons for the consolidation in the past decade mentioned above).

Testing costs for heaters for compliance with the requirements in the proposed measures, which for gas- and oil-boilers are hardly affected by these, are estimated at <0.5% of the product price in the preparatory study. Further estimates about the impact on employment and SMEs are provided in § 5.5 and Annex VII.

5.6.5. *No Proprietary Technology*

The nature of the proposals is to request end points, in terms of energy efficiency and emissions. This approach is relatively technology blind as any technology which achieves the end point will be acceptable (on the assumption that no other negative impacts occur). In some cases there are known means to achieve the ends. However these focus on general approaches rather than specific (proprietary) technologies.

5.6.6. *Administrative burden*

As a consequence of the structure and procedures prescribed in the Ecodesign Framework Directive, the main carriers of any administrative burdens, Member States and industry, are part of the process (from the preparatory study to the end of the impact assessment process) for developing measurement methods to be used for testing and information to be provided. This was subject of discussions in several stakeholder meetings, two Consultation Forum meetings and one Regulatory Committee meeting.

Administrative costs defined as the coast of providing information in order to meet legal obligations is expected to be negligible, around 0.1 % of the cost per model for the end-consumer. Therefore the Standard Cost Model has not been applied in the impact assessment. Annex X provides a detailed assessment of the administrative burden for manufacturers and retailers as well as for Member States and the Commission.

5.7. Conclusion on economic, social and environmental impacts

Summary of Impact Assessment Results

MAIN IMPACTS (Aggregated)			**Scenarios 2020**							
			Base	**1**	**2**	**3**	**4**	**5a****	**5b****	**5c****
(as Art. 15, sub. 4., subsec e. of 2009/125/EC)			2005	BAU	Min only *	Min+Lbl	Min+Lbl-Small *	NOx Scenarios		
ENVIRONMENT										
EU totals	ENERGY	PJ/yr	12089	10688	9678	8761	8804	8761		
	GHG	Mt CO2 eq./yr	698	617	558	506	508	506		
	AP	kt SOx eq./yr	821	783	n.a.	566	515	515	491	449
CONSUMER										
EU totals	expenditure	€ bn/yr****	211.2	289.7	276.2	263.8	264.3	264		
	purchase costs	€ bn/yr	25.2	24.5	33.6	41.8	41.3	42		
	running costs	€ bn/yr	186.1	265.2	242.5	222.0	223.0	222		
per product	product price	€	2247	2090	2860	3560	3519	3560		
	install cost	€	1627	1725	2330	2919	2884	2919		
	energy costs	€ /yr	1437	1737	1317	1031	1044	1031		
	payback(SPP)	years	N/A	reference	3.3	3.8	3.7	3.8		
BUSINESS										
EU turnover	manufacturers	€ bn/yr	7.9	8.7	11.8	14.8	14.6	14.8		
	wholesalers	€ bn/yr	2.4	2.6	3.5	4.4	4.4	4.4		
	installers	€ bn/yr	28.0	35.4	40.0	44.6	44.4	44.6		
	TOTAL	€ bn/yr	38.2	46.7	55.3	63.9	63.4	63.9		
EMPLOYMENT										
employment (jobs)	industry EU (incl OEM)	'000	94	105	139	176	174	176		

	industry non-EU	'000	47	52	69	87	86	87
	wholesalers	'000	11	13	17	21	21	21
	installers	'000	445	563	627	705	701	705
	TOTAL	'000	598	734	852	990	982	990
	of which EU	'000	551	681	783	903	896	903
	EXTRA EU jobs	'000	reference	reference	101	221	214	221
	of which SME***	'000	reference	reference	70	153	148	153

*=Water Heater element of this scenario included as in Min+Lbl.

**5a= NOx scenario at 90 mg/kWh, 5b= NOx scenario at 70 mg/kWh, 5c= NOx scenario at 35 mg/kWh.

***= partitioning 50% of industry & wholesale, 80% of installers

****=all money amounts in Euro 2005 (inflation corrected).

BOUNDARY CONDITIONS ("should be no negative impacts")		Scenarios 2020/ 2025						
		1	**2**	**3**	**4**	**5a**	**5b**	**5c**
"No negative impacts" following Art. 15, sub 5 of 2009/125/EC		BAU	Min only	Min+Lbl	Min+Lbl-Small	NOx Scenarios		
functionality of product		+	+	+	+	+	+	+
health, safety and environment		+	+	+	+	+	+	+
affordability and life cycle costs		+	+	+	++	+	0	-
industry competitiveness		+	+	+	+	+	+	+
no proprietary technology		+	+	+	+	+	+	+
no excessive administrative burden		+	+	+	+	+	+	+

Key: ++ = Strong Positive Rating + = Positive Rating 0 = Neutral Rating - = Negative Rating.

Based on assessment of costs and benefits a combination of Scenarios 4 is the preferred option to solve the problem of the market failure for the uptake of heaters with improved environmental performance, as it optimally fulfils the requirements of the Ecodesign and Energy Labelling Directives.

5.8. Sub-options considered for timing and energy label of heaters

Timing

Intermediate assessments on timing and ambition levels were performed over the past 5 years for quantitative scenario 3 (based on the policy option of §4.7).

Sub-option 1: the minimum efficiency criteria to introduce condensing technology of gas/oil fired boilers take effect after 2 years

Good balance of ambition and implementation capacity of industry, certainly now industry has already started adapting.

Sub-option 2: the minimum efficiency criteria to introduce condensing technology of gas/oil fired boilers take effect after 1 year

This would cause problems for R&D and the supply chain of manufacturers.

Sub-option 3: the minimum efficiency criteria to introduce condensing technology of gas/oil fired boilers take effect after 3 years

This is not necessary for manufacturers and would lead to an unnecessarily late take-off of environmental benefits and financial benefits for the end-consumers.

A more detailed analysis of these sub-options can be found in Annex XI.

The preferred option is sub-option 1:

For gas/oil-fired boilers there is no second tier after three years, as is often the case in ecodesign measures, but strict values are proposed after two years. The stricter time line will allow earlier energy savings and emission reductions. Two years are also necessary to prepare for testing and capacity build-up of seasonal space heating and water heating energy efficiency for heaters. The proposed measure is wider in scope than the old Boiler Efficiency Directive (to be repealed) to consider other heating equipment with a current market share < 10%, that is electric boilers and heat pumps. For these heating appliances the Member States required in the stakeholder consultation of May 2011 to introduce minimum requirements after 2 and 4 years at a comparable low level, not hindering the market introduction of heat pumps and allowing electric boilers to remain on the market for certain niches, e.g. secondary homes, while preventing low quality products.

The market transformation in anticipation of the ecodesign measure during the unforeseen delays has not been part of the quantitative modelling. Therefore a more quantitative approach on the effects of timing compared to the original scenarios would not be relevant. However, the requirements can easily be met by all manufacturers and have not been seriously questioned either by the associations of manufacturers, which also include SMEs, or by individual SMEs. In combination with the observed market transformation already taking place this warrants the conclusion that the proposal with sub-option 1 is perfectly reasonable. This will also guarantee that after two years savings will become apparent.

Energy label of heaters

The key elements of the energy labelling regulation are given in chapter 4.9, including a product label of heaters and a package label of heaters combined with related products.

Product label of heaters

The option of combination of ecodesign, labelling and EPBD requirements as presented in chapter 4.7 and modelled in section 5 and Annexes V and VII includes dynamic labelling for heaters. Dynamic labelling, as described in chapter 4.9, creates incentives to accelerate market transformation towards energy-efficient technologies: a new A++ to G energy efficiency class scale would be introduced in the first tier two years after the Regulation enters into force. An A+++ would be added on the top of the scale in the second tier five years after the Regulation enters into force.

Package label of heaters combined with related products

The scope of the proposed measures is the "product package". A heater is not just a heat generator. For assessing and labelling a heater, closely related products such as controls, solar thermal systems and supplementary heaters (so-called hybrid products) cannot be ignored. This "product package approach" has been used in other ecodesign measures before and is well established by now.

The energy labelling measure proposes a label for the heat generator. But in order to address the concern of component manufacturers (often SMEs) and consumer organisations, a "dealer label" is proposed in addition to the label for the heat generator. This means that based on data provided by the manufacturers of the various components, the dealer/installer can establish the energy efficiency of the product package (heat generator plus components) as this combination is what the consumer is buying and this combination determines the energy efficiency (see Annex VI for illustration).

This is different from the "system approach" under the EPBD where the entire installation is considered, including distribution and emission of heat in the building, and where the heat demand and required heating capacity are relevant as well. The product package approach is complementary to the system approach in the EPBD but they are different.

5.9. Sensitivities considered

The preparatory study (Task 7) has performed several sensitivity analyses regarding energy rates (half or double) and other factors. The end result was that the target levels, which were at that time certainly not less ambitious than what is now proposed, are robust in terms of payback time and affordability.

Please note that, for reasons of affordability to a very particular group of home owners, the proposed minimum requirements are already relaxed[33].

6. SECTION 6: CONCLUSION

Following the principle of proportionality in the analysis effort, policy options 1 to 6 were discarded at an earlier phase of the analysis. The analysis of several sub-options for the intensity of an ecodesign regulation on the energy consumption shows that the present policy option 7 bis ("Min + Lbl – small" in § 4.7, quantified as scenario 5a with timing sub-option 1, package label and dynamic product label) optimally fulfils the objectives, namely improving the market penetration of heaters using cost-effective and energy efficient technologies.

In particular, this option implies

– cost-effective reduction of energy consumption related to heaters, leading to a reduction of the energy consumption by 45 Mtoe annually by 2020 compared to the business-as-usual scenario, corresponding to annual energy cost savings of about € 42 billion, and about 110 million tons avoided CO_2 emissions;

[33] The 'very particular group' is the group of the low-income private apartment owners facing extra costs to renovate the chimney, if they could only install a condensing heater for which their chimney is not suited (e.g. water leakages through the wall). The ecodesign measure on heaters proposes a lower minimum efficiency requirement for heaters used in private apartments to guarantee the affordability for low income apartment owners and encourages Member States to set up chimney renovation programs.

– the consumer will have to pay more for the heaters and its installation but will save considerably in energy, resulting in a pay-back time of less than 4 years whereas the lifetime of a heater is estimated to be 15-17 years;

– correction of market failures and improvement of the functioning of the internal market;

– no significant administrative burdens for manufacturers or retailers;

– insignificant, if any, increase of the purchasing cost, which would be largely overcompensated by savings during the use-phase of the product;

– that the specific mandate of the Legislator is respected[34];

– incentives for manufacturers to innovate and invest into technologies because of the energy label;

– market transparency and easily accessible information provided by the energy label, fostering consumer awareness and facilitating consideration of energy consumption when making the purchasing decision;

– costs for re-design and re-assessment upon introduction of the regulation, which are limited in absolute terms, and not significant in relative terms (per product);

– fair competition by creation of a level playing field;

– no significant impacts on the competitiveness of industry, and in particular SMEs, due to the small absolute costs related to product re-design and re-assessment;

– a low risk for having negative impacts employment, in particular in SMEs.

7. SECTION 7: MONITORING AND EVALUATION

The appropriateness of scope, definitions and limits will be reviewed after maximum 5 years from the adoption of the measure (as required by Annex VII.9 of the Ecodesign Directive and laid down in the implementing measure). Account will be taken also of the speed of technological development and input from stakeholders and Member States. Compliance with the legal provisions will follow the usual process of "New Approach" regulations as expressed by the CE marking.

Compliance checks are mainly done by market surveillance carried out by Member State authorities ensuring that the requirements are met. Further information from the field as e.g. complaints by consumer organisation or competitors could alert on possible deviations from the provisions and/or of the need to take action. In addition, the Commission and the Member States are increasingly cooperating to improve market surveillance, e.g. by exchanging surveillance results and coordinating their market surveillance efforts to avoid double checks. Taking into consideration the market structure, the involvement of industry in the legislative process, and the interest for labels as a marketing instrument, (near) immediate progress in implementation can be expected.

[34] Article 16 of Directive 2009/125/EC explicitly asks for implementing measures for heating products.

Input is also expected from work carried out with international partners, e.g. in the framework of the IEA Implementing Agreement for Energy Efficiency End-Use Equipment.

ANNEX I: STRUCTURE OF THE METHODOLOGY USED FOR ESTABLISHING THE TECHNICAL, ENVIRONMENTAL AND ECONOMIC ANALYSIS

Following the "Methodology Study Eco-design of Energy Using Products" ("MEEuP"), the tasks listed below are carried out for developing the technical, environmental and economic analysis referred to in Annex II of the Ecodesign Directive:

Task 1: Product definition, existing standards and legislation

Task 2: Economics and market analysis

Task3: Analysis of consumer behaviour and local infrastructure

Task 4: Technical analysis of existing products

Task 5: Definition of base case ("average" model) and related environmental impact

Task 6: Technical analysis of best available technology

Task 7: Improvement potential

Task 8: Policy, impact and sensitivity analysis

ANNEX II: DETAILS OF THE BASELINE SCENARIO

The base case defines the situation relating to CH (space heating function) and COMBI (water heating function) heaters as it stood in 2005, regarding the mix of heaters in place and being purchased across the EU and the load profiles they are installed to meet.

Space Heating Function Base Case

As mentioned in the Ecodesign directive all previous and current technology-dependent classifications for heater space heating function will not be used for measures, i.e. there is no distinction between *"gas/oil/electric"* or "*condensing/low temperature/standard"* or "*atmospheric/ fan-assisted/ pre-mix"* or classes based on *"fuel input in Net Calorific Value" (<70 kW, 70-300 kW, etc.).* 9 load profiles were used to distinguish CH heater-systems using the standard denominations S-M-L (small-medium-large) extended downwards to XS and XXS and extended upwards to XL, XXL, 3XL and 4XL. An overview of load profiles from the Ecoheaters preparatory report task 7 is given in the table below.

Table 1 Overview of CH heater space heating load profiles

Size			**Examples of applications**
XXS	market share	**2.3%**	**apartment new**
	Net load	**2,354** kWh/a	passive house new
	Pmin	**3.6** kW	professional practice (part of house)
			small shop-/ office-space new
XS	market share	**7.6%**	**average dwelling new**
	Net load	**3,699** kWh/a	terraced or low-E house new
	Pmin	**5.1** kW	large apartment new
			medium shop-/ office-space new
S	market share	**15.2%**	**apartment existing**
	Net load	**4,850** kWh/a	house new/ fully renovated
	Pmin	**6.9** kW	penthouse new
			small shop/ office space existing
M	market share	**51.5%**	**average existing**
	Net load	**7.480 kWh/a**	house partially renovated
	Pmin	**7,7** kW	large apartment existing
			medium shop/ office space existing
L	market share	**9.9%**	**house existing**
	Net load	**10,515** kWh/a	small low-rise apt. building (4 apartments) new
	Pmin	**10.5** kW	two-family house new
	Pmax	**45**	small office/shop building new
XL	market share	**9.9%**	**new avg. apt. building (8 apt.)**
	Net load	**20,284** kWh/a	small low-rise apt. building (4 apartments) existing
	Pmin	**30.6** kW	villa, large house, 2-family house existing
	Pmax	**90**	medium shop/office building new
XXL	market share	**2.6%**	**existing avg. apt. building (8 apt.)**
	Net load	**42,195** kWh/a	high-rise apt. building (12-20 apartments) new
	Pmin	**46.4** kW	medium shop/ office building existing
	Pmax	**180**	large low-rise shop/office building new
3XL	market share	**0.6%**	high-rise apt. building (12-20 apt.) existing
	Net load	**150,000** kWh/a	large low-rise shop/office building existing
	Pmin	**150** kW	medium/ high-rise office building new
			in cascade: larger high-rise building
4XL	market share	**0.6%**	block heating 3 high-rise buildings (60 apartments)
	Net load	**400,000** kWh/a	large high-rise office building
	Pmin	**300** kW	hospital, shopping mall, small airport (cascades)
			district-heating substations

Table 1 summarizes the CH stock model base case[35] and forms the starting point of the scenario analysis for the space heating function of heaters. In part A, it gives the 2005 heater sales figures subdivided by unit size, a total of 6.6m units/year, with over 50% of units sold being the M size class. Part B lists the total net load in GWh/yr applicable to each size class, which is calculated from the net unit load multiplied by the sales. This amount to an EU total net load of 76 600 GWh/year for the BaseCase and it should be noted that the 3 largest size classes, while accounting for less than 4% of unit sales make up over 30% of the net load. For the scenario analysis the weighted average load of 11 602 kWh/year is important, as it is used

[35] As derived from VHK Ecoboilers report task 5 & 7.

throughout the analysis. Part C gives the estimated efficiencies of the individual heater sizes used in the base case, giving a weighted average of 48% in 2005, that all of the scenarios will be evaluated against. Part D lists the actual annual energy consumption of heaters sold in 2005, based on the net load and from Part B and the efficiency in Part C. In total this amounts to 160 300 GWh/year of primary energy consumption. Part E lists the energy consumption in GWh/year in the case that LLCC target levels were being achieved, this gives energy consumption of 101 900 GWh/year at a weighted average efficiency of 75%.

Table 2 Calculation of annual primary energy consumption – Space Heating - Base Case (avg. EU-25, sold in 2005)

A. Total sales EU-25 in '000 units in the year 2005											
in '000 units	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total	
Heater	150	500	1000	3400	650	650	170	40	40	6600	
As %	2.3%	7.6%	15.2%	51.5%	9.8%	9.8%	2.6%	0.6%	0.6%	100%	
Total	150	500	1000	3400	650	650	170	40	40	6600	
B. Net load in GWh/year											
Net load kWh/year .unit	2350	3700	4850	7480	10515	20000	42195	106738	320215		
total net load in GWh/year	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total GWh/year	Weighted Average kWh/year
Heater space heating	353	1,850	4,850	25,432	6,835	13,000	7,173	4,270	12,809	76,571	11602
Total GWh/year	**353**	**1,850**	**4,850**	**25,432**	**6,835**	**13,000**	**7,173**	**4,270**	**12,809**	**76,571**	**11602**
As %	0.5%	2.4%	6.3%	33.2%	8.9%	17.0%	9.4%	5.6%	16.7%	100%	
C. Efficiency in % (primary energy, Gross Calorific Value)											
in %	XXS	XS	S	M	L	XL	XXL	3XL	4XL	weight avg.*	
Heater space heating	53%	54%	52%	54%	55%	44%	45%	43%	43%	48%	
D. Energy consumption in GWh/year (net load efficiency)											
Sales	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total	
Heater space heating	665	3,426	9,327	47,096	12,427	30,233	15,940	9,929	31,240	160,284	
Total	**665**	**3,426**	**9,327**	**47,096**	**12,427**	**30,233**	**15,940**	**9,929**	**31,240**	**160,284**	
Efficiency aggreg.	53%	54%	52%	54%	55%	44%	45%	43%	43%	48%	
*=weighted for total net load in GWh/year, so taking into account both sales and load											
E. Energy consumption at LLCC targets (in GWh/year)											
target	68%	68%	68%	76%	76%	76%	76%	76%	76%	75%	
energy in GWh/year	518	2721	7132	33463	8993	17105	9438	5618	16853	101842	

Water Heating Function Base Case

The load profile of COMBI heaters uses the same system of 9 load profile categories based on size but bound by hot water demand instead of space heating demand. These alternative profiles are based on those set out in the Ecohotwater preparatory report task 7, an overview is given in table 3.

Table 3 Overview of COMBI heater water heating load profiles

Size			**Examples of applications**
3XS	market share	**1%**	single point only
	Largest flow rate required (ΔT=45 K)	**2 ltr./min**	(semi-) public toilets (if hot water needed)
	Largest tapping required	**0,3 ltr**	
	24 h net hot water demand	**0,345 kWh/d**	
	Nr. of cycles per 24 h	**23**	
XXS	market share	**6,0%**	**small sink tap (no dishwash) [1 c]**
	Largest flow rate required (ΔT=45 K)	**2** ltr./ min.	single point only
	Largest tapping required	**2** ltr	(semi-) public toilets (if hot water needed)
	24 h net hot water demand	**2,1** kWh/ d	
	Nr. of cycles per 24 h	**18**	
XS	market share	**12,5%**	**average sink tap [1 b]**
	Largest flow rate required (ΔT=45 K)	**4** ltr./ min.	single point only
	Largest tapping required	**5** ltr	
	24 h net hot water demand	**2,1** kWh/ d	
	Nr. of cycles per 24 h	**16**	
S	market share	**24,0%**	**large sink tap/ small shower tap [1]**
	Largest flow rate required (ΔT=45 K)	**5** ltr./ min.	1 person household
	Largest tapping required	**9** ltr	student flat
	24 h net hot water demand	**2,1** kWh/ d	holiday home
	Nr. of cycles per 24 h	**11**	single point or small multi-point
M	market share	**52,7%**	**average shower tap [2]**
	Largest flow rate required (ΔT=45 K)	**6** ltr./min.	2-3 person household, showers
	Largest tapping required	**24** ltr.	multi-point
	24 h net hot water demand	**5,85** kWh/ d	larger holiday home
	Nr. of cycles per 24 h	**23**	
L	market share	**9,0%**	**bath tap [3]**
	Largest flow rate required (ΔT=45 K)	**10** ltr./ min.	4-5 person household with showers
	Largest tapping required	**62** ltr	and occasional bath
	24 h net hot water demand	**11,7** kWh/ d	small restaurants
	Nr. of cycles per 24 h	**24**	
XL	market share	**5,5%**	**large bath [4]**
	Largest flow rate required (ΔT=45 K)	**10** ltr./ min.	4-5 person household + daily bath
	Largest tapping required	**76** ltr	medium restaurants
	24 h net hot water demand	**19,1** kWh/ d	barber shop
	Nr. of cycles per 24 h	**30**	
XXL	market share	**8,8%**	**simultaneous bath+shower [5]**
	Largest flow rate required (ΔT=45 K)	**16** ltr./ min.	>4-5 person household, frequent bath
	Largest tapping required	**107** ltr	2-family household
	24 h net hot water demand	**24,5** kWh/ d	barber shop, large restaurants
	Nr. of cycles per 24 h	**30**	small public sauna or spa
3XL	market share	**<1%**	**multi-family (8 * M-class)**
	Largest flow rate required (ΔT=45 K)	**48** ltr./ min.	small hotels & camp sites
	Largest tapping required	**215** ltr	small collective shower facility
	24 h net hot water demand	**46,8** kWh/ d	also in cascades
	Nr. of cycles per 24 h	**23**	
4XL	market share	**<1%**	**collective hot water (16 * M-class)**
	Largest flow rate required (ΔT=45 K)	**96** ltr./ min.	larger multi-family, homes for elderly

Size			Examples of applications
	Largest tapping required	**430** ltr	swimming pool showers, hospitals, military, prisons
	24 h net hot water demand	**93,6** kWh/ a	hotels, car wash
	Nr. of cycles per 24 h	**23**	collective shower facilities (gym), also in cascades

The COMBI stock model base case[36] is summarised in Table 4; this forms the starting point of the scenario analysis for the water heating function of heaters.

[36] From the EcoHotwater report task 7.

Table 4 Calculation of annual primary energy consumption – Water Heating - Base Case (avg. EU-25, sold in 2005)

A. Total sales EU-25 in '000 units in the year 2005											
in '000 units	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total	
CYL				450.5	373.5	370.5	268.5	112	66	1,614	
COMBI				3,990	130	73	40			4,233	
Total				4,441	504	444	309	112	66	5,874	
B. Net load in GWh/yr (60% of tapping pattern * no. of units)											
Net load kWh/yr unit	461	461	461	1284	2559	4188	5387	10268	20537		
total net load in GWh/yr	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total GWh/yr	Weighted Average kWh/yr
CYL				578	956	1,552	1,446	1,150	1,355	7,038	4,289
COMBI				5,123	333	306	215			5,977	1,412
Total GWh/yr	**0**	**0**	**0**	**5,702**	**1,288**	**1,857**	**1,662**	**1,150**	**1,355**	**13,015**	**2,218**
C. Efficiency in % (primary energy, Gross Calorific Value)											
in %	XXS	XS	S	M	L	XL	XXL	3XL	4XL	weight avg.*	
CYL				33%	42%	47%	50%	52%	49%	47%	
COMBI				38%	48%	52%	55%			40%	
D. Energy consumption in GWh/yr (net load/ efficiency)											
Sales	XXS	XS	S	M	L	XL	XXL	3XL	4XL	Total	
CYL				1,753	2,276	3,301	2,893	2,212	2,766	15,201	
COMBI			0	13,482	693	588	392			15,155	
Total WH	**0**	**0**	**0**	**15,235**	**2,969**	**3,889**	**3,285**	**2,212**	**2,766**	**30,355**	
Efficiency	-	-	-	38%	43%	48%	51%	52%	49%	43%	
*=weighted for total net load in GWh/a, so taking into account both sales and load											
E. Energy consumption at LLCC targets (in GWh/yr)											
target	32%	34%	34%	41%	55%	60%	72%	80%	86%	50%	
energy in GWh/yr	0	0	0	13,906	2,343	3,096	2,308	1,438	1,576	24,666	

Part B lists the total net load in GWh/yr applicable to each size class, this is calculated from the net unit load multiplied by the sales. This amounts to an EU total heater water heating net load of 13 015 GWh/year for the BaseCase. With cylinder heaters only making up 25% of unit sales but making up over 50% of the net load. For the scenario analysis the weighted average load of 2 218 kWh/year is important, as it is used throughout the analysis. Part C gives the estimated efficiencies of the individual heater sizes used in the base case, giving a weighted average of 47% for Cylinder heaters and 40% for Combi heaters in 2005. Part D lists the actual annual energy consumption of heaters sold in 2005, based on the net load from Part B and the efficiency in Part C. In total this amounts to 30 355 GWh/year of primary energy consumption. Part E lists the energy consumption in GWh/year in the case that LLCC target levels were being achieved, this gives energy consumption of 24 666 GWh/year at a weighted average efficiency of 50%.

BaU Scenario

The Business as Usual (BaU) scenario is designed to model what would occur if the baselines continued into the future based on historic trends and application of legislation already announced.

Space Heating Function

In respect of the space heating heater function the "efficiency effect" in the BaU scenario sees approximately +0.6% annual efficiency gains for the total heater park between 2005 and 2010 and +0.2% gains thereafter. The overall effect of this is that the weighted average space heating efficiency for all heaters will be 6% higher by 2020 at 54%, as shown in table 5, this increase is driven by the gradual increase in market share of more energy efficient CH heaters. The other variables in the stock model all remain as listed before.

Table 5 BaU Scenario – Space Heating

year-->	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Heater sales (000 units)	4778	5520	5993	6600	6952	7432	7911
Average net load in kWh/year							
Heater space heating	15162	13868	12684	11602	10595	9675	8835
Weighted efficiency (for load and sales)							
Heater space heating	42%	44%	46%	48%	52%	53%	54%
TWh primary/year							
Heater space heating	172,5	174,0	165,2	158,0	143,0	137,0	130,6
Total in PJ/year	**621**	**626**	**595**	**569**	**515**	**493**	**470**
avg. kWh/year/unit	36099	31518	27575	23942	20572	18428	16514
avg. efficiency	42%	44%	46%	48%	52%	53%	54%

Water Heating Function

In respect of the water heating heater function the "efficiency effect" in the BaU scenario sees approximately +0.2% annual efficiency gains for the total heater park between 2005 and 2020. The overall effect is that the weighted average water heating efficiency for all heaters will be 4% higher by 2020 at 47%, as shown in table 6, this increase is driven by the gradual increase in market share of more energy efficient cylinder and combi heaters. The other variables in the stock model all remain as listed before.

Table 6 BaU Scenario – Water Heating

year-->	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
CYL	1577	1640	1622	1641	1724	1775	1825
COMBI	2029	2639	3537	4233	4311	4699	5086
TOTAL	**3606**	**4279**	**5159**	**5874**	**6035**	**6473**	**6911**
Average net load in kWh/year							
CYL	4031	4132	4235	4341	4449	4561	4675
COMBI	1296	1328	1361	1395	1430	1466	1503
Weighted Average	2492	2403	2265	2218	2293	2314	2340
Weighted efficiency (for load and sales)							
CYL	42%	43%	44%	46%	47%	48%	49%
COMBI	34%	35%	36%	40%	41%	42%	44%
Avg. efficiency	39%	40%	40%	43%	44%	45%	46%
TWh primary/year							
CYL	15.1	15.8	15.6	15.5	16.3	16.9	17.4
COMBI	7.7	10.0	13.4	14.9	15.0	16.4	17.4
Total TWh pr/a	22.8	25.8	29.0	30.4	31.3	33.3	34.8
Total in PJ	**82**	**93**	**104**	**109**	**113**	**120**	**125**
avg. kWh/year/.unit	6342	6023	5619	5172	5196	5138	5033
avg. efficiency	39%	40%	40%	43%	44%	45%	47%

BaU-scenario modelling

The Business as Usual (BaU) scenario is designed to model what would occur if the baseline continued into the future based on historic trends. The BaU-scenario takes into account the increase in number of households plus higher penetration rate ("growth effect" incorporated in sales projections), increase in comfort ("load effect" at 0.5%/yr) and a continuation of the efficiency improvement trend ("efficiency effect").The efficiency effect is given in Table 4. These values are used as in the stock model calculations. The values are based on the following considerations:

1. The base year 2005, where values derived from the base case values as shown in Table 4;
2. Post-2005, where it is assumed that the pilot flame will be substituted by electronic ignition and ESWH efficiency will increase through better insulation and smart control;
3. Pre-2005, where ESWHs and GIWHs were assumed to be less efficient.

The diagram in Fig. 1 shows that unit sales for dedicated heaters are stable over time, but in terms of market share dedicated heaters are losing ground, particularly to combi types. Combi and CYL types are expected to increase their share of water heater unit sales from around 35% in 2005 to 40% in 2020. The market study also expects solar-assisted units to play a more important role in the future.

The 2006 market study did not foresee a market share for dedicated heat pump heaters. However, based on the latest information, a gradual market penetration at the expense of ESWHs has now been incorporated. However, without policy interventions to support market penetration numbers are expected to remain modest (similar to solar in the past).

ANNEX III: DETAILS OF THE POLICY SCENARIOS

Min Only Scenario ('Min only')

The Min only scenario models the impact of imposing minimum efficiency standards on new heaters. Appliance efficiency standards are common across a range of products and can induce innovation towards the efficiency levels prescribed by the standard. For standards to be effective they need to be set at a challenging level, and this level needs to be reviewed periodically as there is a tendency for manufacturers to meet only the minimum requirements of the standard until the next regulatory change. Current EU heater efficiency standards are 5-7% points lower than in the US, Canada and Japan[37], this means that standards need to be raised to make the EU competitive and retain its position as a world leader in energy efficiency.

Space Heating Function

The latest European Commission proposal for minimum space heating efficiency standards for CH heaters was shown in paragraph 2.7.

The stock model uses these standards as a base and calculates an "efficiency effect" from a target of 62% overall weighted efficiency for all heaters in 2014. After this time an "efficiency effect" growth rate of 1% a year is assumed. This is based on the efficiency standards as described above and an assumption that 50% of heaters sold in 2013 will be condensing at a level of 91% at part load (88% real) efficiency and 50% at best LT, i.e. Nominal 85% (real 82%) efficiency. This leads to overall weighted efficiency improvement on BaU of 14% points by 2020

The efficiency increases would be expected to slowly rise towards the weighted average for new heaters over the course of 18 years as the whole heater park is replaced. It would be unlikely to raise much beyond this as in the absence of other policies or revised minimum standards there would be little incentive for manufacturers to exceed the standard and a lack of clear information for consumers to drive efficiency higher through demand.

The min only scenario is based upon all of the same assumptions regarding sales, product life, load effect, growth effect and other variables as described in section 1.3.

In technical terms the higher minimum levels of efficiency can be achieved in a variety of ways as outlined in Task 6 of the preparatory study, and summarised as follows:

- Reducing standby heat loss through better insulation of the casing, burner and heat exchanger;
- Reduced convection losses through heat traps or flue valves;

[37] China is also expected to adopt Japanese level standards in the' next few years.

- Improved air-fuel ratios through ionisation and next generation O_2 and CO sensors;
- High efficiency computer controlled circulation pumps;
- Improved fan motor and impeller efficiency;
- Improved CPU and controller power consumption;
- Improved heater temperature control system;
- Improved thermal valves;
- Fitting electronic optimisers;
- Automatic weather adapting control systems and individual room temperature sensors;
- Solar collectors;
- Electric heat pumps.

All of these options are available to achieve the targets and the preparatory report advised that most advanced solutions for overall system and component efficiency be promoted.

Water Heating Function

A Min only water heating function scenario has not been modelled as the water heating efficiency standards proposed by the commission are in many cases lower than those already being achieved, was shown in paragraph 2.7.

Still there remains much scope for improved efficiency in heater water heating function. In technical terms higher levels of efficiency can be achieved in a variety of ways, including many of those listed in section 2.3.1. Those specific to COMBI heater water heating function include:

- Improved insulation beyond best-practice, e.g. vacuum insulation level;
- Continuing phase-out of pilot flame use in favour of electronic ignition;
- Increased use of renewables (Heat Pumps and Solar), particularly solar water heating in Southern Europe;
- Smart Controls;
- Room-sealed pre-mix burners, possibly condensing through heat exchanger between flue gas and cold water inlet;
- More efficient back-up heaters for Solar and conventional electric Heat Pump solutions.

Min+Lbl Scenario (‘Min+Lbl’)

This scenario considers the minimum standards proposed in the previous scenario being applied in tandem with a labelling programme that is mandatory for manufacturers.

Energy efficiency appliance labelling is a common instrument and is applied across many products and in many countries worldwide. Labelling is regarded as effective because:

- It helps buyers, retailers, and builders to make informed choices;
- It induces manufacturers to produce more efficient products;
- It gives authorities a method of identifying the best products which can be linked to specific financial incentives, promotion, etc.;
- It provides a tool for market surveillance and to check if policy goals are being met.

The International Energy Agency has estimated that the application of standards, labelling and voluntary agreements will have reduced energy usage in OECD countries by 12% in 2020 and in the period 1990-2020 will have led to net cost savings of €137Bn for OECD Europe. Further to this it also states that even greater benefits could be reaped if policies were strengthened with the net cost saving/benefit of this equivalent to a negative CO_2 abatement cost of -€169 t/CO_2[38]. Evidence within the EU in respect of refrigerator energy efficiency labelling has shown labelling to have dramatic effects on purchase decisions and improving overall energy efficiency[39].

Space Heating Function

The space heating Min+Lbl scenario has been modelled on the basis that labelling encourages the purchase of heaters which are more efficient than the minimum standard leading to higher overall efficiency results. Labelling is important for heaters for the following reasons:

Labelling of CH heaters has been on the agenda of the Energy Labelling framework directive 92/75/EC for the last 15 years. Despite several SAVE studies, Commission mandates to CEN/Cenelec, etc. no labelling directive currently exists. The main problem has been the lack of harmonised test standards for this heterogeneous product group. Ecodesign measures and rating methods for heaters will enable – for the first time – comprehensive energy efficiency labelling for this product group.

In modelling this scenario a study from the Dutch Fiscal Administration (*Belastingdienst*) was considered. This showed that within 5 years of the introduction of a mandatory EU Energy Label most "A" labelled white goods (washing machines, dishwashers, refrigerators, etc.) reached a 40% market share, from a 0% start.[40] The average improvement for all sales over the same period was by – at least – two energy classes (from average score "D" to "B"). The subsidy scheme available in the Netherlands and other (financial) incentives were found to be important accelerators, driving the market share of "A" labelled appliances even higher and/or over a shorter time period.[41]

The minimum requirements and labelling classes are applied as given in chapter 4.8 tables.

Water Heating Function

The water heater function Min+Lbl scenario for COMBI heaters has also been modelled on the basis that labelling encourages the purchase of heaters which are more efficient than the

38 IEA, 2003a: Cool appliances: policy strategies for energy efficient homes. International Energy Agency, Paris.

39 CECED (European Committee on Household Appliance Manufacturers), 2005: CECED Unilateral Commitment on reducing energy consumption on household refrigerators and freezers. 2nd Annual report for 2004 to the Commission of the European Communities.

40 Belastingdienst/Centrum voor proces- en productontwikkeling (Ministry of Finance, Tax Services), Rapportage Van Onderzoeksbevindingen In Het Kader Van De Evaluatie Van De Energiepremieregeling, The Hague, 21 juni 2002.

41 This is also confirmed by miscellaneous data from market research by GfK. There is only one exception to this rule: laundry driers where the "A" level required a technology jump (for mass production), was only recently realized, thus more than 10 years later. This will not be the case for heaters as "A" appliances are already available.

minimum standard, leading to higher overall efficiency results. The minimum standards, although weak, are applied for this scenario (see chapter 4.8 tables).

Manufacturers shall supply the following information: Copies of:

1. The label (with energy efficiency Rating);
2. The information Fiche /Technical input sheet form (Data report CH-Heaters & Water Heaters from annex B1. general of the Annex V);
3. NO_x rating.

B1 boilers

The Min+Lbl scenario for space heating CH heaters is modelled with a reduced minimum efficiency standard for heaters <10 kW. This tangibly affects the results as approximately 1.6m (25%) of the 6.6m CH heater units sold in 2005 were of these sizes, though it should be noted that as being smaller they represented only 9.2% of total energy consumption. A reduction in efficiency targets for smaller heaters (so-called B1 boiler) is a practical consideration as in older apartment blocks collective chimneys cannot usually accommodate the higher efficiency condensing heaters without renovation[42]. The extra expense and difficulties in agreeing cost sharing and timing mean slow progress for renovations in collective blocks[43]. On this basis and bearing in mind the affordability requirement of ecodesign measures, a relaxation in standards for smaller heaters is not unreasonable.

This B1 aspect assumes that member states will decide not to engage in a chimney renovation programme, but instead will lower the efficiency targets for small apartment size heaters to system efficiency of 68%, so that they can be non-condensing and thus connected to a collective chimney with other older models.

The overall effect of this is small. Within the stock model the calculation is based on an "efficiency effect" with an 80% target by 2015 and 2.4% point's annual efficiency growth following that. This is 1% point lower than a Min+Lbl scenario without a B1 aspect and with a 0.1% less growth rate. By 2020 this results in 2% points less overall weighted efficiency compared to Min+Lbl without a B1 aspect, though is still 38% points higher than in BaU.

The technical dimensions of achieving the minimum standards will be the same as in the Min only scenario. This B1 aspect addresses the efficiency issue in the same way as in the Min+Lbl scenario but makes a small trade off in overall efficiency against cost and the practical difficulties that exist. This is the reason why it is by far the preferred option of stakeholders and Member States.

Water Heating Function

A B1 water heating function has not been modelled separately as there are no COMBI heaters in the 3 smallest water heating load profiles.

NO_x scenarios

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[42] This relates to problems caused by condensate accumulating in collective flues.

[43] This has led to a recommendation for an "Early Replacement/Chimney Renovation Programme" (Ecoboilers Preparatory Report Task 7) to subsidise work to upgrade the chimney stock in the EU.

Emissions are discussed in more detail in Annex IX.

ANNEX IV: SCENARIO INPUTS

The calculation method for the scenario analysis is a so-called "stock model". This means that it is derived from accumulated annual sales and redundancy figures for heaters over the period 1990-2020 (with a start-up period 1960-1990), i.e. it is a model of the numbers and types of heaters that are installed and working, taking account of new installations, existing installations and replacement of existing installations over the period.

The following parameters are used, as developed in the preparatory study:

– number of households;

– consumer behaviour, e.g. tendency to take longer showers;

– number of heaters per household; and

– energy efficiency.

The main variable in the scenarios is energy and its derived parameters, and the following outputs are created for the scenarios:

– energy consumption in PJ/annum(a);

– carbon emissions in Mt CO_2 equivalent/a, using a multiplier based on electricity and gas shares (see below) and the values from the preparatory study;

– acidifying emissions (e.g. NO_x, SO_2) in kt SO_x equivalent/a;

– economic parameters: purchase price, energy expenditure, maintenance costs and total expenditure in bln EURO per year. [2005 Euro, inflation-corrected at 2% per year].

CH Stock Model Variables Tables

NB: The efficiency values as agreed with Member States and stakeholders in May 2011 and given in section 2.5 slightly differ from the average values used for the impact assessment stock model, however, the results of the stock model used for the policy scenario analysis remain the same.

Nr	Scenario	Note
1	**BaU**	Includes 'normal' EPB measures at MS level
2	**Min only**	76% system efficiency <=XL, 96% boiler efficiency >=XXL
3	**Min+Lbl**	Reference (note: good working labelling scheme!)
4	**Min+Lbl-Small**	boiler size <="S" can be 'non-condensing' (because of collective chimney problems)
	Min+Lbl+NO$_x$ scenarios:	
5a	**COM proposal**	as 5b but MS can ask exception to postpone limit 120 mg/kWh to 2018 for oil
5b	**Gas cond. boiler**	70 mg/kWh gas; 120 mg/kWh oil in 2013
5c	**Near BAT**	20 ppm-->35 mg/kWh (double when with renewables)

Table INPUTS

Scenario		Eff		Year		
BAU	src	**49.6%**	srcyear	2008	posttgtsrc	0.40%
Min gen Only	tgt1	**62.0%**	tgtyear1	2014	posttgt1	1.00%
Min+Lbl	tgt2	**81.0%**	tgtyear2	2015	posttgt2	2.50%
Min+Lbl -small	tgt3	**80.0%**	tgtyear3	2015	posttgt3	2.40%
min+Lbl+NO_x	tgt4	**81.0%**	tgtyear4	2015	posttgt4	2.50%

Average energy efficiency new sales in the stock model 2009-2016												
year -->	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Freeze 2005	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%
BaU	51%	52%	52%	52%	52%	52%	53%	53%	53%	53%	53%	54%
Min only*	52%	54%	56%	58%	60%	62%	63%	64%	65%	66%	67%	68%
Min+Lbl	54%	59%	63%	68%	72%	76.5%	81%	84%	86%	89%	91%	94%
Min+Lbl-small	54%	58%	63%	67%	71%	76%	80%	82%	85%	87%	90%	92%
NO_x +	54%	59%	63%	68%	72%	77%	81%	84%	86%	89%	91%	94%

* assumes lower-than-limit efficiencies due to the lack of market transparency

NO_X SCENARIOS		
	mg/kWh	
NO_x175	175	BaU NO_x emissions in mg/kWh
NO_x130	130	Min+Lbl-small, "
NO_x90	90	weigthed average in COM proposal and_econ, "
NO_x70	70	Gas based condensing, "
NO_x35	35	near BAT, "
ECONOMICS		
Baseprice	3305	Product price (58%) + Installation costs(42%) incl. VAT 2005 [€]
PriceInc Eur	55	Price increase per efficiency %-point [€/ %]
Rel	0.15	Electricity rate 2005 [€/ kWh electric]
Rgas	0.047	Gas rate 2005 [€/ kWh primary GCV]
Roil	0.061	Oil rate 2005 [€/ kWh primary GCV]
Rmaint	180	Annual maintenance costs [€/ a]
Relinc	2%	Annual price increase electricity [%/ a]
Rgasinc	5.60%	Annual price increase gas [%/ a]
Roilinc	8.20%	Annual price increase oil [%/ a]
Rmaintinc	2%	Annual cost increase maintenance [%/ a]
PriceDec	1.00%	Annual product price decrease [%/ a]
InstallDec	0.00%	Annual installation cost decrease [%/ a]
ManuFrac	53.8%	Manufacturer Selling Price as fraction of Product Price [%]
WholeMargin	30%	Margin Wholesaler [% on msp]
RetailMargin	20%	Margin Installer on product [% on wholesale price]
VAT	19%	Value Added Tax [in % on retail price]
ManuWages	0.12	WH manufacturer turnover per employee [mln €/ a]
OEMfactor	1.24	OEM personnel as fraction of WH manufacturer personnel [-]

WholeWages	0.2	WH manufacturer turnover per employee [mln €/ a]
RetailWages	0.06	WH manufacturer turnover per employee [mln €/ a]
ExtraEUfrac	0.6	Fraction of OEM personnel outside EU [% of OEM jobs]
Inflation	2%	Inflation rate [%/ a]
LoadCor	1.8%	annual load increase over 1970-1990 model stock built up period
ProductLife	18	product life
Discount rate	4%	

ANNEX VA: SCENARIO OUTPUTS SPACE & WATER HEATING, AGGREGATED (TABLES)

Aggregated Model

B1. CH STOCK Environmental									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015***	**2020**	**2025**
Stock energy in GWh/a									
WITH CORRECTION									
Freeze	11808	12094	12188	12089	11852	11654	11524	11266	11133
BaU	11808	12094	12188	12089	11745	11428	11209	10688	10265
Min only	11808	12094	12188	12089	11710	11214	10803	9678	8530
Min+Lbl	11808	12094	12188	12089	11646	10957	10375	8761	7086
Min+Lbl-small	11808	12094	12188	12089	11650	10971	10396	8804	7152
NO_x+	11808	12094	12188	12089	11646	10957	10375	8761	7086
CO_2 in Mt (1 PJ= 0,0577 Mt)									
Freeze	681	698	703	698	684	672	665	650	642
BaU	681	698	703	698	678	659	647	617	592
Min only	681	698	703	698	676	647	623	558	492
Min+Lbl	681	698	703	698	672	632	599	506	409
Min+Lbl-small	681	698	703	698	672	633	600	508	413
NO_x+	681	698	703	698	672	632	599	506	409
Acidification (in kt Sox equivalent)									
Freeze	740	749	776	821	826	825	824	826	836
BaU	740	749	776	821	819	809	801	783	771
Min+Lbl-small	740	749	776	821	780	716	673	566	460
NOx (Min+Lbl-small)	740	749	776	821	780	716	673	566	460
NOx ECON (Min+Lbl-small)	740	749	776	821	771	695	643	515	388
NOx EHI (Min+Lbl-small)	740	749	776	821	767	684	629	491	354
NOx BAT (Min+Lbl-small)	740	749	776	821	760	667	605	449	294

B2. CH STOCK Consumer Economics (not corrected for inflation unless indicated otherwise)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Oil share	18%	16%	14%	12%	10%	9%	8%	6%	4%
Oil price	0.019	0.028	0.041	0.061	0.090	0.115	0.134	0.199	0.295
Gas price	0.021	0.027	0.036	0.047	0.062	0.073	0.081	0.106	0.140
El price	0.045	0.049	0.054	0.060	0.066	0.070	0.073	0.081	0.089
Maintenance	22	25	27	30	33	35	37	40	45
Share electricity									
Freeze	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
BaU	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min only	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Min+Lbl	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min+Lbl-small	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NO_x	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Avg. Fuel price									
Freeze	0.02	0.03	0.04	0.049	0.06	0.08	0.08	0.11	0.14
BaU	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min only	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Min+Lbl	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min+Lbl-small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO_x	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Avg. Purchase Product (incl. install)									
Freeze	3386	3518	3643	3874	3874	3874	3874	3874	3874
BaU	3386	3518	3643	3874	4087	4140	4176	4285	4359
Min only	3386	3518	3643	3874	4286	4768	5148	5952	6320
Min+Lbl	3386	3518	3643	3874	4552	5434	6138	7355	8135
Min+Lbl-small	3386	3518	3643	3874	4536	5394	6083	7272	8025
NO_x	3386	3518	3643	3874	4552	5434	6138	7355	8135
Avg. Energy costs Eur/a.unit									
Freeze	896	1051	1237	1437	1761	1981	2139	2586	3111
BaU	896	1051	1237	1437	1667	1855	1987	2352	2784
Min only	896	1051	1237	1437	1597	1622	1645	1783	2009

Min+Lbl	896	1051	1237	1437	1492	1408	1357	1397	1526
Min+Lbl-small	896	1051	1237	1437	1498	1419	1370	1413	1547
NO_x	896	1051	1237	1437	1492	1408	1357	1397	1526
Total purchase costs EU per annum (inflation corrected, in Euro 2005)									
Freeze	21.1	23.0	23.7	25.2	23.9	23.4	23.1	22.2	22.0
BaU	21.1	23.0	23.7	25.2	25.2	25.0	24.9	24.5	24.7
Min only	21.1	23.0	23.7	25.2	26.4	28.7	30.5	33.6	35.2
Min+Lbl	21.1	23.0	23.7	25.2	28.1	32.8	36.5	41.8	45.7
Min+Lbl-small	21.1	23.0	23.7	25.2	28.0	32.6	36.1	41.3	45.1
NO_x	21.1	23.0	23.7	25.2	28.1	32.8	36.5	41.8	45.7
Total running costs (energy+maint) (inflation corrected, in Euro 2005)									
Freeze	106.8	130.4	157.3	186.1	215.0	232.5	244.7	278.1	317.2
BaU	106.8	130.4	157.3	186.1	213.2	228.5	238.7	265.2	294.6
Min only	106.8	130.4	157.3	186.1	212.6	224.6	230.9	242.5	249.5
Min+Lbl	106.8	130.4	157.3	186.1	211.6	220.0	222.7	222.0	211.9
Min+Lbl-small	106.8	130.4	157.3	186.1	211.7	220.3	223.1	223.0	213.6
NO_x	106.8	130.4	157.3	186.1	211.6	220.0	222.7	222.0	211.9
Consumer expenditure (inflation corrected, in Euro 2005)									
Freeze	128.0	153.4	181.0	211.2	238.9	255.9	267.8	300.4	339.1
BaU	128.0	153.4	181.0	211.2	238.4	253.5	263.5	289.7	319.2
Min only	128.0	153.4	181.0	211.2	239.0	253.3	261.3	276.2	284.6
Min+Lbl	128.0	153.4	181.0	211.2	239.7	252.8	259.2	263.8	257.6
Min+Lbl-small	128.0	153.4	181.0	211.2	239.6	252.8	259.2	264.3	258.7
NO_x	128.0	153.4	181.0	211.2	239.6	252.8	259.2	263.8	257.6

* first full year after implementation of minimum requirements and labelling

B3. CH STOCK Business Economics (inflation corrected, in Euro 2005)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Avg. Product Price [Euro 2005]									
Freeze	2324	2283	2235	2247	2122	2051	2005	1894	1790
BaU	2324	2283	2235	2247	2238	2190	2159	2090	2007
Min only	2324	2283	2235	2247	2346	2518	2649	2860	2855
Min+Lbl	2324	2283	2235	2247	2493	2874	3168	3560	3716
Min+Lbl-small	2324	2283	2235	2247	2484	2853	3139	3519	3664
NO_x+	2324	2283	2235	2247	2493	2874	3168	3560	3716
Avg. Install [Euro 2005]									
Freeze	1482	1517	1550	1627	1605	1593	1585	1567	1551
BaU	1482	1517	1550	1627	1693	1701	1706	1725	1733
Min only	1482	1517	1550	1627	1773	1952	2084	2330	2425
Min+Lbl	1482	1517	1550	1627	1885	2232	2500	2919	3188
Min+Lbl-small	1482	1517	1550	1627	1878	2215	2477	2884	3141
NO_x+	1482	1517	1550	1627	1885	2232	2500	2919	3188
Avg. Heater Unit Cost [Euro 2005]									
Freeze	3806	3800	3785	3874	3727	3644	3590	3461	3341
BaU	3806	3800	3785	3874	3931	3891	3865	3815	3740
Min only	3806	3800	3785	3874	4119	4470	4733	5190	5280
Min+Lbl	3806	3800	3785	3874	4378	5106	5668	6479	6904
Min+Lbl-small	3806	3800	3785	3874	4362	5068	5616	6403	6805
-small									
NO_x+	3806	3800	3785	3874	4378	5106	5668	6479	6904
Avg. Energy/unit new sales [Euro 2005]									
Freeze	1206	1281	1365	1437	1591	1685	1747	1910	2077
BaU	1206	1281	1365	1437	1507	1578	1624	1737	1859
Min only	1206	1281	1365	1437	1444	1380	1344	1317	1341
Min+Lbl	1206	1281	1365	1437	1348	1198	1109	1031	1019
Min+Lbl-small	1206	1281	1365	1437	1354	1207	1119	1044	1033
NO_x+	1206	1281	1365	1437	1348	1198	1109	1031	1019
INDUSTRY Turnover [€ bln 2005]									
Freeze				7.9	7.8	7.9	7.9	7.9	8.2
BaU				7.9	8.2	8.4	8.5	8.7	9.2
Min only				7.9	8.6	9.6	10.3	11.8	12.9

Min+Lbl				7.9	9.2	11.0	12.4	14.8	16.9
Min+Lbl-small				7.9	9.1	10.9	12.3	14.6	16.7
NO_x+				7.9	9.2	11.0	12.4	14.8	16.9
WHOLESALER Turnover [€ bln 2005]									
Freeze				2.4	2.3	2.4	2.4	2.4	2.5
BaU				2.4	2.5	2.5	2.5	2.6	2.8
Min only				2.4	2.6	2.9	3.1	3.5	3.9
Min+Lbl				2.4	2.7	3.3	3.7	4.4	5.1
Min+Lbl-small				2.4	2.7	3.3	3.7	4.4	5.0
NO_x+				2.4	2.7	3.3	3.7	4.4	5.1
INSTALLER Turnover [€ bln 2005]									
Freeze				28.0	30.1	31.4	32.2	34.1	36.6
BaU				28.0	30.7	32.1	33.0	35.4	38.1
Min only				28.0	31.2	33.9	35.8	40.0	43.9
Min+Lbl				28.0	32.0	36.0	38.9	44.6	50.5
Min+Lbl-small				28.0	32.0	35.9	38.7	44.4	50.1
NO_x+				28.0	32.0	36.0	38.9	44.6	50.5
VAT on product (excl. Energy) Turnover [€ bln 2005]									
Freeze				7.3	7.6	7.9	8.1	8.4	9.0
BaU				7.3	7.9	8.2	8.4	8.9	9.5
Min only				7.3	8.1	8.8	9.4	10.5	11.5
Min+Lbl				7.3	8.3	9.6	10.5	12.1	13.8
Min+Lbl-small				7.3	8.3	9.5	10.4	12.0	13.6
NO_x+				7.3	8.3	9.6	10.5	12.1	13.8
ENERGY SECTOR Turnover [€ bln 2005], incl. VAT and other taxes									
Freeze				165.7	192.6	209.0	220.5	252.3	289.6
BaU				165.7	190.8	205.0	214.5	239.4	267.0
Min only				165.7	190.3	201.2	206.8	216.9	222.2
Min+Lbl				165.7	189.3	196.6	198.7	196.4	184.6
Min+Lbl-small				165.7	189.3	196.9	199.1	197.3	186.3
NO_x+				165.7	189.2	196.6	198.6	196.2	184.4
ALL SECTORS Turnover [€ bln 2005] (=consumer expenditure inflation corrected)									
Freeze				211.2	240.4	258.5	271.0	305.2	345.9
BaU				211.2	240.1	256.2	267.0	295.0	326.6
Min only				211.2	240.8	256.5	265.4	282.7	294.3
Min+Lbl				211.2	241.6	256.5	264.2	272.4	270.8
Min+Lbl-small				211.2	241.5	256.4	264.2	272.8	271.6
NO_x+				211.2	241.5	256.4	264.1	272.2	270.6

B4. CH STOCK Social-Economics									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
INDUSTRY									
MANUFACTURER Personnel [000]									
Freeze				63	63	63	64	64	67
BaU				63	66	67	68	70	74
Min only				63	69	77	82	93	102
Min+Lbl				63	74	88	100	118	135
Min+Lbl-small				63	73	88	99	116	133
NO_x+				63	74	88	100	118	135
OEM Total Personnel [000]									
Freeze				78	78	79	79	80	83
BaU				78	82	84	85	87	92
Min only				78	86	95	102	115	126
Min+Lbl				78	91	110	124	146	168
Min+Lbl-small				78	91	109	122	144	165
NO_x+				78	91	110	124	146	168
of which OEM Personnel in EU [000]									
Freeze				31	31	31	32	32	33
BaU				31	33	33	34	35	37
Min only				31	34	38	41	46	50
Min+Lbl				31	37	44	49	58	67
Min+Lbl-small				31	36	44	49	58	66

NO_x+				31	37	44	49	58	67
WHOLESALER									
Personnel Wholesaler [000]									
Freeze				11	11	11	12	12	12
BaU				11	12	12	12	13	13
Min only				11	13	14	15	17	18
Min+Lbl				11	13	16	18	21	24
Min+Lbl-small				11	13	16	18	21	24
NO_x+				11	13	16	18	21	24
INSTALLER									
Personnel [000]									
Freeze				445	479	500	513	545	585
BaU				445	489	511	526	563	609
Min only				445	497	538	566	627	691
Min+Lbl				445	510	573	618	705	801
Min+Lbl-small				445	509	571	615	701	794
NO_x+				445	510	573	618	705	801
ALL SECTORS									
Personnel x 1000									
Freeze				598	631	653	667	700	746
BaU				598	649	675	692	734	788
Min only				598	664	725	765	852	937
Min+Lbl				598	688	787	859	990	1128
Min+Lbl-small				598	687	783	854	982	1116
NO_x+				598	688	787	859	990	1128

ANNEX VB: SCENARIO OUTPUTS SPACE HEATING (GRAPHS & TABLES)

Figure 0.1 Heater Energy Scenarios 1990-2025 in PJ/yr

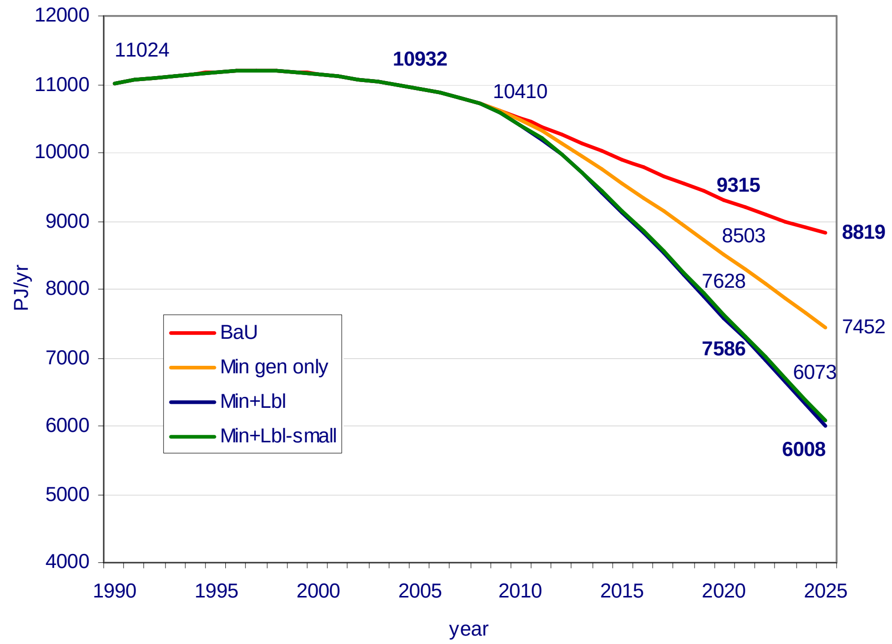


Figure 0.2 Heater Carbon Scenarios 1990-2025 in Mt CO2 eq./yr [EU-27 energy-related CO2 eq 2005: 4,109 Mt]

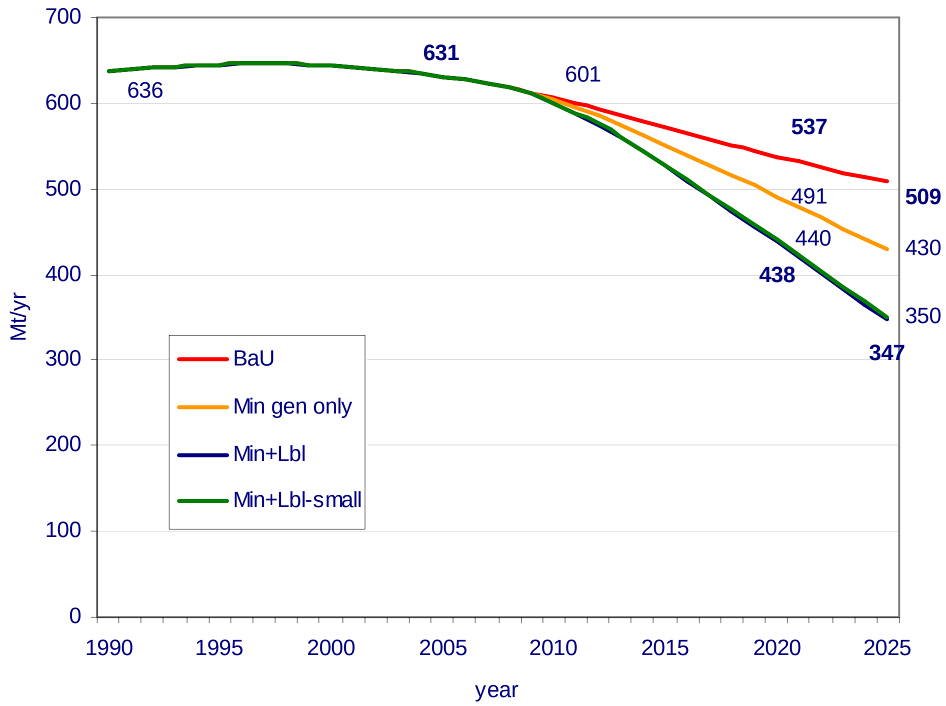


Figure 0.3 Heater Acidification Scenarios 1990-2025 in kt SOx eq./yr [EU-27 total in 2005: 16.269 kt SOx equivalent, from 11406 kt NOx (*0,7) and 8284 kt SO2]

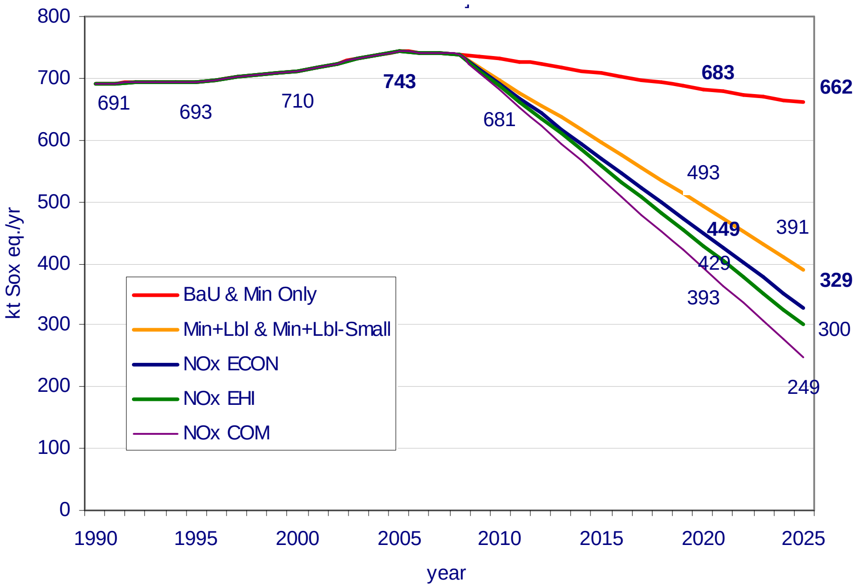


Figure 0.4 **Heater Expenditure Scenarios 1990-2025 in €bn/yr [Euro 2005, inflation corrected at 2%; Compare: EU-25 residential housing expenditure in 2003 is €1112 bn. and total household expenditure €6791 bn]**

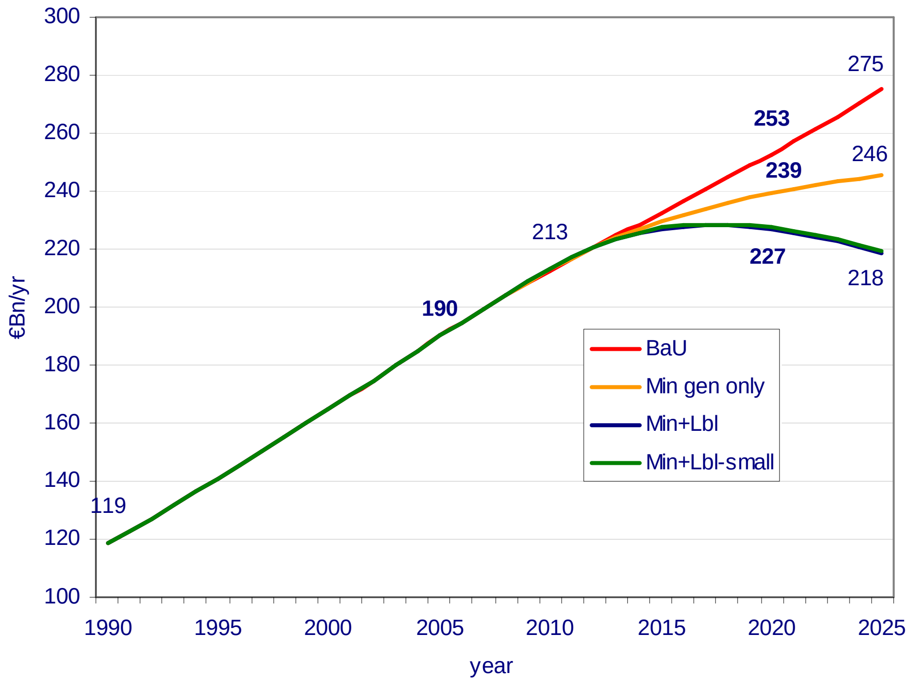


Figure 0.5 **Heater Average Unit Cost Scenarios 1990-2025 in € (avg. product price and avg. installation)**

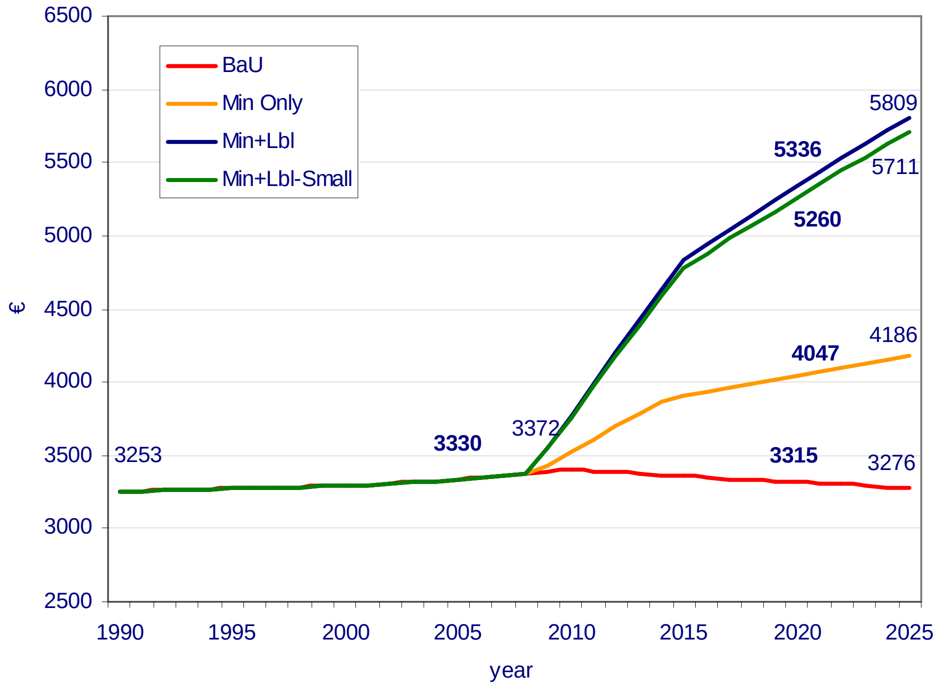


Figure 0.6 Heater Turnover Scenarios 2020 (Total Turnove 2005 = € 33,7 Bn)

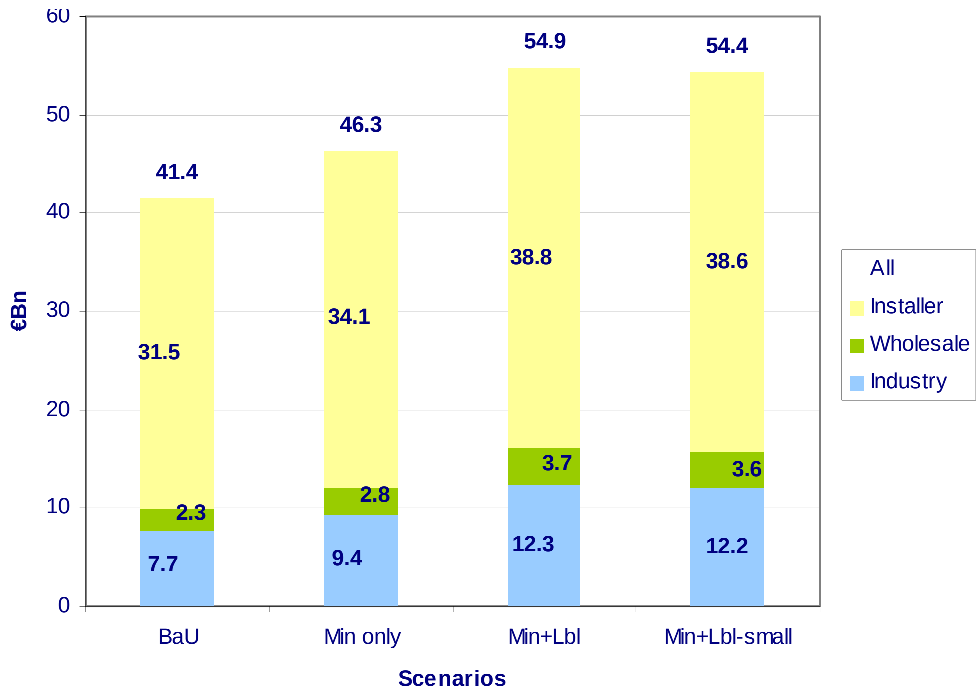
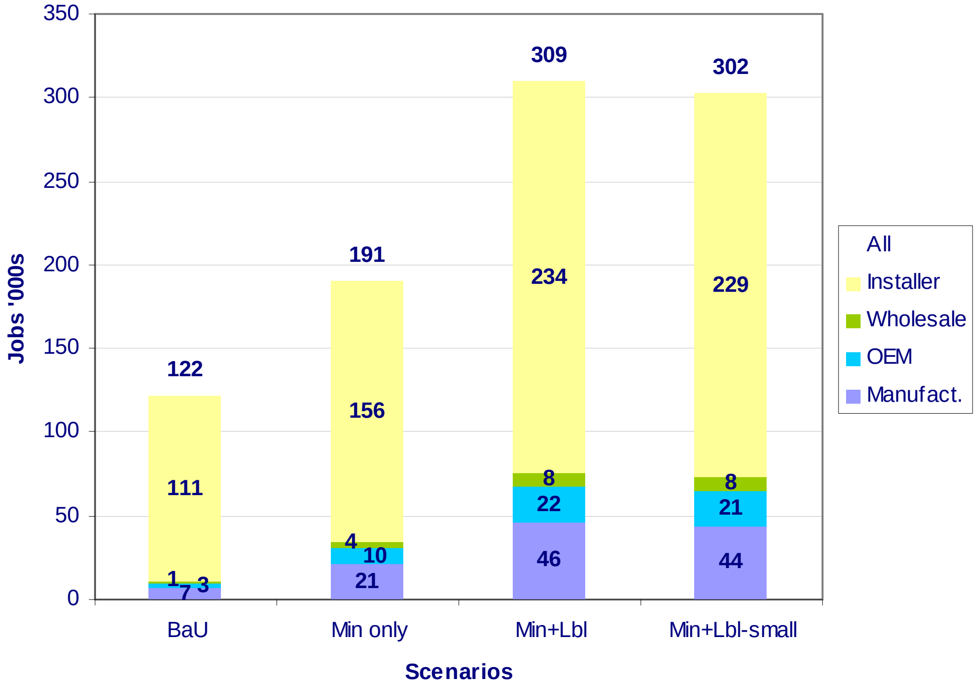


Figure 0.7 Heater Employment Scenarios 2020 (New jobs created in EU compared to 2005)



350
300
250
200
150
100
50
0
Jobs '000s
122
111
1
7
3
191
156
4
10
21
309
234
8
22
46
302
229
8
21
44
BaU
Min only
Min+Lbl
Min+Lbl-small
Scenarios
All
Installer
Wholesale
OEM
Manufact.

Table 0.1 Heater Scenarios Summary Table 2020

MAIN IMPACTS (CH side only)				Scenario s 2020						
				1	**2**	**3**	**4**	**5a***	**5b***	**5c***
(as Art. 15, sub. 4., subsub e. of 2009/125/EC)			2005	BAU	Min Only	Min+Lbl	Min+Lbl -small	min+Lbl		
ENVIRONMENT										
EU totals	ENERGY	PJ/a	10932	9315	8503	7586	7628	7586		
	GHG	Mt CO2 eq./a	631	537	491	438	440	438		
	AP	kt SOx eq./a	743	683	683	493	493	449	429	393
CONSUMER										
EU totals	expenditure	€ bn/yr ***	190.0	252.7	239.1	226.8	227.3	226.8		
	purchase costs	€ bn/yr	22.0	21.1	25.7	33.9	33.5	33.9		
	running costs	€ bn/yr	168.1	231.6	213.4	192.9	193.8	192.9		
per product	product price	€	1932	1800	2197	2897	2856	2897		
	install cost	€	1399	1515	1850	2439	2405	2439		
	energy costs	€ /yr	1182	1332	1048	762	774	762		
	payback(SPP)	years	N/A	reference	2.6	3.5	3.5	3.5		
BUSINESS										
EU turnover	Manufacturers	€ bn/yr	6.9	7.7	9.4	12.3	12.2	12.3		
	Wholesalers	€ bn/yr	2.1	2.3	2.8	3.7	3.6	3.7		
	Installers	€ bn/yr	24.8	31.5	34.1	38.8	38.6	38.8		
	TOTAL	**€ bn/yr**	**33.7**	**41.4**	**46.3**	**54.9**	**54.4**	**54.9**		
EMPLOYMENT										
employment (jobs)	industry EU (incl OEM)	'000	86	95	117	154	152	154		
	industry non-EU	'000	43	47	58	76	75	76		
	Wholesalers	'000	10	11	14	18	18	18		
	Installers	'000	413	524	569	647	643	647		
	TOTAL	**'000**	**552**	**679**	**758**	**896**	**888**	**896**		
	of which EU	'000	509	631	700	819	812	819		
	EXTRA EU jobs	'000	N/A	reference	68	188	181	188		
	of which SME**		N/A	reference	47	131	126	131		
*5a= NOx scenario at 90 mg/kWh										
5b= NOx scenario at 70 mg/kWh										
5c= NOx scenario at 35 mg/kWh										
**= partitioning 50% industry & wholesale, 80% installers										
***=all money amounts in Euro 2005 (inflation corrected)										

Model Output Tables

B1. Heater STOCK Environmental									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
net load (kWh/a)	15162	13868	12684	11602	10595	10043	9675	8835	8068
sales (000)	4778	5520	5993	6600	6952	7240	7431.7	7911	8686
park (000)	69174	79650	90278	100923	110974	116291	119735	128288	137322
Efficiency									
Freeze	42%	44%	46%	48%	48%	48%	48%	48%	48%
BaU	42%	44%	46%	48%	52%	52%	53%	54%	55%
Min only	42%	44%	46%	48%	54%	60%	63%	68%	73%
Min+Lbl	42%	44%	46%	48%	59%	72%	81%	94%	106%
Min+Lbl-small	42%	44%	46%	48%	58%	71%	80%	92%	104%
NOx+	42%	44%	46%	48%	59%	72%	81%	94%	106%
kWh/a.unit									
Freeze	36099	31518	27575	23942	21863	20724	19965	18232	16649
BaU	36099	31518	27575	23942	20572	19276	18428	16514	14804
Min only	36099	31518	27575	23942	19717	16757	15357	12993	11052
Min+Lbl	36099	31518	27575	23942	18089	13943	11944	9449	7611
Min+Lbl-small	36099	31518	27575	23942	18177	14083	12094	9603	7758
NOx+	36099	31518	27575	23942	18089	13943	11944	9449	7611
TWh primary/a new sales (without corr.)									
Freeze	172	174	165	158	152	150	148	144	145
BaU	172	174	165	158	143	140	137	131	129
Min only	172	174	165	158	137	121	114	103	96
Min+Lbl	172	174	165	158	126	101	89	75	66
Min+Lbl-small	172	174	165	158	126	102	90	76	67
NOx+	172	174	165	158	126	101	89	75	66
Sales year energy									
With single point correction (0,93*0,84)									
Freeze	3062	3106	3096	3037	2944	2875	2829	2731	2663
BaU	3062	3106	3096	3037	2917	2817	2749	2588	2450
Min only	3062	3106	3096	3037	2908	2766	2653	2362	2070
Min+Lbl	3062	3106	3096	3037	2891	2694	2534	2107	1669
Min+Lbl-small	3062	3106	3096	3037	2892	2698	2540	2119	1687
NOx+	3062	3106	3096	3037	2891	2694	2534	2107	1669
Stock energy in TWh/a									
WITH CORRECTION									
Freeze	11024	11180	11146	10932	10599	10348	10185	9833	9587

B1. Heater STOCK Environmental									
BaU	11024	11180	11146	10932	10500	10141	9897	9315	8819
Min only	11024	11180	11146	10932	10471	9956	9552	8503	7452
Min+Lbl	11024	11180	11146	10932	10407	9699	9124	7586	6008
Min+Lbl-small	11024	11180	11146	10932	10410	9713	9145	7628	6073
NOx+	11024	11180	11146	10932	10407	9699	9124	7586	6008
CO2 in Mt (1 PJ= 0,0577 Mt)									
Freeze	636	645	643	631	612	597	588	567	553
BaU	636	645	643	631	606	585	571	537	509
Min only	636	645	643	631	604	574	551	491	430
Min+Lbl	636	645	643	631	600	560	526	438	347
Min+Lbl-small	636	645	643	631	601	560	528	440	350
NOx+	636	645	643	631	600	560	526	438	347
Acidification (in kt SOx equivalent)									
Freeze	691	693	710	743	739	732	728	721	720
BaU	691	693	710	743	732	718	707	683	662
Min+Lbl-small	691	693	710	743	698	636	595	493	391
COM proposal	691	693	710	743	690	618	570	449	329
Gas cond. boiler	691	693	710	743	687	610	558	429	300
Near BAT	691	693	710	743	681	595	537	393	249

B2. Heater STOCK Consumer Economics (not corrected for inflation unless indicated otherwise)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Oil share	18%	16%	14%	12%	10%	9%	8%	6%	4%
Oil price	0.019	0.028	0.041	0.061	0.090	0.115	0.134	0.199	0.295
Gas price	0.021	0.027	0.036	0.047	0.062	0.073	0.081	0.106	0.140
El price	0.045	0.049	0.054	0.060	0.066	0.070	0.073	0.081	0.089
Maintenance	133	147	163	180	199	211	219	242	267
Share electricity									
Freeze	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
BaU	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min only	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min+Lbl	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min+Lbl-small	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
NOx	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Avg. Fuel price									
Freeze	0.02	0.03	0.04	0.049	0.06	0.08	0.08	0.11	0.14
BaU	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min only	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min+Lbl	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14

B2. Heater STOCK Consumer Economics (not corrected for inflation unless indicated otherwise)									
Min+Lbl-small	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
NOx	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Avg. Purchase Product (incl. install)									
Freeze	2975	3085	3195	3330	3330	3330	3330	3330	3330
BaU	2975	3085	3195	3330	3498	3531	3553	3608	3663
Min only	2975	3085	3195	3330	3620	3961	4130	4405	4680
Min+Lbl	2975	3085	3195	3330	3886	4627	5120	5808	6495
Min+Lbl-small	2975	3085	3195	3330	3871	4587	5065	5725	6385
NOx	2975	3085	3195	3330	3886	4627	5120	5808	6495
Avg. Energy costs Eur/a.unit									
Freeze	762	882	1027	1182	1415	1573	1684	1990	2336
BaU	762	882	1027	1182	1331	1463	1554	1803	2077
Min only	762	882	1027	1182	1276	1272	1295	1418	1550
Min+Lbl	762	882	1027	1182	1170	1058	1007	1032	1068
Min+Lbl-small	762	882	1027	1182	1176	1069	1020	1048	1088
NOx	762	882	1027	1182	1170	1058	1007	1032	1068
Total purchase costs EU per annum (inflation corrected, in Euro 2005)									
Freeze	19.1	20.8	21.1	22.0	20.9	20.5	20.2	19.5	19.3
BaU	19.1	20.8	21.1	22.0	22.0	21.7	21.6	21.1	21.2
Min only	19.1	20.8	21.1	22.0	22.8	24.4	25.1	25.7	27.1
Min+Lbl	19.1	20.8	21.1	22.0	24.4	28.5	31.1	33.9	37.7
Min+Lbl-small	19.1	20.8	21.1	22.0	24.3	28.3	30.8	33.5	37.0
NOx	19.1	20.8	21.1	22.0	24.4	28.5	31.1	33.9	37.7
Total running costs (energy+maint) (inflation corrected, in Euro 2005)									
Freeze	99.4	120.2	143.6	168.1	192.2	206.5	216.4	243.2	273.9
BaU	99.4	120.2	143.6	168.1	190.5	202.8	210.9	231.6	254.0
Min only	99.4	120.2	143.6	168.1	190.1	199.5	204.3	213.4	218.4
Min+Lbl	99.4	120.2	143.6	168.1	189.0	194.9	196.1	192.9	180.8
Min+Lbl-small	99.4	120.2	143.6	168.1	189.1	195.1	196.5	193.8	182.5
NOx	99.4	120.2	143.6	168.1	189.0	194.9	196.1	192.9	180.8
Consumer expenditure (inflation corrected, in Euro 2005)									
Freeze	118.5	141.0	164.7	190.0	213.1	227.0	236.6	262.6	293.3
BaU	118.5	141.0	164.7	190.0	212.5	224.5	232.4	252.7	275.2
Min only	118.5	141.0	164.7	190.0	212.8	223.9	229.4	239.1	245.5
Min+Lbl	118.5	141.0	164.7	190.0	213.4	223.4	227.2	226.8	218.5
Min+Lbl-small	118.5	141.0	164.7	190.0	213.4	223.3	227.2	227.3	219.5
NOx	118.5	141.0	164.7	190.0	213.4	223.4	227.2	226.8	218.5

Heater STOCK Business Economics (inflation corrected, in Euro 2005)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Avg. Product Price [Euro 2005]									
Freeze	2003	1977	1948	1932	1837	1782	1747	1661	1580
BaU	2003	1977	1948	1932	1929	1889	1863	1800	1737
Min only	2003	1977	1948	1932	1997	2120	2166	2197	2220
Min+Lbl	2003	1977	1948	1932	2144	2476	2686	2897	3081
Min+Lbl-small	2003	1977	1948	1932	2135	2455	2657	2856	3029
NOx+	2003	1977	1948	1932	2144	2476	2686	2897	3081
Avg. Install [Euro 2005]									
Freeze	1250	1296	1342	1399	1399	1399	1399	1399	1399
BaU	1250	1296	1342	1399	1469	1483	1492	1515	1538
Min only	1250	1296	1342	1399	1521	1664	1735	1850	1966
Min+Lbl	1250	1296	1342	1399	1632	1943	2150	2439	2728
Min+Lbl-small	1250	1296	1342	1399	1626	1927	2127	2405	2682
NOx+	1250	1296	1342	1399	1632	1943	2150	2439	2728
Avg. Energy/unit new sales [Euro 2005]									
Freeze	1026	1075	1134	1182	1279	1338	1376	1470	1559
BaU	1026	1075	1134	1182	1203	1245	1270	1332	1386
Min only	1026	1075	1134	1182	1153	1082	1058	1048	1035
Min+Lbl	1026	1075	1134	1182	1058	900	823	762	713
Min+Lbl-small	1026	1075	1134	1182	1063	909	833	774	727
NOx+	1026	1075	1134	1182	1058	900	823	762	713
INDUSTRY Turnover [€ bn 2005]									
Freeze				6.9	6.9	6.9	7.0	7.1	7.4
BaU				6.9	7.2	7.4	7.5	7.7	8.1
Min only				6.9	7.5	8.3	8.7	9.4	10.4
Min+Lbl				6.9	8.0	9.6	10.7	12.3	14.4
Min+Lbl-small				6.9	8.0	9.6	10.6	12.2	14.2
NOx+				6.9	8.0	9.6	10.7	12.3	14.4
WHOLESALER Turnover [€ bn 2005]									
Freeze				2.1	2.1	2.1	2.1	2.1	2.2
BaU				2.1	2.2	2.2	2.2	2.3	2.4
Min only				2.1	2.2	2.5	2.6	2.8	3.1
Min+Lbl				2.1	2.4	2.9	3.2	3.7	4.3
Min+Lbl-small				2.1	2.4	2.9	3.2	3.6	4.2
NOx+				2.1	2.4	2.9	3.2	3.7	4.3
INSTALLER Turnover [€ bn 2005]									
Freeze				24.8	26.7	27.9	28.7	30.5	32.9
BaU				24.8	27.2	28.5	29.4	31.5	34.1
Min only				24.8	27.6	29.9	31.2	34.1	37.8
Min+Lbl				24.8	28.4	31.9	34.3	38.8	44.4
Min+Lbl-small				24.8	28.4	31.8	34.2	38.6	44.0
NOx+				24.8	28.4	31.9	34.3	38.8	44.4

Heater STOCK Business Economics (inflation corrected, in Euro 2005)									
VAT on product (excl. Energy) Turnover [€ bn 2005]									
Freeze				6.4	6.8	7.0	7.2	7.5	8.1
BaU				6.4	7.0	7.2	7.4	7.9	8.5
Min only				6.4	7.1	7.7	8.1	8.8	9.7
Min+Lbl				6.4	7.4	8.4	9.2	10.4	12.0
Min+Lbl-small				6.4	7.4	8.4	9.1	10.3	11.9
NOx+				6.4	7.4	8.4	9.2	10.4	12.0
ENERGY SECTOR Turnover [€ bn 2005], incl. VAT and other taxes									
Freeze				149.9	172.2	185.6	194.9	220.2	249.4
BaU				149.9	170.6	181.9	189.4	208.6	229.4
Min only				149.9	170.1	178.6	182.8	190.4	193.9
Min+Lbl				149.9	169.1	174.0	174.6	169.9	156.3
Min+Lbl-small				149.9	169.1	174.2	175.0	170.9	158.0
NOx+				149.9	169.1	174.0	174.6	169.9	156.3
ALL SECTORS Turnover [€ bn 2005] (=consumer expenditure inflation corrected)									
Freeze				190.0	214.7	229.6	239.8	267.5	300.0
BaU				190.0	214.2	227.2	235.9	257.9	282.6
Min only				190.0	214.5	226.9	233.3	245.5	254.9
Min+Lbl				190.0	215.3	226.9	232.1	235.2	231.4
Min+Lbl-small				190.0	215.2	226.9	232.1	235.5	232.3
NOx+				190.0	215.3	226.9	232.1	235.2	231.4

B4. Heater STOCK Social-Economics									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
INDUSTRY									
MANUFACTURER Personnel [000]									
Freeze				57	57	58	58	59	62
BaU				57	60	61	62	64	68
Min only				57	62	69	72	78	86
Min+Lbl				57	67	80	89	103	120
Min+Lbl-small				57	67	80	89	101	118
NOx+				57	67	80	89	103	120
OEM Total Personnel [000]									
Freeze				71	71	72	72	73	76
BaU				71	75	76	77	79	84
Min only				71	77	85	90	97	107
Min+Lbl				71	83	100	111	127	149
Min+Lbl-small				71	83	99	110	126	146
NOx+				71	83	100	111	127	149
of which OEM Personnel in EU [000]									
Freeze				28	28	29	29	29	31

B4. Heater STOCK Social-Economics									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
BaU				28	30	30	31	32	34
Min only				28	31	34	36	39	43
Min+Lbl				28	33	40	44	51	60
Min+Lbl-small				28	33	40	44	50	59
NOx+				28	33	40	44	51	60
WHOLESALER									
Personnel Wholesaler [000]									
Freeze				10	10	10	10	11	11
BaU				10	11	11	11	11	12
Min only				10	11	12	13	14	16
Min+Lbl				10	12	14	16	18	22
Min+Lbl-small				10	12	14	16	18	21
NOx+				10	12	14	16	18	22
INSTALLER									
Personnel [000]									
Freeze				413	446	465	478	509	548
BaU				413	454	475	489	524	569
Min only				413	460	498	520	569	630
Min+Lbl				413	473	532	572	647	740
Min+Lbl-small				413	473	530	569	643	734
NOx+				413	473	532	572	647	740
ALL SECTORS									
Personnel x 1000									
Freeze				552	584	605	619	652	697
BaU				552	600	624	640	679	732
Min only				552	611	664	695	758	839
Min+Lbl				552	635	726	789	896	1031
Min+Lbl-small				552	634	723	784	888	1019
NOx+				552	635	726	789	896	1031

ANNEX VC: SCENARIO OUTPUTS WATER HEATING (GRAPHS & TABLES)

Figure 0.1 Combination Heater, Water Heating, Energy Scenarios 1990-2025 in PJ/yr

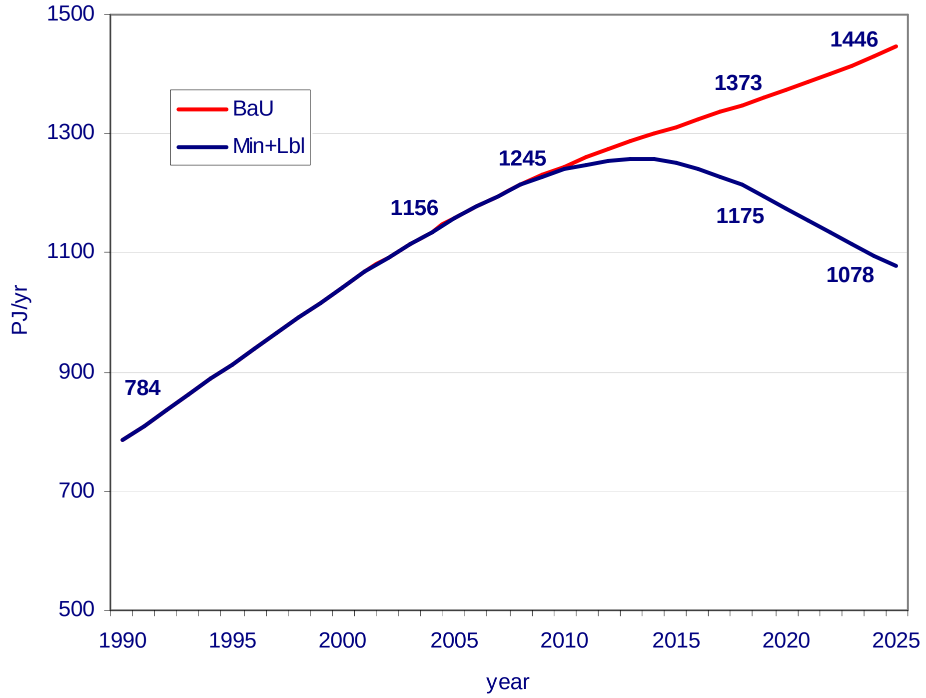


Figure 0.2 Combination Heater, Water Heating, Carbon Scenarios 1990-2025 in Mt CO2 eq./yr [EU-27 enery-related CO2 eq. 2005: 4,109 Mt]

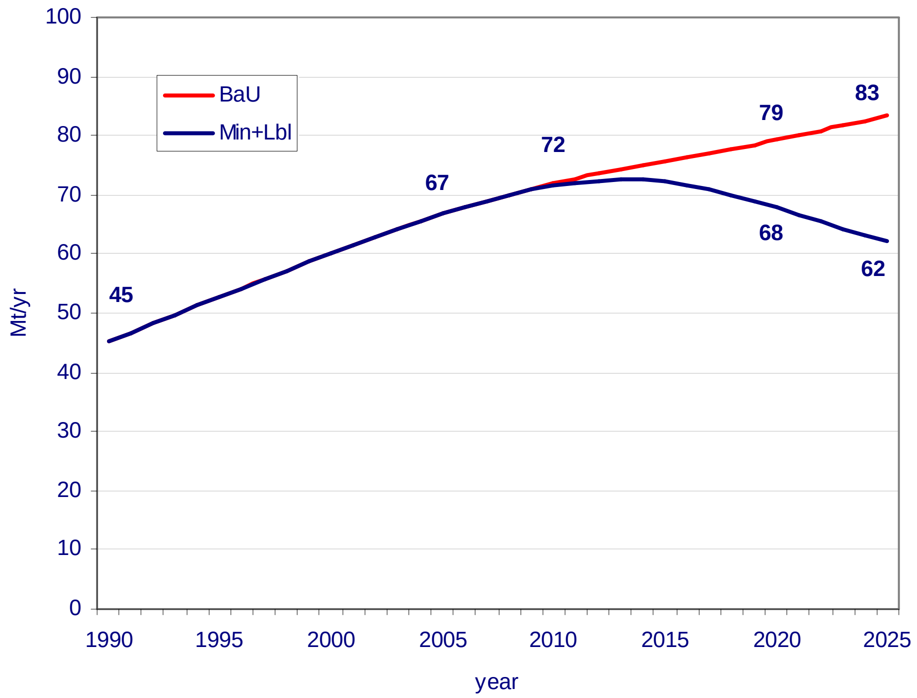


Figure 0.3 Combination Heater, Water Heating, Acidification Scenarios 1990-2025 in kt SOx eq./yr [EU-27 total in 2005: 16.269 kt SOx equivalent, from 11406 kt NOx (*0,7) and 8284 kt SO2]

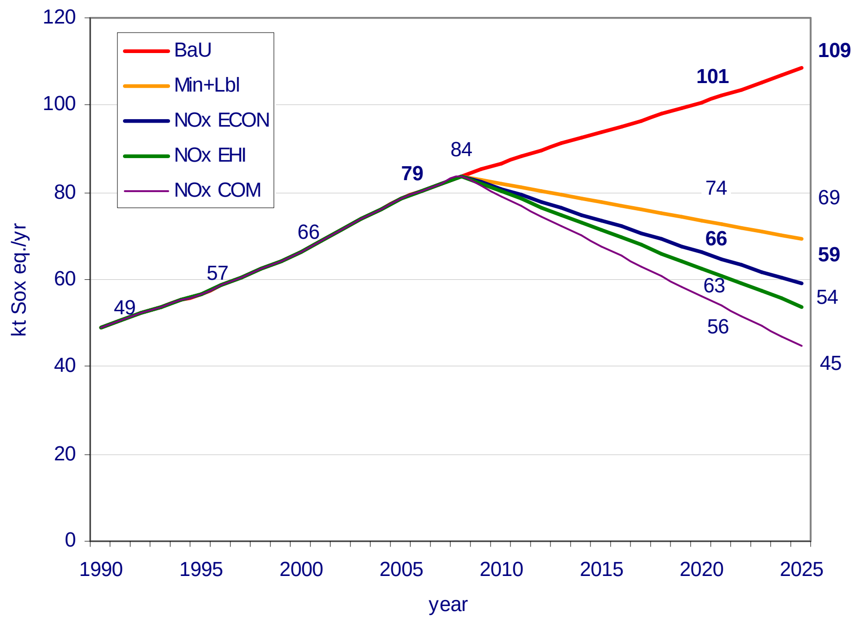
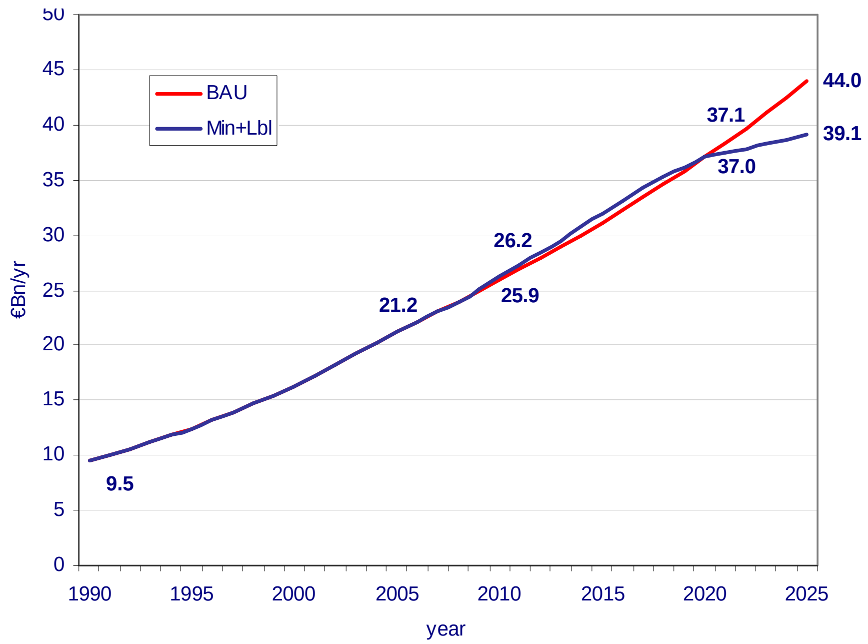


Figure 0.4 Combination Heater, Water Heating, Expenditure Scenarios 1990-2025 in €Bn/yr [Euro 2005, inflation corrected at 2%, Compare: EU-25 residential housing expenditure in 2003 is 1112 bln. and total household expenditure 6791 bln. Euro]



From the starting point of average annual expenditure on combination heaters of €21 Bn in 2005 both scenarios see consumer expenditure increase as a result of the increase in capital costs and energy costs described above. The added capital expense of more efficient combination heater water heating functions sees Min+Lbl as a slightly higher cost scenario when the measures start taking effect. However, around 2020 the cost savings due to higher energy energy efficiency lead to substantial lower overall expenditure for combination heater purchase and energy consumption.

Figure 0.5 Combination Heater, Unit Cost (Avg. Product Price + Avg. Installation), Scenarios 1990-2025 in €

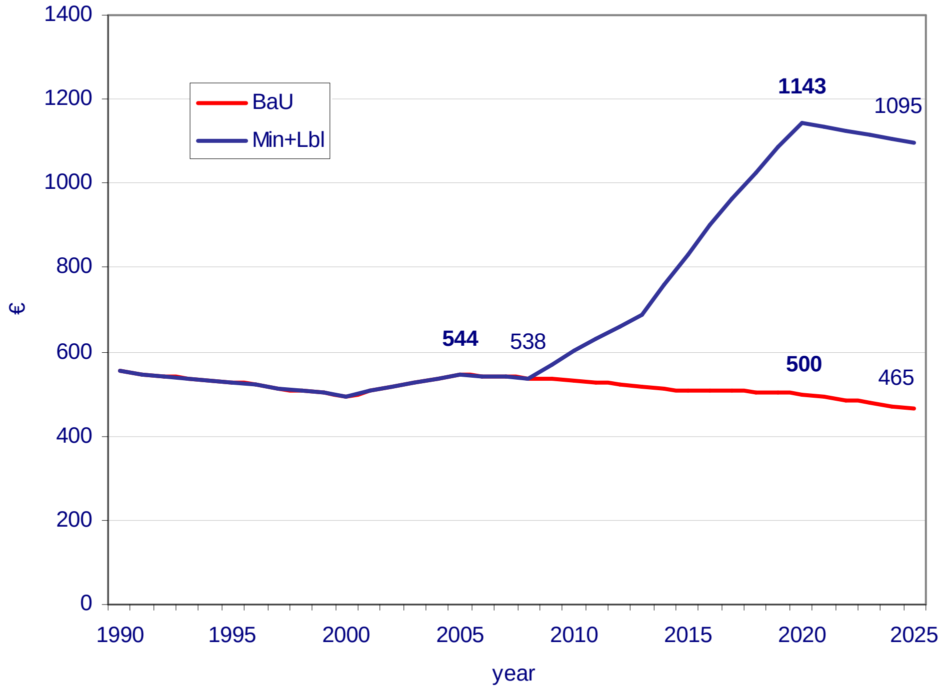


Figure 0.6 Combination Heater, Water Heating, Turnover Scenarios 2020, Total Turnover 2005 = €4,5 bn

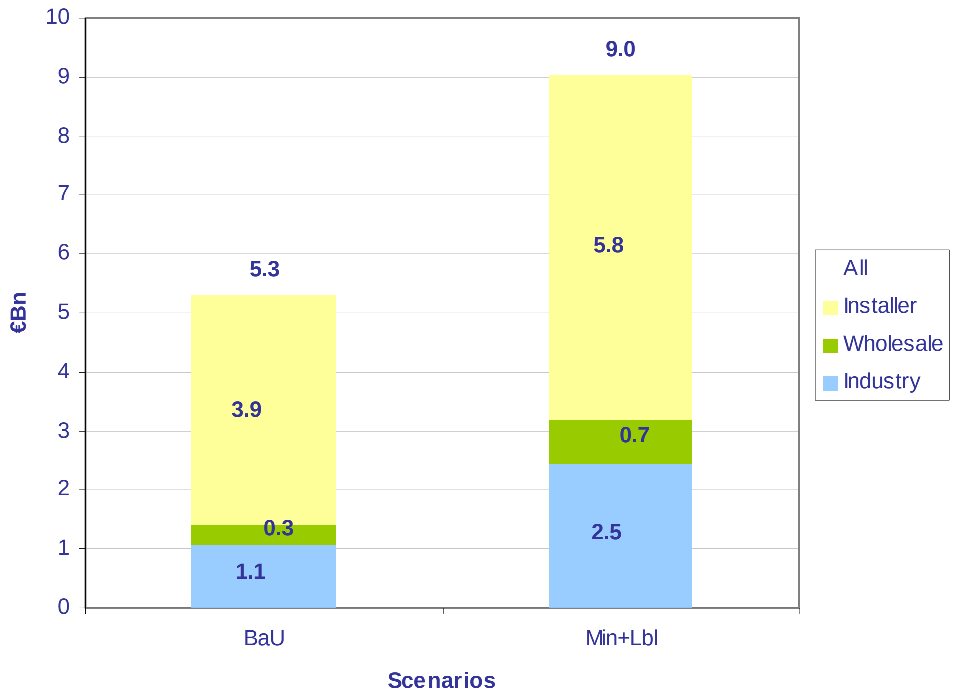


Figure 0.7 COMBI Heater, Water Heating, Employment Scenarios 2020, New jobs created in EU compared to 2005

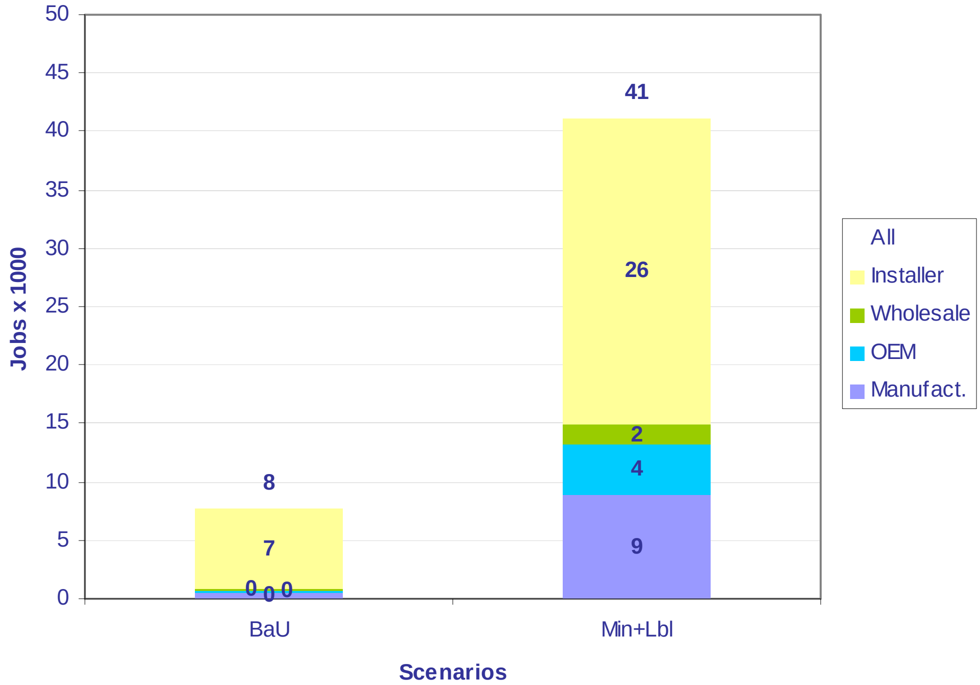

50
45
40
35
30
25
20
15
10
5
0
Jobs x 1000
41
26
2
4
9
8
7
0
0
0
BaU
Min+Lbl
Scenarios
All
Installer
Wholesale
OEM
Manufact.

Table Combination Heater Scenarios Summary Table 2020 (WATER HEATING)

<table>
<tr><td colspan="4" rowspan="2">MAIN IMPACTS (COMBI-)HEATER WATER HEATING</td><td colspan="5">Scenarios 2020</td></tr>
<tr><td>1</td><td>3</td><td>5a*</td><td>5b*</td><td>5c*</td></tr>
<tr><td colspan="3">(as Art. 15, sub. 4., subsub e. of 2009/125/EC)</td><td>2005</td><td>BAU</td><td>Min+Lbl</td><td colspan="3">Min+Lbl
+NOx</td></tr>
<tr><td colspan="9">ENVIRONMENT</td></tr>
<tr><td rowspan="3">EU totals</td><td>ENERGY</td><td>PJ/yr</td><td>1156</td><td>1373</td><td>1175</td><td colspan="3">1175</td></tr>
<tr><td>GHG</td><td>Mt CO2 eq./yr</td><td>67</td><td>79</td><td>68</td><td colspan="3">68</td></tr>
<tr><td>AP</td><td>kt SOx eq./yr</td><td>79</td><td>101</td><td>74</td><td>66</td><td>63</td><td>56</td></tr>
<tr><td colspan="9">CONSUMER</td></tr>
<tr><td rowspan="3">EU totals</td><td>expenditure</td><td>€ bn/yr****</td><td>21</td><td>37.0</td><td>37.1</td><td colspan="3">37.1</td></tr>
<tr><td>purchase costs</td><td>€ bn/yr</td><td>3</td><td>3.5</td><td>7.9</td><td colspan="3">7.9</td></tr>
<tr><td>running costs</td><td>€ bn/yr</td><td>18</td><td>33.6</td><td>29.2</td><td colspan="3">29.2</td></tr>
<tr><td rowspan="4">per product</td><td>product price</td><td>€</td><td>316</td><td>290</td><td>663</td><td colspan="3">663</td></tr>
<tr><td>install cost</td><td>€</td><td>228</td><td>210</td><td>480</td><td colspan="3">480</td></tr>
<tr><td>energy costs</td><td>€ /yr</td><td>255</td><td>406</td><td>270</td><td colspan="3">270</td></tr>
<tr><td>payback(SPP)</td><td>years</td><td>N/A</td><td>reference</td><td>4.7</td><td colspan="3">4.7</td></tr>
<tr><td colspan="9">BUSINESS</td></tr>
<tr><td rowspan="4">EU turnover</td><td>manufacturers</td><td>€ bn/yr</td><td>1.0</td><td>1.1</td><td>2.5</td><td colspan="3">2.5</td></tr>
<tr><td>wholesalers</td><td>€ bn/yr</td><td>0.3</td><td>0.3</td><td>0.7</td><td colspan="3">0.7</td></tr>
<tr><td>installers</td><td>€ bn/yr</td><td>3.2</td><td>3.9</td><td>5.8</td><td colspan="3">5.8</td></tr>
<tr><td>TOTAL</td><td>€ bn/yr</td><td>4.5</td><td>5.3</td><td>9.0</td><td colspan="3">9.0</td></tr>
<tr><td colspan="9">EMPLOYMENT</td></tr>
<tr><td rowspan="8">employment (jobs)</td><td>industry EU (incl OEM)</td><td>'000</td><td>9</td><td>10</td><td>22</td><td colspan="3">22</td></tr>
<tr><td>industry non-EU</td><td>'000</td><td>4</td><td>5</td><td>11</td><td colspan="3">11</td></tr>
<tr><td>wholesalers</td><td>'000</td><td>1</td><td>1</td><td>3</td><td colspan="3">3</td></tr>
<tr><td>installers</td><td>'000</td><td>32</td><td>39</td><td>58</td><td colspan="3">58</td></tr>
<tr><td>TOTAL</td><td>'000</td><td>47</td><td>55</td><td>94</td><td colspan="3">94</td></tr>
<tr><td>of which EU</td><td>'000</td><td>42</td><td>50</td><td>83</td><td colspan="3">83</td></tr>
<tr><td>EXTRA EU jobs</td><td>'000</td><td>N/A</td><td>reference</td><td>33</td><td colspan="3">33</td></tr>
<tr><td>of which SME***</td><td>'000</td><td>NA</td><td>reference</td><td>22</td><td colspan="3">22</td></tr>
<tr><td colspan="9">*5a= NOx scenario at 90 mg/kWh, 5b= NOx scenario at 70 mg/kWh, 5c= NOx scenario at 35 mg/kWh</td></tr>
<tr><td colspan="9">**= partitioning 50% industry & wholesale, 80% installers</td></tr>
<tr><td colspan="9">***=all money amounts in Euro 2005 (inflation corrected)</td></tr>
</table>

Model output tables

B1. WH STOCK Environmental									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
net load (kWh/a)	2492	2403	2265	2218	2293	2306	2314	2340	2370
sales (000)	3606	4279	5159	5874	6035	6298	6473	6911	7349
park (000)	42540	51159	61014	72024	81828	86566	89282	95021	101037
Efficiency									
Freeze	39%	40%	40%	43%	43%	43%	43%	43%	43%
BaU	39%	40%	40%	43%	44%	45%	45%	47%	47%
Min only	0%	0%	0%	0%	0%	0%	0%	0%	0%
Min+Lbl	39%	40%	40%	43%	46%	50%	56%	70%	73%
Min+Lbl-small	0%	0%	0%	0%	0%	0%	0%	0%	0%
NOx+	39%	40%	40%	43%	46%	50%	56%	70%	73%
kWh/a.unit									
Freeze	6342	6023	5619	5172	5345	5376	5396	5456	5525
BaU	6342	6023	5619	5172	5196	5161	5138	5033	5042
Min only	0	0	0	0	0	0	0	0	0
Min+Lbl	6342	6023	5619	5172	4965	4611	4154	3343	3269
Min+Lbl-small	0	0	0	0	0	0	0	0	0
NOx+	6342	6023	5619	5172	4965	4611	4154	3343	3269
TWh primary/a new sales (without corr.)									
Freeze	23	26	29	30	32	34	35	38	41
BaU	23	26	29	30	31	33	33	35	37
Min only	0	0	0	0	0	0	0	0	0
Min+Lbl	23	26	29	30	30	29	27	23	24
Min+Lbl-small	0	0	0	0	0	0	0	0	0
NOx+	23	26	29	30	30	29	27	23	24
Sales year energy									
With single point correction (0,93*0,84)									
Freeze	218	254	289	321	348	363	372	398	429
BaU	218	254	289	321	346	358	365	381	402
Min only	0	0	0	0	0	0	0	0	0
Min+Lbl	218	254	289	321	344	349	347	326	300
Min+Lbl-small	0	0	0	0	0	0	0	0	0
NOx+	218	254	289	321	344	349	347	326	300
Stock energy in TWh/a									
WITH CORRECTION									
Freeze	784	914	1042	1156	1253	1305	1339	1434	1545
BaU	784	914	1042	1156	1245	1288	1312	1373	1446
Min only	784	914	1042	1156	1240	1258	1251	1175	1078
Min+Lbl	784	914	1042	1156	1240	1258	1251	1175	1078
Min+Lbl-small	784	914	1042	1156	1240	1258	1251	1175	1078
NOx+	784	914	1042	1156	1240	1258	1251	1175	1078
CO2 in Mt (1 PJ= 0,0577 Mt)									
Freeze	45	53	60	67	72	75	77	83	89
BaU	45	53	60	67	72	74	76	79	83
Min only	45	53	60	67	72	73	72	68	62
Min+Lbl	45	53	60	67	72	73	72	68	62
Min+Lbl-small	45	53	60	67	72	73	72	68	62
NOx+	45	53	60	67	72	73	72	68	62
Acidification (in kt SOx equivalent)									
Freeze	49	57	66	79	87	92	96	105	116
BaU	49	57	66	79	87	91	94	101	109
Min+Lbl-small	49	57	66	79	82	79	78	74	69
COM proposal	49	57	66	79	81	76	74	66	59
Gas cond. boiler	49	57	66	79	80	75	71	63	54
Near BAT	49	57	66	79	79	72	68	56	45

B2. WH STOCK Consumer Economics (not corrected for inflation unless indicated otherwise)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Oil share	18%	16%	14%	12%	10%	9%	8%	6%	4%
Oil price	0.019	0.028	0.041	0.061	0.090	0.115	0.134	0.199	0.295
Gas price	0.021	0.027	0.036	0.047	0.062	0.073	0.081	0.106	0.140
El price	0.045	0.049	0.054	0.060	0.066	0.070	0.073	0.081	0.089
Maintenance	22	25	27	30	33	35	37	40	45
Share electricity									
Freeze	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
BaU	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min only	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Min+Lbl	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Min+Lbl-small	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NOx	3.0%	3.0%	4.0%	6.0%	7.0%	7.6%	8.0%	9.0%	10.0%
Avg. Fuel price									
Freeze	0.02	0.03	0.04	0.049	0.06	0.08	0.08	0.11	0.14
BaU	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min only	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Min+Lbl	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Min+Lbl-small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.02	0.03	0.04	0.05	0.06	0.08	0.08	0.11	0.14
Avg. Purchase Product (incl. install)									
Freeze	411	433	448	544	544	544	544	544	544
BaU	411	433	448	544	590	610	624	678	696
Min only	411	433	448	544	666	807	1018	1547	1640
Min+Lbl	411	433	448	544	666	807	1018	1547	1640
Min+Lbl-small	411	433	448	544	666	807	1018	1547	1640
NOx	411	433	448	544	666	807	1018	1547	1640
Avg. Energy costs Eur/a.unit									
Freeze	134	169	209	255	346	408	455	596	775
BaU	134	169	209	255	336	392	433	549	707
Min only	134	169	209	255	321	350	350	365	459
Min+Lbl	134	169	209	255	321	350	350	365	459
Min+Lbl-small	134	169	209	255	321	350	350	365	459
NOx	134	169	209	255	321	350	350	365	459
Total purchase costs EU per annum (inflation corrected, in Euro 2005)									
Freeze	2.0	2.3	2.6	3.2	3.0	2.9	2.9	2.8	2.7
BaU	2.0	2.3	2.6	3.2	3.2	3.3	3.3	3.5	3.4
Min only	2.0	2.3	2.6	3.2	3.6	4.3	5.4	7.9	8.0
Min+Lbl	2.0	2.3	2.6	3.2	3.6	4.3	5.4	7.9	8.0
Min+Lbl-small	2.0	2.3	2.6	3.2	3.6	4.3	5.4	7.9	8.0
NOx	2.0	2.3	2.6	3.2	3.6	4.3	5.4	7.9	8.0
Total running costs (energy+maint) (inflation corrected, in Euro 2005)									
Freeze	7.5	10.2	13.7	18.0	22.8	26.0	28.3	34.9	43.2
BaU	7.5	10.2	13.7	18.0	22.7	25.7	27.8	33.6	40.6
Min only	7.5	10.2	13.7	18.0	22.6	25.2	26.6	29.2	31.1
Min+Lbl	7.5	10.2	13.7	18.0	22.6	25.2	26.6	29.2	31.1
Min+Lbl-small	7.5	10.2	13.7	18.0	22.6	25.2	26.6	29.2	31.1
NOx	7.5	10.2	13.7	18.0	22.6	25.2	26.6	29.2	31.1
Consumer expenditure (inflation corrected, in Euro 2005)									
Freeze	9.5	12.4	16.3	21.2	25.8	28.9	31.2	37.7	45.9
BaU	9.5	12.4	16.3	21.2	25.9	29.0	31.1	37.0	44.0
Min only	9.5	12.4	16.3	21.2	26.2	29.5	32.0	37.1	39.1
Min+Lbl	9.5	12.4	16.3	21.2	26.2	29.5	32.0	37.1	39.1
Min+Lbl-small	9.5	12.4	16.3	21.2	26.2	29.5	32.0	37.1	39.1
NOx	9.5	12.4	16.3	21.2	26.2	29.5	32.0	37.1	39.1

B3. WH STOCK Business Economics (inflation corrected, in Euro 2005)									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**
Avg. Product Price [Euro 2005]									
Freeze	321	306	287	316	285	268	258	233	211
BaU	321	306	287	316	309	301	295	290	269

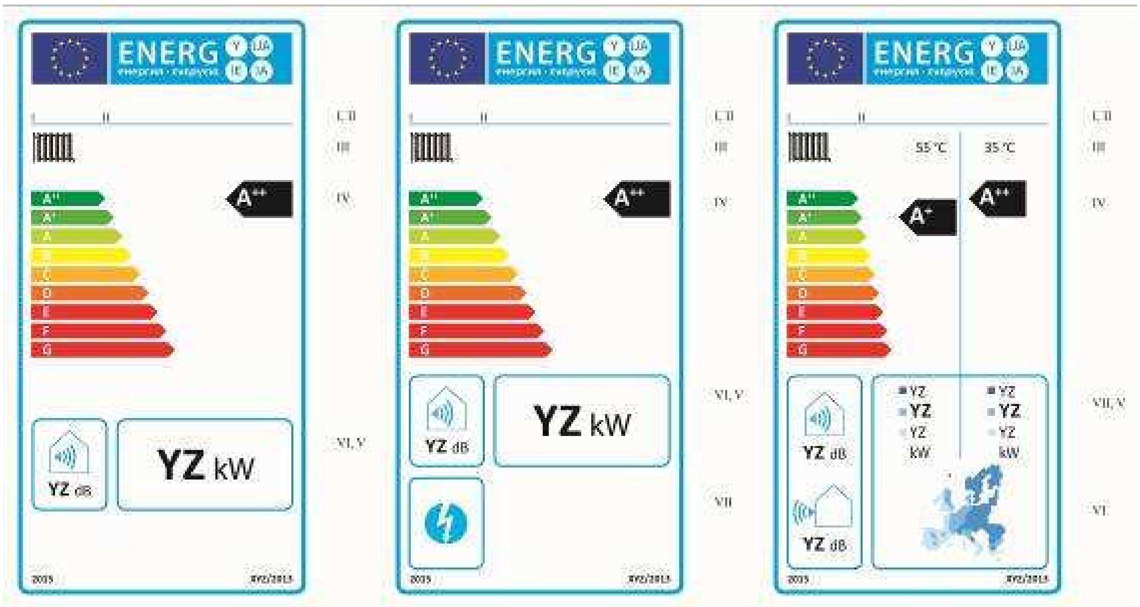
B3. WH STOCK Business Economics (inflation corrected, in Euro 2005)									
Min only	321	306	287	316	349	398	483	663	635
Min+Lbl	321	306	287	316	349	398	483	663	635
Min+Lbl-small	321	306	287	316	349	398	483	663	635
NOx+	321	306	287	316	349	398	483	663	635
Avg. Install [Euro 2005]									
Freeze	232	222	208	228	207	194	187	169	153
BaU	232	222	208	228	224	218	214	210	195
Min only	232	222	208	228	253	288	349	480	460
Min+Lbl	232	222	208	228	253	288	349	480	460
Min+Lbl-small	232	222	208	228	253	288	349	480	460
NOx+	232	222	208	228	253	288	349	480	460
Avg. Energy/unit new sales [Euro 2005]									
Freeze	180	205	231	255	313	347	372	440	517
BaU	180	205	231	255	304	333	354	406	472
Min only	180	205	231	255	290	298	286	270	306
Min+Lbl	180	205	231	255	290	298	286	270	306
Min+Lbl-small	180	205	231	255	290	298	286	270	306
NOx+	180	205	231	255	290	298	286	270	306
INDUSTRY Turnover [€ bln 2005]									
Freeze				1.0	0.9	0.9	0.9	0.9	0.8
BaU				1.0	1.0	1.0	1.0	1.1	1.1
Min only				1.0	1.1	1.3	1.7	2.5	2.5
Min+Lbl				1.0	1.1	1.3	1.7	2.5	2.5
Min+Lbl-small				1.0	1.1	1.3	1.7	2.5	2.5
NOx+				1.0	1.1	1.3	1.7	2.5	2.5
WHOLESALER Turnover [€ bln 2005]									
Freeze				0.3	0.3	0.3	0.3	0.3	0.2
BaU				0.3	0.3	0.3	0.3	0.3	0.3
Min only				0.3	0.3	0.4	0.5	0.7	0.8
Min+Lbl				0.3	0.3	0.4	0.5	0.7	0.8
Min+Lbl-small				0.3	0.3	0.4	0.5	0.7	0.8
NOx+				0.3	0.3	0.4	0.5	0.7	0.8
INSTALLER Turnover [€ bln 2005]									
Freeze				3.2	3.4	3.4	3.5	3.6	3.7
BaU				3.2	3.5	3.6	3.7	3.9	4.0
Min only				3.2	3.6	4.1	4.6	5.8	6.0
Min+Lbl				3.2	3.6	4.1	4.6	5.8	6.0
Min+Lbl-small				3.2	3.6	4.1	4.6	5.8	6.0
NOx+				3.2	3.6	4.1	4.6	5.8	6.0
VAT on product (excl. Energy) Turnover [€ bln 2005]									
Freeze				0.9	0.9	0.9	0.9	0.9	0.9
BaU				0.9	0.9	0.9	1.0	1.0	1.0
Min only				0.9	1.0	1.1	1.3	1.7	1.8
Min+Lbl				0.9	1.0	1.1	1.3	1.7	1.8
Min+Lbl-small				0.9	1.0	1.1	1.3	1.7	1.8
NOx+				0.9	1.0	1.1	1.3	1.7	1.8
ENERGY SECTOR Turnover [€ bln 2005], incl. VAT and other taxes									
Freeze				15.9	20.4	23.4	25.6	32.1	40.2
BaU				15.9	20.2	23.1	25.1	30.8	37.6
Min only				15.9	20.2	22.6	24.0	26.5	28.3
Min+Lbl				15.9	20.2	22.6	24.0	26.5	28.3
Min+Lbl-small				15.9	20.2	22.6	24.0	26.5	28.3
NOx+				15.9	20.1	22.6	23.9	26.3	28.1
ALL SECTORS Turnover [€ bln 2005] (=consumer expenditure inflation corrected)									
Freeze				21.2	25.8	28.9	31.2	37.7	45.9
BaU				21.2	25.9	29.0	31.1	37.1	44.1
Min only				21.2	26.3	29.6	32.1	37.2	39.4
Min+Lbl				21.2	26.3	29.6	32.1	37.2	39.4
Min+Lbl-small				21.2	26.3	29.6	32.1	37.2	39.4
NOx+				21.2	26.2	29.5	32.0	37.1	39.1

B4. WH STOCK Social-Economics									
	1990	**1995**	**2000**	**2005**	**2010**	**2013**	**2015**	**2020**	**2025**

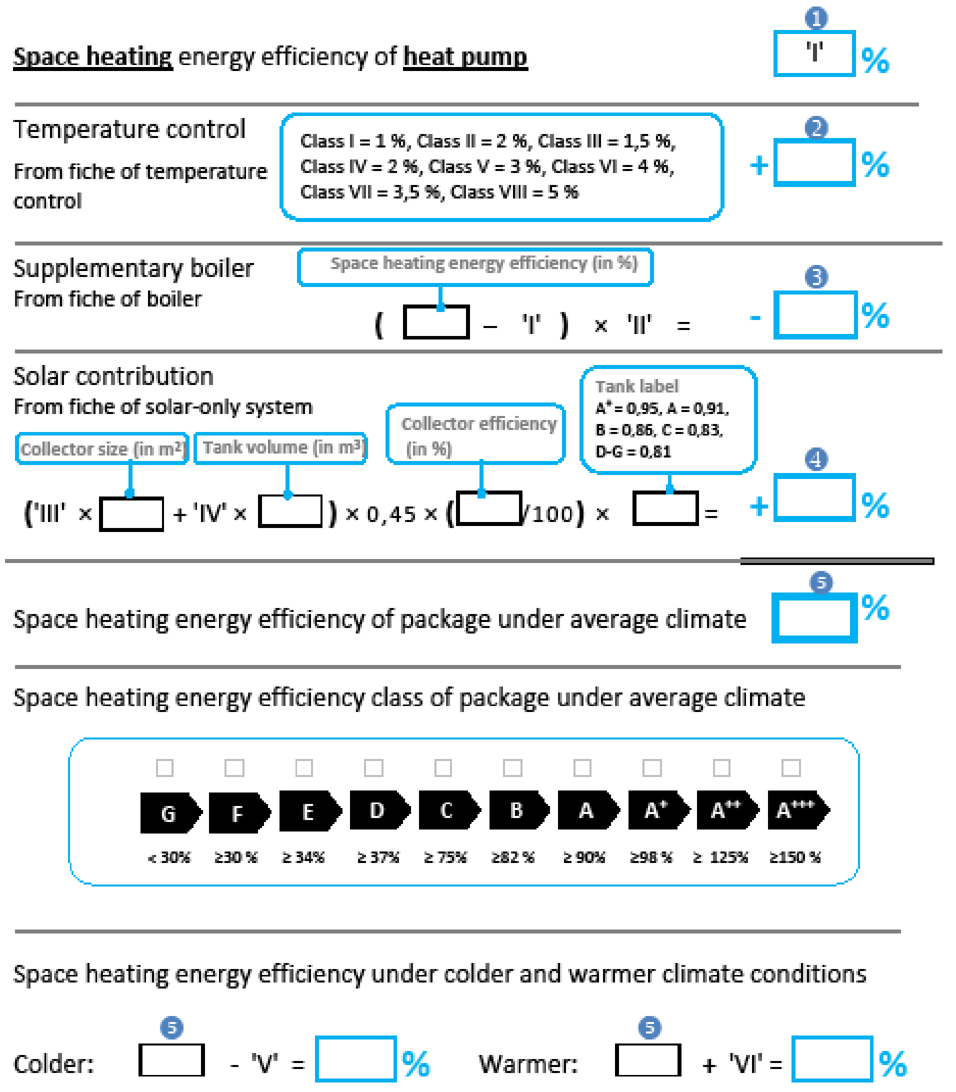
INDUSTRY									
MANUFACTURER Personnel [000]									
Freeze				6	6	5	5	5	5
BaU				6	6	6	6	7	6
Min only				6	7	8	10	15	15
Min+Lbl				6	7	8	10	15	15
Min+Lbl-small				6	7	8	10	15	15
NOx+				6	7	8	10	15	15
OEM Total Personnel [000]									
Freeze				7	7	7	7	6	6
BaU				7	7	8	8	8	8
Min only				7	8	10	13	18	19
Min+Lbl				7	8	10	13	18	19
Min+Lbl-small				7	8	10	13	18	19
NOx+				7	8	10	13	18	19
of which OEM Personnel in EU [000]									
Freeze				3	3	3	3	3	2
BaU				3	3	3	3	3	3
Min only				3	3	4	5	7	7
Min+Lbl				3	3	4	5	7	7
Min+Lbl-small				3	3	4	5	7	7
NOx+				3	3	4	5	7	7
WHOLESALER									
Personnel Wholesaler [000]									
Freeze				1	1	1	1	1	1
BaU				1	1	1	1	1	1
Min only				1	1	2	2	3	3
Min+Lbl				1	1	2	2	3	3
Min+Lbl-small				1	1	2	2	3	3
NOx+				1	1	2	2	3	3
INSTALLER									
Personnel [000]									
Freeze				32	34	34	35	36	37
BaU				32	35	36	37	39	40
Min only				32	36	41	46	58	60
Min+Lbl				32	36	41	46	58	60
Min+Lbl-small				32	36	41	46	58	60
NOx+				32	36	41	46	58	60
ALL SECTORS									
Personnel x 1000									
Freeze				47	47	48	48	49	49
BaU				47	49	51	52	55	56
Min only				47	53	60	71	94	97
Min+Lbl				47	53	60	71	94	97
Min+Lbl-small				47	53	60	71	94	97
NOx+				47	53	60	71	94	97

ANNEX VI: LABELS AND FICHE

Examples of labels for boilers, cogeneration and heat pumps



Example package fiche:



The energy efficiency of the package of products provided for in this fiche may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as heat losses in the distribution system and the dimensioning of the products in relation to the building size and characteristics.

ANNEX VII: EMPLOYMENT ESTIMATE

Introduction

The impact assessment scenario's predict employment on the basis of employee/turnover value and cost ratios from consultation with the industry during the heater and water heater preparatory studies. However, as the scenarios predict a very substantial new job creation of over 200.000 new jobs we wanted to make a reality check especially regarding the largest source of this new employment, i.e. the installers.

In that sense, this Annex tries to make an assessment of the employment in the space heating sector, based on publicly available numbers.

Installers UK

The UK represents around one-third of the gas-fired boiler market. CORGI (The Council For Registered Gas Installers) is the body given the responsibility by the Health and Safety Authorities to maintain a register of competent gas installers in Great Britain, Northern Ireland and the Isle of Man. As the National Watchdog for Gas Safety, CORGI's role is to protect the public from unsafe gas installations and to ensure gas work is carried out safely and competently by registered gas installers. CORGI maintains a computerised database listing all Registered Gas Installers on mainland Britain.44

There are approximately 49 000 Installers with a total of over 113 000 operatives registered with CORGI.

All businesses, whether employers or self-employed persons, who undertake any work in relation to a gas fitting or gas storage vessels must by law be registered with CORGI.

Installers NL

UNETO-VNI is employers' association for the installation sector and technical retail. It includes not only space heating but also electricians, cooling, bathroom fittings, etc. UNETO has around 6000 members with around 110 000 operatives.[45]

Installers DE

The Zentralverband Sanitär Heizung Klima (ZVSHK) unites Installers (vormals Gas- und Wasserinstallateur und Zentralheizungs- und Lüftungsbauer), plumbers, storage vessel technicians (previous copper), oven and air heating installers, etc. Turnover in the sector is around € 26 billion. There are 50 000 companies with almost 300 000 employees (including 40 000 trainees).

EU associations

44 http://www.plumbers.uk.com/site/corgithe.html. For larger installers see http://www.hvca.org.uk/; association with in Britain 1400 installers and 50000 employees 3 bn pound turnover. Also see http://www.iphe.org.uk/index.html IPHE has a membership of over 12000, some 3500 of whom are listed in a Member Directory where a local Registered Plumber can be found.

45 http://www.uneto-vni.nl/.

Number of EU-25 installation companies ca. 2004 (source: extract from VHK company table 2008, estimates based on Eurostat NACE classification and misc. sources)	
NACE number and description	**Nr. of companies**
45.310 Electrical installation contractors	286798
45.320 Contractors for insulation work	16915
45.331 Contractors for heating and sanitary equipment installation	197060
45.332 Contractors for ventilation equipment installation	70991
45.333 Contractors for refrigeration and freezing equipment installation	15393
45.339 Other plumbing contractors	3124
45.340 Other building installation contractors	23633

European associations :

CEETB - Comité Européen des Equipements Techniques du Bâtiment[46]
Member associations:

- GCI - Génie Climatique International;
- UICP - Union Internationale de la Couverture et de la Plomberie;
- AIE - Association Internationale des Entreprises d'Equipement Electrique.

Estimate number of installers

Based on the above we estimate Europe to have 200.000 registered installation firms with around 1.4 million employees and € 100-120 billion turnover.

Estimated split:

- 10-15% in roof and copper;
- 15% ventilation and air conditioning;
- 15-20% bathrooms;
- 50% in Central Heating, of which:
  - repairs/maintenance/etc. 18 billion;
  - installation 10 billion;
  - products (incl. 2 billion margin) → 3 billion for heaters + 5 billion for parts/ chimneys etc;
  - Installation of radiators etc. for 2.5 mln. houses → also 2000 euro -→ 5-10 billion;
  - Water heaters, local heaters, etc.: 10 billion.

Therefore: € 50-56 billion turnover in central heating, of which € 36-40 billion in sales, installation, reparation and maintenance of space heating heaters plus € 10 billion in water heaters (mostly combis and indirect cylinders). 50% turnover = 50% employees → 50% of 1.4 million employees → **600-700 000 employees partitioned to heaters and similar.**

Wholesalers

46 www.ceetb.org.

There are two multinational wholesalers for heaters and heater-related products: St. Gobain (FR) and Wolseley (UK). The former is the largest, but involved in so many different parts of the building products industry that employment figures specifically for wholesale of heaters are not conclusive. Most wholesalers operate mainly on a national scale. VHK estimates that 50 000 employees work in the EU in wholesale of heaters and heater-related articles (also chimney materials, oil storage tanks, etc.). Specifically in the wholesale of heaters the share will be around *half*: ca. 25.000 employees.

Industry

A description of the cost built-up for the BaseCase and a 70/15/15% mix of design options 6, 7, 9 around the LLCC point is given in the table below for the "L" load profile. The data are taken from the heater study but adjusted to the average price levels.

These figures are an alternative to the calculations in the scenarios and they allow a more detailed overview of where new jobs in the Min+Lbl scenario will be allocated.

Please note that as more detail is added the margin of error becomes wider. Precision is not larger than ± 20%.

The table is preceded by a description of the cost items below.

Description of cost items plus examples of OEMs/ producers		
Cost items	**Description**	**Firms (examples)**
OEM Subass. Costs (Task 2, Ch. 5)		
Heat exchanger group	combustion chamber, heat exchanger, flue duct	Giannoni
El. controls group	(CPU), 230 V cable & plug, max. heater thermostat, sensors, pressure diff. switch, cable subassembly	Honeywell, Siemens
Burner group	burner plate, mixing chamber, ignition, burner sensors (thermostat/ ionisation)	Bekaert, Weisshaupt, Riello (oil)
Fuel controls group	gas valve(s), internal gas pipes	Honeywell, Siemens
CH-return group	CH return piping + circulator pump	Grundfos, Wilo
CH-supply group	overflow valve (excl. 3-way valve, because taken into account with hot water group)	misc.
Fan group	fan, fan-controller, internal duct to burner	EBM
Casing	casing, frame & human interface, incl. external casing, inner casing, insulation, panel	misc.
Condensate collect	condensing heater only (25% market share --> 25% of costs): condensate collector & drain, incl. collector, drain, diverters/ condensing plate	misc.
Hot water group	integrated combi only (58% market share): incl. tank and/or flow-thru heat-exchanger, 3 way valve, temp. sensor	misc. (Inventum, Daalderop, etc.)
Packaging etc.	packaging incl. foil, instruction manual, pallet (4 on 1)	
Extra oil-fired (*0,12)	floor standing oil-fired (12% market share): oil tank +oil pump+extra costs misc. Components --> factor 1,45 * 1,5=2,1	misc.
Subtotal OEM		
Labour	15/50 of Subtotal OEM (see table 5.4, Task 2 report)	Vaillant, BBT, Baxi, Merloni,

Description of cost items plus examples of OEMs/ producers		
Cost items	**Description**	**Firms (examples)**
Overhead	35/50 of Subtotal OEM (see table 5.4, Task 2 report)	Remeha, Viessmann, Riello, Ferroli, Immerfin, etc.
total MSP	Manufacturer Selling Price	
Ex wholesale	1,3 * MSP (30% mark-up)	St. Gobain, Wolseley
Ex installer excl. VAT	1,55*MSP (20% mark-up on wholesale)	
HEATER consumer street price incl. VAT	MSP*1,84 (VAT 19%) List price is ca. 15% higher	
CONTROLLERS incl. VAT	Room thermostat, outdoor sensors, floor-heating controls, multi-zone controls, building control systems, cascade/ solar/ heat pump control systems, hydraulic optimiser, etc. Includes both integrated (with heating package) and separately purchased controls. Default on/off thermostat and simple TRV valves are included under "INSTALLATION" and not included here.	Danfoss, Honeywell, Siemens
INSTALLATION (Labour, materials, VAT)	default (replacement): 0,6*consumer street price. Incl. new flue/air ducts attic: *0,9 Incl. new lateral flue/air ducts: * 1,0 Incl. chimney inner liner: * 1,2	misc. (incl. British Gas)
subtotal Heater (all in)		
SOLAR materials incl. VAT	solar collector, solar tank, solar pump, control, piping	misc.
SOLAR installation incl. VAT	default: 350 euro + 100 euro per m2 collector.	misc.
HEAT PUMP materials incl. VAT	air-based: 500 euro + 500 euro/kW water-based: 1000 euro+ 1000 euro/kW	BBT, Stiebel eltron, Viessmann, Robur, etc.
HEAT PUMP installation incl. VAT	air-based: 500 Euro + 100 Euro per kW for air-duct water-based: 1000 Euro + 500 Euro per kW for drilling hole (ground source) or insert in garden (soil source) plus installation	
TOTAL PURCHASE	**used for LCC calculation**	

Cost built-up for Basecase (1) and a mix of design options 6,7,9 (from VHK Heater study 2007)										
Min+Lbl scenario 220	**3660**					**5978**				
design option-->	**1**		**6**	**7**	**9**	**Target**	**0,815**	**diff**	**mln. Eur**	**new jobs**
weighting-->			**80%**	**10%**	**10%**	**(70/15/15%)**				
OEM Subass. Costs (Task 2, Ch. 5)	Eur	Eur	Eur	Eur	Eur	Eur	Eur	Eur		
Heat exchanger group	104	134	144	173	173	150	157	24	166	2759
El. controls group	50	64	90	100	100	92	97	32	226	3774
Burner group	23	30	29	29	29	29	30	1	6	104
Fuel controls group	35	45	60	80	80	64	67	22	156	2593
CH-return group	40	51	82	82	82	82	86	35	243	4048
CH-supply group	10	13	10	10	10	10	11	0	0	0
Fan group	30	39	45	45	45	45	47	9	61	1015

Cost built-up for Basecase (1) and a mix of design options 6,7,9 (from VHK Heater study 2007)										
Min+Lbl scenario 220	**3660**					**5978**				
design option-->	**1**		**6**	**7**	**9**	**Target**	**0,815**	**diff**	**mln. Eur**	**new jobs**
weighting-->			**80%**	**10%**	**10%**	**(70/15/15%)**				
Casing	35	45	46	46	46	46	48	3	23	388
Condensate collect	8	10	35	35	35	35	37	26	185	3088
Hot water group	21	27	21	21	21	21	22	0	0	0
Packaging etc.	10	13	12	12	12	12	13	0	0	0
Extra oil-fired (*0,12)	69	89	108	119	119	110	116	27	189	3155
Subtotal OEM	**435**	**559**	**681**	**751**	**752**	**695**	**730**	**171**	**1196**	**20925**
Labour	131	168	204	225	226	208	219	51	357	2232
Overhead	305	391	477	526	526	487	511	120	839	5244
total MSP	870	1.118	1.363	1.502	1.504	1.391	1.461	343	2398	28401
Ex wholesale	1.131	1.453	1.771	1.953	1.955	1.808	1.898	445	3112	11700
Ex installer excl. VAT	1.349	1.733	2.112	2.328	2.331	2.156	2.263	530	3713	14282
HEATER street price incl. VAT	1.605	2.062	2.513	2.770	2.774	2.565	2.693	631	4417	54383
		0				0	0	0	0	
CONTROLLERS	0	0	365	715	715	435	457	457	3197	31974
INSTALLATION	1.244	1.598	1.477	1.552	1.552	1.492	1.567	0	0	0
subtotal Heater (all in)	**2.861**	**3.677**	**4.355**	**4.355**	**5.041**	**4.424**	**4.645**	**968**	**6775**	**86357**
SOLAR materials	0	0	0	0	2.500	250	263	263	1838	30627
SOLAR installation	0	0	0	0	1.100	110	116	116	809	13476
		0				0	0	0		
HEAT PUMP materials	0	0	0	2.550	0	255	268	268	1874	31239
HEAT PUMP installation	0	0	0	1.400	0	140	147	147	1029	17151
		0				0	0	0		
TOTAL PURCHASE	**2.861**	**3.677**	**4.355**	**8.305**	**8.641**	**5.179**	**5.438**	**1.761**	**12325**	**205416**

Based on the above --but corrected for obvious errors-- the following estimate is given of the employment effect for a total of 200 000-250 000 new jobs to be created in the Central Heating sector until 2020:

- OEMs 18% : 35 000-42 000 jobs, of which > 50% extra-EU;
- Manufacturers 12% : 24 000-30 000 jobs, of which 10-20% extra-EU;
- Wholesalers 10%: around 10 000-20 000 (difficult to estimate);
- Installers 60%: around 120 000-150 000 in sales, installation but above all in maintenance and repair. This includes also separate components like controls, chimneys, etc., so in fact a part of the installer jobs should be partitioned to these component manufacturers.

ANNEX VIII: EMISSIONS

The impact analysis involved 4 different levels of efficiency requirements (scenario 1 to 4, with numbers as specified in Annex III) and 3 levels of NO_x requirements (scenarios 5a, 5b and 5c). The outcomes are visible in section 5 and the various annexes. An extensive discussion of these outcomes in the main body text was not given because most of the outcomes are self-explanatory. This Annex aims to clarify several issues related to emissions.

Only NO_x has been taken into account.

Most of the fossil fueled heaters in the EU are gas fueled. For these NO_x is the only direct emission with an impact on acidification (expressed in kt SO_2-equivalent).

The number of liquid fossil fuel using heaters is much smaller, although still large. Emissions of hydrocarbons other than CH4 may occur but these are not easy to quantify.

The relationship with standards.

The preparatory study reports on comparative laboratory tests between steady-state and on-off cycling of gas-burners, which show that on average for the various burner types 80% of overall CO emissions and 97% of CH4 emissions occur during burner start-up and shut-down (VHK 2007, preparatory Study Lot 2, Task 4, page 8). This would mean that only 20% of actual CO emissions and 3% of CH4 would be covered by steady-state tests.[47] PM10 of liquid and gaseous heaters was not considered significant in the preparatory study.

Unfortunately, the current EN standards do not cover CO, CH_4 or other hydrocarbons or possibly PM10 tests and the Member State type-approvals and national regulations on emissions usually cover only NO_x and CO. The tests for national type approvals only involve steady-state testing, thus covering only a fraction of real-life emissions.

More realistic testing of CO, hydrocarbons and possibly PM10 emissions at cycling-conditions is technically possible, but -apart from the much higher costs- is complex in terms of accuracy and reproducibility (tolerances). These issues need to be solved before it can serve as a basis for legal requirements.

The situation above has prompted the Commission to propose only NO_x limits in the current regulation and to foresee mandates to the European Standardisation organizations (ESOs) to develop realistic testing methods for other emissions.

Health and environmental impact of emissions

The CO_2 equivalent is expressed in GWP-100 and NO_x is expressed in SO_2-equivalent (in line with the ecodesign methodology (MEEuP) for the conversion NO_x-SO_2).

As regards the health and (fire) safety hazards of using open combustion systems in habitable rooms this is generally not the case for space heating heaters as it is handled by safety provisions in building codes. In addition, at EU level the GAD (Gas Appliances Directive)

[47] Note that for NOx emissions the steady-state tests do represent a fairly accurate representation of real-life emissions.

has led to improvements and progress has been made, for example by means of extra safety devices and the addition of flue ducts (instead of fully open, type A) for larger units. And the regulation, as it is proposed, will induce further progress: The efficiency requirements will effectively eliminate the use of pilot flames; both the efficiency limits and the NO_x-requirements will lead to improvements in the combustion process (e.g. pre-mix burners).

NO_x Scenarios

The NO_x scenarios model the Min+Lbl scenarios for both the space heating and water heating functions with regulated levels of NO_x emissions. In these scenarios all other model outputs remain the same as the Min+Lbl scenarios including the "efficiency effect". It is assumed by the model that NO_x emissions limits have no impact on any of the other variables and that NO_x emission reduction technologies do not reduce energy efficiency. This is consistent with the findings of the preparatory study and Grauss & Worrell (2007) that estimated the reduction in efficiency due to NO_x emissions reduction to be less than 1%.

The proposed NO_x limits (see section 4.8) lead to a weighted average of about 90 mg/kWh fuel input in terms of GCV which based on the criteria of the Ecodesign Framework directive such as affordability and LLCC, is the preferred suboption 5a in the table in § 5.7.

Timing and values of the emission thresholds were established based on feedback from Member States as well as stakeholders. In particular, the emission limits for oil-fueled heaters correspond to the targets of a multi-annual programme in the UK that aims at reducing the NO_x emissions from approx. 200 mg/kWh fuel input in terms of GCV to 120 mg/kWh fuel input in terms of GCV in the coming years.

Micro-cogeneration and heat pumps using fuels are new technologies and too ambitious NO_x limits would risk stopping the innovation of micro-cogeneration using liquid fuels or micro-cogeneration and heat pumps with internal combustion engines. The priority there is to improve energy efficiency (also leading to fewer emissions), after which reduction of emissions will be tackled. As this is an upstart technology with good potential for efficiency, industry associations and Member States have argued for some leniency; a five year period before emission requirements will take effect. For the overall picture it does not make much difference as sales are still small compared to the long existing fossil fuel heater technologies. In a review the emission requirements will be stricter as the technology will have matured by then.

The NO_x dimensions of the other scenarios modelled in this study are:

- The **BaU** & **Min only** scenarios at 175 mg NO_x/kWh fuel input in terms of GCV;
- The **Min+Lbl** scenarios at 90 mg NO_x/kWh fuel input in terms of GCV.

These are all above the stringent NO_x standards the commission has proposed and were based on suggestions at the time of the preparatory study. Since then emission requirements in Member States and technological possibilities have evolved and these values are now considered too lenient. Therefore these two options have been analysed and described in lesser detail in this impact assessment. So the separate modelling of NO_x scenarios has 3 sub-scenarios that model the implementation of more stringent NO_x emissions requirements as follows:

a. The heater scenario at 90 mg NO_x/kWh fuel input in terms of GCV;
b. The heater scenario at 70 mg NO_x/ kWh fuel input in terms of GCV;
c. The heater scenario at 35 mg NO_x/kWh fuel input in terms of GCV.

Scenario a is based on a gas and liquid fuel heaters and a more cost-effective requirement, scenario b assumes a continued switch to a higher proportion of gas fueled condensing boilers and scenario c is modelled at BAT values of gas fueled boilers. As Member States required in the stakeholder consultation of May 2011 to set lower standards for heat pumps and micro-cogeneration with internal combustions engines and heaters using liquid fuels, scenario a is supported.

From a technical perspective reduced NO_x emissions can be achieved in a variety of ways such as:

- Compliance of fossil-fuel fired systems;
- Pre-mix technology with ionisation-control or better;
- Combustion air fans;
- Improved air-fuel mixing controls;
- Flue-gas Re-circulation;
- Combustion control technologies – e.g. Staged, Delayed, Humidified, Radiant, Catalytic or Pulse Combustion;
- Flame Inserts;
- Thermally Active Burners;
- Port Loading Redesign and Reductions.

These are applicable to both the space and water heating functions of heaters and implementing these measures on heaters will enable emissions standards of as low as 35 mg NO_x/kWh or less to be met[48]. Furthermore, design analysis carried out in the preparatory study showed that efficiency targets for larger heaters would require more heat pump solutions, and that this in turn brings a higher share of electricity in the mix. This increased electricity use would be expected to cause an increase in NO_x and SO_2 emissions in the short-medium term before corrective measures could be applied.

[48] For a fuller appraisal of NOx reduction technologies please refer to task 4 of the VHK preparatory reports http://www.ecoboiler.org/public/ecoboiler_task4_final.pdf.

ANNEX IX: OUTCOME OF THE CONSULTATION PROCESS

The positions of main stakeholders on crucial features of the Commission services' working documents can be summarised as follows.

In general it is welcomed to focus the approach on products instead of systems. This implies significant simplifications for the required testing and calculation methods. Also a “modular” approach is introduced for evaluating the energy performance of combinations of heat generators with further heat generators and/or further parts such as controls for indicating the energy performance of the product package in the context of the energy labelling scheme, which is welcomed as well. As far as the scope is concerned, it was suggested to remove the exceptions for equipment with heat output smaller than 4 kW, and it was suggested to use heat output instead of energy input for the purpose of scope definition.

For the product label of heaters there are numerous divergent opinions between Member States and stakeholders, which include the following key elements:

- A single mandatory label whereby all heaters should be labelled with a scale that goes to A^{+++}.
- All heaters should carry a mandatory label with a scale that goes to A^{++}. Alternatively, heat pumps and micro-cogeneration could carry a voluntary label with a scale that goes to A^{+++}. In addition, the labels should display the energy efficiency in percentage.
- Two mandatory labels whereby boilers should carry a mandatory label with a scale that goes to A^{+}; heat pumps and micro-cogeneration should carry a mandatory label with a scale that goes to A^{+++}.

Further comments from Member States and stakeholders were raised as follows. They are taken into account in the ecodesign and energy labelling requirements set out in the proposed regulation, except the request for third-party certification which cannot legally be introduced to reinforce market surveillance:

Member States

The **Member States** support in general the suggested content of ecodesign and energy labelling legislation. The level of ambition for ecodesign requirements and the approach for an energy efficiency grading for the energy label based on primary energy consumption were in general considered appropriate. However, as any measure will also affect the EEA, Norway contests this approach. In particular, it was accepted that the level of ambition of ecodesign requirements for energy efficiency should correspond to condensing technology of gas/oil fired heaters. It was suggested that, instead of the envisaged two-stage approach to introduce condensing technology of gas/oil fired boilers, the requirements of the second stage should be applicable 2 years after entry into force of the regulation. The requirements for heat pumps should be more ambitious and/or the assumptions for the difference of the performance at low/medium system temperatures should be re-considered and adjusted, requirements for electric boilers, although covering only a small market segment of < 5%, should be introduced, and the “bonus” for the use of refrigerants with low global warming potential (GWP) should be abolished or converted into a “malus” for refrigerants with large GWP. As far as ecodesign requirements for nitrogen oxides emissions are concerned, it was suggested to further differentiate between fuels and technologies, in particular micro-cogeneration and heat pumps. In addition, the requirements for noise were considered inappropriate for heat pumps with large heat output. The approach for defining the range of heaters for which energy efficiency requirements would apply which are less ambitious than those corresponding to "condensing" technology was questioned, and it was suggested to use the concept of "B1" heaters specifically designed for shared open flue systems instead of a maximum power output.

There is also broad support, albeit not from all Member States, that the energy efficiency ranking is gauged such that best condensing technology should be classified as "A", while using an energy label format that would show energy efficiency classes "better than A" from the very beginning, in order to achieve an ambitious energy labelling scheme for promoting heaters which use cogeneration and renewable energy input, while ensuring effective market transformation also in those cases where renewable energy sources are not used. However, it was suggested that the label format of the second stage should show energy efficiency classes up to class "A+++" instead of "A++". In the Member State expert meeting of 29 June 2012, a group of Member States suggested and supported a compromise for the energy label of heaters as outlined in the third bullet point above. Furthermore, several modifications to the layout of the energy label were suggested, including requests to indicate the energy efficiency at low system temperatures for heat pumps which are capable of being operated at a system temperature of 55°C.

The value of 2,5 for the EU average conversion coefficient describing the efficiency of producing and distributing electricity, thereby achieving comparability of electricity and gas consumption, was considered by most as being appropriate, although some Member States would have preferred a smaller value, while other Member States would have preferred a larger value. The Commission pointed out that the value should be in line with the conversion coefficient of 2,5 reflecting the estimated 40 % average EU generation efficiency, as established in Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services[49].

Manufacturers/suppliers and installers

The general approach to set mandatory requirements in the framework of ecodesign, and energy labelling legislation is in general supported by **Industry**[50] associations representing heater manufacturers, such as the Association of the European Heating Industry (EHI), the European Heat Pump Association (EHPA), the European Partnership for Energy and the Environment (EPEE) and the European Trade Association for the Promotion of Cogeneration (COGEN). Further industry associations representing manufacturers of additional parts such as the European Solar Thermal Industry Federation (ESTIF) and associations covering heating controls support the "extended product" approach of the energy label. In particular, the latter actors and the associations of installers welcome the dealer label of packages of heaters, temperature controls and solar-only systems which avoids discrimination of configurations offered by dealers/installers consisting of parts that were placed in the market individually compared with identical configurations offered by a single supplier/dealer.

[49] OJ L 114, 27.4.2006, p. 64.

The proposed levels and timing of the ecodesign requirements for energy efficiency are accepted. However, it was suggested to reduce somewhat the efficiency requirements for heaters with heat output above 70 kW, and to reformulate or extend the range of heaters that would have to achieve energy efficiency less stringent than “condensing” technology from 15 to 30 kW. Furthermore, it was suggested to use third-party certification instead of self-certification in order to reinforce national market surveillance, in particular as third-party certification is already established under the old Boiler Directive and inaccuracies in declaring the energy efficiencies of only 1% bear the risk of not achieving the high environmental improvement potential of heaters.

The energy efficiency ranking for the energy label based on primary energy consumption is accepted by some and contested by others, and the upgrade of the label format to show energy efficiency classes “A++” is criticised by some. EHI and Eurofuel supported the separate label approach for boilers (see third bullet point above), whereas EPEE, EHPA, Eurovent, Cogen Europe, ESTIF and Marcogaz supported the single label approach (see first bullet point above). Furthermore, it was requested to align the layout of the new dealer label to the well known product label to ensure that it is a useful marketing tool for promoting configurations involving renewable energy sources, and to include on the energy label the indication of the performance at a system temperature of 35°C for heat pumps capable of being operated at a system temperature of 55°C.

Environmental NGOs and consumer organisation in general welcome ecodesign and energy labelling legislation for heaters, and the suggested ecodesign approach is largely supported. However, it was suggested that the energy efficiency requirements envisaged for the second stage should be effective 2 years after entry into force of the regulation, and the first stage should be skipped. The approach for defining the range of heaters which could comply with less ambitious energy efficiency requirements than those corresponding to “condensing” technology was questioned, and an alternative approach to the approach based on heat output <= 15 kW was requested. Environmental NGOs and consumer organisations supported a single mandatory label whereby all heaters should be labelled with a scale that goes to A^{+++}. They did not agree to the two label approach proposed by a group of Member States due to reduced energy savings and the voluntary labelling involved. On the other hand, the indication of sound power levels on the energy labels was welcomed.

ANNEX X: ADMINISTRATIVE BURDEN

As a consequence of the structure and procedures prescribed in the Ecodesign Framework Directive, the main carriers of any administrative burdens, Member States and industry, are part of the process (from the preparatory study to the end of the impact assessment process) for developing measurement methods to be used for testing and information to be provided. This was subject of discussions in several stakeholder meetings, at least one Consultation Forum meeting and at least one Regulatory Committee meeting.

Any related mandates for standardisation activities are also discussed with Member States in the 98/34 Committee. Market surveillance is discussed in the ADCO group to minimise the burden and realise an exchange of best practice and results. Industry is heavily involved in the work in the European Standardisation Organisations that is to produce the standards linked to any ecodesign measure.

Administrative burden for manufacturers and retailers

In addition to administrative costs for Member States and the Commission, manufacturers and retailers may face higher administrative costs in testing and provision of labels. These costs are likely to vary considerably between manufacturers as the number of models subject to testing and the degree of testing already carried out for other purposes. Again referring to the 'Impact assessment study on a possible extension, tightening or simplification of the framework directive 92/75 EEC on energy labelling of household appliances' a stakeholder suggested that if new equipment needs to be labeled.

This could take manufacturers between three and four months per product. On the other hand, most of the work has already been carried out in the course of product development and quality control. Talking about heaters and labelling means that the technical details (like the levels of NOx, sound power, energy efficiency) of the product should be known and that should not be a problem. So we estimate that this cost for manufacturers is rather small and marginal (less than 0.1%) if compared to their turnover.

This estimate has been reached as follows.

Business-as-usual requires manufacturers –under the Gas Appliance Directive requirements, national type approvals, voluntary benchmarks (SOLKEYMARK), standards and CE-marking- to do performance and emission tests, go through the approval procedure, keep the test results on file, publish validated test data in the product fiche/ manual, mention certification on their website, possibly with (a link to) a copy of the certificate, etcetera. In this sense, the information requirements under Ecodesign measures do not constitute a substantial change. In term of end-user prices this is estimated to come down to € 0.10 per unit extra.

The mandatory energy label that is foreseen to be supplied under the delegated regulation is new. The new label is a full colour label, where both variable and fixed data are printed on the same label[51]. Industry costs for blank label, printing, ink, handling, etc. is estimated at around

[51] OJ L 114, 27.4.2006, p. 64.

€ 0.10[52]. In terms of consumer end-prices this comes down to around € 0.20 per heater. To this, extra retailer costs have to be added. This includes the application of labels on showroom models at retail level. At 1 minute per label, integrated hourly tariff of € 50/hour, 1 out of 10 products sold being showroom models, this comes down to € 0.08. Furthermore, the label rating has to be added to print publicity and website, estimated at around € 0.02 per product. The increase in consumer end-price due to the retail efforts (including 20% VAT) is thus estimated at around € 0.12.

All in all, strictly looking at the cost side and not the commercial benefits of adding energy labels, the measure would cost the end-user around € 0.42 extra (€ 0.10 + € 0.20 industry and € 0.12 retail). At an average end-user product price incl. VAT of € 450 (see also Annex V) this constitutes an end-user price increase of around 0.1%.

This is a rough estimate, but it is in line with the findings of the energy label evaluation studies under the SAVE program showing that the cost aspect of the labelling measure is not critical.

Manufacturers of solar thermal components (mostly SMEs) are pleased with the fact that the proposed dealer label allows for a modular approach, where test results can be used for any heater and solar-only system combination, avoiding separate testing of all combinations where solar-only systems could be used and thus keeping costs low.

The costs for dealers for completing the dealer fiche and label is considered low, as these fiche and label have only to be completed, based on the product fiches provided by the part suppliers, if a package of heater, temperature control, solar-only system and/or passive flue heat recovery device is offered to the end-users, supporting the necessary sales conversation of the dealer.

Third party verification

Under the Ecodesign and Energy Labeling Directives self-certification is the norm, unless there are reasons to do otherwise.

It has to be noted that fossil fueled boilers have been subject to the Boiler Efficiency Directive (BED) since 1992. As it was an efficiency counterpart of the Gas Appliance Directive, focusing on safety, the BED prescribes third party testing by independent Notified Bodies, accredited by Member States, for both gas and oil boilers. Therefore the boiler industry has grown used to third party verification, even if it is a bit more expensive. The main advantage is the reinforcement of national market surveillance.

In the proposal also heat pumps and micro-cogeneration are covered. The manufacturers (with a relatively high proportion of SMEs) of these appliances or components also prefer to have third party testing to be able to have solid claims how their products can improve efficiency compared to the incumbent manufacturers of fossil fuel boilers.

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[51] The old label under 92/75/EC consisted of a colour offset print of the fixed data, often for several language versions, plus a BW thermal transfer print of the variable data (the 'strip') which then had to be applied manually by the retailer.

[52] This is comparable to the "old" labels under 92/75/EC, which had lower printing costs but higher handling costs.

Based on the historic context, quite a few Notified Bodies are available with experience in testing heating systems, so there will be competition in price for the testing procedures. And of course less testing will be required in house. Overall testing costs are not estimated to increase much, if at all, and will not be a problem.

However, the Energy Labeling Directive 2010/30/EU does not foresee the use of third-party certification and the Ecodesign Directive 2009/135/EC only allows the introduction of third-party certification where duly justified and proportionate to the risk. Third-party certification for continuation of a practice introduced in 1992 in BED (without a risk assessment) and for reinforcement of national market surveillance does not fulfill those criteria of the Ecodesign Directive.

Administrative burden for Member States and the Commission

The administrative burden regarding the implementation of labelling for heaters will be different for each Member State as their national procedures differ. In some Member States the products will be tested by the government which will involve an estimated cost of €2,500 - €3,000 per model family, though higher for heat pump installations. In other Member States action is only undertaken when a consumer association makes a complaint about the non-compliance of a labelled product.

The administrative burden for a Member state at the legislative level should be much less than when amending the existing Energy Labelling Directive (200 hours of work), negotiating changes to the Directive (€ 75 000) or transposing it into national legislation (€ 150 000). As the implementation of measures for heaters will not involve any changes at the Framework directive for Ecodesign these costs shouldn’t rise. There may be some legislative work for member states when technical standards need to be adapted but this should not involve more than 200 hours of work per member state.

On the other hand, the administrative cost for the Commission will be much higher as the commission has to implement a new product under the Framework Directive. Referring to the ‘Impact assessment study on a possible extension, tightening or simplification of the framework directive 92/75 EEC on energy labelling of household appliances’ it is estimated that this will require more administrative work than the amendment of existing directives. An indicative cost of € 720 000, based on twice the time for amendments, is suggested.

The impact of these sub-options will be considered both with and without energy labelling/building system requirements in the EPBD, in order to

– verify that the requirements of the Ecodesign Directive are fulfilled,

– assess the impact of ecodesign, energy labelling/EPBD, and the combination thereof.

Impact on compliance costs for existing legislation such as the EPBD

The proposed measures under the Ecodesign and Energy Labelling Directive will reduce compliance costs as compliance will be for the whole internal market. In the past industry had to deal with national and even regional requirements increasing compliance costs and effectively barring industry from expanding the geographical coverage and effectively reducing competition. This is one of the important reasons why the industry supports the proposed measures.

There are no expected costs from the ecodesign or energy labelling measures related to the EPBD as Member States will base their EPBD measures on the efficiency requirements and the energy labels of the appliances. On the contrary, the proposed ecodesign measures - once they are implemented - are expected to simplify and streamline some complex heating installation aspects in the current EPBD, and thus will lower the EPBD compliance costs, because a part of the cost on the demonstrating of the compliance will then be moved to the equipment-manufacturers.

ANNEX XI: SUB-OPTIONS FOR TIMING UNDER THE BEST POLICY OPTION (§4.7)

Sub-option 1: minimum requirements to introduce condensing technology of gas/oil fired boilers after 2 years

After the second Consultation Forum in July 2008 there was already a clear direction that an Ecodesign measure was pending that would address various the energy efficiency of heat generators (fossil fueled (condensing) heaters, heat pumps, solar thermal, and later also micro-cogeneration). As can be deduced from trade fairs and the development of product catalogues, this was the starting point -for the vast majority of producers- to take into account the imminent Ecodesign requirements and optimise their new products for the coming energy label rating. For example, heat pumps and micro-cogeneration appliances have received more attention in research and development to improve or establish a market share.

Although many manufacturers have maintained the older products in their catalogues, trying to maximise profits while awaiting legislation, it can be observed that most have been working hard to already transform their product lines over the last 3 years.

Although it can never be excluded that there might still be a company for which the Ecodesign measure may contain unforeseen elements, a further delay by using a less-than-ambitious timing of measures would have a considerable negative impact for the vast majority of the companies that have already made the transformation and which have counted on a (much earlier) introduction of measures to recuperate their investments.

Taking into account the considerable delay due to stakeholder consultations, procedures and unforeseen circumstances, all manufacturers have had time to prepare for the currently proposed measure, which is confirmed by the already on-going market transformation and the reactions of the industry to the proposal.

Therefore, the approach envisaged in the proposal (sub-option 1: firm requirements to introduce condensing technology of gas/oil fired boilers after two years) -previously seen as ambitious- is now more than fair.

Sub-option 2: minimum requirements to introduce condensing technology of gas/oil fired boilers after 1 year

If the proposal would go for faster adoption of the minimum efficiency criteria, e.g. 1 year, of course accumulated energy and CO_2 savings would be higher by 2020. However it could create problems for manufacturers as well as for their supply chain who in their redesign planning have taken into account a transition period after adoption of the measure. As the ecodesign requirements will also be copied in the measure for water heaters for the sanitary hot water function, this could especially create problems for manufacturers that produce both oil and gas fired dedicated water heaters and combi-heaters. Such problems should be avoided under the Framework ERP Directive.

Another bottle neck could be the capacity of Notified Bodies. Industry prefers third party verification, but the independent laboratories must be able to prepare for the new measure and the flow of products for testing to comply with ecodesign and labelling requirements.

Sub-option 3: minimum requirements to introduce condensing technology of gas/oil fired boilers after 3 years

If the proposal would allow a longer transition period for stricter requirements to introduce condensing technology of gas/oil fired boilers, e.g. a transitional tier after 1 year and introduction of condensing technology after 3 years, industry would easily be able to comply but it is likely that part of the redesign work has already been done as industry has been expecting the measure for some years. It is unlikely that industry will need such a long period to comply, especially taking into account what has been happening in the past 3 years in anticipation of the measures. Furthermore it would extend the review too much into the future. It would also lead to much less accumulated energy and CO_2 savings until 2020, and Member States would not benefit from NO_x reductions that they need to comply with European emission Directives. Consumers would continue to pay unnecessarily more for water heating based on life cycle cost. In addition, manufacturers would lose the incentive to improve competitiveness in the world market with efficient products.

The market transformation in anticipation of the ecodesign measure during the unforeseen delays has not been part of the quantitative modelling. Therefore a more quantitative approach on the effects of timing compared to the original scenarios would not be relevant. However, the requirements can be met by all manufacturers after two years. This period has not been seriously questioned either by the associations of manufacturers, which also include SMEs, or by individual SMEs. On the contrary, SME manufacturers are overrepresented in the niches that would benefit from efficiency requirements. In combination with the observed market transformation already taking place this warrants the conclusion that the proposal with sub-option 1 is perfectly reasonable. This will also guarantee that after two years savings will become apparent. Additionally, Member States required in the stakeholder consultation of May 2011 to introduce minimum requirements for electric boilers and heat pumps with a current market share < 10% after 2 and 4 years at a comparable low level, not hindering the market introduction of heat pumps and allowing electric boilers to remain on the market for certain niches, e.g. secondary homes, while preventing low quality products.

ANNEX XII: THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE AND THE ENERGY EFFICIENCY OF WATER HEATERS AND OF BOILERS

Under Directive 2002/91/EC on the energy performance of buildings (EPBD), Member States must apply minimum requirements as regards the energy performance of new and existing buildings, ensure the certification of their energy performance and require the regular inspection of heaters systems in buildings.

While these systems have an important energy saving potential (up to 40-60% of their total energy use) and the current Directive is estimated to result in 10% energy savings, it has proven very difficult to quantify the real impact of the current EPBD for the whole Union because of highly disaggregated nature of the sector, the complementary nature of energy improvements with other policy objectives, slow transposition, and lack of proper monitoring. To address some of these issues the recast EPBD (Directive 2010/31/EU) includes the requirement for Member States to establish energy performance requirements for technical building systems (including heating and hot water systems). However, with the transposition deadline of 9 July 2012, it is too early to quantify the actual impact of these measures on the energy efficiency of these systems.

The proposed ecodesign measure will provide harmonised minimum efficiency requirements for heater and water heater products placed on the market (so not for the existing heater and water heater stock already installed). The ecodesign and labelling measures are supported by a measurement and calculation methodology at product level which has been accepted by Member States and stakeholders. The methodology in combination with the requirements will help Member States in setting up heating and hot water system requirements in respect of the proper installation, and the appropriate dimensioning, adjustment and control and the overall energy performance of the technical building systems which are installed in existing buildings and that include heaters and water heaters. The EPBD addresses maintenance and inspection aspects of the heater or water heater once it is installed, which the ecodesign and labelling measures cannot do.

The EPBD also can promote replacement of the heater and water heater stock through the building label which raises awareness whereas, as stated above, the proposed measures on heaters and water heaters can address only efficiency of new products placed on the internal market.

Therefore the impact of the EPBD on the energy efficiency of the products concerned is limited. Thus, the EPBD and ecodesign/labelling measures complement each other. However, as the total saving potential in heating systems in buildings is so high the expected impact of energy savings from the EPBD can be as much as 130 Mtoe, corresponding to 6.6% reduction of the total EU primary energy supply by 2020. The indirect effect of the EPBD on e.g. determining the necessary heating capacity and on increased insulation has been taken into account in the baseline scenarios as explained in the IAs.

Detailed information on the relation of EPBD with the proposed measures is contained in nearly 200 pages in the preparatory studies available on http://ecoboiler.org for heaters as well as on http://www.ecohotwater.org for water heaters.

Recent studies confirm the above, for example the study by BPIE on developments and progress in Member States regarding the EPBD[53]. On page 78 it states:

"While no country has directly and fully applied the CEN standards in their methodology procedures, many countries have adopted an approach which is broadly compatible with the CEN methodology. A variety of reasons were cited for not using the CEN standards, including difficulty of converting into practical procedures, timing and copyright issues. Most national procedures are applied as software programmes and many countries (but by no means all) have adopted a CEN based methodology (EN 15603: Energy Performance of Buildings) and/or are using the EN 13 790 monthly calculation procedure, as the basis for the calculation “engine” for simple building. Others allow proprietary dynamic simulation (for more complex buildings), whilst others have developed their own national methods. The assessment of existing buildings (for building code or Certification purposes) is often based on a reduced data-set model.

A detailed assessment of the energy performance requirements is provided in Table 2B7. It can be seen that many different approaches have been applied and no two countries have adopted the same approach. It is important not to attempt to compare the performance requirements set by Member States, given the variety of calculation methods used to measure compliance and major differences in definitions (e.g. definitions of primary and final energy, heated floor area, carbon conversion factors, regulated energy and total energy requirement etc.). The setting of building code requirements with legally binding performance targets, is normally based on either an absolute (i.e. not to exceed) value, generally expressed in kWh/m2a, or on a percentage improvement requirement based on a reference building of the same type, size, shape and orientation. Some countries (e.g. Belgium) express the performance requirement as having to meet a defined “E value” on a 0 to 100 scale, or on an A+ to G scale (e.g. Italy and Cyprus).

Most methodology procedures are applied as software programmes. Software quality assurance accreditation is undertaken in only about half of the countries, a finding which has been drawn by the Concerted Action 2010 Report. About 50% of Member States have already introduced changes to their methodology procedures to either to tighten requirements, achieve greater conformity with CEN standards, and include additional technologies and/or to correct weaknesses/gaps in earlier EPBD methodology procedures.

There is a growing interest in the harmonisation of methodology procedures. This is likely to become an increasingly important issue in the context of the EPBD recast Article 2.2 and Article 9 requirements associated with nearly Zero Energy Buildings (nZEB) and cost optimality (EPBD recast Article 5) since the Commission will need to demonstrate that all Member States are delivering equivalent outcomes. A harmonised approach to setting and measuring nZEB targets and cost-optimality implies that a broadly equivalent methodology will be required. Table 2B8 provides a summary of the certification method used for new buildings."

And on page 89:

[53] Europe's buildings under the microscope – A country-by-country review of the energy performance of buildings, Buildings Performance Institute Europe (BPIE), October 2011 (page78, 89)

"In addition, many observers suggest that the compliance and enforcement of building energy codes is currently undertaken with less rigour and attention to detail, than other building regulation requirements such as structural integrity and/or fire safety. While there are few studies on compliance with building energy codes, there is a growing body of academic research suggesting that as building thermal requirements become more demanding (e.g. in the pursuit of nearly Zero Energy Buildings) there is increasing evidence of a performance gap between design intent (i.e. theoretical performance as modelled using national calculation methods) and the actual energy performance in-use. This suggests one or more of the following issues: the calculation methods are flawed, the enforcement regime is not being undertaken sufficiently rigorously or designers and builders are failing to satisfactorily deliver the outcome intended.

Closing the performance gap between design intent (and regulatory requirement) is likely to become an important issue over the next decade if countries are to deliver the climate and environmental targets related to buildings. The key findings of the PRC/Delft Univ. of Technology review of National Building Regulations[1] found that there was "little attention yet to enforcing sustainable building regulations in most of the various countries analysed". The report also suggested that, given the highly technical nature of the requirements associated with sustainability and energy, there was a serious shortage of individuals with appropriate expertise to undertake the building control function. This is resulting in poor enforcement of compliance associated with these important issues."

This confirms the usefulness for EPBD purposes of establishing harmonised efficiency requirements for heaters in the proposed measures (which, if adopted, will require no transposition, and which will have an established market surveillance), to develop a related measurement methodology and to ask CEN/CENELEC in the Ecodesign horizontal mandate for European standards covering both the heat generator and (the components of) the product package. It will help Member States in faster implementation of the EPBD and in establishing building codes, it will enable better enforcing, monitoring and comparisons of progress and developments and it will reduce burdens on manufacturers for compliance in the internal market, especially taking into account Article 8 of the EPBD which links the EPBD with ecodesign and labelling. Therefore the proposed measures are not considered to limit Member States flexibility, but rather as useful help to implement the EPBD, save primary energy for 2020 and realise emission ceilings.

ANNEX XIII: ACTIONS TAKEN BY MEMBER STATES TO PROMOTE HIGHER EFFICIENCY EQUIPMENT

Information on actions by Member States have taken to promote higher efficiency equipment is contained in task 1 and task 2 of the preparatory study available on http://ecoboiler.org for heaters. This information reveals that there is some fragmented national legislation on heaters, complemented by very limited financial programmes, to promote high efficient heaters, whereas other third countries such as the U.S., Japan, Australia etc. have had legislation and funding programmes on heaters for two decades.

The existing initiatives in Member States have been taken into account in the baseline scenario. However, these actions are not considered sufficient to promote higher efficiency equipment in the Union. The proposed ecodesign and labelling measures should therefore introduce harmonised minimum requirements on heaters, coupled with dynamic labelling and benchmarks for public procurement and financial incentives.

Since the work on heaters started, hardly any Member State has worked on national or regional requirements for heaters as they are expecting the pending EU legislation.

ANNEX XIV: DATA ABOUT INSTALLED STOCK AND PRODUCTION OF HEATERS, AND THE ASSESSMENT OF THEIR CURRENT ENERGY PERFORMANCE.

Heater market sales and stock data have been retrieved and reported by a specialist subcontractor, BRG Consult, in the preparatory study, building on a detailed market study on the heater market on 2006 (TREN/D1/31-2005, including nearly 500 pages with country-specific analysis and forecasts, which is the only time that such a separate and detailed study on the market has been carried out for an ecodesign product category). BRG Consult is the foremost market research specialist in the heater sector with over 20 years of experience in data collection and processing as well as scenario building and modelling.

As regards the efficiency numbers used, they were retrieved by the main contractor of the preparatory study, i.e. VHK engineering consultants, with long experience in the sector. Furthermore, as reported in the preparatory study, VHK used numerous sources from field testing to back up their assessment on real-life heater system energy consumption. VHK also developed the integrated measurement and calculation methodology that allows comparing the performance of the appliances (gas, oil, electrical, heat pumps, micro CHP and solar heaters), which has been agreed with industry and other stakeholders after extensive technical expert meetings.

The methodology will be published as a Commission communication to assist industry (manufacturers, importers, dealers) and market surveillance authorities instantly after adoption of the measures. The communication will be replaced by (a) harmonised European standard(s), as soon as available from the European Standardisation Organisations under the Ecodesign horizontal mandate. The references of the harmonised standard(s) are published in the Official Journal of the EU. During the preparatory study and impact assessment, several dedicated expert meetings were held on the measurement and calculation methodology. The results used in and for the IA were not disputed. The description in §2.2 on page 10 refers to the situation before the work done on a measure for heaters.