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EXECUTIVE SUMMARY OF THE IMPACT ASSESSMENT

Accompanying the document

Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air heating products, cooling products and high temperature process chillers

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1. INTRODUCTION

This impact assessment discusses the different policy options available to the Commission for implementing the Ecodesign Directive (Directive 2009/125/EC of the European Parliament and of the Council[1]) and the Energy Labelling Directive (Directive 2010/30/EU of the European Parliament and of the Council[2]) in respect of air heating products, cooling products and high temperature process chillers.

The preparatory studies analysing the technical, environmental and economic characteristics of these products concluded that these products comply with the criteria set out in Article 15(2) of the Ecodesign Directive and with the criteria set out in Article 10(2) of the Energy Labelling Directive. These products can therefore be made subject to EU measures under both Directives.

This impact assessment covers air heating products used for indoor space heating and cooling products used for space cooling and/or process cooling (there being products that combine both functions), using various heat sources and various heat generation or space cooling generation principles.

The generic types of products covered by this impact assessment are:

- air heating products with a rated heat output of up to 1 MW;
- cooling products with a rated cooling output of up to 2 MW; and
- high temperature process chillers.

In accordance with Article 18 of the Ecodesign Directive, the Commission consulted interested parties through a Consultation Forum, held on 25 September 2013. The balanced participation of Member States' representatives and all interested parties concerned with the product group in question required by Article 18 was ensured.

2. PROBLEM DEFINITION AND OBJECTIVES

The air heating products, cooling products and high temperature process chillers currently being sold and used in the EU consume significant amounts of energy, thereby contributing to greenhouse gas emissions. Improving energy efficiency is a way of increasing the security of energy supply.

In addition to the environmental consequences of the energy consumption of air heating products, cooling products and high temperature process chillers powered by any fuel, products using gas or liquid fuel also contribute significantly to emissions of nitrogen oxides.

[1] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10).

[2] Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (OJ L 153, 18.6.2010, p. 1).

Setting limits on emissions for these products therefore has a significant effect in terms of reducing the negative effects of emissions on air quality and human health.

Some of the products covered by the proposed Regulation also have a detrimental effect on the environment through the noise they produce.

There is currently no EU legislation specifically regulating the energy consumption and emissions of air heating products, cooling products and high temperature process chillers.

3. POLICY OPTIONS

The options 'no EU action', 'self-regulation', 'energy labelling scheme only' and 'ecodesign requirements and energy labelling' were rejected as they do not achieve the EU's objectives in this area, as described above, and received no support from interested parties. The option 'ecodesign requirements only' was divided into three sub-options.

The sub-options present different combinations of requirements for minimum energy efficiency, maximum nitrogen oxide emissions and maximum noise emissions. Different timelines for the entry into force of the requirements have been considered.

Energy labelling has been rejected as an option as the products covered by the proposed Regulation are different to many other products such as domestic appliances and electronics in terms of how they are typically purchased.

The effect of labelling depends on the market uptake of the label information. As most if not all of these products are rarely bought from a 'shop floor' or ordered by lay persons and are instead mainly bought on behalf of such persons by trained personnel such as installers (for replacement sales, or new installations), specialist advisers (for new builds) and well-informed customers (in particular for the largest equipment that constitutes a major investment for these customers), access to and interpretation of information on the performance and energy efficiency is not a fundamental problem. An energy labelling scheme would not convey significantly more meaningful information than would be available in the technical information that manufacturers could be required to provide under possible ecodesign information requirements.

3.1. Sub-option A

This sub-option corresponds to the ecodesign requirements presented in the working document discussed at the Consultation Forum meeting of 25 September 2013.

Of the three sub-options, sub-option A covers the widest range of products and includes the most requirements.

It was suggested that energy efficiency and noise requirements could be phased in, with one set of requirements applying from 2017, and more stringent requirements then coming into force in 2019. This two-phase entry into force would give industry a longer transitional period. Limits on nitrogen oxide emissions would not be phased in in this way.

This sub-option was discussed at the Consultation Forum meeting of 25 September 2013 but industry bodies in particular indicated that they could not accept it. They claimed that the

requirements relating to energy efficiency and emissions were too stringent, especially in combination with the proposed noise requirements.

Other parties, such as environmental and consumer NGOs, welcomed the stringency of the proposal.

3.2. Sub-option B

In response to the opinions voiced during the Consultation Forum by some parties concerned, namely industry bodies, a second sub-option was considered, which involves less stringent requirements.

The main differences between this and sub-option A are:

1. no maximum noise levels would be imposed;

2. fan coils would be exempted from the requirements;

3. the energy efficiency requirements would generally be made less stringent for all products covered by the Regulation; and

4. no requirements would be introduced relating to energy efficiency, or nitrogen oxide emissions for fuel (most often gas) powered chillers, air conditioners and heat pumps. Manufacturers would only be required to provide information.

3.3. Sub-option C

As some parties concerned have expressed their preference for stricter energy efficiency requirements, a further sub-option was considered under which the ecodesign requirements would be less strict than in sub-option A, but stricter than in sub-option B, thus offering greater potential energy savings than sub-option B.

The same products would be covered by the requirements as in sub-option B, but the requirements relating to energy efficiency would be stricter.

The main differences between this and sub-option A are that:

1. no maximum noise levels would be imposed;

2. fan coils would be exempted from the requirements ;

3. requirements relating to nitrogen oxide emissions would be less stringent; and

4. requirements relating to energy efficiency, and nitrogen oxide emissions for fuel (most often gas) powered chillers, air conditioners and heat pumps would be less stringent.

The main differences between this and sub-option B are that:

1. the requirements relating to energy efficiency would be stricter; and

2. it includes limits on nitrogen oxide emissions from fuel (most often gas) powered warm air heaters (although these are less stringent than under sub-option A).

The requirements for the different sub-options are given in Tables 1 and 2.

Table 1: Minimum energy efficiency requirements for sub-options A, B and C (seasonal efficiencies)

		BAU			Option A		Option B		Option C	
		2010	2015	2020	2017	2019	2017	2019	2017	2019
Cooling	AC<350 kW	136%	102%	116%	157%	161%	137%	149%	149%	157%
	AC>350 kW	140%	105%	119%	173%	185%	137%	157%	157%	173%
	WC<350 kW	186%	139%	158%	196%	200%	172%	188%	188%	196%
	WC>350 kW	217%	163%	185%	256%	272%	196%	236%	236%	256%
	WC>1000 kW	217%	163%	185%	256%	272%	236%	256%	236%	256%
	split AC	156%	117%	132%	181%	189%	157%	169%	169%	181%
	VRF	165%	124%	140%	181%	189%	157%	169%	169%	181%
	rooftop	152%	114%	129%	181%	189%	157%	169%	169%	181%
	GEHP	103%	77%	88%	167%	177%	157%	169%	157%	167%
	HTPC-AC<350 kW	188%	141%	160%	180%	200%	180%	200%	180%	200%
	HTPC-AC>350 kW	204%	153%	173%	200%	220%	200%	220%	200%	220%
	HTPC-WC<350 kW	292%	219%	248%	260%	280%	260%	280%	260%	280%
	HTPC-WC>350 kW	340%	255%	289%	300%	320%	300%	320%	300%	320%
	HTPC-WC>1000 kW	344%	258%	292%	320%	340%	320%	340%	320%	340%
Heating	split AC	126%	95%	107%	141%	146%	115%	125%	133%	137%
	VRF	130%	98%	111%	141%	146%	115%	125%	133%	137%
	rooftop	125%	94%	106%	141%	146%	115%	125%	133%	137%
	GEHP	131%	98%	111%	137%	142%	115%	125%	133%	137%
	gasWAH	60%	45%	51%	72%	78%	68%	74%	70%	74%
	elecWAH	30%	23%	26%	30%	32%	30%	32%	30%	32%

4. ECODESIGN MAXIMUM EMISSION VALUES

The maximum emissions allowed under the different sub-options are presented in the following table.

Table 2: Ecodesign maximum NO_x emission requirements (g/kWh)

	BAU			Option A		Option B		Option C	
	2010	2015	2020	2017	2019	2017	2019	2017	2019
rooftop	900	900	900	240	240			350	350
GEHP	900	900	900	240	240			350	350
gasWAH	275	275	275	70	70	200	150	150	150

5. ANALYSIS OF EFFECTS

The figures cited in the tables above, illustrating the effect of the three sub-options in quantitative terms, relate to air heating products that have a rated heat output of up to 1 MW,

cooling products with a rated cooling output of up to 2 MW and high temperature process chillers.

5.1. Economic effects

Total annual energy consumption for air heating products, cooling products and high temperature process chillers in use in the EU is estimated at 2 349 PJ for 2010. This is expected to increase to 2 555 PJ by 2030 under a business-as-usual scenario (a similar scenario to 'no EU action'). The sub-options A, B and C aim to reduce this level of energy consumption, the related carbon dioxide and nitrogen oxide emissions. The effect on overall energy consumption of each of these options is presented in the table below.

Table 3: Total combined energy consumption for the three product types for the different policy options [PJ/year][3]

Energy consumption	1990	2000	2010	2020	2030
BAU	1531	2019	2349	2541	2555
Option A	1531	2019	2349	2225	2242
Option B	1531	2019	2349	2331	2333
Option C	1531	2019	2349	2286	2291

Some parties have argued that the requirements proposed under sub-option A would be too difficult to achieve in the given timeframe and would remove too many models from the market (see also the section on effects on business).

Sub-option B presents the savings that would be achieved were the less stringent requirements preferred by industry to be introduced. The percentage of the savings achieved under sub-option A that would be 'missed' were sub-option B to be introduced instead is 3%.

Sub-option C presents the savings that would be achieved were a 'compromise solution' to be chosen, under which the requirements set would be between those proposed in sub-options A and B. Under this option, there would be 2% of 'missed' savings relative to sub-option A and 1% of extra savings relative to sub-option B.

The requirements that would be introduced under sub-option A phase 1 (from 2017) and especially phase 2 (from 2019) are very stringent as they would affect models representing between 60% and 84% of comfort chiller sales volume over four years (and which accounted for 80-90% of 2010 sales, in financial terms). The requirements to be introduced under sub-option B would affect between 20% and 70% of sales volume (after correction for the improvement in the business-as-usual scenario), and under sub-option C between 45% and 80% of sales volume. These values do not take into account the combined effect of requirements relating to energy efficiency being introduced together with requirements relating to noise levels or emissions of nitrogen oxides, or with other requirements where relevant.

It should be noted that this data is not sales weighted and is therefore only indicative of the potential effects of the measures being considered. It should only be used to compare the

[3] The calculations are based on a changing primary electricity conversion rate — see Annex 2.

relative effects of the different options, but not the actual number of models that would no longer be sold.

Options B and C would not have a proportionally greater effect on larger or smaller manufacturers. Some manufacturers have already adapted their products in order to be able to remain present on the market in Member States where stringent energy efficiency and low-emission requirements are already in force. The Regulation will support manufacturers of air heating products, cooling products and high temperature process chillers that have already gained experience with energy-efficient and low-emission technology.

Total turnover would be almost the same under all three sub-options, at around EUR 44-45 billion/year, slightly higher than in the baseline scenario (EUR 41.6 billion/year). There are only small differences in the distribution of this turnover under the different sub-options. Sub-options A and C have the most stringent minimum energy performance standards, meaning that more efficient technologies are required, which in turn have a positive impact on the turnover of manufacturers, wholesalers, retailers and installers.

5.2. Environmental effects

An appliance's greenhouse gas emissions are calculated on the basis of the fuel or electricity consumption of the appliance and the greenhouse gas emissions created by the consumption of a unit of the fuel or of electricity. The emission values for electricity are based on the results of the study *MEErP 2011*[4].

In the baseline scenario, total greenhouse gas emissions are expected to increase from 119 Mt $CO_{2\ eq}$ in 2010 to around 130 Mt $CO_{2\ eq}$ in 2030, as a result of the combined effect of increased sales and ongoing improvements in energy efficiency, i.e. the ongoing improvement in energy efficiency cancels out part of what would otherwise have been a larger increase, caused by increased sales. The different policy options being considered here would reduce total greenhouse gas emissions in 2030 from the 130 Mt $CO_{2\ eq}$ expected in the baseline scenario to between 120 and 122 Mt $CO_{2\ eq}$, a reduction of 6-8%. The savings are also, in part, attributable to an increase in the efficiency of electricity generation (included in the calculation according to the conversion given in *MEErP 2011*).

Table 4: Total greenhouse gas emissions [Mt $CO_{2\ eq}$/year]

	1990	2000	2010	2020	2030
BAU	84	105	119	129	130
Option A	84	105	119	117	120
Option B	84	105	119	120	122
Option C	84	105	119	119	122

The proportion of total greenhouse gas emissions created by equipment using compressors (i.e. excluding warm air heaters) that is attributable to direct (i.e. refrigerant related) emissions rather than indirect (i.e. electricity consumption related) emissions is expected to increase from 6% in 1990 to 12% in 2020 and further to 17% in 2030 under the baseline scenario, and to 21-22% in 2030 under any of sub-options A to C.

[4] Methodology for Ecodesign of Energy-related Products.

EU policies and measures designed to reduce emissions of polluting substances also have as an objective to reduce emissions of nitrogen oxides. All three of the policy options considered here would contribute to achieving this objective.

The current trend suggests that emissions of nitrogen oxides will fall from 37 kton $SO_{x\ eq}$/year in 2010 to 24 kton $SO_{x\ eq}$/year in 2030.

The industries concerned (manufacturers of gas-engine heat pumps and fuel powered warm air heaters) have declared that they would not be able to meet the requirements proposed under sup-option A, and that the introduction of such requirements would therefore result in a complete phasing-out of these types of product. It must therefore be concluded that the savings offered by sub-option A can only be achieved if a major phasing-out of models is accepted.

Under sub-option B, no limits on nitrogen oxide emissions would be introduced for gas-engine heat pumps, and those for warm air heaters are much less stringent than under sub-option A. Introducing these requirements would produce savings of around 3 kton $SO_{x\ eq}$/year by 2030, compared to the baseline scenario.

Sub-option C includes requirements limiting the allowed nitrogen oxide emissions for gas-engine heat pumps, as some industry actors consider such requirements realistic. The requirements for warm air heaters are identical to those proposed under sub-option B. Due to the extremely large influence of warm air heaters relative to gas-engine heat pumps, sub-options B and C would result in the same level of savings, of 11 kton $SO_{x\ eq}$/year by 2030.

Table 5: Total nitrogen oxide emissions [kton $SO_{x\ eq}$/year]

	1990	2000	2010	2020	2030
BAU	41.6	46.3	36.7	29.2	24.2
Option A	41.6	46.3	36.7	24.1	20.2
Option B	41.6	46.3	36.7	25.3	21.0
Option C	41.6	46.3	36.7	25.3	21.0

5.3. Social effects

All three policy options considered here would have a positive effect on employment, with sub-option A creating 21 000 new jobs in the EU by 2030, sub-option B 12 000 and sub-option C 17 000.

Society's total expenditure on the products covered by the proposed requirements is estimated to reach around EUR 57 billion/year by 2030. This includes the cost of purchasing the product, the cost of the energy used to run the product and the cost of installing new products and maintaining existing products. Were the requirements proposed under any of the three sub-options to be introduced, this would reduce this total expenditure by around 3% per year in 2030.

Table 6: Total expenditure [EUR billion/year]

Total expenditure	1990	2000	2010	2020	2030
BAU	25	35	44	51	57
Option A	25	35	44	49	56
Option B	25	35	44	49	56
Option C	25	35	44	49	56

6. CONCLUSIONS

All three policy options considered in this impact assessment would contribute to an improvement in the energy efficiency of the products in question, and therefore to a reduction in the growth of energy consumption and emissions, compared to their forecast progression in the baseline scenario.

The analysis carried out shows that the three policy options would reduce energy consumption by between 313 and 222 PJ and would reduce emissions of nitrogen oxides by between 4.0 and 3.2 kton $SO_{x\ eq}$/year by 2030.

The table below compares the three options, in terms of how well they fulfil the requirements set out in Article 15 of the Ecodesign Directive.

Table 7: Evaluation of policy options in terms of their effect relative to the base line scenario

	Sub-options			Comment
	A	B	C	
Promote energy efficiency and hence contribute to security of supply	+++	+	++	Option A reduces energy consumption and emissions the most.
Reduce energy consumption and related carbon dioxide emissions	+++	+	++	
Reduce greenhouse gas and nitrogen oxide emissions	+++	+	++	
Have no significant negative impacts on the functionality of the product from the user's perspective	---	0	-	Negative for A as certain products are completely removed from the market (gas-engine heat pumps and warm air heaters) and the sales volumes of others would be seriously affected; neutral for B and slightly negative for C as sales volume would be slightly affected.
Not adversely affect health, safety or the environment	++	0	0	Option A addresses noise; options B and C do not.
Have no significant negative impact on consumers as regards affordability and lifecycle costs	---	0	-	Option A prohibits the sale of certain products; under option B, prices, at least, are affected. Lifecycle costs vary considerably between the different options and between products.
Have no significant negative impacts on the industry's competitiveness	--	0	-	Most negative for A as this option would place the greatest strain on design and engineering and SMEs would have most serious difficulties in keeping pace with developments.
Not impose proprietary technology on manufacturers	--	0	-	
Not impose any excessive administrative burden on manufacturers	**0**	0	0	Neutral for all options, as all options create a similar administrative burden (although slightly less for options B and C, as fan coils are excluded from the scope of the Regulation).

Legend:
+++: very positive impact
++: significant positive impact
+: slightly positive impact
0: neutral impact
-: slightly negative impact
--: significant negative impact

The above assessment shows that, although sub-option A is the most advantageous for the environment, its effect on businesses would be considerable. This leaves sub-options B and C as viable alternatives. A balance needs to be struck between a slightly greater reduction in

harmful effects on the environment (sub-option C) and a slightly lesser effect on business (sub-option B).

Removing noise requirements from the measures to be introduced already reduces the strain that meeting these new requirements places on businesses, and option C is therefore considered to strike the right balance between protecting the environment while maintaining the competitiveness of the industry.