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**COMMISSION STAFF WORKING DOCUMENT**

**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 local space heaters, and**

**Commission Delegated Regulation implementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling for local space heaters**

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## 1. INTRODUCTION

This impact assessment assesses the impacts of different policy options, in the context of the Ecodesign Directive 2009/125/EC and of the Energy Labelling Directive 2010/30/EU, for Local Space Heaters (or 'LSH'), which are define as space heating devices that convert electricity, gaseous, liquid or solid fuels directly into heat in order to provide heating comfort in the space they are situated.

The preparatory studies covering these products concluded that LSH comply with the criteria in Art. 15, sub 1, of the Ecodesing Directive and with the criteria in Art 10, sub 2 of the Energy Labelling Directive and are therefore a candidate for measures under both Directives.

The scope of the impact assessment covers LSH whose maximum rated capacity depends on its fuel:

- Solid fuel local space heaters up to 50 kW rated capacity (heat output);
- Gaseous/liquid fuel fired local space heaters for residential applications up to 50 kW rated capacity;
- Electric local space heaters up to 12 kW rated capacity (heat output);
- Gaseous fuel fired local space heaters for commercial applications (tube radiant and luminous radiant heaters) up to 120 kW input/output;

Further to Article 18 of the 2009/125/EC Directive, formal consultation of stakeholders was carried out through the Ecodesign Consultation Forum on 20 September 2012, consisting of a balanced participation of Member States' representatives and all interested parties concerned with the product group of solid fuel boilers.

## 2. PROBLEM DEFINITION AND OBJECTIVES

The local space heaters in the current stock of the EU space heating appliances are significant energy users, thereby contributing to greenhouse gas emissions. The improvement of energy efficiency is able to increase the security of energy supply.

In addition to the energy consumption of LSH using any fuel, solid fuel fired local space heaters in particular contribute significantly to emissions of particulate matter (PM), organic gaseous carbon (OGC) and carbon monoxide (CO). Furthermore, LSH also release emissions of NOx (oxides of nitrogen). Thus, by setting requirements for emissions from these products, the negative impacts of emissions affecting air quality and human health can be signifacantly reduced.

Currently, there is no EU legislation specifically dealing with the energy consumption and the emissions of local space heaters. This has led to a situation where individual Member States have addressed environmental parameters of local space heaters through national regulations, especially with regard to solid fuel operated LSH. Nevertheless, these national legislations does not address the problem for the EU as a whole and maintain the situation of

transboundary air pollution across national borders as not all Member States are legislating for emissions of solid fuel boilers.

## 3. POLICY OPTIONS

Options 'no EU action', 'self-regulation', 'ecodesign requirements only' and 'mandatory energy labelling scheme only' were discarded since they do not achieve the objectives and they received no support from stakeholders. The option 'ecodesign requirements and energy labelling' was divided into five sub-options.

All sub-options include ecodesign requirements on energy efficiency and maximum emission values of PM, OGC and CO. Different timings for the entering into force of the requirements have been analysed.

For solid fuel local space heaters using biomass, a biomass label factor (BLF) multiplying the efficiency would apply for the determination of the energy efficiency class of biomass LSH. This is in order to compensate for the fact that biomass fuel LSH are inherently less efficient that gas and oil LSH, but their use is preferred as they use renewable energy.

All sub-options include energy labelling for LSH, but the options of using of a single label covering all fuels, covering only combustion LSH under the labelling scheme and using two different scales for combustion and non-combustion LSH have been analysed.

**Table 1: Overview of evaluated sub-options**

| Sub-option | Energy efficiency | Emissions | Labelling |
|---|---|---|---|
| A | 3 TIERS (2016/2018/2020) | 3 TIERS (2016/2018/2020) | Single scale for all fuels |
| B | 3 TIERS (2016/2018/2020) | 2 TIERS (2016/2018) | Only Combustion LSH |
| C | 3 TIERS (2016/2018/2020) | 2 TIERS (2016/2018) | 2 scales (combustion and non-combustion) |
| D | 2 TIERS (2016/2018) | 2 TIERS (2016/2018) | 2 scales (combustion and non-combustion) |
| E | 1 TIER (2018) | 1 TIER (2018) | 2 scales (combustion and non-combustion) |
| PM | To be combined with any of the previous options | | |

### 3.1. Sub-option A: ME&EPS[1] 2016/2018/2020 and energy labelling

The requirements of sub-option A are given in Table 2 and Table 3 and correspond to the proposal of the working document for the 20 September 2012 Consultation Forum meeting.

**Table 2: Ecodesign minimum energy efficiency requirements for sub-option A**

| | | | TIER I | TIER II | TIER III |
|---|---|---|---|---|---|
| **Solid fuel LSH** | Open fire | NCV | 41% | 47% | 52% |
| | Closed fire | | 70% | 75% | 80% |

[1] Minimum Energy and Emission Performance Standards

| | | | | | |
|---|---|---|---|---|---|
| | Cookers | | 65% | 70% | 80% |
| | Pellet LSH | | 86% | 86% | 89% |
| **Electric LSH** | Portable | SPB | 30% | 31% | 32% |
| | Fixed | | 30% | 35% | 39% |
| **Gas or liquid fuel LSH** | Open fire | | 45% | 50% | 50% |
| | Closed fire | | 65% | 70% | 80% |
| **Non-residential LSH** | Luminous heaters | S GCV | 82% | 89% | 89% |
| | Tube heaters | | 78% | 83% | 83% |

**Table 3: Ecodesign maximum emission requirements for sub-option A[2].**

| **Carbon monoxide (CO)** | | | |
|---|---|---|---|
| Solid fuel LSH only | **TIER I** | **TIER II** | **TIER III** |
| Open fire | 3500 | 2000 | 1500 |
| Closed fire | 3500 | 2000 | 1250 |
| if using Pellets | 500 | 400 | 250 |
| Cooker | 4500 | 3500 | 1500 |
| **Organic gaseous compounds (OGC)** | | | |
| Solid fuel LSH only | **TIER I** | **TIER II** | **TIER III** |
| Open fire | 160 | 120 | 80 |
| Closed fire | 160 | 120 | 80 |
| if using Pellets | 100 | 60 | 40 |
| Cooker | 160 | 120 | 80 |
| **Particulate matter (PM)** | | | |
| Solid fuel LSH only | **TIER I** | **TIER II** | **TIER III** |
| Open fire | 150 | 75 | 40 |
| Closed fire | 150 | 75 | 40 |
| if using Pellets | 100 | 50 | 30 |
| Cooker | 150 | 75 | 40 |

All limit values presented for emission from solid fuel LSH are based in the heated filter method described in Annex A.1 of CEN/TS 15883.

### 3.2. Sub-option B: ME 2016/2018/2020, EPS 2016/2018 and modified energy labelling (not for non-combustion LSH)

Sub-option B uses the same energy efficiency requirements proposed for sub-option A. This sub-option reflects the approach suggested by some Member States and stakeholder representatives during the Consultation Forum of 20 September 2012.

For emission requirements an earlier implementation of more ambitious targets with only 2 tiers is proposed in sub-option B. The Tier 1 on sub-option A is skipped and the requirements of the Tier 1 correspond to the requirements of the Tier 2 on sub-option A.

Based on requests from stakeholders during the Consultation Forum, the energy labelling scheme of this sub-option excludes from its application non-combustion LSH.

[2] Given in $mg/m^3$ @ 13% $O_2$, referring to dry exit flue gas, 0°C, 1013 mbar. PM does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air.

### 3.3. Sub-option C. ME 2016/2018/2020, EPS 2016/2018 for energy efficiency of LSH and modified energy labelling (combustion and non-combustion products)

Sub-option C is identical to sub-option B in relation to minimum energy efficiency and maximum emission values requirements.

The main difference is in the energy labelling scheme for this sub-option which includes a labelling scale for non-combustion LSH and another labelling scale for combustion LSH.

The different requisites for installing combustion and non-combustion LSH make it very difficult to compare them under the same labelling scheme as the combustion and non-combustion LSH, although performing the same basic function (heating a space); do not have the same patterns of use or infrastructure requirements. In practice, these products are not substitutes for consumers that will compare non-combustion LSH versus other non-combustion LSH and combustion LSH versus other combustion LSH.

In consequence, a specific labelling scheme is used for non-combustion LSH due to their different usage patterns and infrastructure requirements. Non-combustion LSH are able to populate all energy classes and only if using advanced controls are able to achieve A or B classes.

Table 4 and Table 5 present the proposed labelling scales for combustion and non-combustion LSH.

**Table 4: Energy efficiency labelling for combustion LSH**

| Seasonal space heating energy efficiency class | Seasonal space heating energy efficiency, in % |
|---|---|
| $A^+$ | $\eta_S \geq 108$ |
| A | $95 \leq \eta_S < 108$ |
| B | $82 \leq \eta_S < 95$ |
| C | $76 \leq \eta_S < 82$ |
| D | $70 \leq \eta_S < 76$ |
| E | $65 \leq \eta_S < 70$ |
| F | $60 \leq \eta_S < 65$ |
| G | $\eta_S < 60$ |

**Table 5: Energy efficiency labelling for non-combustion LSH**

| Seasonal space heating energy efficiency class | Seasonal space heating energy efficiency, in % |
|---|---|
| A | $\eta_S \geq 40$ |
| B | $38 \leq \eta_S < 40$ |
| C | $36 \leq \eta_S < 38$ |
| D | $34 \leq \eta_S < 36$ |
| E | $32 \leq \eta_S < 34$ |
| F | $30 \leq \eta_S < 32$ |
| G | $\eta_S < 30$ |

### 3.4. Sub-option D. ME&EPS 2016/2018 for LSH and modified energy labelling (combustion and non-combustion LSH).

Sub-option D considers ecodesign energy efficiency requirements for LSH in two tiers 2016/2018. Therefore energy savings should be realised more quickly than under sub-options A, B and C. The former Tier 1 on sub-options A, B and C is skipped and the requirements of the new Tier 1 correspond to the requirements of the former Tier 2 on sub-options A, B and C. The second tier in sub-option D correspond to the third tier in sub-options A, B and C.

The maximum emission values are identical to those used in sub-options B and C.

The energy labelling scheme for this sub-option is identical to the one used in sub-option C.

### 3.5. Sub-option E. ME&EPS 2018 and modified energy labelling (combustion and non-combustion LSH).

Sub-option E considers ecodesign energy efficiency and emission requirements for LSH in only one tier, applicable as of 2018.

This option would avoid the need for notification procedures for Member States that already have legislation in place. Energy savings before 2018 can be realised through the energy labelling scheme.

The energy labelling scheme of this sub-option is identical to the one used in sub-options C and D.

### 3.6. Indication of the PM emission level on the label

The indication of particulate matter (PM) could be combined with any of the proposed sub-options (A-E). Of the emissions types for which ELVs are proposed, particulate matter is the most important in terms of impact on air quality and human health. The indication of PM emissions on the label could further reduce such emissions, as consumers may choose for LSH with lower emissions out of concern of local pollution and authorities might promote such LSH.

Nevertheless, different methods exist for measuring the PM emissions from solid fuel LSH, these methods are presented in CEN/TS 15883. These methods lead to different results. The repeatability and comparability needs to be ensured in order to provide accurate and relevant information to consumers.

The impacts of this sub-option are the same as the chosen sub-option with which it is combined except for PM emissions, where due to the higher level of information provided to consumers the emissions would be reduced to a higher extent. The specific impact depends on the assumptions made on consumer behaviour and no data on this matter is available.

Nevertheless, it is to be taken into account that all sub-options propose in any case very stringent requirements in their last tier for PM emissions. In consequence, as ecodesign requirements will be close to BAT technologies after 2, 4 or 6 years of the entering into force of the Regulation the reduction of PM emissions due to their indication on the label will be

limited and will only have effect during a short period of time between the entering into force of the energy labelling Regulation (2016) and the entering into force of the most stringent requirements (2018 or 2020).

## 4. ANALYSIS OF IMPACTS

The quantitative impacts presented cover LSH with a rated capacity below 50 kW for solid fuel LSH, 70 kW for gas and liquid fuel LSH, 12 kW for electric LSH and 120 kW for commercial radiant and tube heaters.

### 4.1. Economic impact

Due to the growing stock of LSH, energy consumption will increase in the future. In the baseline, the energy consumption of these appliances can rise to 2362 PJ/year (656.1 TWh/year) in 2020 and to 2404 PJ/year (667.7 TWh/year) in 2030.

The future energy consumption of LSH will be reduced by between 2% and 8% in year 2020 depending on the chosen sub-option. The energy consumption in 2030 will be reduced by 12% or 13% depending on the sub-option to be implemented. This reduction of energy consumption will contribute to the security of energy supply of the EU.

The analysed policy options do not affect competitiveness of European industry. Exact figures are not available, but extra-EU imports are currently only very few percentages. Manufacturers expect them to increase but there is no difference between the baseline and the different options in terms of imports. In any case, development of innovative technology due to requirements set and additional policy implemented will increase competitiveness of European manufacturers in other markets like China, where solutions regarding fuel consumption or the problem of PM emissions and other pollutants will become increasingly important. Moreover, regulation will foster competition between manufacturers within Europe, where markets seem to be not fully integrated yet.

All sub-options have almost the same total turnover, which is slightly lower than in the baseline (96.8 billion €/year) while the different sub-options are in the area of 91 billion €/year. Differences in the distribution are small between different sub-options. Sub-options D and E have the most stringent MEPS and therefore more efficient technologies are required, which have a positive impact on the manufacturer, wholesale and retail/installer turnover.

### 4.2. Environmental impact

Greenhouse gas (GHG) emissions are calculated based on the fuel or electricity consumption and the specific GHG emission of a fuel or unit of electricity.

GHG emissions will decrease from 85 Mt $CO_{2eq}$ to 77 Mt $CO_{2eq}$ in the baseline as an effect of ongoing improvement of energy efficiency. All policy options reduce GHG emissions compared to baseline to 66-67 Mt, a reduction of 13-14%.

The current trend will reduce PM emissions by 20 kton/year in 2020 and by 61 kton/year in 2030 compared to 2010 values. These values could be increased up to 37 kton/year in 2020 and 88 kton/year for sub-options D and E.

The indication of the PM emissions on the label has also been analysed. The most optimistic but unrealistic scenario for PM reductions would mean that the indication of PM emissions on the label would lead all consumers to choose BAT products from the entering into force of the Labelling Regulation (2016), which would be equivalent to the entering into force of the most stringent emission requirements already in 2016.

This would save additional 3.3 kton/year of PM emissions for options B and C, 2.1 kton/year for option D and 2.4 kton/year for option E. Option A is not further analysed because emission requirements were considered no stringent enough by Consultation Forum Members (Annex 1) and it would be incoherent to combine soft requirements with the proposed labelling of PM emissions.

These positive reductions in PM emissions are however not feasible in practice as not all consumers will take into account PM emissions when making their purchasing decisions. A still optimistic estimation assuming that 10% of the consumers will choose products with the lowest PM emission values leads to additional reductions on PM emissions below 0.5 kton/year for all scenarios.

The current trend will reduce OGC emissions by 32 kton/year in 2020 and by 70 kton/year in 2030 compared to 2010 values. These values could be increased to 36 kton/year in 2020 and 75 kton/year in 2030 for sub-option E, similar values are found when analysing sub-option D.

The current trend will reduce CO emissions by 78 kton/year in 2020 and by 225 kton/year in 2030 compared to 2010 values. These values could be increased to 330 kton/year in 2020 and 813 kton/year in 2030 for sub-option D, similar values are found when analysing sub-option E.

### 4.3. Social impact

All policy options have a positive impact on employment, creating around 24000 jobs in the EU in year 2030; most of these jobs are to be created on the retailer/installer sector.

Total expenditure is foreseen to increase from 90 billion €/year in 2010 to 92 billion €/year in 2020 and 93 billion €/year in 2030 in the base case scenario. All proposed sub-options lead to an overall expenditure between 88 billion €/year and 93 billion €/year in 2020 and around 84 billion €/year in 2030.

## 5. CONCLUSIONS

All policy options analysed in this impact assessment contribute to an improvement of energy efficiency and therefore to a reduction in growth of solid fuel consumption and emissions compared to baseline development.

The analysis shows that the policy options save between 62 and 183 PJ (17.2 and 50.8 TWh) in 2020, reduce PM emissions by between 9% and 14% in 2020, reduce OGC emissions by between 2% and 5% in 2020 and reduce CO emissions by between 7% and 16% in 2020.

The analysis indicates that the policy options save between 207 and 313 PJ (57.5 and 86.9 TWh) in 2030, reduce PM emissions by between 36% and 42% in 2030, reduce OGC emissions by between 5% and 11% in 2030 and reduce CO emissions by between 31% and 40% in 2030.

**Table 6: Evaluation of policy options in terms of their impacts compared to the base line**

| | Sub-options | | | | |
|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** |
| Promote energy efficiency hence contribute to security of supply | + | + | + | ++ | ++ |
| Reduce energy consumption and related $CO_2$ missions | + | + | + | + | + |
| Reduce PM, OGC and CO emissions | + | + | + | ++ | ++ |
| 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 | + | + | + | + | + |
| No significant negative impact on consumers in particular as regards affordability and life-cycle costs | + | + | + | + | + |
| No significant negative impacts on industry's competitiveness | + | + | + | + | + |
| Setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers | + | + | + | + | + |
| Impose no excessive administrative burden on manufacturers | + | + | + | + | + |

Legend:

++: very positive impact

+: condition met;

-: condition not met.

The preferred sub-options are sub-options D and E[3] [4] and indication of particulate matter on the label could be added to that. Impacts on energy consumption and emissions are very similar for these sub-options, sub-option D achieves a European harmonisation of minimum requirements for placing LSH on the market earlier, while sub-option E avoids notification procedures for Member States that already have national legislationin place.

Due to lack of data regarding NOx emissions from LSH in Europe, it was not possible to quantify the impacts of NOx regulation. However, in order to prevent an increase of NOx emissions due to new LSH technology it is recommended that a limit value for NOx emissions from LSH is set in order to avoid the increase of this emissions in the future.

[3] The Ecodesign Regulatory Committee voted on 10 October 2013 on ecodesign requirements for local space heaters using gas, liquid fuel or electricity for the year 2018 that closely resemble option E.

[4] The Ecodesign Regulatory Committee voted on 14 October 2014 on ecodesign requirements for solid fuel local space heaters for the year 2022 that closely resemble tier 3 of option A.

For solid fuel LSH the limit regarding NOx is set at 200 mg/Nm3 (at 13% O2) when measured according to the relevant methods indicated in CEN/TS 15883:2009, a level that is technically feasible based on analysis of recent LSH5.

For gas and liquid fuel LSH it is proposed to set a limit value for NOx emissions of 130 mg/kWhinput based on NCV. This value corresponds with the value used in 2002 Blue Angel RAL UZ 71.

For radiant and tube heaters the NOx limit value is proposed to be set at 200 mg/kWhinput based on NCV. This value corresponds with the typical value identified in the lot 20 preparatory study.

For the review of the proposed Regulations, it is recommended to request to the European Standardisation Organisation the development of a standard for measuring the emissions from LSH that takes into account real life use of these products.

[5] See BAT analysis in Lot15 Preparatory Study Task 6.