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COMMISSION STAFF WORKING DOCUMENT

Accompanying document to the

**PROPOSAL FOR A COMMISSION REGULATION
implementing Directive 2005/32/EC with regard to motors**

SUMMARY IMPACT ASSESSMENT

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SUMMARY IMPACT ASSESSMENT

Lead DG: DG TREN

Associated DG: DG ENTR

Other involved services: SG, LS, DG ENV, DG COMP, DG ECFIN, DG INFSO, DG MARKT, DG SANCO, DG TRADE, DG RTD.

EXECUTIVE SUMMARY

The Ecodesign Framework Directive lists products which have been identified by the Council and the European Parliament as priorities for the Commission for implementation. The Spring Council 2007 called for thorough and rapid implementation of the five priorities¹ set by the Energy Council on 23 November 2006², based on the Commission's Action Plan on Energy Efficiency. One of those priorities is to "dynamically and regularly improve and expand the scope of minimum efficiency requirements for energy-using products by "fully utilizing the Ecodesign Directive", including appliances in motor driven systems, such as motors, drives, pumps and fans (Article 16). These products are one of the priority product groups considered for implementing measures under the Ecodesign Directive. The need to quickly come up with minimum energy performance requirements for these devices has been emphasised in the Article 16.2 of the Ecodesign Directive and supported by the Member States representatives and the stakeholders in the Consultation Forum.

The approach for developing the proposed ecodesign implementing regulation for motors and its impact assessment was structured in four steps:

Step 1: assessment of the criteria for an Ecodesign implementing measure as laid out in Article 15(2a)-15(2c) of the Ecodesign Directive, taking into account the Ecodesign parameters identified in Annex I of the Ecodesign Directive;

Step 2: consideration of relevant Community initiatives, market forces and environmental performance disparities of the equipment on the market with equivalent functionality as laid out in Article 15(2) of the Ecodesign Directive);

¹ Brussels European Council 8/9 March 2007, Presidency Conclusions, 7224/07.

² TTE (Energy) Council on 23 November 2006, 15210/06.

Step 3: establishing policy objectives including the desirable level of ambition, the policy options to achieve them, and the key elements of the Ecodesign implementing measure as required by Annex VII by the Ecodesign Directive;

Step 4: environmental, economic and social assessment of the impacts on environment, consumers and industry, with a view to the criteria on implementing measures set out in Article 15(5) of the Ecodesign Directive.

- Step 1

In order to assess the criteria for Ecodesign implementing measures as laid out in Article 15(2) of the Ecodesign Directive, the Commission has carried out a technical, environmental and economic preparatory study on motors, pumps, circulators and fans³ following the provisions of Article 15(4a) and Annexes I and Annex II of the Ecodesign Directive. The study has shown that (1) motors are placed on the EU market in large quantities but surprisingly with little control technology⁴, such as variable speed drives (VSD), (2) the environmental impact related to the life cycle energy consumption and electricity consumption of motors is significant, (3) there is a wide disparity in the environmental impacts of motors currently on the market, and technical cost-effective solutions exist that could lead to significant improvements. These criteria are fully met by motors. Motors covered include all general-purpose, single-speed, three-phase, 50 Hz and 60 Hz, cage-induction motors in the power range of 0,75-375kW. Drives covered include VSDs⁵ used in conjunction with these motors.

With regard to the criteria established by Article 15(2) of the Ecodesign Directive, the preparatory study has established the following results for motors in EU, covered by this impact assessment:

Table 1: Total motors (figures given for 2005)

Article 15 (2a):	Annual sales volume in the Community	10,3 million units
Article 15 (2b):	Environmental impact: energy consumption of motors (BaU)	1100 TWh⁶
Article 15 (2c):	Improvement potential of motors (applying existing cost-effective technology)	31 TWh
Article 15 (2c):	Improvement potential of motors and drives (applying existing cost-effective technology)	171 TWh

³ "Preparatory studies for ecodesign requirements – Lot 11 on electric motors, water pumps, circulators in buildings and fans for ventilation in non-residential buildings. Available on: <http://www.ecomotors.org>.

⁴ Control technology, or 'controls', refers to equipment used to control the speed of machinery.

⁵ Variable Speed Drives

⁶ This represents 40 % of the total EU electricity consumption of about 2760 TWh in 2005.

The sector is economically significant. Motor unit sales in the EU27 (2005) amount to 10,3 million units per annum. The combined turnover of motor industry and trade is over €2,5 billion. Extra-EU imports account for only 15-25% of sales, meaning that most of sales are from EU-based industry.

Motors alone consume about **40% of all electricity in the EU27**. In terms of (indirect) CO₂ emissions, motors are responsible for around 12% of the total CO₂ emissions in the EU27, second largest emitter after space heating products within the scope of the 2005/32/EC Directive.

The significant aspect for improving the environmental performance of motors is the life cycle energy consumption. Impacts from production and distribution are minor compared to the use-phase impact. The use-phase electricity consumption of motors can be reduced significantly in a cost effective way in using high-efficient motors in full speed applications and using motors with appropriate controls in variable speed operations.

There is a potential to improve the energy efficiency of motor systems by roughly 20% to 30%. A recent study by Eurelectric⁷ shows that the electricity saving potential of motors is around 1% and with the drives 5,5% of the total EU27 electricity consumption⁸. Translated back to the fact that motors and drives consume 40% of the total, this would mean a saving potential within the group of 16-17% overall⁹.

In terms of motor efficiency the EU is lagging behind the United States where the ACEEE/ NEMA Agreements has succeeded in bringing the standard efficiency IE2 type motor to a market share of 54% and the high-efficient IE3 (NEMA) to a market share of over 15%.

The objective of the proposed Regulation is to trigger the market transformation needed to realise the improvement potential. Compared to a business as usual (BaU) scenario it is estimated that the proposed regulation will lead to annual use-phase electricity consumption saving in EU of about 139 TWh by 2020, corresponding to an annual reduction of 64 Mt CO₂ emissions.

The improvement potential is due to the fact that cost-effective technical solutions and products already exist on the market, but has practically no market share. In 2006, the market share for high-efficient IE3 motors remained within few percentages at best while the market share of standard efficiency IE2 motors was 12% (for comparison, in the US, this figure is 70%).

The aggregated energy-saving potential of 139 TWh in 2020 is close to the total annual electricity consumption of Sweden (2008), and is therefore considered to be very significant.

- Step 2

Further to Articles 15(2) and 15(4c) of the Ecodesign Directive, relevant Community and national environmental legislation is considered. Related (voluntary) initiatives both on

⁷ Eurelectric/ UIE, Electricity for More Efficiency : Electric Technologies and their Energy Savings Potential, Report Ref: 2004-440-0002, 2004.

⁸ 3106 TWh in 2007.

⁹ Total potential refers to total stock replacement, i.e. beyond 2020 (motor life time is 20 years for big motors).

Community and Member State level are taken into account, and barriers preventing for market take up of technologies with improved environmental performance leading to market failures are analysed.

The Ecodesign Directive implies that legislative action on motors cannot be taken on Member State level, and the Member States expect that a harmonized legislative framework is set, the legal basis being Article 95 of the Treaty.

Several market failures have been identified to explain that cost-effective technologies leading to energy efficiency improvements are not penetrating the market to a satisfactory extent by market forces alone. Not all environmental costs are included in electricity prices. Consumer choice is made on the basis of the purchase price, as the lower electricity price is not reflecting environmental costs for the society (negative externality).

A part from using high-efficient motors, a main consumer related barrier for energy efficiency is the fact that consumers are not able to consider the cost-efficiency of the use of control technology and the full life-cycle cost of the motor and its related drives. The purchase price is well visible and is typically higher for energy efficient motors. On the other hand, information on running costs/cost savings is not explicit and can be obtained only with difficulties (asymmetric information).

However, the main element leading to the excessive power consumption of motors is the fact that control technology is not used with motors in variable speed applications. The only exception is Germany, where one of every three motors sold is already equipped with a VSD. However, the German VSD market is about 50% of the total EU27 market.

As a result, manufacturers have no incentive to reduce the energy consumption of motors, even though this could be done at reasonable additional cost to the manufacturer and would bring significant savings to the consumer and reduced CO₂ emissions.

In addition, practically all motors are sold in the OEM¹⁰ market, where the motor manufacturer do not pay the electricity bill generated by the use of the motor application, which makes the purchase/selling price the first priority rather than the life cycle cost (split incentives). This causes a market failure and, consequently, the improvement potential is not realized. This is further discussed in Section 2.

- Conclusions on Step 1 and 2

Over the coming years the amount of motors sold in the EU and the associated energy consumption will continue growing, in particular in the new Member States. However, low-efficient IE1 motors are dominating European motor sales. Existing cost-effective solutions that allow reducing the energy consumption of these devices are not applied because of the market failures outlined above. The existing policy initiatives will have only a very limited impact on the environmental performance of motors. In the light of the important savings potential, and in the absence of Community action, there is a risk that future initiatives at Member State level could hamper the free circulation of these products within the internal market.

¹⁰ Original Equipment Manufacturer is the original manufacturer of a component for a product, which may be resold by another company.

It is concluded that the criteria for Ecodesign implementing measures as set out in Article 15(2) of the Ecodesign Directive are met, and motors shall be covered by an Ecodesign implementing measure pursuant to Article 15(1) of the Ecodesign Directive.

- Step 3

The Annex II of the Ecodesign Directive provides that the level of ambition for improving the environmental performance and electricity consumption be determined by an analysis of the least life cycle cost for the user of equipment. Furthermore, benchmarks for technologies yielding best performance, as developed in the preparatory study and the discussions with stakeholders during the meeting of the Ecodesign Consultation Forum¹¹ on 29 May 2008, are considered. The minutes of these meeting are attached in Annex 1. The results are reflected in the objectives that the proposed regulation aims to achieve.

The objective of the proposed Implementing Regulation is to trigger the market transformation that would enable the realisation of the improvement potential. Several policy options were considered, including self-regulation, mandatory energy labelling and mandatory minimum energy performance requirements. This is discussed in Section 3. However, due to the mandate of the Legislator for establishing ecodesign requirements for motors, the depth of the analysis for options other than an ecodesign implementing measure is proportionate for an implementing legal act, and the focus is on the assessment of the proposed implementing regulation. This is discussed in the first part of Section 4.

- Step 4

An assessment of the proposed implementing measure is carried out. In particular, sub-options for Ecodesign requirements in several stages are analysed, taking into account the criteria set out in Article 15(5) of the Ecodesign Directive, and the impacts on manufacturers including SMEs. This is discussed in Section 5. The considered sub-options are as follows:

1. **IE2:** IE2 mandatory from 2011;
2. **IE2+IE3:** IE2 mandatory for all motors from 2011 and IE3 from 2015 for motors > 7,5 kW;
3. **IE3:** IE2 mandatory for all motors from 2011 and IE3 from 2015 for all motors;
4. **VSD/IE3 II:** IE2 mandatory for all motors from 2011 and either IE2+VSD or IE3 for motors 7.5-375 kW from 2015 and either IE2+VSD or IE3 for motors 0.75-375 kW from 2017.

¹¹ The Consultation Forum is a balanced formation of the Member States representatives and of affected parties such as the industry, consumer and environmental NGOs called to express their views.

The considered sub-options lead to gross savings as detailed in Table 2.

Table 2. Electricity Savings 2020 in TWh vs. BaU:			
	Use	Savings	
		TWh/a	%
BaU	1252		
IE2	1207	45	3,6%
IE2+IE3	1209	43	3,5%
IE3	1188	65	5,2%
VSD/IE3	1114	139	11,1%
Electricity Savings 2020 in EUR vs. BaU:			
	Expenditure	Savings	
		bln. Euro	%
BaU	111,0		
IE2	107,3	3,7	3,3%
IE2+IE3	107,6	3,4	3,0%
IE3	106,0	5,0	4,5%
VSD/IE3	102,1	8,5	7,7%
Carbon (CO₂ eq) Savings 2020 vs. BaU			
	Emissions	Savings	
		Mt CO₂ eq/a	%
BaU	574		
IE2	553	21	3,7%
IE2+IE3	554	20	3,6%
IE3	544	30	5,3%
VSD/IE3	510	64	11,5%

The preferred choice in terms of expected savings is the fourth sub-option VSD/IE3.

- Conclusions on Step 3 and 4

A comparison of objectives (sub-options within the option on ecodesign implementing measure) shows that the appropriate policy option for realizing the improvement potential of motors is a Commission Regulation setting ecodesign requirements in three tiers with entering into force one year, five years and seven years respectively after the proposed regulation has entered into force. This approach ensures that:

- cost-effective potentials to improve the electricity consumption of motors are quickly realized, leading to important electricity and CO₂ savings in the Community, while reducing the life-cycle costs of these devices for consumers;
- by 2020, the annual electricity consumption of motors will be reduced by 139 TWh compared to a business as usual scenario. Due to motor life of 20 years for big motors, these savings will reach 1573 TWh by 2025, which is close to half of the EU electricity consumption in 2007¹²;
- a clear legal framework providing a level playing field for manufacturers, ensuring fair competition and free circulation of products;
- requirements for motors are harmonized in the Community, leading to a minimization of administrative burdens and costs for the economic operators;
- disproportionate burdens for manufacturers are avoided due to transitional periods which duly take into account redesign cycles;
- SMEs, which would face more difficulties than big manufacturers in investing for high-efficiency IE3 motors, will have less obligations to do so, as the standard-efficiency IE2 motor can still be put on market when equipped with a VSD;
- important additional energy savings outside the EU27 can be expected, as several third countries are following the EU legislation approach on motors. Motors are sold in global markets, where the European manufactures belong among the biggest ones.

As laid out in Section 6, monitoring of the impacts will mainly be done by market surveillance carried out by Member State authorities ensuring that the requirements are met, whereas the appropriateness of scope, definitions and concepts will be monitored by the ongoing dialogue with stakeholders and Member States.

¹² 3160 TWh.