Brussels, 25 November 2013

Dear Mr. González Álvarez,

EPEE and Eurovent would like to thank you for giving us the opportunity to provide comments on the Working Documents on air heating products, cooling products and high temperature process chillers (Ecodesign ENTR Lot 6/ENER Lot 21 and parts of ENTR Lot 1).

We are particularly concerned about the level of ambition concerning the suggested minimum Ecodesign requirements. As they stand now, the requirements would ban more than 90% of the products from the market.

In addition, the suggested sound power requirements are in our view severe impediments to achieving more efficient products, as decreasing the sound power of the products would also decrease their efficiency.

Below you will find detailed comments on those and additional points we would like to raise as part of the consultation on the Working Documents.

We remain at your disposal for any questions or comments you may have.

Kind regards,

Andrea Voigt, AP EuroConsult sprl
Director General EPEE
a.voigt@epeeglobal.org

Felix van Eyken
General Secretary, Eurovent
felix.vaneyken@agoria.be

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

Executive Summary

EPEE and Eurovent would first like to emphasize the need to consider the incompatibility of the proposed Ecodesign requirements and the upcoming revision of the F-gas regulation which creates uncertainty for manufacturers. If a ban or phase down of HFC is enforced, all or most of the product ranges will need to be re-designed. For example, it is currently uncertain if the proposed energy efficiencies and required safety can be achieved with alternative refrigerants.

Secondly, EPEE and Eurovent would like to raise awareness of the need to more thoroughly investigate the trade-off between sound power requirements and energy efficiency. This is because the proposed sound power requirements would result in reduced energy efficiency.

EPEE and Eurovent would also like to emphasise the following points, which are explained in more detail below:

- The current proposal of minimum requirements would ban more than 93% of the products on the market today. This is unacceptable for our industry. To achieve the necessary energy savings whilst maintaining the competitiveness of our industry, we therefore propose the following minimum requirements for chillers with an additional capacity class:

Commission			
Product group		Tier 1	Tier 2
Aircooled	< 400 kW	157%	161%
	≥ 400 kW	173%	185%
Watercooled	< 400 kW	196%	200%
	≥ 400 kW	256%	272%

EPEE/Eurovent			
Product group		Tier 1	Tier 2
Aircooled	< 400 kW	137%	149%
	≥ 400 kW	137%	157%
Watercooled	< 400 kW	172%	188%
	400-1500kW	196%	236%
	≥ 1500 kW	236%	256%

- We disagree with a bonus on efficiency based on the GWP of refrigerants. Refrigerants are regulated by the F-gas Regulation.
- Sound power requirements need to be deleted. Information requirements are sufficient, as this Regulation focuses on efficiency, and sound requirements negatively impact energy efficiency.
- For HT process chillers, EPEE and Eurovent believe that it is sufficient to set requirements on the bases of SEER only and deem a requirement on SEPR unnecessary.

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

EPEE and Eurovent Position on the working documents on requirements for air heating products, cooling products and high temperature process chillers

1. Minimum Requirements

1.1. Chillers

Based on the findings of the preparatory study (table 7-26), tier 1 bans up to 89% of the market and tier 2 up to 93%. This is unacceptable.

Table 7 - 26 . Illustration of the impact of $SEER_{net}$ MEPS on air-conditioning chillers certified by Eurovent in 2012

Illustration of the possible impact of $SEER_{net}$ MEPS on air-conditioning chillers *remaining products in the 2012 Eurovent database*									
Indicators	Scenario 1			Scenario 2			Scenario 3		
	2015	2017	2019	2015	2017	2019	2015	2017	2019
Air-cooled chillers < 400 kW									
$SEER_{net}$	3.5	3.8	4.1	3.8	4.0	4.1	4.0	4.1	4.1
$ESEER_{net}$	3.8	4.1	4.45	4.1	4.35	4.45	4.35	4.45	4.45
% RP(*)	46%	17%	4.5%	17%	6.5%	4.5%	6.5%	4.5%	4.5%
Air-cooled chillers >= 400 kW									
$SEER_{net}$	3.5	4.0	4.4	4.0	4.4	4.7	4.4	4.7	4.7
$ESEER_{net}$	3.7	4.25	4.65	4.25	4.65	5.0	4.65	5.0	5.0
% RP(*)	70%	12%	1%	12%	3.5%	1%	3.5%	1%	1%
Water-cooled chillers < 400 kW									
$SEER_{net}$	4.5	4.9	5.2	4.9	5.1	5.2	5.1	5.2	5.2
$ESEER_{net}$	4.95	5.4	5.75	5.4	5.65	5.75	5.65	5.75	5.75
% RP(*)	54%	20%	7.5%	20%	9%	7.5%	9%	7.5%	7.5%
Water-cooled chillers >= 400 kW									
$SEER_{net}$	5.1	6.1	6.6	6.1	6.6	7.0	6.6	7.0	7.0
$ESEER_{net}$	5.35	6.4	6.95	6.4	6.95	7.35	6.95	7.35	7.35
% RP(*)	55%	13%	5.5%	13%	6%	5.5%	6%	5.5%	5.5%

This ban is unreasonable and the following should be considered:

- The market for chillers consists to a large extent of SMEs. The proposed requirements would negatively affect the competiveness of these SMEs.
- Furthermore, the redesign cycle of chillers is much longer than the redesign cycle of smaller air conditioning products. The target date for the current Ecodesign requirements is therefore not compatible with the length of the redesign cycles of chillers.
- Instead, a combination of relatively lower requirements and a relatively longer time for their implementation are necessary in order to achieve the desired energy savings for these products.
- Furthermore, the current uncertainties stemming from the ongoing review of the F-gas regulation makes it difficult to predict the actual impact of the proposed Ecodesign requirements, as the efficiency of air conditioning products is dependent on the choice of refrigerants.
- Moreover, the proposed requirements need to balance differences in the operation chillers in cooling and heating systems. Due to the reversibility of some chillers, improving the cooling function does not necessarily result in improving the heating function and vice versa. Since the heating requirements have been decided under another Ecodesign implementing

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

measure, the cooling requirements should take these into account in order to allow for a feasible balancing of cooling and heating efficiency.

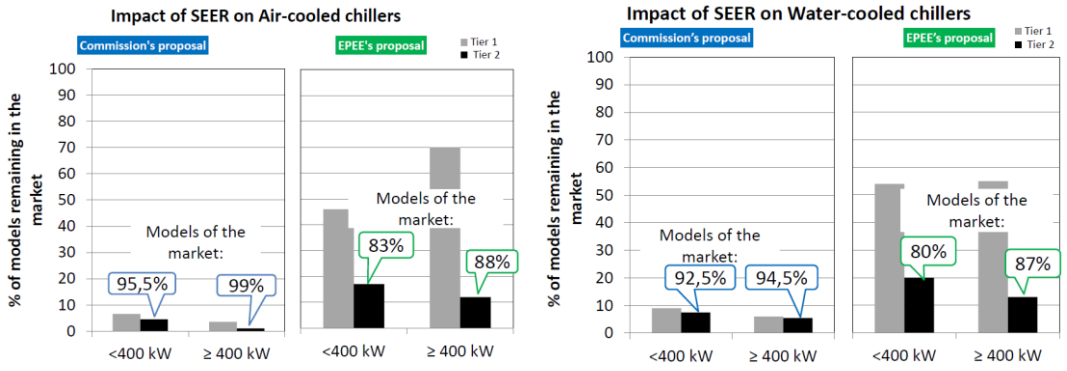
- Regarding the timing, EPEE considers that the proposal to introduce different implementation timeframes for Lot 1 ((EU) No 813/2013) and Lot 6/Lot 21 creates complexity and provides industry with too many different targets to achieve.
- For chillers above 400kW, the proposed requirements as they currently stand are not technology neutral, as they strongly promote oil free technologies. Therefore, we propose lowering the SEER values and introducing an additional capacity class starting from 1,5 MW.
- For high capacity air cooled chillers, there is little room for improvement in the future. They are already highly optimized, due to efficient fluids, screw compressors, economizers and flooded or falling film evaporators, as explained in detail in the Annex I. One possibility would be to use magnetic bearing centrifugal compressors. They can offer better efficiency than screws at part load. However, these machines are economically not affordable and are for the moment still proprietary technologies.

In view of all these arguments, the minimum efficiency requirements should be reduced in order to provide the industry with the room to manoeuvre to improve the products in an economically responsible way. In the following table you can find a proposal for minimum requirements, which represent the maximum values that we can accept for our products.

Commission			
Product group		Tier 1	Tier 2
Aircooled	< 400 kW	157%	161%
	≥ 400 kW	173%	185%
Watercooled	< 400 kW	196%	200%
	≥ 400 kW	256%	272%

EPEE/Eurovent			
Product group		Tier 1	Tier 2
Aircooled	< 400 kW	137%	149%
	≥ 400 kW	137%	157%
Watercooled	< 400 kW	172%	188%
	400-1500kW	196%	236%
	≥ 1500 kW	236%	256%

Please note that the proposed minimum requirements from EPEE and Eurovent cannot be achieved without changing the timeline. EPEE and Eurovent are confident that this proposal will achieve the energy savings that the European Commission has targeted. To this end, we have also evaluated the impact on the market and see that we still maintain an acceptable level of ambition:



Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

1.2. Air conditioners / Air to air heat pumps

All air to air heat pumps should have the same requirements, regardless of the energy source used
EPEE and Eurovent see a difference in requirements between gas driven heat pumps and electric driven heat pumps. We strongly request aligning the requirements for all types of heat pumps towards the lowest requirements, for consistency and equity in treatment.

Heating requirements and renewables
The requirements for heating for heat pumps need to ensure fair competition with similar products.

Air heating products, but also other heating products, such as space heaters, biomass boilers, etc. are products that can be used for the same application, i.e. central heating using hot air to distribute heat. In other words, a consumer can install any of these products to heat a building. Comparability is necessary in order to prevent certain high efficient products from not being selected due to price pressure from products for the same application with lower energy efficiency.

In the current Working Documents, the space heating efficiencies for heat pumps go beyond the space heating energy efficiency requirements for products with similar capacities in other Ecodesign implementing measures:

	Heat pumps			**Other heating products**	
	Air heating products		**Space heaters**	**Space heaters**	**Air heating products**
	Electricity	Fuel	All	Fossil fuel	Fossil fuel
2017	**141%**	**137%**	115-125%	86%	72%

We suggest reducing the heating requirements in order to:

- Ensure a **level playing field** whilst maintaining ambition for products that have the same function as heat pumps.
- Ensure competitiveness of heating products that will ensure **promotion of renewable energy sources**.
- Avoid **unnecessary price pressure** for better technologies. If the price offset between heat pumps and other heating products is too big due to too high requirements, many consumers will choose the cheaper heating products
- Ensure **a balance between the requirements for cooling and heating**. Due to the reversibility of the product, it is clear that when improving cooling, heating will not necessarily improve accordingly, and vice versa. As such, the requirement on heating should not be as high as for cooling.

1.3 HT chillers

EPEE recommends applying a single declaration for Comfort/HT process chillers based on SEER since:
- The market significance of these products is lower, with roughly 20% of chillers accounting for HT chillers, while 80% concern comfort chillers.
- Chillers for comfort applications and chillers for HT process applications are the same product design, often operating at exactly the same chilled water temperatures (delta T).

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

- Due to the different load profiles, SEPR requirements can be achieved with fixed speed compressor technology, while SEER will often require variable speed. As such, cost effective high temperature process chillers with fixed speed compressors could end up in comfort applications where they would not be able to provide the required efficiency. Therefore, requirements based on SEER will ensure a push to better technologies, as this is the most stringent requirement.
- The declaration and measurement methods for SEER are already well defined by EN 14825.
- This would also simplify the measure for both the authorities and the manufacturers, as SEPR for HT process chillers would require substantial extra resources to test the equipment at three additional load rate and operating conditions (93% - 87% - 80%) and to develop and maintain catalogues & selection software.

1.4 Hours per functional mode

The hours per functional mode for the calculation of the SCOP in Table 29 on p. 44 should also consider reversible products. To this end, the hours for reversible products as integrated in lot 10 have to be included.

Reversible units work in both the cooling and the heating season, and therefore the unit is never in off-mode. This affects the hours in off mode and also the crankcase heater hours, as these hours are the sum of the hours in off mode, standby mode and thermostat off mode.

The hours in ENER lot 10 for reversible products are as follows:

	Equivalent hours	**Thermostat off mode hours**	**Standby mode hours**	**Off mode hours**	**Crankcase heater mode hours**
	H_{CE}	**H_{TO}**	**H_{SB}**	**H_{OFF}**	**H_{CK}**
Average	1400	179	0	0	179
Colder	2100	131	0	0	131
Warmer	1400	755	0	0	755

1.5 Bonus for refrigerants

EPEE and Eurovent consider that a bonus on efficiency requirements does not serve the purpose of generating additional energy savings, and therefore the proposal of the bonus should be deleted. EPEE and Eurovent would like to clearly emphasize that requirements on refrigerants should be separated from Ecodesign requirements to ensure certainty on the measures and avoid double regulation.

2. Timing

The requirements proposed by EPEE and Eurovent are not achievable in the current timeframe proposed by the European Commission. As stated earlier, the complexity of the products in scope results in relatively long redesign cycles. Redesign in between the two tiers is not possible because it is usually the case for chillers that multiple product ranges exist. The products in scope typically have more models and smaller sales quantities per model than the products in scope of ENER lot 10 (airco

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

< 12kW). Consequently, the manpower for the development per model is smaller, and thus the redesign cycle will be longer (> 5 years). (Please see Annex II for further details).

Therefore, EPEE and Eurovent propose:

- At least **two years between the publication of tier** 1 in order for industry to be able to prepare.
- Moreover, considering the simultaneous implementation of the F-gas regulation, a second tier **four years after the first tier** would be most desirable.
- We appreciate the fact that the **tiers start in the beginning of the year** as this coincides with the timing of the process for preparing catalogues.

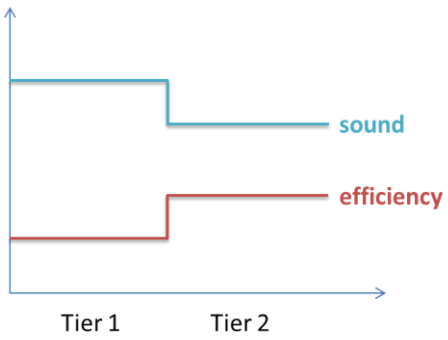
3. Sound power requirements

3.1 Limiting sound power will also limit efficiency

The main causes of sound emissions are the operation of the fans and the compressors. In order to decrease sound power, the fan speed needs to be reduced or fans need to be redesigned. As a result, the air flow over the heat exchangers decreases, and as such the efficiency decreases too.

Therefore, by defining sound power requirements, the energy consumption would increase, and this goes against the objectives of Ecodesign.

Given the dependency between sound power and energy efficiency, it is not feasible to fulfil simultaneously the requirements of two tiers of improved energy efficiency and two tiers of lower sound power.



In the preparatory study of ENTR lot 6, the impact of the sound power on energy efficiency and on the cost were not investigated in the least life cycle cost analysis. Therefore, we believe that any measures on sound power are not based on sufficient evidence and are hence not acceptable.

A detailed analysis on this point, demonstrating the relations between energy efficiency, sound power, and cost can be found in the presentation attached to this position paper.

3.2 Double regulation should be avoided as noise emissions are already regulated by the consumer, local regulations and by the machinery directive 2006/42/EC,

This market segment should be considered as a non-residential self-regulating market, as the products are selected by building engineers who have to consider the demand of the client at all times. Sound emissions are part of this investigation. As such, these issues are handled based on the requirements of the installation site. Where necessary, measures are taken to reduce the sound emissions on site.

Today, local pieces of legislation already limit the sound pressure levels depending on the location of installation (see examples in the Annex III). Where sound emissions exceed the limit set down in the local legislation, measures are taken on site, as opposed to on the product itself (e.g. sound walls) which do not affect the energy efficiency of the product.

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

Furthermore, the Machinery Directive has evaluated the risks evolving from noise emissions and has defined that machinery has to be designed and constructed in such a way that the noise levels are reduced to the lowest level. The Machinery Directive deemed it appropriate and sufficient for non-residential machines to provide information about sound pressure values, so that the necessary precautionary steps can be taken. Setting additional requirements under Ecodesign would result in double regulation, which should be avoided.

3.3 The basis of the sound power requirements is not correct and relating with other lots does not make sense

The current sound power requirements as set out in the draft Regulation are too severe and even go beyond the requirements of other lots without any rationale or data analysis in the preparatory study.

Sound power requirements should be based on all products that are in the scope of this Ecodesign lot. Referring to the preparatory analyses of other lots seems to be a questionable approach. The fan and compressor settings can be different, and this results in a different sound power. Sound power requirements should be based on a thorough analysis. Setting values based on this information would be against the European Commission's knowledge-based approach principle. The current proposal is therefore not acceptable and should be deleted.

The preparatory study report does not show any sound power data on VRFs, because there is no database available. The small quantity of catalogue data on sound is mostly sound ***pressure*** data, as opposed to sound ***power*** data.

In our view, the sound power requirements for air-to-air air conditioners and heat pumps are based on the assumption that the outdoor units of the air-to-air air conditioners and heat pumps are the same as the outdoor units of the ENER Lot 1 products. In other words, the sound power requirements are based on the base case of the ENER Lot 1 products. Indeed some outdoor unit types of ENER Lot 1 have similar technologies, but do not necessarily possess the same sound power levels. ENTR Lot 6 base cases have higher energy efficiencies and sound powers than ENER Lot 1 products. More efficient products require higher air flows in the equipment, which consequently causes relatively more noise. Meeting the sound power requirements is therefore not feasible.

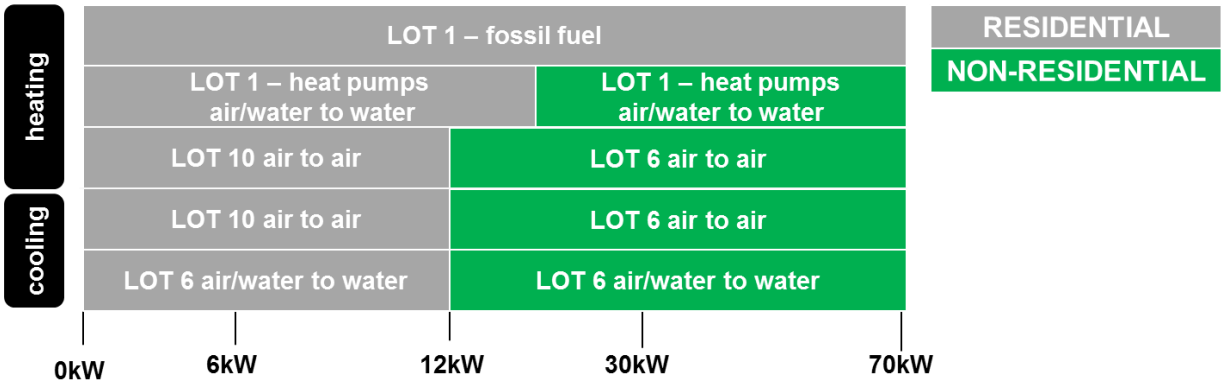
The rationale behind the introduction of sound power requirements in Lot 10 was to ensure that manufacturers would not improve their products in a cheap way in order to ensure sustainable solutions for increasing the efficiency of the product. In this lot, we deal with non-residential products, and consequently the dynamic for design is very different. The existing national legislation for sound emissions already limits the sound levels of the products. The best solution for sound requirements is selected by the building engineer for the site. Therefore, there is no room to improve the products in this application range without business impact.

3.4 Sound power requirements only make sense for residential applications, the boundaries of residential application is different in lot 6 compared to lot 1 and lot 10.

In Lot 1, where products are primarily sold based on heating capacity, product ranges between 0-70kW are considered to be residential. This boundary has been set due to the mix of products in scope. Gas boilers are residential up to 70kW. Heat pumps in Lot 1, however, are considered in

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

general to be residential up to 16-20kW, higher capacities are considered to be commercial or industrial application.
In Lot 6, where cooling is the primary feature, product ranges between 12-70kW are considered to be used for commercial and industrial application. This is clearly substantiated in the report of Lot 10, where there the report states that between 0-12kW, 60% is considered to be commercial. As such any product above 12kW is considered as non-residential.



3.5 Sound power requirements will hamper the installation of efficient products

Depending on the installation site, sound power will be more important (e.g. in a hotel) or less important (e.g. industrial area), as the surrounding noise may be much higher. In such a case, the sound power requirements will restrict the availability of more efficient products. Even in other locations, where sound may be an important factor, solutions are available to installers, such as sound walls and funnels, and these do not affect the efficiency. However, these solutions are not part of the product.

3.6 Information requirements will ensure that there is a correct basis at the time of review to define sound power requirements

EPEE and Eurovent believe that, at the moment, information requirements regarding sound emissions are sufficient for the products under this Lot. These requirements will ensure that a correct data basis of sound emissions will be available at the time of the revision of this Lot.

4. Product information

Annex II, 6)a)x)

The current clause requires that a list has to be provided of all the combinations recommended by the manufacturer.

It should be understood that these requirements cannot be met for VRF systems, for instance. The combination made for these products are unlimited. Such a product is designed to be combined with more than 100 indoor units. Each indoor unit is selected based on the need of the room and can be wall mounted, ceiling suspended, or floor standing. For each of these indoor units there are several capacities available. The possible number of combinations is over 1 million. Typically a VRF system is custom-made towards the building, and the engineers are provided with a full list of outdoor units and a full list of indoor units, where all features are explained and they can combine what they want.

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

The efficiency of the total system can then be derived based upon the date book. This is the current practice today and cannot be altered.

We strongly recommend removing this requirement and maintaining current practice.

5. Other editorial comments

ANNEX I Definitions

5.1 Chapter 2: definitions

5) 'Sound power level'

The testing condition is not indicated in this definition, this creates confusion. EPEE would suggest to replace the definition as follows:

5) 'sound power level' (L_{WA}) means the A-weighted sound power level measured indoors or outdoors, expressed in dB;

By the definition in Regulation EU 206/2012:
'Sound power level' (L_{WA}) means the A-weighted sound power level indoors and/or outdoors measured **at standard rating conditions** for cooling (or heating, if the product has no cooling function);
The test standard applied for heat pumps is EN 12102. This reference should be included in the transitional method.

5.2 Definitions applicable for Annexes II to VII (of the Working Document)

(68) 'Design load for heating ' Pdesignh

Although this definition is in line with ENER lot 1, it is recommended to align the definition with ENER lot 10, as the rated heat output is not the same as the load.

(76) 'Degradation coefficient'

In this definition, the default degradation coefficient is 0.9 for chillers, air conditioners and heat pumps. This is not according to the standard EN14825, ENER lot 1 and ENER lot 10. The degradation coefficient is dependent on whether the system distributes heat/ cooling by air of by water.

Therefore the sentence:

'if Cd is not determined by measurement then the default degradation shall be Cd = 0.9.'

Should be replaced by:

'If Cd is not determined by measurement, then, for air to air and water to air units the default degradation shall be Cd = 0.25; for air to water and water/brine to water units the default the degradation coefficient shall be Cd = 0.9.'

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

ANNEX II

5.3 Working documents

p5, Chapter 1. 2. b

b) products covered under the scope of Regulation No 206/2011[5] on ecodesign requirements for room air conditioners and comfort fans;

Regulation 206/2011 should be 206/2012

p22, Annex II, table 7

rated output > 6 kW and < 12 kW	69

Should be 'rated output ≥ 6kW and < 12 kW'

p26, Table 11, 12 and 13

Delete line "combination heater: yes/no".

5.4 Transitional method

p12, calculation for seasonal space cooling energy efficiency

$$\eta_{S,cool} = SEER - \sum F(i)$$

SEER should be divided by CC:

$$\eta_{S,cool} = \frac{1}{CC} SEER - \sum F(i)$$

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

ANNEXES

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

ANNEX I Technology levels of high capacity chillers

In the category of air-cooled chillers above 400 kW, the best available products on the market from the leading OEMs are already highly optimized. The reason is that due to their high capacity, these units consume a high input power. Therefore, while the market of smaller units is driven mostly by the initial cost, the operating cost becomes a much more important criterion on larger units. So, energy efficiency is already an important market driver

These "state of the art" technologies are nearly the same for the best products of the leading OEMs. They are already highly optimized in terms of refrigerant being used, thermodynamic cycle, compressors, heat exchangers and controls, as shown below:

- The dominant fluid is R-134a, versus 410A for smaller units. 134a provides better energy efficiency than 410A, due to a higher critical temperature. But using this fluid means a higher cost of the chillers because it requires a higher volumetric flow.
- The compressors are usually screw compressors, versus scrolls for smaller units. The cost is higher, but the efficiency is better.
- In terms of thermodynamic cycles, state of the art products also feature an "economized" cycle. It requires an additional heat exchanger, plus additional piping and controls. This also means an additional cost for better efficiency.
- To keep the benefit of the economized cycle at part load conditions, the leading products also have a variable speed drive, another expensive feature to optimize the efficiency.
- The evaporators tend to be flooded or Falling Film. These are more expensive than the D-X evaporators, but provide very small temperature differences (of the order of 2 K).
- Condensers tend to be of the "micro-channel" technology, the best available today in terms of performance and refrigerant charge. Air cooled condensers are extremely difficult to further improve because of the inherently low heat transfer on the air side. Efficiency improvements require larger heat transfer area, or larger air flow; but:
    - Larger air flow takes more energy for ventilation, and the compromise between power from ventilation and compression is already close to an optimum. In addition, increasing the air flow would also increase the noise level.
    - Larger heat transfer surface in the condensers is extremely expensive, making the cost prohibitive. In addition, it is often not possible because of space constraints: a large share of the market for such units is used to replace old units with a predefined foot print that cannot be changed. Also, these units must fit within standard containers for transportation, which puts an additional constraint on size.

For all these reasons, there is very little room for efficiency improvement in the future for this category of machines, already highly optimized. One possibility would be to use magnetic bearing centrifugal compressors. They can offer a better efficiency than screws at part load. But these machines are still quite expensive. Also, in the capacity range that is needed for this category of chillers, these compressors are offered by only one manufacturer. Setting MEPS targets that can be reached with this technology only would create a monopoly situation that is not acceptable.

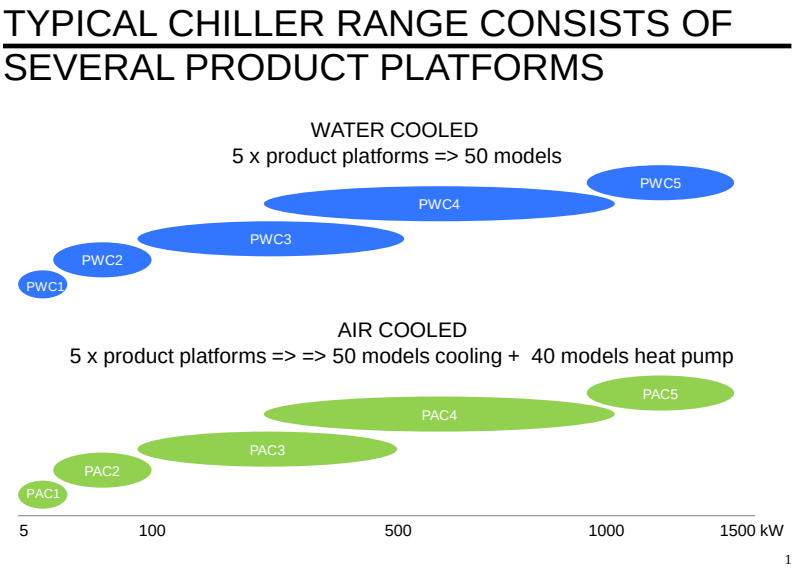
Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

As a conclusion, we believe that the best machines available today in this category (air cooled >400 kW) are already close to an optimum. It would be unrealistic to expect further substantial improvements in the mid-term future.

ANNEX II Redesign Cycle

Chiller products ranges are complex

Industry typical chiller product range consists of multiple product platforms, In average the industry needs 5 x water cooled product platforms with 50 models (different cooling capacity) and 5 x air cooled product platforms with 50 models in cooling only and 40 models reversible heat pump. In total a full chiller range consists of approximately 140 different models



Chillers have long development cycles

Chillers are complex systems using multiple compressors and smart control systems to optimize energy consumption. Most chillers are also available with many factory installed options to address special applications, ie: low sound emissions, heat recovery for sanitary hot water production, low leaving water temperature applications...etc which further increase the research development time

Depending on the complexity of the redesign (partial or full redesign) the overall development time goes from 18 to 30 months for a single product platform. More details are given in the graph here with.

	TECHNOLOGY Technology assessment Product concepts Supplier selection	*DEVELOPMENT* Specifications Qualification Testing Reliability	*PRODUCT LAUNCH MANUFACTURING* Product literature Selection software Assembly line set up	**TOTAL**
PARTIAL REDESIGN	3 months	12 months	3 months	**~18 months**
FULL REDESIGN	6 months	18 months	6 months	**~30 months**

Note: Industry average product development cycles

Manufacturers need time to redesign their products

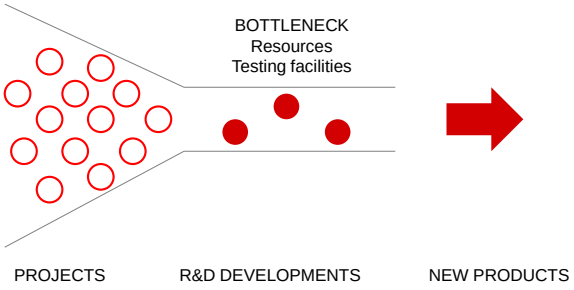
Manufacturer R&D's are already fully engaged to redesign reversible chillers up to 400 kW to conform with Ecodesign requirements for space water heater in 2015 & 2017.

Because of limited human resources and testing facilities it is not possible to engage simultaneously more than 3 major platform redesign and therefore new products development must be spread over time.

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

In conclusion the industry needs a minimum of 4 years between Tier 1 and Tier 2 to redesign products

MANUFACTURERS HAVE LIMITED R&D CAPACITY TO REDESIGN PRODUCTS



ANNEX III Examples of national legislations for sound emissions

Introduction

In this Annex all the sound levels are based on sound pressure not on sound power. The difference between sound power and sound pressure can be explained by using the analogy of an electrical fire. The power of the fire can be specified in kilowatts, but the temperature achieved in a room is dependent on the distance from this fire, the insulation of the room, etc. This is exactly the same for sound power and sound pressure, see Figure 1. Sound power is the power of the noise source and

sound pressure is the 'audible' noise and is dependent on the location of the equipment in the room, the material of the walls and floor and ceiling, and the distance from the noise source.

Greek building code

The Greek building codes sets insulation requirements for buildings, such that the sound levels inside the buildings do not exceed a certain value.

For the minimum acoustic comfort all new buildings must meet at least following requirements as example of sound insulation criteria for external noise:

Sound level caused by external noise	Hourly equivalent A - sound level (LAeq, h) in dbB(A)
HOUSE - TEMPORARY ACCOMMODATION	35
OFFICE – RETAIL	40
EDUCATION	35
HEALTH	35
Gatherings – INDUSTRY	(25)

The French noise legislation (extract):

Noise emission limits for new or modified permit holding installations after 1st July 1997:

The legislation sets, for classified installations, noise level limits tolerable by local residents and a maximum emergence level of the noise of the installations in relation to the ambient noise.

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu

Permissible emergence values
The noise emissions of a classified installation should not generate, within regulated emergence areas, an emergence higher than the permissible values stipulated in the following table:

Level of ambient noise in ZERs (including the noise of the facility)	Permissible emergence E dB(A)	
	7.00 a.m. – 10.00 p.m. except Sundays and bank holidays	10.00 p.m. - 7.00 a.m. + Sundays and bank holidays
>35 dB(A) et ≤ 45 dB(A)	6 dB(A)	4 dB(A)
> 45 dB(A)	5 dB(A)	3 dB(A)

Emergence is defined under the law as the difference between the equivalent A-weighted continuous acoustic pressure levels of ambient noise (operating facility) and residual noise (in the absence of noise generated by the facility but measured over the operating period of the facility); in the case of a facility subject to an authorized modification, residual noise does not include the noise generated by the entire modified facility.

ZER = Regulated emergence areas:

- the inside of buildings lived in or occupied by third parties, existing at the date of the installation's permit order and their nearest external areas when relevant (courtyards, gardens, terraces),
- building areas defined by urban planning documents enforceable against third parties and published at the date of the order,
- the inside of buildings lived in or occupied by third parties, set up after the permit order in the building areas and their adjoining areas as defined above, with the exception of buildings set up in ZAA (local exchange areas) and ZAI (Intercommunal activity areas).

Permissible levels at property boundaries
Permissible levels at property boundaries cannot exceed **70 dB(A) for the daytime and 60 dB(A) for the night time**, unless the residual noise for the period considered is higher than this limit.

⇨ There are limits for sound pressure values at the boundaries of the property and there are limits for permissible emergence.

Conclusion:
National legislation will regulate the unit sound level requirement on a case-by-case basis. It will therefore not be efficient to introduce a general requirement on the sound level in the Ecodesign Implementing Measure. It is important to stick to the case-by-case analysis, as especially for commercial applications sound level requirements may have a significant impact on the overall system efficiency.

***

Avenue des Arts, 46, 1000 Brussels, + 32 (0) 2 732 70 40, www.epeeglobal.org
Eurovent Association, Bd. A. Reyers 80, B-1030 Brussels, +32 (0) 2 706 7962, www.eurovent-association.eu