ECODESIGN PREPARATORY STUDY FOR AIR-CONDITIONING AND VENTILATION SYSTEMS – ENTR LOT 6

EPEE comments on the draft final preparatory study – April 2012

Brussels, 14 May 2012

Dear Mr Rivière,

[Cc = Mr Biermann, Mr Kemna, Mrs Lichtenvort]

The European Partnership for Energy and the Environment (EPEE), representing the heating, cooling and refrigeration industry in Europe, would like to thank ARMINES for the draft final preparatory study on the air-conditioning side of ENTR Lot 6, released on 23 April 2012.

We welcome the overall approach of the study and the quality of the reports. We consider the study as solid and appreciate in particular the level of technicality.

EPEE also welcomes the decision made by the European Commission to merge ENTR Lot 6 and ENER Lot 21 into a future common regulation.

However, alike we did during the 3rd Stakeholder meeting on 16 April 2012; we cannot agree with the full content of the study and therefore would like to raise several comments and remarks. We very much hope that this contributes further to the consolidation of the final preparatory study.

Please find below our comments in detail.

Should you have any questions, please do not hesitate to contact us.

Best regards,

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Detailed comments

The comments below are based on three key concerns regarding the preparatory study:

I- The refrigerant requirements;
II- The minimum efficiency requirements; and
III- Other requirements

<u>I - REFRIGERANT REQUIREMENTS</u>

1. The principle of better and smarter regulation should apply: In general, EPEE considers that it is contradictory to the EU principle and objective of better and smarter regulation to have the same subject being regulated in different pieces of legislation. In addition, it will severely limit the opportunity for innovation and for air conditioning specialists to exploit the benefits of the full range of available refrigerants in specific applications.

The performance and energy efficiency of AC products is not simply related to the GWP of the contained refrigerant, but on a complex combination of design parameters. Falsely restricting one of those factors will inevitably affect the optimum performance of the product.

The Ecodesign Directive seeks to reduce the CO_2 emissions in Europe by promoting energy efficient products. This aim could be undermined by placing unwarranted and unproven restrictions on the availability of highly efficient and safe refrigerants used widely in the global RAC industry.

For these reasons, we firmly believe that the refrigerant issue should be dealt with in the F-gas regulation, to avoid complications and double regulation and to ensure that there is clarity on how these aspects will be covered. We understand that all environmental aspects of these products, including refrigerants should be evaluated in preparatory studies; however, we do not support that the type of refrigerant should serve as a basis for an Ecodesign requirement.

2. The TEWI Approach is an assessment tool, not a regulatory tool: In general EPEE supports the TEWI approach as an assessment tool but not as a regulatory tool.

Whereas TEWI is a helpful methodology, when it comes to using it as a minimum requirement under Ecodesign, TEWI would be difficult to handle and risks complicating calculations.

Specific problems with a TEWI approach are the following:

- Due to the lack of sound data, the leakage rates are unknown. However, from the sensitivity analysis, it is clear that the variation of leakage rates has a big impact on the final TEWI value.
- No incentives are possible for manufacturers that deliver a leak tight product on the market.
- The fact that leakage rates are dropping thanks to the F-gas regulation is not taken into account.

3. The importance of refrigerant choice and the risk of a bonus/malus system: Different applications need different refrigerant solutions. In this regard, EPEE supports manufacturers' continued refrigerant choice, and opposes any bonus granted to low GWP or malus to high GWP refrigerants as such a system might be detrimental to energy efficiency.

Indeed, in some applications, a product using a refrigerant with a GWP higher than 150 will be more energy efficient than another product using a refrigerant with a GWP lower than 150.

As already argued in ENER Lot 10, reduced minimum efficiency requirements for low GWP refrigerants is not useful and creates an unbalanced situation and plays against a level playing field.

From our viewpoint, it does not make sense to have reduced efficiency requirements for low GWP refrigerants and for this reason we suggest to delete the proposal to use a bonus/malus system.

4. The banning of refrigerants is unfeasible: Even if the above comments would not be taken into account, the bans as proposed in the study are not feasible due to the following reasons:

- Some Member States (France, Italy and Spain) have building codes that prevent the use of flammable refrigerants in certain quantities in certain building types. As long as the building codes are not adjusted to these alternative refrigerants, manufacturers will not opt for alternative solutions, as these are no viable alternatives for the current high GWP refrigerants. In addition, even if permitted by the legislation, this does not release the reliability of the manufacturer of the equipment or of the end user.
- Stringent product liability prevents manufacturers from increasing charges due to flammability, which also in some cases leads to lower energy efficiency.
- EN 378-1 also sets limitations in the use of flammable refrigerants, and this is also a threshold for the use of these types of refrigerants in large direct systems.

5. 6% leakage rate

Regarding the TEWI analysis in table 6.36 to 6.39 of the study, we believe that the leakage rates used they are too high and do not reflect the reality.

Indeed, assuming a leakage rate of 6% implies that the product needs to be maintained very regularly. From a commercial perspective, it is neither realistic nor cost-practical to have such a high maintenance requirement. In general, these products would not be sellable.

When an installer installs a VRF system, they mostly give a guarantee on the system (e.g. 2 years). This means that during this guarantee period, they have to seal and fill refrigerants without charging anything to the customer.

Moreover, when installers do a good job, they will avoid costs for refills and maintenance. Finally, if annual leakage rates would really be as high as 6%, installers would have a full-time job only by refilling the products with refrigerants.

In general, there is an unwritten rule, the more expensive the refill the tighter the equipment. This rule has 2 consequences:

1) Large systems are as leak tight as possible
2) The more expensive the refrigerant, the tighter the system will be.

By assuming a leakage rate of 6%, the report gives the message that the current F-gas regulation is ineffective, which indirectly is unacceptable because it implies that manufacturers/installers are not complying with the law.

The F-gas regulation obligates annual (> 3kg, but < 30 kg) or biannual (> 30 kg, but < 300 kg) inspection of the products in scope containing HFC refrigerants. During this check the leakage checked e.g. indirectly by testing the energy consumption, pressure, etc. or directly e.g. by using a leak sensor.

The first results of the implementation of the F-gas regulation can be seen in logbook data from the Netherlands, the UK and Hungary:

- In the Netherlands, 17 installations with VRF systems from one manufacturer (EPEE member) were investigated; the annual leakage rate was determined to be 0.44%.
- In the UK a 3rd party evaluation was performed, with split system data from systems with products from different manufacturers, in total 327 systems were investigated during a period of 3 years. The annual leakage rate for these systems were 0.35%.
- Hungary is one of the MSs that implemented the F-gas regulation only recently. The annual leakage rate is shown per refrigerant. As the refrigerant R410A is mostly used in splits and VRFs, we look at the annual leakage rate of R410A, the average value in the report for 2 years is 1.44%.

We believe that these field data have more credibility than the estimations of leakage in the existing reports on F-gases.

Furthermore, we believe that the report contains inconsistencies. We investigated in more detail how the low estimate and high estimate refrigerant leakage rates were determined, by comparing Table 4.18, 4.31 of task 4. The following Table summarizes the lowest and highest leakage rates from Table 4.18 and Table 4.31. We would expect that the lowest leakage rates in Table 4.18 are chosen as the low estimate in Table 4.31, but in some cases there is clearly no straightforward relationship between the two tables:

		Refrigerant fluid consumption (%)	life time	recovery losses	total losses
Air cooled chiller	Table 4.31 Low estimate	1%	20	10%	30%
	Table 4.18 Lowest values	0.5%		5%	20%
	Table 4.31 High estimate	5%	20	30%	130%
	Table 4.18 Highest values	10%		50%	250%
	TEWI	3.0%		20%	80%
Water cooled chiller	Table 4.31 Low estimate	1%	25	10%	30%
	Table 4.18 Lowest values	0.5%		5%	17.5%
	Table 4.31 High estimate	5%	25	20%	145%
	Table 4.18 Highest values	10%		50%	300%
	TEWI	3.0%		17.5%	92.5%
Rooftop	Table 4.31 Low estimate	1%	15	15%	30%
	Table 4.18 Lowest values	1%		15%	30%
	Table 4.31 High estimate	5%	15	20%	95%
	Table 4.18 Highest values	5%		20%	95.%
	TEWI	5%		15%	90%
Split system	Table 4.31 Low estimate	2%	15	10%	35%
	Table 4.18 Lowest values	2%		10%	30%
	Table 4.31 High estimate	8%	15	50%	170%
	Table 4.18 Highest values	8%		50%	170%
	TEWI	6%		15%	105%
VRF	Table 4.31 Low estimate	2%	15	10%	35%
	Table 4.18 Lowest values	2%		10%	30%
	Table 4.31 High estimate	10%	15	20%	170%
	Table 4.18 Highest values	10%		15%	165%
	TEWI	6%		15%	105%

In task 4, it is mentioned that the low estimates do not include accidental releases and poor maintenance practices. Nevertheless, to our knowledge the reports to which is referred in Table 4.18 do not make a distinction between accidental and non-accidental, on the contrary, in the lowest leakage rates mentioned in Table 4.18 the accidental releases are included. The reason for the diverse results in the different studies is a lack of sound data, not in- or exclusion of accidents, poor maintenance etc.

It should be clearly explained how the values for low and high estimates are deducted.

In general we have seen that the TEWI is an average of the low and high estimates, except for splits, we believe that this is due to the estimations of leakage rates in ENER lot 10, but this is not clear. **We believe that taking the average of the high and the low estimate is too simple to come to a yearly leakage rate** and not based on technical and realistic rationale.

As a conclusion, we feel that the yearly leakage rate should be revised to more realistic values. We strongly recommend modifying the higher values in the sensitivity analysis. In addition, we believe that a more fact-based definition of TEWI enables better choices in the future.

6. Cost evaluations/efficiency improvements:
EPEE doubts that the EER increase for the R32 improvement option would be 10% in comparison with R410A version with a charge reduction of 15%. We believe that these kind of efficiency improvements in combination with a lower charge correspond to higher ambient temperatures (> 35°C).
Moreover, the charge of the VRF with propane seems very low (3.7 kg). We assume that it concerns a model with two circuits. In that case the VRF works as a chiller, and this could explain a lower charge. Nevertheless, without any improvements in comparison to the base case, we would expect a charge around 10 kg (in analogy with table 6-32, 400 kW chiller = 80 kg charge).
In conclusion, we need to make sure that the base case VRF is compared with comparable VRFs with alternative refrigerants and not with the best available technologies for these alternative refrigerants. In the case no data is available; it has to be explained in the text in what way the unit was improved.

7. Unachievable benchmarks: The benchmark of < 150 GWP that was written down in the key points presentation is not an achievable target. The described alternative refrigerants with a GWP < 150 are not a feasible option for energy efficiency, safety and affordability considerations. Instead of setting a general benchmark, EPEE proposes to define Benchmarks per refrigerant per application. This is clearer and explains better the feasibility.

8. Inconsistency in references: Regarding the GWP values, a clear reference to the assessment reports is required. Task 6 and 7 presumably refer to the 4th assessment report of TEAP, while in other tasks, the 3rd is used.

II - MINIMUM ENERGY EFFICIENCY REQUIREMENTS

1. **Timing:** Considering the timing of this Ecodesign lot, we estimate that, without delay, this regulation will be published in June 2014. A period of at least two years between the publication and Tier 1 needs to be foreseen in order for industry to be able to adapt. For the evaluation in this report, 2015 seems reasonable. However, this may mislead policy makers for defining implementing measures. It should be clear that for drafting of the implementing measures, 2015 seems too soon.
2. Considering the tight schedule, we prefer scenario 1 for all classes and products with a time to adjust to the energy efficiency requirements. Anyhow, the same scenario for all product groups should be chosen in order to keep a level playing field.

3. **How to determine SEER:** the way to determine SEER is not clear and this should definitely be clarified in the report.
   - The main questions remains whether the SEER value for VRFs based on only the outdoor unit or on the outdoor unit combined with a number of indoors. We recommend only looking at the outdoor unit.
   - From the text it is not clear how many indoors are connected for the part load test. Is this 10 indoors as specified in base case in task 4? The number of outdoor units should be in line with the Eurovent test method.

4. **SEER values:**
   Due to separate product usage conditions, applications and user behaviour, we would prefer different requirements for split and VRF systems.

5. **BIN hours:** We generally accept the proposed approach for the calculation of SEER.

   Nevertheless, clarification is needed on the following:
   - How are the thermostat off hours derived

- How are the equivalent hours deducted
    - Based on set-back
    - Based on average load/average capacity

A specific explanation is needed so that for future reference and standardization purposes this is crystal clear.

Moreover, the crankcase heater hours in EN14825 are lower for reversible products then for cooling only products. During the stakeholder meeting and in the presentation published on the Ecohvac website, these hours were 1956 hours for both cooling and reversible. An explanation should be provided how these hours are determined.

6. **Improvement options:** We believe that the cost rise for an increase in outdoor heat exchanger surface is not equal to the price increase of the equipment alone.

   A 100% increase in surface for example, means 100% larger equipment, which means that the installation costs will also be more expensive. More specifically:
   - the installation will be heavier => a stabilization needed before the outdoor unit can be placed on the roof. Static analysis and special constructions will increase cost.
   - More people will be needed for the installation
   - The installation will take longer
   - Transportation costs will be higher

   For the moment, this is to our understanding not considered in the analysis.

7. **Standardisation**
   As no reference note are indicated, it seems that the whole study done by ARMINES contractor is based on the Eurovent Certification 2011 liquid chiller package efficiencies database. For the 2011 season, the chiller performances were calculated according the performances calculation standard EN 14511:3-2007 with exception of heat exchanger pressure drop & Water pump efficiency. These performances were called « gross » performances.
   From January 2012, the Eurovent Certification Company has decided to suppress this « historical » exception, and to leverage the opportunity of the newly EN14511:3-2011 standard voted last July 19th, 2011 for the 2012 chillers certification scheme with new "net" performances metrics.

   As a direct consequence, the chillers' performances have been "rerated" according this new standard, and a significant difference is now appearing especially for the part-load ESEER level (see slide 29 of ARMINES material). As an example, the WCC BC ESEER = 5.72 will now be close to 5.2/ 5.4, and the WCC I6 ESEER=9.2 will now be close to 7.8/ 8.2 according to EN14511:3-2011 standard.

   We consider it as important that this study must be based in full compliance on a European standard, and we recommend to be used the 2012 Eurovent Certification "net" database according EN14511:3-2011 standard. We request ARMINES to update its full study before it is to be officially published.

III- OTHER REQUIREMENTS

1. **Noise requirements:** EPEE is opposing some of these requirements which are not feasible, in particular for applications above 30kW.

2. **Information requirement:** EPEE appreciates the inclusion of harmonised part load information to ensure proper EPBD implementation. We also support that the information should be flexible for all kinds of temperature conditions and part loads.

   However, some concerns need to be addressed:
   1. It should be clearly agreed with industry what would need to be required to set up this data. We support to set up a particular working group for this purpose, preferably in CEN TC113.
   2. The approach how to determine the data on other temperature conditions and part loads through simulations, interpolations, and extrapolations should be clarified and agreed upon.
   3. It should also be clarified how this data should be checked during market surveillance. Ecodesign enters already in a new level of complexity due to the seasonal performance approach. How market surveillance can check this data needs further clarification.

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