POLICY OPTIONS FOR ECO-DESIGN REQUIREMENTS OF ENERGY USING PRODUCTS – RESIDENTIAL COOLING (LOT 10)

EPEE COMMENTS ON THE 'TASK 8 REPORT-March 2009' PREPARED BY ARMINES

Brussels, 3rd April 2009

Attn: Mr Rivière
CC: Mr Gronroos-Saikkala, Mr Brisaer, Mrs Lichtenvort.

Dear Mr. Rivière,

the *European Partnership for Energy and Environment* (EPEE) [1] /Japan Business Council in Europe(JBCE)[2] are pleased to participate in the process to ensure that this report is ready for use for the Commission and likes to share its comments with you.

We have reviewed the draft final report. Throughout the report, we appreciate very much the fact that former comments have been taken into account during the several stages that this report went through. Today the report climaxes in task 8 which provides the policy that will be used by the commission as a base for the implementing measures for airconditioners below 12kW.
As such, we have reviewed it with the thourougness it deserves due the important impact this report will have on future heat pump and airconditioning market. This proposal is defining vast changes, and will reshape the present energy efficiency landscape for airconditioners below 12 kW.

Here are the main points of concern that we would like to adress:

1. The comparison with lot 1 raises concerns that need further consideration
2. Minimum efficiency requirements do not take into account the physical limitations of ceiling mounted products.
3. The energy label should be clear and easily understandable for the consumers
4. compliance assessment should take into account technical challenges and should rely on standards that are being produced.
5. The calculation method needs to be clear and suitable avoiding misinterpretations and should as much as possible be incorporated in European standards that are now under preparation.
6. The calculations in the report are not transparent and examples should be provided how the result has been achieved. Going back and forth through all the tasks to find the source is not transparent to judge the numbers correctly.

We trust that the information contained in this position paper will be of relevance and interest to you. Should you have any questions or require any additional input, please do not hesitate to contact us.

Yours sincerely,

Friedrich P Busch
Director General - EPEE

Lars Brückner
Chairman Envionment Committee- JBCE

1.The European Partnership for Energy and the Environment (www.epeeglobal.org) was formed in September 2000 to represent the interests of the air-conditioning, heat pump and refrigeration industry. Our central mission is to contribute to the development of effective European policies which have the aim to reduce greenhouse gas emissions from the use of refrigerants.

2.The Japan Business Council in Europe (JBCE) is an European representative organisation for companies of Japanese parentage that operate in the European Union. A large part of the JBCE membership consists of manufacturers of electrical and electronic equipment, including major producers of leading technology air-conditioning, ventilation and heating products.

EPEE
European Partnership for Energy and the Environment

Japan Business Council in Europe

1 Comparision with EUP – lot 1 (task 8 clause 8.1.2.5.1 – task 7 clause 7.4.10)

The assumptions made in task 7 about system losses are overestimated and based on information which is not supported by actual studies on split systems. The unrecoverable losses by stratification and fluctuation for example are not appropriate in properly designed buildings. How the loss percentages given have been calculated is completely unclear. In properly designed buildings, unrecoverable stratification losses are known to be maximal 6-7%.

This seems also to be caused by the calculation tool proposed for EuP lot 1. The tool requires input of turndown ratio in values relative to full capacity such as 0.5 or 50%. if the input is 0.5 then losses are calculated properly. However, if the value such as 50 is input, it calculates extremely high system losses. Since there is "%" indicated in the tool, such mistake tends to happen.

Furthermore we get the impression that capacity increase is mixed with efficiency reductions, which makes any comparison erroneous.

But, there is more. EPEE considers the whole system approach adopted in the document to go beyond the product approach that is clearly the main aim of EUP. The purpose of EUP in fact is to evaluate equipment performance, not whole system performance. System performance in fact depends on the way a building is designed and the way occupants behave.

Whole system design is a basic task for those designing and engineering the building. The assumptions made in task 7 do not take into account that reality when forwarding fixed loss percentages, that in most cases are wrong.

Based on the methodology of EN 15316-1 we need to compare equipment based on its efficiency as a sub-system, not on the overall efficiency of the whole system that includes the equipment, in relation to the building and its occupants. This differentiation is clearly defined in EN 15316-1.

In conclusion, EPEE request to have a more transparant approach considering efficiencies of sub-systems as specified in EN 15316-1 for comparison of lot 1 and lot 10 product efficiency. We feel that the comparison with lot 1 is not properly done e.g. unclear assumptions, mixing a system approach with a product approach hence creating a very confusing result.

2 CO_2 emissions at LLCC and BAT levels (8.1.2.5.2)

The calculation is not transparent in that sence that you can calculate CO2 emissions based on several sets of data provided in the report:

For example, one approach for the base case for a 3,5 kW cooling only: the product uses 445 kWh * 430 gCO2/kWh = 191 Kg eq / y for indirect emission and it reaches 238,5 Kg eq/y taking into account the direct emission also. This is not in relation to the table, where an amount of 262 Kg eq / y is shown.

The other approach on the same basecase is to assume the following:
If refrigerant charge is 1.1 kg, assuming annual leak 3%, end of life leak 5% and 13 years of product life, annual leak is 3.38%. That is 37g/year. If GWP value of 1975 for 410A is multiplied, LCCP becomes 264.9 kg/year $CO2_{eq}$. So, the calculation in the report appears appropriate under these assumptions but it is not transparent.

In conclusion, EPEE requests to have a clear view on the calculations, and to have the values corrected where necessary combined with examples where possible.

3 Energy efficiency scales & Energy label (clause 8.1.2.6)

EPEE appreciates the proposal having independent labels for Cooling and Heating. It gives freedom to the end-user to decide for the most efficient system depending on their main use (cooling or heating). The levels should be as much as possible similar to the boiler label (of course taking into account the previous comments)

For Indication of the noise level we propose to change the wording. The wording sound power level is understandable for consumers and technically clearly defined. Any kind of mix up with Sound Pressure is misleading. So we propose to replace the wording as follows:

- *"Noise inside"* should be replaced with *"sound power level inside"*
- *"Noise outside"* should be replaced with *"sound power level outside"*

Indication of the heating capacity should be indicated based on fixed conditions to ensure comparability between the different brands. For EPEE, it is clear that the capacity indicated on the energy label is very important, but for EPEE it is for the moment uncertain what value (Pdesign, capacity at 2°C or capacity at 7°C) is most suitable. EPEE wishes to study this issue more in detail and give advice in later stages of this process.

It is our understanding that the indication on top of the label of "heat pump" or "air conditioner" will have to be replaced with the modelname of the product. Is this correct understanding?

EPEE believes that indication of the capacity via size (M/L/XL/XXL) with a radiator symbol misleads the consumer since the requested heating capacity is depending on the building, climate zone and especially their insulation. A small room with certain windows and low insulation requires a higher heating capacity than a room with high insulation standard and small windows. We propose to delete the size indication (M/L/XL/XXL) and the radiator symbol and indicate the heating capacity at nominal conditions only.

The way how climate zone is shown is confusing. End-user may mix it up with weather conditions. For example, "if it is snowing the heat pump will not work" or "if it is cloudy, the heat pump will have less efficiency"….
Therefore we propose to either indicate the city of the related region, or the region, or both. But this needs to be investigated more in detail. The perception by the end user of this energy label is not studied yet, and before deciding such symbols this is a necessity.

The present percentage between classes should be similar between the different classes, but also between cooling and heating. Current range width is fairly large (24%) in high efficiency. As such a lot of products may be in one energy class, but differing in efficiency with 24%. This may mislead the consumer. The steps should be re-distributed above the A-label.

4 Tolerances (8.1.2.6.2)

Tolerance of capacity is not clearly explained nor its effect on efficiency. Current JIS standard defines capacities with tolerances for manufacturing. If EuP is set without capacity tolerance for manufacturing, manufacturers have to increase the average capacity or decrease the rating capacity of units considering their manufacturing tolerance. This surely reduces COP of units. Current Japanese or other energy efficiency regulations need to be evaluated considering the difference of capacity tolerance.
In addition, uncertainty of measurement is not clearly explained. It appears that it is mixed with manufacturing tolerance.
The report should clearly stipulate manufacturing tolerance and uncertainty seperately.

5 Minimum energy performance requirements (8.1.2.8)

The draft report quotes the Japanese top runner seasonal efficiency values. However, these values are applied to wall mounted type indoor unit of air conditioners and heatpumps. Other type units such as ceiling indoor units have different limit value. The size of these units is limited by standard construction of ceiling. Other type indoor unit is limited by the standard column space.

In addition, Japanese top runner law has different limit value depending on capacity of unit. Surface area is proportional to square of dimension while volume is cubic of dimension. This results in relatively higher heat exchanger area with smaller units. That means better energy efficiency in smaller capacity units. Longer pipe is needed for larger units that also results in lower efficiency with larger units. In order to ensure lubricant circulation, velocity of refrigerant flow needs to be higher than certain limit. So, larger pressure drop is inevitable with larger units. This also results in lower efficiency in larger units.

Current draft explains the difference of best available products in Japan and Europe depending on capacity of units, but it is not reflected to the proposed scenarios.

The limit value should be determined depending of type and size of unit taking into account such limit of design.

The minimum efficiency requirements proposed for 2015 scenario are unclear. In clause 8.1.2.8.1, there is specified that C-F class will be banned. However, in 8.1.2.8.5 it is specified that B-F will be banned. Please indicate the correct intention and correct the report accordingly.

6 Link with EU legislation (8.1.3)

paragraph 7 proposes to include on-board monitoring data recording systems that evaluate the cooling capacity of the equipment as a function of the operating conditions. Again EPEE wants to recap previous comments:

We oppose this requirement since it is adding requirements that should be covered by other directives. The proposal to include on board systems for assessing the efficiency & sizing seems too much technology prescriptive. Manufacturers should have the liberty, if required, how to provide these monitoring tools. Not necessarily, this should be integrated in the system/product.

Also to include the system with hourly steps etc, as specified in the last paragraph seems to be overspecification.

Furthermore, it is technically possible to provide such kind of systems, however cost becomes fairly high against the expected usage of it. The usage appears very limited for units with capacity less than 12 kW, though the products sold millions. Monitoring of 10 to 100 units seems sufficient. Evaluation of transient condition is also a problem. All units will operate at maximum capacity, if unit is stopped for a moment with certain level of cooling or heating load, such as end of set back period. Is there clear distinction?

If this type of recording is required, more specific standard should be provided.

7 noise requirements (8.1.4)

The draft report includes noise limits. EPEE opposes this requirement and feels that indication of sound power level on the energy label is sufficient.

One reason is that the public allowance on noise varies depending on time and location. Commercial area at daytime allows much higher noise than residential area at night. So, single limit value on noise is not meaningful. So basically the customer will restrict noise levels by choosing the product that fits his demand.

Next to that, noise measurement condition is not clearly indicated. Present EN12102 specifies to measure standard operation at rating conditions. For present EN 14511 this is for cooling 35°C, and for heating set at 7°C. However in the frame of HSPF calculation, the rating condition might be changing to 2°C. At this condition it is not possible to determine the noise levels properly due to defrost cycle. We propose to keep the present conditions to measure noise levels. This needs to be reflected in the measuring standards.

In addition, if the noise limit values for indoor and outdoor are applied, the indoor limit values should be applied to packaged unit located in indoor when they are operating. Rationale is not clear why current draft report allows outdoor value for all packaged unit.

8 conformity assessment (8.1.8)

EPEE has already presented its comments, and seeing the report, we can conclude that these have not been taken into account, although the reasons are well founded and reasonable to consider:

The present proposal is requiring module B&C for compliance module. This means that a new product needs to be tested by a third party before it is put on the market.

EPEE requests and urges the commission to apply module A as compliance module and this for the following reasons:

- The consultant states that this is required because there is a lack of market surveillance. Even with module B & C, there should be a market surveillance in place, that is checking whether 3rd party certifications are correctly performed.
- Also for the moment, there is a lack of testing facilities in labs in EU which will create delays for manufacturers for testing their appliances. This of course will increase the re-design cycle period. That delays sales of high efficiency product with state of the art technology.
- As Industry, in general we oppose the requirement to have module B & C, since this will give additional administrative burden and lack of testing labs will delay the marketing of products due to waiting lists for testing the products.
- The conclusion of this studie, and forthcoming measures will impact the current way of presenting energy efficiency data, and also propose seasonal calculation instead of nomimal point. As such, there is some time required to adapt to these changes, and to set up the required testing systems.
- Furthermore, a lot of manufacturers have their own labs in place to perform the necessary testing in house and are first in line to evaluate these new methods. They also have to set up systems for practical implementation.

In this respect, module A has to be applied, to provide testing facilities to get in gear for this new approach. Besides this, it is most important to set up calibration systems considering the total test set up between labs of testing institutes and manufacturers.

The report does not address the complications of using seasonal performance factors with the proposed compliance modules. EPEE wants these issues included in the report.

9 Better information received by end user (8.2.2)

EPEE supports that the consultant has removed the LCCP indication and considers that using an LCCP scheme with CO2 indicators will confuse the enduser especially for heat pumps, and should be avoided.

10 Affordability (8.2.2)

Table 8-25 shows that the price of an airconditioner is estimated in the future to be higher than for the heatpump. This is an unlikely scenario and needs further corrections.

LCC of air conditioner decreases very much between 2005 and 2010; 1757 becomes 1010 while unit price decrease is just 10 euros in this period. SEER values are 3.0 in 2005 and 3.2 in 2010. So, question is why such large decrease with LCC is possible in this period with BAU scenario?

In conclusion, EPEE requests to have a clear view on the calculations, and to have the values corrected where necessary combined with examples where possible.

Furthermore, Using reversible heat pumps to replace conventional heating systems with low investment and low running costs seems not to be considered. The economic impact especially for low GDP countries should be investigated. Increasing heat pump prices will have an adverse affect in this replacement market.

11 Calculation (8.4)

EPEE welcomes the proposal to use a BIN method since it is a more accurate approach than the weighting methods used in the previous task reports.
Nevertheless, the calculation method also need to find its way into standardisation, and has to be incorporated in prEN 14825.
The annex as written right now is not sufficient to provide compliance with the present proposals in task 8 and should be supported by test methods and calculations to be incorporated in prEN 14825.

This also means that the method in lot 10 should be correct and clear, using correct definitions, and using correct units and abbreviations to avoid misinterpretations in further stages of drafting the standard.

As such, EPEE presents herewith the necessary fundamental comments next to corrections we need to be taken into account to avoid misinterpretations.

The present proposal for calculation is very important and needs to be reflected in the part load standard prEN14825, to assure that this standard can be used for calculating efficiency in view of EUP – lot 10 requirements.

Current draft report employs the climate of Strasbourg. It is understood for harmonize with EuP lot 1. However, actual average climate for air source heatpump is much warmer due to difference of distribution. Air source heatpumps have higher COP in warmer climate that results in shorter pay back period. In addition, cooling need increases the sales of reversible heatpump. So, this difference of average climate between heatpump and fossil fuel boiler will remain for decades or forever. The evaluation with Strasbourg climate is about 1.5 times higher heating demand than average of current heatpump market distribution. Result of current study overestimates heating impact and under estimate average SCOP of heatpumps.

The definition of load is unclear and should be explained more clearly. This is a comment that needs to be reflected in prEN 14825. Current draft explains the "load", but it should also be given in a form formula to avoid misunderstanding.

In the present calculation of HSPF, assumption has been made that the heating capacity at Tj<-7°C is considered to be 0. Current draft assume all heatpump can not operate below -7°C, but it is not correct. The minimum temperature of the appliance has to be considered for determining the capacity at -7 and lower temperatures as follows:

When Tmin<Tj and Tj<-7

PH(Tj)=PH(A)-(-7-Tj)/(-7-2)*(PH(B)-PH(A))

When Tj<Tmin and Tj<-7

PH(Tj)=0

As such, whole clause 3.2 Electric power of the heat pump should be replaced by following.

Electric power of heatpump

Coefficient of Performance of the heat pump shall be calculated first.

When Tj<Tmin

COP=1

When Tmin≤Tj and Tj<2°C and Tmin<-7°C

COP(Tj)=COP(A)+(-7-Tj)/(-7-2)*(COP(B)-COP(A))

When Tmin≤Tj and Tj<2°C and -7°C <Tmin

COP(Tj)=COP(Tmin)+(-7-Tj)/(-7-2)*(COP(B)-COP(Tmin))

COP=1 may be used instead of COP(Tmin)

When 2°C ≤Tj<7°C

COP(Tj)=COP(B)+(2-Tj)/(2-7)*(COP(C)-COP(B))

When 7°C ≤Tj

COP(Tj)=COP(C)+(7-Tj)/(7-12)*(COP(D)-COP(C))

Electric power consumption for each bin temperature shall be calculated from building load divided by COP at each bin temperature.

PE(Tj)=BL(Tj)/COP(Tj)

In the present calculation of HSPF, assumption has been made that the heating capacity at 7°C<Tj<12°C, it is unclear whether Cd & CC should be taken into account as soon as the capacity of the heat pump becomes higher than load of building. As the method is written now, it is assumed that Cd&CC should only be taken into account when Tj>12°C. As such the calculation method should be corrected and clarified in this sence.

The calculation procedure for the other climates has to be set up accordingly.

In addition, detailed calculation example should be added to the report in order to avoid any misunderstanding of calculation procedure. Since the procedure is fairly complicated, calculation sample and/or special tool (calculation spread sheet) is to be provided.

12 Energy performance information

The draft report stipulates that "All the test results required to determine the SEER and HSPF should be made available in the technical documentation supplied with the product."

EPEE feels that such information has no added value for the enduser, but is of use for laboratories of testing institutes and competing companies. As such, information on test results should not be published but made available when requested.

13 Task 7

The LCC values reported in table 7-12 and 7-13 are wrong and need to be corrected in line with the assumptions made in the report.

BASE CASE FOR H/P 3,2 Kw

Purchasing price €		683	
Discount %	2%		**669,34**
kWh/y	1499		
Electricity price €/kWh	0,158		
Life time y	12		
Yearly energy bill €		236,842	
Total energy bill €			**2842,104**
Installation €			**1000**
Maintenance €/y	67		
Maintenance for 11 years			**737**
TOTAL €			**5248,444**
TOTAL reported into Tab. 7-12 €			**4964**

BASE CASE FOR H/P 7,1 Kw

Purchasing price €		1385	
Discount %	2%		**1357,3**
kWh/y	3150		
Electricity price €/kWh	0,158		
Life time y	12		
Yearly energy bill €		497,7	
Total energy bill €			**5972,4**
Installation €			**1000**
Maintenance €/y	67		
Maintenance for 11 years			**737**
TOTAL €			**9066,7**
TOTAL reported into Tab. 7-12 €			**8782**

In conclusion, EPEE requests to have a clear view on the calculations, and to have the values corrected where necessary combined with examples where possible.

14 Test points

Test point would be too much, if simply apply the method of the current draft report. Efforts to minimize them are necessary. For instance, if the capacity can not be predetermined value with step control unit and if it is predictable, any test temperature and capacity which satisfies current linear correlation of them should be accepted. The cooling test at approximately 75% capacity with continuous capacity control unit may not be necessary. Interpolation seems acceptably accurate.

15 Technical or editorial detailed comments.

T/E	Clause	Comments and Proposal
E	8.3	Typing error at 8.3 “Sensitivity analysis” and at 8.3.1 “ LLCC variations by country”: one is the exact repetition of the other; one of the two shall be deleted.
E	8.3.1.2	Appendix A is mentioned but not present.
E	8.4.1 Part 1 Terms	“Reference cooling capacity” and “Reference heating capacity” are not used anymore. Remove these definitions. At least $SCOP_{on}$ should be replaced with $HSPF_{on}$.
E	8.4.1 Part 1 Terms	“TMIN” should be “Tmin”. Purpose of quoting EN 14511-4 is not clear. Definition should be as follows; The minimum outside air temperature of operation in heating mode declared by the manufacturer or importer and stipulated in the technical documentation of the equipment, as required in EN 14511-4.
E	8.4.1 Part 2 SEERon	Description of multiplying should be unified to “x”. Use “·” instead of “x” is confusing.
E	8.4.1 Part 2 SEERon	whether Tj>Tdesign BL(Tj)=1 is not correct. It should be; where Tj>Tdesign BL(Tj)=Pdesign
E	8.4.1 Part 2 SEERon	Description of multiplying should be unified to “x”. Use “·” instead of “x” is confusing.
E	8.4.1 Part 2 SEERon	“Where -1≤j≤21” should be “Where 1≤j≤24”. Temperature bin is 1 to 24. Putting - “dash” in front of 1 is confusing.
E/T	8.4.1 Part 2 Pdesign	Current description of “maximum capacity” is not appropriate. It should be “rated capacity”. If it really requires maximum capacity of inverter drive units, it will reduce EER values. It does not meet the purpose of EuP.
T/E	8.4.1 p.64 last paragraph	Linear interpolation should be done on EER not power consumption. As capacity of a unit has larger curvature than power consumption, linear interpolation in power input results in non linear EER curve against temperature. This should be avoided. Text should be as follows; The electric power consumption should be estimated assuming linear correlation between outdoor temperature and EER as in the heating mode (part 3) for bin temperatures between measurements A, B, C and D.
	8.4.1 Part 2	Pdesign is used for both heating and cooling. Suffix to distinguish cooling and heating should be added.
T	8.4.1 Part 2 2.2 Last paragraph	Description about SEER of single duct unit is not reasonable. It should be calculated with increased or reduced building load due to its ventilating function.
T/E	8.4.1 Part 2 2.3 (Eq.3)	The word *EERmin load* is not appropriate. It should be calculated from estimated EER assuming the unit is operated with minimum continuous operation capacity at the bin temperature. This formula should be in clause 2.4 not in clause 2.3 to avoid misunderstanding in fixed speed unit calculation. Formula in clause 2.3 should be almost the same to it, but use *EER full capacity* instead of *EER min capacity*.

T/E	Clause	Comments and Proposal
E	8.4.1 Part 3 3.1 Eq.4	Add "*on*" to "*HSPF*" in denominator. It should be divided by *HSPFon* not *HSPF*.
E	8.4.1 Part 3 3.2	*BL(Tj)* seems to be the building load at the bin temperature not ratio. If it is ratio, it would require division by full building load.
T	8.4.1 Part 3 3.2 Heating Capacity	If Tmin is above -7°C and Tj>Tmin, current formula is as follows. PH(Tj)= PH (A)+(-7- Tj)/(-7-2)* (PH (B)- PH (A)) However, PH(A) is zero because heat pump can not operate at -7°C. Linear interpolation between PH(A) and PH(B) is very simple but gives wrong results. If Tmin is higher than -7°C, measurement of heatpump capacity at Tmin should be recommended. Current simple method may remain as an option.
T/E	8.4.1 Part 5 5.4	The thermo-off due to excessive minimum capacity of the unit should be included in operating hours. If thermo-off due to excessive capacity of unit is considered as thermo-off, thermo-off time varies depending on the minimum capacity, heat capacity of the room and differential of thermo-stat. Current report does not take this consideration. The thermo-off due to no load condition is thermo-off under current definition. So, the electric power consumption should be included in COP measurement at on-off cycle operation. In addition, how to test is not clear. So, text should be as follows; *The unit is cycled on for 6 minutes and then off for 24 minutes for an approximately 20% part load by switching on and off the compressor.* *During this cyclic test, the delivered cooling (heating) capacity and electric energy consumed are integrated over the on/off interval. Then the cyclic EER (COP) is obtained by dividing the integrated cooling (heating) capacity (Wh) by the electrical energy used by the unit over the same on/off interval. The electric energy consumption is to be measured when the compressor is off for Cc calculation.*
E	8.4.1 Part 5 5.4	Part load factor is not used anymore. So, eliminate the 3rd paragraph of page 72.
T/E	8.4.1 Part 5 5.4 page 72 4th paragraph	If current draft employs eq.3, slope of the test result can not be used to determine Cd degradation factor as it includes both Cc and Cd effects. Please see the formulas at the end of the document.
E	8.4.1 Part 6.3	Current test says 'temperature for the "A" temperature condition', but it should be "B".
E	8.4.1 Part 1	"Desing temperature" should be "Design temperature."
E	8.4.1 Part 1	In the bin interval definition, "I" should be "i".
E	8.4.1 Part 1 Eq.1	Hce should be clearly defined. Correlation with table 5 also needs to be clarified.
E	8.4.1 Part 1 Line 22	"Nj" should be "nj"
T	8.1.2.2.1 Table	Table indicates that air conditioner market is decreasing slightly between 2005 and 2010 and it will increase again after 2010. Is this correct estimation? This does not match Japanese market history where air conditioner decreased constantly against reversible heatpump.
E	8.1.2.3 Note 3	Situation is changing. Current APF rating has no tolerance. So, manufacturer has to assure the declared APF value. However, capacity still has tolerance. Current tolerance are as follows; capacity not less than 95%, Input not exceed 110%, APF not less than 100%. Old target had capacity and power input tolerances and resulted in large energy efficiency tolerances. As capacity of air

T/E	Clause	Comments and Proposal
		conditioner or heatpump must be declared according to standard sequence of numbers in Japan, capacity tolerance has significant meaning.
E	8.4.1 Part 3 3.1 p.69 Whether 12<Tj	Eq.2 is referred, but it should be Eq. 3.
T	6.3 2nd paragraph	If the room temperature is raised to Tck and the crank case heater control sensor is located at compressor, most crank case heater does not seem to work within 30 minutes. Because compressor is generally insulated to prevent noise and maintain the heat of operation. Intention of this test at Tck is not clear. Insulation performance is not clear at Tck, since there is no temperature difference between Tck and ambient. If crank case heater works at cooling mode, similar test as heating but temperature such as 10 °C should be applied as ambient temperature. Several hours and several degree of temerature difference between Tck and ambient are necessary to judge the control and insulation of compressor.
T	8.4.1 part 6 6.4	Cooling mode and heating mode may have different thermostat-off power due to the draft control difference. Draft is more acceptable in cooling mode than heating mode. So, if thermostat-off measurements are done for both modes, they should be used respectively in calculation.
T	8.1.2.5.2	Refrigerant reduction technology is introduced as if it is easily applicable to reversible heatpump. However, due to difficulty for defrost operation, micro channel heat exchanger are not easily used for heatpumps.

$$Cc = 1 - \frac{Thermostat - off\ power}{measured\ power\ of\ thermostat\ on\ (100\%)}$$

$$Cd = \left(1 - \frac{EER_{partload}}{EER_{\min load} \times (\frac{load}{Cc \times load + (1 - Cc)})}\right) \times \left(\frac{1}{1 - load}\right)$$

* * * * * * * * * *