EHPA Proposal on self-monitoring requirements

Technical Meetings with VHK on Lot 1 & Self-monitoring requirements

EHPA would like to thank the Commission and the study team for the work already carried out on the review of the Ecodesign Regulation 813/2013, and for the organisation of the additional technical meetings on self-monitoring.

Please note that EHPA position paper has been updated and finalized on 22 August 2022.

General remarks

Overall, when discussing about the monitoring requirements, it is important to keep in mind the following:

- We should be aware that these additional requirements can increase the cost and environmental impacts of heating equipment, so we need to make sure that their benefits to the end-users and energy savings outweigh these impacts. It should not be the intention of the proposal to create additional burden and cost for heat pump technology without clearly defined benefits.
- The EU wants to accelerate the development of the heat pump market, consequently whatever increases the cost of heat pumps should be avoided. It is important to understand that any additional data storage and management for connected appliances increase the cost of the appliance.
- We should not forget that this is introduced as a minimum Ecodesign, or Energy labelling requirement and we shouldn't try to match these requirements with requirements of voluntary national financial incentive schemes.
- We should ask if the EC will look at all technologies in scope of Lot 1 from >4-5kW to <35kW. It is important to have the same level playing field with other technologies.
- The timeline must be kept in mind, which will depend on the final proposed requirements.
- As each installation has its specificities, data form different installations should not be compared which each other.
- Today's heating systems suit many different requirements of a variety of new buildings and the renovation market in a flexible manner. Final installations of the heating system comprise of elements which are part of the manufacturers package and other integrated / added on site as part of a complex installation. Therefore, the fulfilment of the requirements needs to be flexible in order to keep the complexity of integration and installation manageable.

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Scope

This self-monitoring requirement should apply to **all technologies in Lot 1,** not only heat pumps. It is important to keep a level playing field for all technologies covered by Lot 1. It should cover all single heaters from >4kW to <35kW (excluding DHW) at rated heat output. The electrical back-up heater is no included.

- Where collective space heater/combination heater is used to heat multi-family building, these requirements do not apply.
- Where space heater/combination heater are used in a cascading setup, these requirements do not apply to the system.

EHPA recommends that the upper limit is maintained at 35 kW. Looking at EHPA market report data we can see that the majority of sales are below 20 kW, the residential applications for single-family buildings.

*Chart 3.2-2: Heat pump sales by capacity class, in kW. *The size classes in this chart don't add up to 100%. The gap is filled by the undefined size of 'total' for countries lacking a more detailed distinction.*

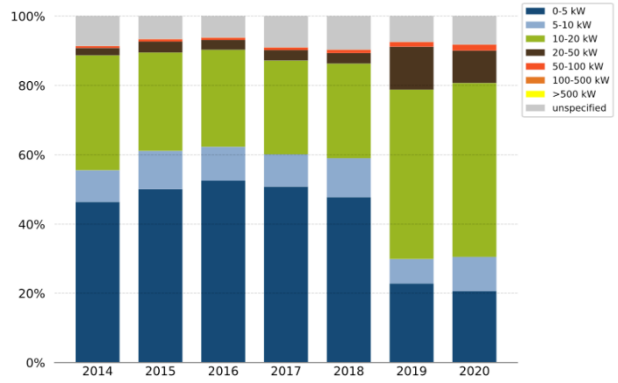

Chart from EHPA Heat Pump Market Report 2021

However, if the European Commission insists having a higher upper limit, then it should not exceed 70kW, for the following reasons:

- The energy monitoring as it is discussed at the moment is only for the single user (residential use case) who can influence the heat consumption behaviour. Heating power above 70kW is linked to multiples users (multi-family buildings) or specific use cases.
    - In case of too many users no useful information can be given form the main generator data because the impact of each user energy saving measures cannot be identified and followed up.
    - In case of specific uses cases such as non-space heating applications we are out of scope of ErP (but would have to fulfil it anyhow).

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- At higher outputs, energy monitoring does not usually carry out at the level of the single heating appliance, but at the level of the heating system or even at a higher level of building, considering building automation and control systems. For these levels (system or building),a professional energy measurement by an external company is more likely. This cannot be compared to the energy monitoring approach. A comparison would probably show huge differences and cause many confusions in the field.
- 70kW would be in line with the scope of the Energy Labelling Regulation which aims exactly for the same customers as the currently discussed energy monitoring approach.
- The relative costs for introduction of energy monitoring are by far higher as the amount of sold units is much smaller. Here the use of new functions has to be checked even more carefully.
- The accuracy calculations we have done so far are only referring to outputs in residential use. If the scope is now extended the accuracy discussions and proposals will have to be reconsidered altogether.
- The lack of installer capacity should not be worsened by additional tasks with little effect.

EHPA cannot agree with the upper capacity limit of 1 MW. EHPA hopes that argumentations described above will convince the European Commission that upper capacity limit of 35 kW (or max. 70 kW if there is a specific evaluation for the benefits of this range) will completely fulfil the purpose of self-monitoring.
If this was not the case and there were still doubts by the European Commission, we would accept the conclusion of the Commission during the last meeting (July 12th) to ask the Member States whether they would prefer a scope of 1MW or 70kW (limitation in the energy labelling regulation).

Display of the data

The display and format of data should be kept as flexible as possible. It should be left to manufacturers on how they want to provide the data. There are some solutions possible, so we could say that there are different ways to make it available to end-user. We cannot have too tough requirements, which might limit our technical flexibility and consequently ban the products indirectly There is no common way today in the industry.

It should be left to the manufacturer to offer to the consumer how to provide those information:

- Mobile equipment via remote control applications when devices are connected or
- Directly on the display of the space heater/combination heater or of the room thermostat.

In case that a manufacturer offers a remote solution, the end-users need to fulfil the basic requirements for implementing the solution (e.g., WIFI connection). The manufacturer is not obliged to develop an additional solution (e.g., on-board display) if the end-user is not able to fulfil the basic requirements defined by the manufacturer.

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Not all end-users are interested to have their heaters connected to the internet. Thus, the remote solution could be also offered as optional part separately on request at the time of purchase or even later.

Connectivity modules, no matter if they are integrated in the appliances or offered as optional part, would cause additional costs for end-users.

In the context of European manufacturers' challenge in purchasing the required chips any additional costs should be economically justified and requested by end-users.

Acquisition frequency & Data storage duration

The higher the frequency, the bigger the generated data will be, the higher the costs for storage. To store the data, there are several solutions (e.g., cloud and storage). It's important to highlight that nothing is for free, also not in terms of environmental impact. It will mean huge datacenters who have environmental impacts that are not negligible where connected devices. For this reason, there should be a limit of how long data should be made available, taking into account the cost-up that is required the longer the data needs to be stored. Furthermore, it is important to store only relevant data. (See as well "Heizkosten-VO").

We understood that the European Commission was looking for a more ambitious acquisition frequency and storage. EHPA would like to propose a compromise which is a mid-way solution between the BEG initiative (voluntary requirements) and the French RE 2020 (mandatory requirements). We believe that this compromise proposal would be more meaningful for the end-users and the installers.

The storage periods for data regarding real-world final energy input and output for heating has to be reasonable and especially useful for the end-users and professionals:

- For daily information: Information within the last 24 hours with a resolution per hour
- For weekly information: Information within the last 7 days with a resolution per day
- For monthly information: Information within the last 31 days with a resolution per day
- For yearly information: Information within the last 12 months with a resolution per month and information for the last two years with a resolution per year

From EHPA point of view, there will be no additional added value with a long file containing 8760 lines with a resolution per hour for energy input and energy output.
Please note that this compromise proposal does not represent the current market and it will require manufacturers to further adapt their products.

We should remind VHK and the EC that the German incentive scheme (BEG) have an incentive program which set voluntary requirements on the storage frequency and duration. These requirements are **not** mandatory to get financial subsidies. In the Ecodesign Directive, it would be an obligation.

Please find below the part from the BEG dealing with the voluntary requirements:

*"Für die Überprüfbarkeit des korrekten Betriebs der Anlage **wird empfohlen** relevante Betriebsparameter (z. B. Energieverbräuche, erzeugte Wärmemengen, Betriebszustände, Außentemperatur) für mindestens 1 Jahr mit mindestens stündlicher Auflösung (Durchschnittswert) sowie für 10 Jahre mit mindestens monatlicher Auflösung (Durchschnittswert) in einem maschinenlesbaren Format (z. B. csv) vorzuhalten."*
To check the correct operation of the appliance **it is recommended to** provide relevant operation parameters (e.g., energy consumptions, produced energies, operation conditions, outdoor temperature) for at least 1 year with at least 1 hour resolution (average) and for 10 years with monthly resolution (average) in a machine-readable format (e.g., csv).

Finally, we would like to highlight that we cannot define a sample rate in the regulation. It is too early to define a sample rate. More research and investigation are needed. The standard could eventually look at the sample rate, but it is a question of defining a requirement of results and not of means.

Measurement or Estimation

These devices provide a way of clearly informing end-users, daily, monthly, and annually the final energy consumption for heating only, for the main energy carrier (and where hybrid units, for both energy carriers). If this option pursued, it will be necessary to further elaborate at a later stage what should be account for. Those information can be based on measurement or on estimation.

Space heaters and combination heaters can measure or estimate the final energy consumption. There should be no obligation to measure such data.

Accuracy

Today, there are no measurement standards which gives us no possibility to determine the accuracy of the data. Moreover, sometimes the data are not measured, but calculated, and in this case calculation methodology and rounding up or down of data are decisive for the accuracy of the data.

High accuracy will have an impact on the cost. Consequently, it should be proportionate to the objective. Based on the clarifications provided by the Commission and consultant on the definition of accuracy for this requirement, please find EHPA detailed recommendation on the accuracy requirement in the annex.

Presented energy consumption shall represent the main heating device within the manufacturer system package. Auxiliary devices and processes, e. g. for media transfer might not be included in those values. The consumption of these auxiliaries is in any case not relevant for the consumer optimization of the generation system. The energy input of the main heating device might be calculated or measured.

Finally, we would like to highlight that the accuracy requirement for instantaneous data does not make sense from the end-users' point of view. They will not check every second or minute the data, but they will simply need the trend. We cannot compare the heat pump with the car industry because end-users do not have the same needs and usages from these two different technologies. A car driver actions have instantaneous effect on his consumption. He can decide to accelerate to go faster from a A point to a B point, considering that its first goal is to reach B point. This will translate in direct increase of fuel consumption as soon as he pushes on the acceleration/gas pedal. Thus, having this information could have some benefit for him to adjust his driving style or to estimate remaining fuel range. While for the end-user of heat pump can only act on the setpoint temperature but lets the system run automatically. The instantaneous consumption of the HP is related to parameters out of his control (building inertia, outdoor conditions, frost accumulation…). Having this information will lead to even more confusion and probably less efficiency and comfort. The accuracy requirement for instantaneous data does not make sense from the laboratory point of view either. Instantaneous data is hard to get, it is on the sensitivity of the labs and units.

Instantaneous display (real-time)

EHPA question both the relevance of real-time data as well as the interpretation of these data (even by professionals) for heating appliances.

Relevance:

There are many examples why this requirement, originated form the car industry, is not suitable for the heating industry. For instance, the use of this function (instantaneous display) depends on full presence of the user while using the product, which is the case of driving a car. A car driver is constantly confronting the real-time data and could improve his/her driving pattern which leads directly to reduction of the fuel consumption. In case of a heating appliance, it is obvious that the end-user is not sitting in front of a heating appliance or looking at an application permanently, while the heating appliance is in operation.

Interpretation:

This is unrealistic to expect that the professionals guide the end-users or take action on what is appropriate for the situation, since an appropriate action can be taken only by considering and analysing the other parameters such as outdoor temperature, heat demand etc. As such, an instantaneous action based on instantaneous data occurs very rarely and cannot be set as a general requirement for heating appliances.

Real-time data would be a best case for cloud provider, but indeed an immense and unnecessary cost driver for OEMs. The added value for the end-users is minimal. Last but not least, the frequency of real-time is depended on communication. The data transport within the end-to-end chain (end-user, device, gateway, backend, application) takes a lot of time, which could be reduced

through advanced and expensive technologies. This disadvantages cloud-based solutions and limit technology open approach.

Reporting Requirement & EPREL

We would like to recall EHPA position regarding the reporting of the data on EPREL.

The data obtained from this monitoring requirements cannot be used to be compared with testing data nor for verification or conformity purposes. Indeed, on-board monitoring and testing conditions do reflect different uses, testing conditions can never be assumed as equal to in-use conditions. Consumption and efficiency data are significantly influenced by the user behaviour, the climate, and the overall building system, in addition to appliance characteristics.

Accuracy issues would also make it extremely difficult to compare and/or aggregate reported data. The differences in accuracy and placement of sensors are crucial factors for comparability of monitoring results. In addition to achieve comparability of data for compliance purpose and EPREL uploading, it will require very high metering technologies, which means high costs for consumers.

Uploading on EPREL will be confusing and misleading for consumers, not appropriate for the current situation. Indeed, aggregated data will not be representative of the situation in which consumers will find themselves in their homes, leading to misunderstanding. In addition, we doubt that compliance checks on such data can be conducted in a rapid and efficient manner, leaving the door open for an unfair playing field in term of non-fulfilment of these new obligations and thus negating the value of the proposed option. Would not the efforts for compliance checks of such requirements outweigh the benefit for MSAs to indent potential equipment candidate for checks?

ANNEX: Proposal with technical arguments and responses on self-monitoring

This proposal is based on the fact that **self-monitoring would only apply for some test points defined in laboratory conditions, and not for the whole operating range of the appliance**. When performing the market surveillance checks, the authorities of the Member States shall only use the test points defined as follows

Validation of self-monitoring and its quality shall be surveilled by comparing measured energy output and input of a specific unit under the test conditions addressed in Annex XX, with the displayed values (on-board display, smartphone applications, or website, etc.) under the same test conditions. The deviation between these results shall not exceed 15%

The permissible uncertainty for the reference tests according to EN 14511 is 5% under steady conditions and 5% in transient operation. Obviously, on-board measurement cannot achieve such demanding tolerances. The following shall be considered for the choice of reference values:

- Test shall be performed under steady state operating conditions since the tolerances of the reference values are included in the overall permissible deviation of 15%.
- Test shall be performed with a spread of 5K or more with regards to the accuracy of on-bord temperature measurement. Sensor characteristics and impact of measuring point will lead to an accuracy of approximately 0,3 to 0,5 K per temperature, resulting in 0,4 to 0,7K for temperature difference.
- Operation of the compressor slightly off limits (e.g. envelope or speed) will ensure stable operation under transient conditions.
- A condition usually tested for eco-design / labelling should be used for comparison

To sum up the before mentioned, in the spirit of EU 813/2013 for parameter declaration, the verification test shall be carried at standard rating conditions from EN 14511 and EN 15879 for medium-temperature application with W 55 (47) at the indoor heat exchanger, except for low temperature heat pump. For low temperature heat pump, the test shall be carried out with low temperature application W 35 (30). This is in line with the mandatory declared parameters for each heat pump type. It will thus cause no additional burden, also for market surveillance authorities.

Test points W35(30) and W55(47) are usually performed at part load. It offers a good indication for the uncertainty of the self-monitoring, as the heating capacity as well as the power consumption is detected in a common condition that the heat pump faces most time of the year.

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* From EN 14511 for LT application: A7 / W35, A20 / 35, B0 / W35, W10 / W35; from EN 15879: E4 / 3
* From EN 14511 for MT application: A7 / W55, A20 / 55, B0 / W55, W10 / W55; from EN 15879: E4 / 3

Electric Heat pumps – energy input and output Considerations:

- No variation in the electricity grid
- Use of mapping based on:
    - Use of compressor frequency
    - Use of sensors to measure outdoor air
    - Use of sensors to measure outlet temperature and inlet temperature with uncertainty of at least 1K, or use of sensors to measure condenser temperature and evaporator temperature
    - Or measurement on water side via mass flow and temperature difference
    - …
- Test conditions: as explained above
- As already included in the annex VI of EU 813/2013, the 1 sigma rule should apply.

The uncertainty could be evaluated through 2 main values:

- Repeatability of appliances
- Uncertainty of sensors (+/1 K)
- We estimate for heat pumps with a rated heat output from 4 to 35 kW, and only if the above test conditions apply, that a tolerance for market surveillance purposes for energy input and output could be set at +/- 15 % as the grid variation can be controlled in the lab.

TDHPs are heat pumps where the limitation on accuracy of the input measurement tends to overlap with the consideration already made for the “boiler category” and the limitation on accuracy for the output measurements overlaps with the considerations made of the “heat pump category”.