25 May 2021

JBCE comments on Stakeholder workshop FOR AN EVALUATION AND IMPACT ASSESSMENT FOR AMENDING REGULATION (EU) NO 517/2014 ON FLUORINATED GREENHOUSE GASES

Japan Business Council in Europe (JBCE) would like to thank the commission and the consultant teams to organize the stakeholder workshop organized on 6th May 2021 and appreciate this opportunity to provide the comments. Although JBCE co-signed with the joint F-gas industry comments, we would like to provide additional comments, especially concerning small and large split air conditioners / variable refrigerant flow (VRF) and heat pumps, on the pathways presented during the stakeholder meeting on May 6th and in the briefing paper, as we believe only a realistic modelling and assumptions can lead to sound policy options. We are happy to discuss and contribute further to technical details in the further development of revised F-gas regulation.

1. **Unrealistic approach to certain refrigerants and technologies**

In table 10 of the maximum substitution scenario in the briefing paper for the stakeholder workshop, we strongly doubt that the safety limitation, energy efficiency aspects and installation considerations have been well considered. However, to build scientifically based policy options, those aspects need to be taken into consideration, not only the refrigerants GWP or its nature. We would like to point out our concerns;

1) Safety

It is important not to forget the state of the art of existing standards and building codes limits the amount of refrigerant to ensure the safety of users and thus the feasibility of introducing flammable alternative refrigerant for such type of products. Following these standards and codes is required to ensure compliance with the requisite health and safety requirement of EU and national regulation and to be able to place products on the market.

[Safety standard]

In Table 10 maximum substitution scenario, for large split air-conditioners / variable refrigerant flow (VRF), HCs are considered as promising refrigerants. However, the maximum refrigerant charge for HC refrigerant in direct expansion systems in safety standards is less than 1kg (IEC 60335-2-40) currently only possible in a very large open room (> 170 m^2). With typical refrigerant charge ranging from 0.3to 0.7 kg per kW (cf. RTOC 2018 report) without considering the necessary refrigerant piping length to connect the indoor units to the outdoor unit, even with the most optimized refrigerant circuit the maximum allowed amount of charge for HC in direct systems is very far from the necessary charge for the smallest VRF system let alone to make the assumption all VRF and multi-split system can be switched to HC. Even with heavy use of costly safety mitigation measures using technology that is still not easily accessible on the market and with big large uncertainties on the readiness of the personnel to install, maintain and service such systems, it is unconceivable that HC can be considered as a feasible option for multi-split systems. In case the consultants considered to replace the VRF by a HC chiller solution, we would like to point out the energy efficiency advantages of VRF (as can be seen from Ecodesign lot 21 MEPS and BAT levels), the zone control and heat recovery advantages, the rapid flexibility to respond to smart grid networks, as well as the space saving applications. These are much needed features for the EU Ecodesign, Energy transition and renovation strategies. It should be also recognized that

over the last two years, there is a significance of delay in incorporating of Ed 6.0 of the IEC 60335-2-40 published in 2018 into a European standard where Ed 4.2 is still the latest version implemented in EU with very limited amount of charge for both A2L and A2/A3. As manufacturers cannot start large scale manufacturing without certainty on the date of application of the European version, it is to be expected that at least further 2 years will be needed before the introduction of product developed according to this standard. While this new edition is a big advancement and will facilitate the installation of A2L refrigerants in smaller systems, there are still barriers pointed out above. Hopefully this will be mitigated with the next revision, Ed 7.0, however this revision is still ongoing on international level with uncertainties on its approval and publication (mostptimistic scenario by mid-2022)and given the history of the speed of adaptation of this international standard as a European standard it is more than likely the EN ed 7.0 will not be published before 2025 let alone to be used for largescale introduction of VRF system with larger amount of A2L refrigerant. It is also to be noted that although this ongoing revision offer more possibilities for using larger charges of refrigerants, there will be still some configuration (sold and installed today with A1refrigerant) where it will be not possible to shift to A2L refrigerant and, for A3 refrigerants, the maximum charge is maintained at less than 1 kg. In addition, the revision of EN ed 7.0 poses still has limited potential for achieving high energy efficiency split AC equipment as required by future Ecodesign and Energy labels for lot 10 products (both for small and large AC systems)

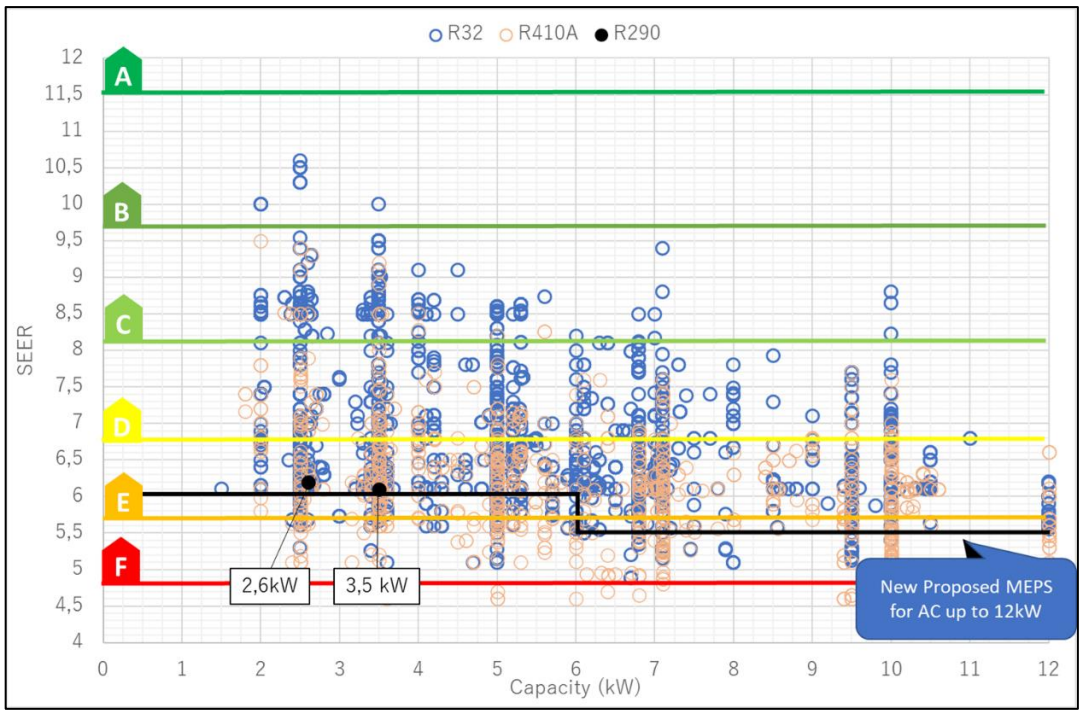
[National regulation: CH35/GH37 in France]

The maximum substitution scenario is forecasted quickly shift to use of lower GWP refrigerants under the condition that there are restrictions to use flammable refrigerants in commercial or large public buildings in national building code. In case of CH35 in France, it is already highly challenging and costly to install A2Lrefrigerants, let alone A3 refrigerants. The GH 37 still forbid any installation with flammable refrigerant.

2) Energy Efficiency

It is important to recognize the demand to increase energy efficiency requirements of equipment in terms of reducing indirect emission. Following two of graphs show the mapping of the current models compared to the future energy efficiency labels under ENER Lot 10 in Ecodesign directive with incorporating the R290 equipment value which is sold online. It can be pointed out that equipment with R290 perform below average in terms of both SEER and SCOP, only just achieving MEPS level in cooling and below the required MEPS level in heating. This is far below the best efficiency level among current available models using R32.

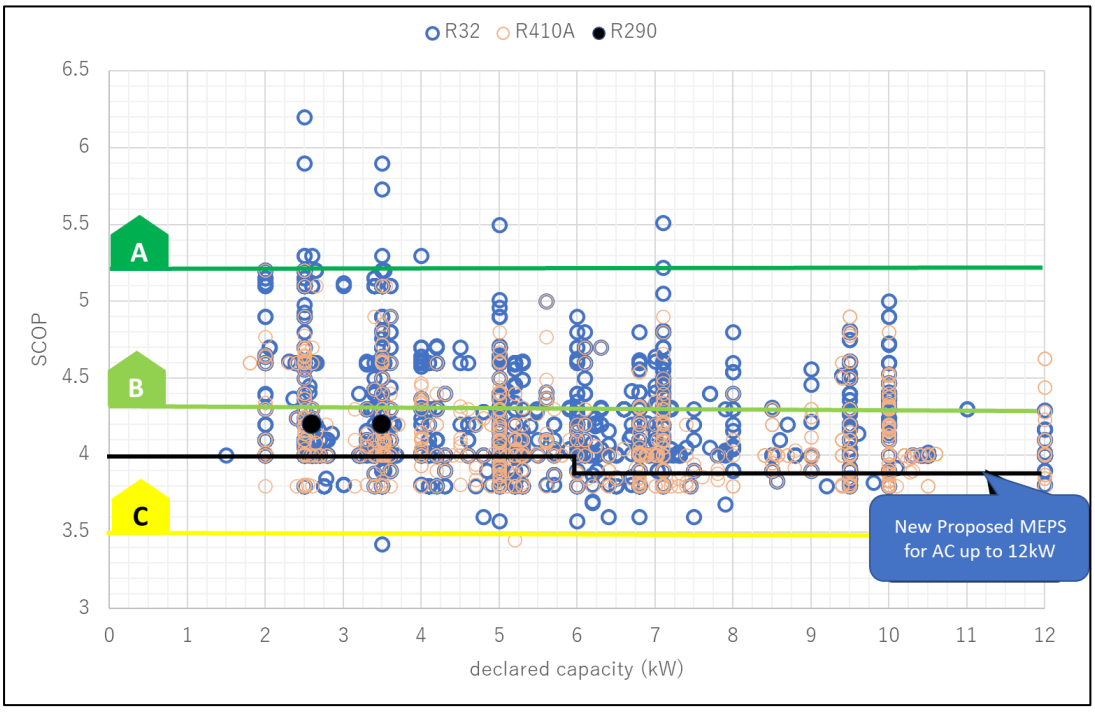
(Fig 1). Air to Air heat pumps AC with capacity up to 12 kW in cooling efficiencies (SEER)



(Reference: Eurovent certification database https://www.eurovent-certification.com/en/search-engine#/

appliancedirect : https://www.appliancesdirect.co.uk/files/pdf/R290%20Split%20user%2020200703.pdf.)

(Fig 2). Air to Air heat pumps AC with capacity up to 12 kW in heating efficiencies (SCOP)



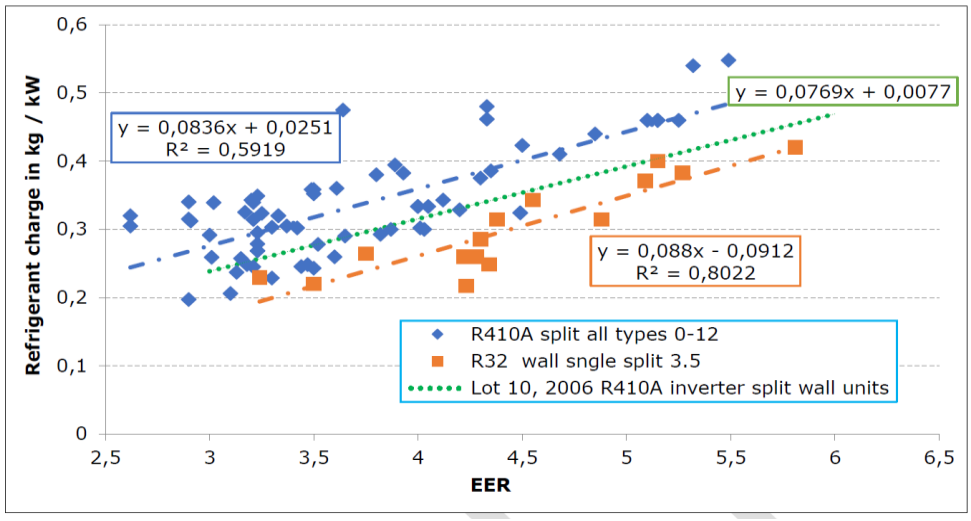
(Reference: Eurovent certification database https://www.eurovent-certification.com/en/search-engine#/

appliancedirect https://www.appliancesdirect.co.uk/files/pdf/R290%20Split%20user%2020200703.pdf.)

[Restricted refrigerant charge volume]

Efficiency and reversibility of the system need to be considered while modeling the feasibility of shifting to lower refrigerant. As indicated in Lot 10 review study (2) for regulation 206/2012 and 626/2011 air-conditioners and comfort fans, higher charge is required to achieve higher efficiency synonym with lower lifecycle emissions and satisfy the increasing requirements from Ecodesign regulation. It should not be forgotten that the energy efficiency minimum requirements and best in class for cooling will be increase of 30% as of 2023 (tentative date for Lot 10 entry into force). For instance, for air-to-air heat pumps below 12kW with a 5m piping length:

(Fig 3). EER versus specific refrigerant charge in kg/kW (capacity and EER at T1 condition), 5m piping length



(Source: Preparatory Study: Review of Regulation 206/2012 and 626/2011 Air conditioners and comfort fans. 2018)

According to the graph above, the refrigerant charge per kW for R410A to comply with the new MEPS should be around 0.4 kg/kW and up to 0.5kg for the most efficient units. Additionally, the piping length is most real life installation will be higher than 5m and which require additional charge of refrigerant. Even when considering the lower charge ratio (40-50%) of R290 compared to R410A, it is unlikely systems with these refrigerants with typical piping length on the market will be able to provide an efficient system with more than 3kW capacity with the current state of art component technology (see attached slides). At the same time, even smaller size units below 3 kW may not be able to achieve the required energy efficiencies in warm climates, and there would be an increased safety risk in case of oversizing.

The reversibility of the system also limits the possibility to use charge reduction measures that are possible for cooling only systems(e.g., microchannel heat exchangers). Introducing lower efficiency systems (due to the restriction of charge or the properties of an ultra-low GWP refrigerant) will be counterproductive for the Green Deal and “energy efficiency first” objectives as the majority of emission are generated by the electricity consumption in use phase.

3) Installation

Currently, there is no mandatory certification scheme in the EU for the installation, servicing,

decommissioning and end of life treatment of non-HFC refrigerants such as HCs. Safety Standard EN 378 and product standard EN60335-2-40 would provide guidance to installers but it is not at guarantee that they sufficiently protect installers and service technicians, especially in case of A3 refrigerants. In addition, the total charge of VRF / AC systems is affected by the total piping length of the system. Additional top-up refrigerant charge is necessary in many installations. This would represent a problem using HCs, the more the charge the more the flammability risk. Safety is of high concern and the minimum required installation floor area would become too big for many installations.

2. **A significant lack of granularity**

[Large split air conditioners / variable refrigerant flow (VRF)]

The product category defined by the consultant does not allow for sufficient distinction between technologies and capacities. It encompasses AC equipment from 3kg of refrigerant size up to more than 80kg of charge, equivalent of products ranging from 12kW up to 300kW. Therefore, we question how it is possible to determine a 'meaningful representative unit' in the modelling for such a large category, as the installation, pipping lengths, number of indoor units etc. vary largely between 3kg charge to 80kg. We would appreciate to receive further background information on the data and assumptions made on the modelling and parameters used to define the maximum substitution scenario as detailed in Table 10. Furthermore, it is important to consider that, most of those units in the market are reversible system with both for cooling and heating. According to the ENTR Lot 6 preparatory study conducted by DG energy in 2008 more than two third of sales of AC>12kW (88% for VRFs) were reversible and it is safe to say that this share has certainly increased since then. It is generally known that cooling and heating modes of a reversible vapour compression heat pump use different amounts of refrigerant quantity, with the heating mode being the most requiring in terms of refrigerant charge. This very simplistic and distorted image of the sector will lead to large errors in term of market projections, safety considerations, energy efficiency etc.

[Heat pump]

We would like to have further information on the heat pumps definition used. We assume it was limited to hydronic type heat pumps (air to water / water to water / ground to water). We would like to remind that the market of Air-to-Air heat pump technologies should not be ignored. In addition, also larger chillers are available for heating as well. The definition of heat pump needs to look into all products that have a heating function, and should not be narrowed down to only one particular technology.

In the recent Lot 10 review study for regulation 206/2012 and 626/2011 air-conditioners and comfort fans, the consultant determined two representing units for the EU market: a 3,5kW unit and a 7,1kW unit. As another example, 2018 RTOC Report place the average size for split unit at 3.8 kW and the smallest unit at 2.0 kW (higher than the assumed average for the model). Thus, we would appreciate to receive further information on the definition and the representative units used as a basis for the modelling and as well the maximum substitutions scenario.

It is also important to recall that splits air to air equipment are in their vast majority reversible, they are actually much more largely used in heating than in cooling. The Lot 10 estimated that a split AC functions 350 hours at cooling full load and 1400 hours in heating mode. We would appreciate to understand which projection shave been used in the model on this matter. Air to air heat pumps will be key to reach EU's decarbonisation targets.

(Fig 4) Repartition of split air conditioners by size, EU 28

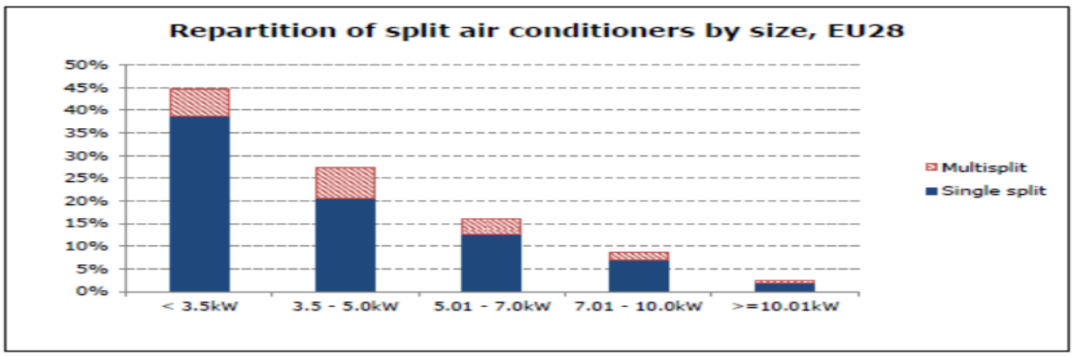


Figure 7: Split sales distribution by size, source BSRIA.

(Source: Graph extracted from 2. ARMINES and Viegand Maagøe . Preparatory Study: Review of Regulation 206/2012 and 626/2011 Air conditioners and comfort fans. 2018: more precisely Task 2 Final Report page 17)

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