Review of: "Refrigerant Selection in Air Conditioning Systems Considering Thermodynamic, Environmental, and Economic Performance Using the BHARAT-II Multi-Attribute Decision-Making Method"

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Potential competing interests: No potential competing interests to declare.

In the present context, finding the suitable alternative for the refrigerants in the given applications from the basket of the suggested alternatives is a daunting task, and authors have brought out a multi-attribute decision-making method, BHARAT II, to select the suitable alternative, taking into consideration mainly the thermodynamic properties and environmental factors.

Authors have considered two case studies to prove that the strategies adopted by them, based on the BHARAT II, are better and select suitable alternatives compared to earlier adopted methodologies based on entropy methods and multi-attribute decision-making methods such as EDAS, TOPSIS, and MOORA based on entropy.

Selection of the pertinent selection attributes is subjective and may vary from expert to expert, and how the presented methodology, BHARAT II, is scientifically proven and well documented needs to be clarified to prove its authenticity. Moreover, whether these are performance data or thermodynamic and environmental properties.

Can you provide specific examples or scenarios where the selection attributes might vary significantly between experts?

Could you clarify how the performance data and thermodynamic properties are treated differently in the BHARAT-II method compared to other methods like EDAS and TOPSIS?

Is the methodology capacity-driven, and is one of the influential parameters, as in case study one, it is stated that "R22 in split AC units with a 1.5 TR capacity"?

It is stated that Prabakaran et al. (2022) considered 15 refrigerants, taking into consideration the discharge temperature, power consumption, coefficient of performance (COP), and total equivalent warming impact (TEWI) index and the lifetime cost; however, thermodynamic properties are considered, not the performance parameters. Are all the thermodynamic properties taken at 60 degrees, which implies that the imposed methodology is not generic; instead, it is operating conditions driven.

What the authors imply and signify is that the attributes T, VD, LH, and TC are the beneficial attributes and are indicated by upward arrows. The other attributes are the non-beneficial attributes and are indicated by downward arrows. Are these

simple 11-point scales or 7 selection attributes, though there are 12 thermodynamic and environmental properties in Table 3? What do the authors mean by average rank 2 and 8, though in the tables, attributes are either 1 or 4 or ¼?

Should we say that methodology adopted by Prabakaran et al. (2022) based on the entropy method is universal and not the individual decision making ability however, in the presented methodology the selection of the suitable refrigerant may vary from expert to expert as it is based on the individual decision making capabilities. In such scenario how come the later methodology would be better than the former. Two different methods suggest two altogether different alternatives R290 and R1234yf for R22 based on the multi attribute decision-making methods however, practically which is the best alternative.

Do the proposed alternatives of R22 refrigerants only suitable for specified operating conditions or universal.