Expert survey on technical requirements of PV-powered passenger vehicles

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Task Managers:

Keiichi Komoto, Mizuho Research & Technologies, Ltd. (MHRT), Japan

Manuela Sechilariu, University of Technology of Compiègne (UTC), France

Authors:

A.J. Carr (the Netherlands) & B.K. Newman (the Netherlands)

Executive Summary

Following on from the previously published PVPS Task 17 technical report 'State of the art and expected benefits of VIPV' this report presents an overview of the technical requirements and challenges for successful adoption of VIPV technology.
The interest in VIPV is growing and it is starting to develop from a niche towards a more mature market. In order to gain insights into what the community considers important in this transition, a survey amongst world experts was conducted by TNO (The Netherlands Organisation for Applied Scientific Research). The survey, in which 110 experts in this field were asked about various aspects of VIPV, provided valuable insights into what areas are important for the adoption of VIPV, and what these experts believe users may be prepared to sacrifice in PV yield to achieve a preferred result in the aesthetics of the vehicle.
The choice to survey VIPV experts of course means that the results may be biased in favour of VIPV technology and not representative of the general preferences of car buyers or early adopters. However, these experts do have extensive knowledge of the technical aspects of VIPV, and so the responses are very well informed.

A. Survey methodology and participants

The experts invited to complete the survey were from 4 continents (Europe, Asia, Australia and North America). Overall 70 people responded to the survey; a 64% response rate. Care was taken to develop questions to eliminate surveyor bias and the responses to the survey were completely anonymous. Survey responders were given the option to choose N/A for any questions that they felt they did not have sufficient expertise to answer. This lead to an average of 40 countable responses for most questions. A great majority of the responders were from Europe >75%, approximately 20% from Asia and small percentage from North America. The distribution of the participant over the various sectors in the field is shown in Figure 1. The majority of the respondents, 62%, came from the PV research.

The remainder of the correspondents was divided almost equally over PV cell and module manufacturing, automotive manufacturing and automotive research.

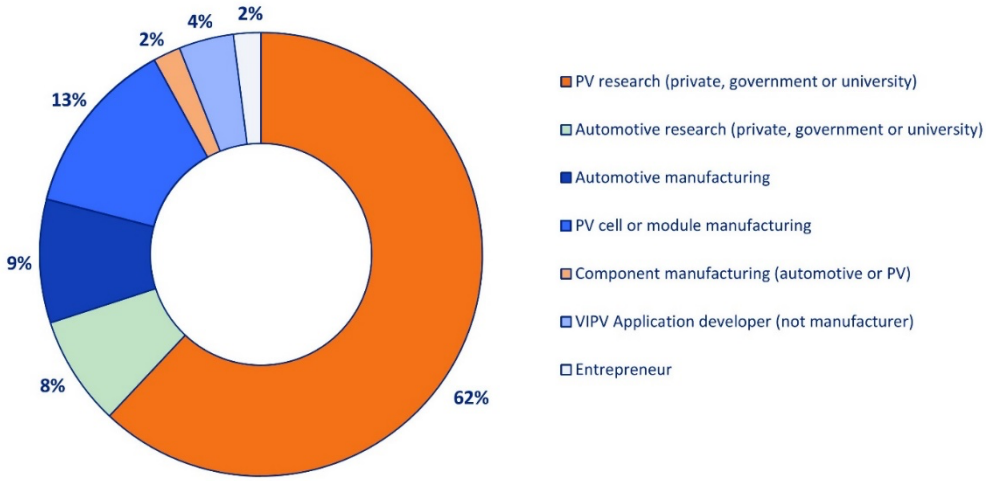

Figure 1. Participants per sector

B. PV Technology

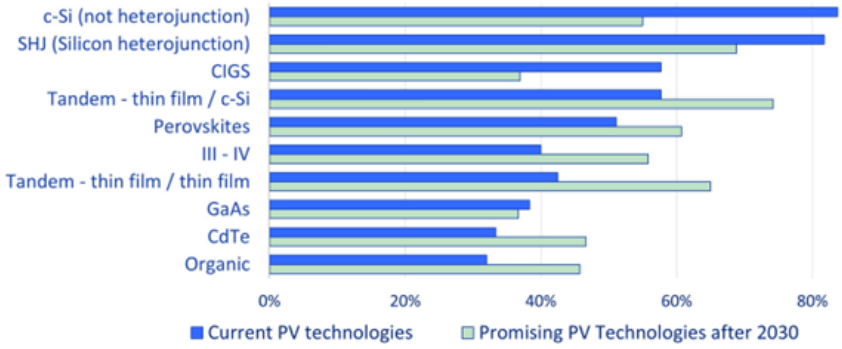

Figure 2. PV technology now and in 2030

The survey results on the preferred type of PV technology for today and in 2030 are shown in Figure 2. Crystalline silicon, c-Si, technology is seen as the current dominant choice for VIPV, however by 2030 respondents expect tandem and thin film technology to grow.

C. Most important system properties

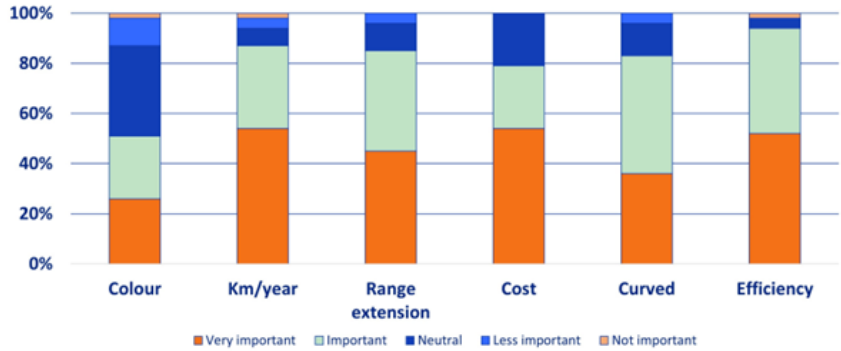

Figure 3. Most important system properties.

Besides efficiency, other system properties, like e.g. colour and range extension, are expected to have an added value for the uptake of VIPV. The survey results show that range extension, km/year, efficiency and cost are ranked as very important or important. Colour was the least important property out of those selected.

D. Summary of key results

The survey has given important insights into the aspects that are found to be important for the further growth of VIPV. Some of the key results were:

- c-Si is the dominant technology of today with tandem (thin film / c-Si) expected to grow in the future.
- PV appearance: a preference for no metal on the front – IBC technology was indicated.
- Efficiency, km/year and range extension were the most important system properties.
- Minimum lifetime should be 10-15 years.
- Largest technical bottleneck – complexity of manufacture.
- Most important benefit – reduced need for charging.