

pv magazine

PHOTOVOLTAIC MARKETS & TECHNOLOGY

Gaining traction

22 pages on electric mobility's inflection point and how it's opening new avenues for solar

The EU bets big on batteries

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New horizons

How offshore PV is opening new frontiers



Fullscreen

ION EQXX

Mercedes-Benz

Staying charged

The integration of solar cells into passenger vehicles appears to be progressing in lockstep with the increasing penetration of electric vehicles, which itself looks to have hit an inflection point. But how does one know whether a solar roof is still in good working order in the testing environment of the open road? German flasher provider Wavelabs is looking closely at the issue, and CEO Torsten Brammer provides some insights into the challenge.

“With perovskites we can go beyond 30% and that would extend the range well beyond 50 km and make it ever more attractive”

In some ways solar electric vehicles (SEVs) can seem like a bit of a gimmick. What do you see as the advantages of solar electric vehicles?

Range extension is the obvious one. Depending on the design of the car, it can be up to 50 km for a sedan. For example, [Dutch SEV developer] Lightyear has 5 m² of solar on the horizontal surface and achieves a range extension of 50 km. This means that definitely less frequent charging is needed [with SEVs]. And of course you save money, because you are using your own electricity. The electricity costs if you charge from the grid are usually €0.20-0.80 (\$0.22-0.80)/kWh, and it is a lot cheaper if you have your own solar on your roof.

Then there is the bigger picture that with SEVs you have the decentralized generation of electricity, since you are generating the electricity on the car. That helps if electric vehicles are applied on a large scale to reduce the load on the grid. All in all, I think these are just some of a range of attractive features. I believe that SEVs have a good chance to become the standard electric vehicle.

I saw a statistic the other day, that in the past 10 years the solar industry has increased the amount of generating capacity that can be installed on a set square meterage of roof by 50%. While it's a rough calculation, it does show how much more power can be added with performance increases. At present, 50 km is not nothing, but to have really meaningful range extension, can solar cells and modules generate a lot more power?

Cranking up the efficiency would help to improve the features of a SEV. We are now looking at 20% to 22%-efficient solar cells. That is why perovskite is such an attractive technology for SEVs, because with perovskites we can go beyond 30% and that would extend the range well beyond 50 km and make it even more attractive for a larger number of customers.

What about even higher efficiency solar technologies like gallium-arsenide based semiconductors? Could you see a future for those?

I was actually thinking about this only the other day – why not deploy these triple or quadruple junction solar cells based on gallium arsenide, indium phosphide, germanium or silicon? This technology could move back from space onto terrestrial cars. These solar cells can have an efficiency of 40%. The thing is that the economics are totally different [with SEVs]. It is more like on a satellite. Cost is always important, but it is less about cost and more about power density. If you can go to 100 km a day, then this would be phenomenal and those super advanced PV technologies, based on gallium arsenide, could be super interesting.

At the moment it is looking like more standard, high-efficiency crystalline silicon cells will be used in SEVs. But we know how fragile they are, what is your understanding as to how being bashed around on the roof of a car is going to impact solar cell durability and performance over time?

That is definitely one of the biggest challenges when you apply solar cells on cars. In standard solar parks you already have the challenge of long-term durability. But, of course, it gets even worse if you have a moving solar park, exposed to high winds due simply to the speed at which you're traveling. The application is really different. Solar technology has come a long way, but the reliability testing has to come up to a new level. The way that the solar cells are encapsulated has to be reinvented with more modern technology to a certain extent. But fortunately it is not totally new. SEVs have been around since way back to the 1950s, and I think Audi used to have a small solar roof some 10 to 15 years ago. This means it's not totally new and there is some experience. I guess it is just material engineering but it has to be done super carefully, to ensure that the performance doesn't come down too quickly.



Wavelabs CEO Torsten Brammer pictured alongside Solar superhero "Flash."

When we're talking about testing, will it be required over the lifetime of the SEV, rather than just on day one?

I usually buy secondhand cars. And if I was considering buying a SEV, then I will ask myself how easily we will be able to check whether the solar still works. There are 30,000 workshops in Germany where they will issue a certificate regarding the quality of the car. Usually, you are not too worried about a combustion engine and it's pretty easy to get a sense of whether it's good or not. But with solar, it doesn't move, or make any noise, so it's hard to know whether the solar is still working. It can be done but we need a standard to qualify the solar quality after a certain period of time in use.

Usually those test units in the workshops, mustn't be too expensive. They cost around €10,000 to €20,000 and at the same time they need to be sufficiently good to qualify whether the solar still works after five to 10 years. This is also true if an SEV has been in a car crash – then the owner definitely wants to know whether the solar is broken or not. Maybe there might just be microcracks or the wiring on the back of the solar cell might be damaged. But these are the type of challenges that face new types of cars, how can the performance of the solar be tested in field.

At Wavelabs have you developed measurement tools to do that?

We do sell what I suppose you could call a modified flasher to SEV companies or companies that provide the sub-unit. For the in-field testing, we are in discussions with stakeholders to see what is required, what the budget is, and that is why we joined ASOM – the Alliance for Solar Mobility. In ASOM, you find companies that provide the solar material, the encapsulation, companies that build solar cars and that is still under discussion as to what is required by the market. And here we definitely need some kind of standard because one workshop can't do it one way, and another the other way. So, there need to be standards, we need to discuss the technology that is adequate. ■

Interview by Jonathan Gifford