LIGHTWEIGHT SOLAR MODULES FOR MOBILE APPLICATIONS

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PV-Days 2017

24.10.2017

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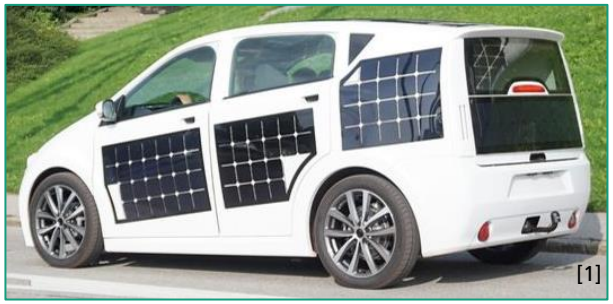
Content

- Motivation
- Lightweight approach
  - Concepts
  - Weight
  - Cost
- Use cases
  - Caravaning
  - Commercial trucks
- Challenges
- Conclusion
- Future works

Motivation

- Electromobility and Photovoltaics (PV) are global growth markets
- Financial amortisation within few years can be feasible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? What is the best module for mobile applications

Lightweight approach should be part of the answer !

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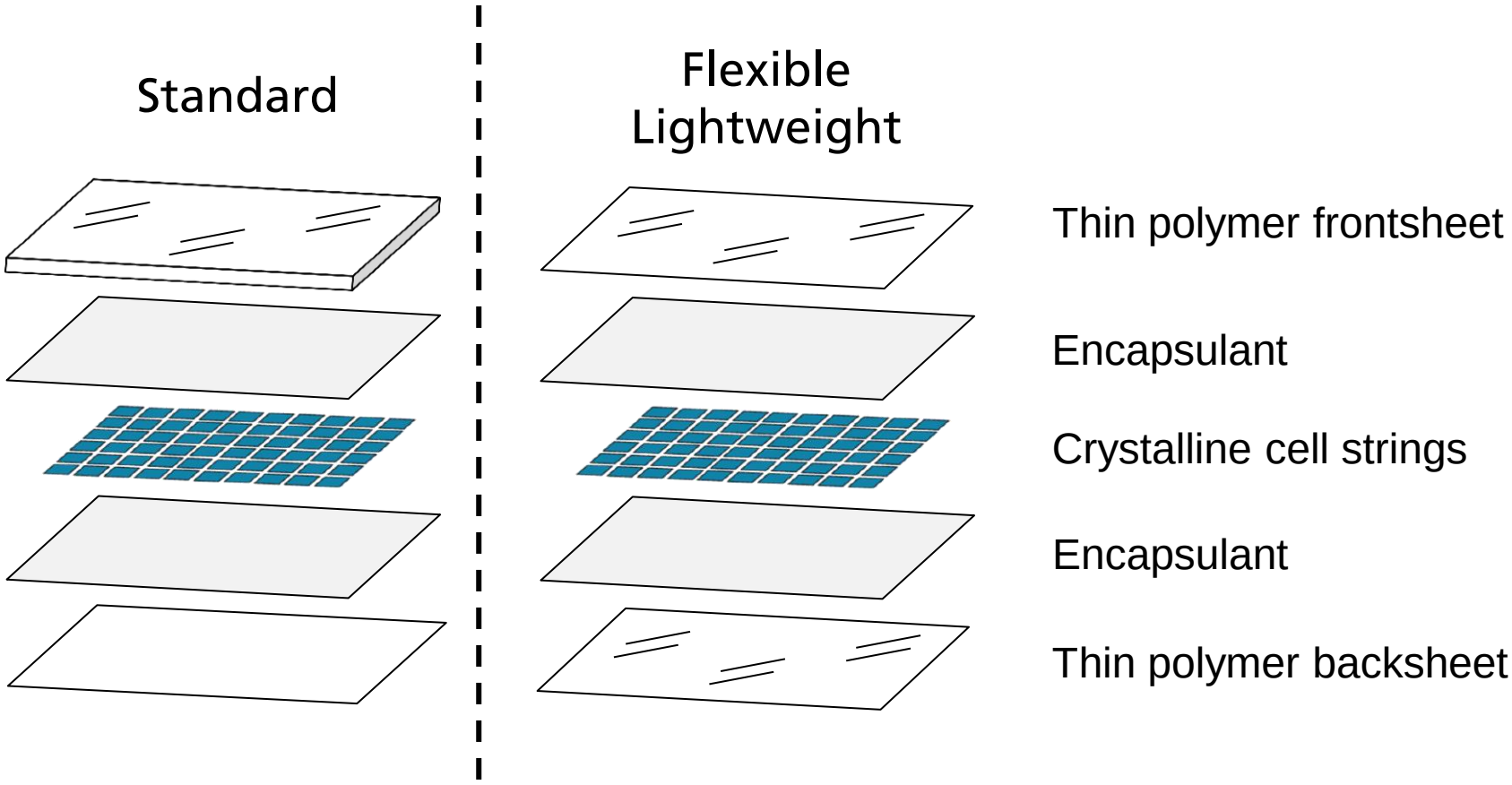
Lightweight approach
Concepts



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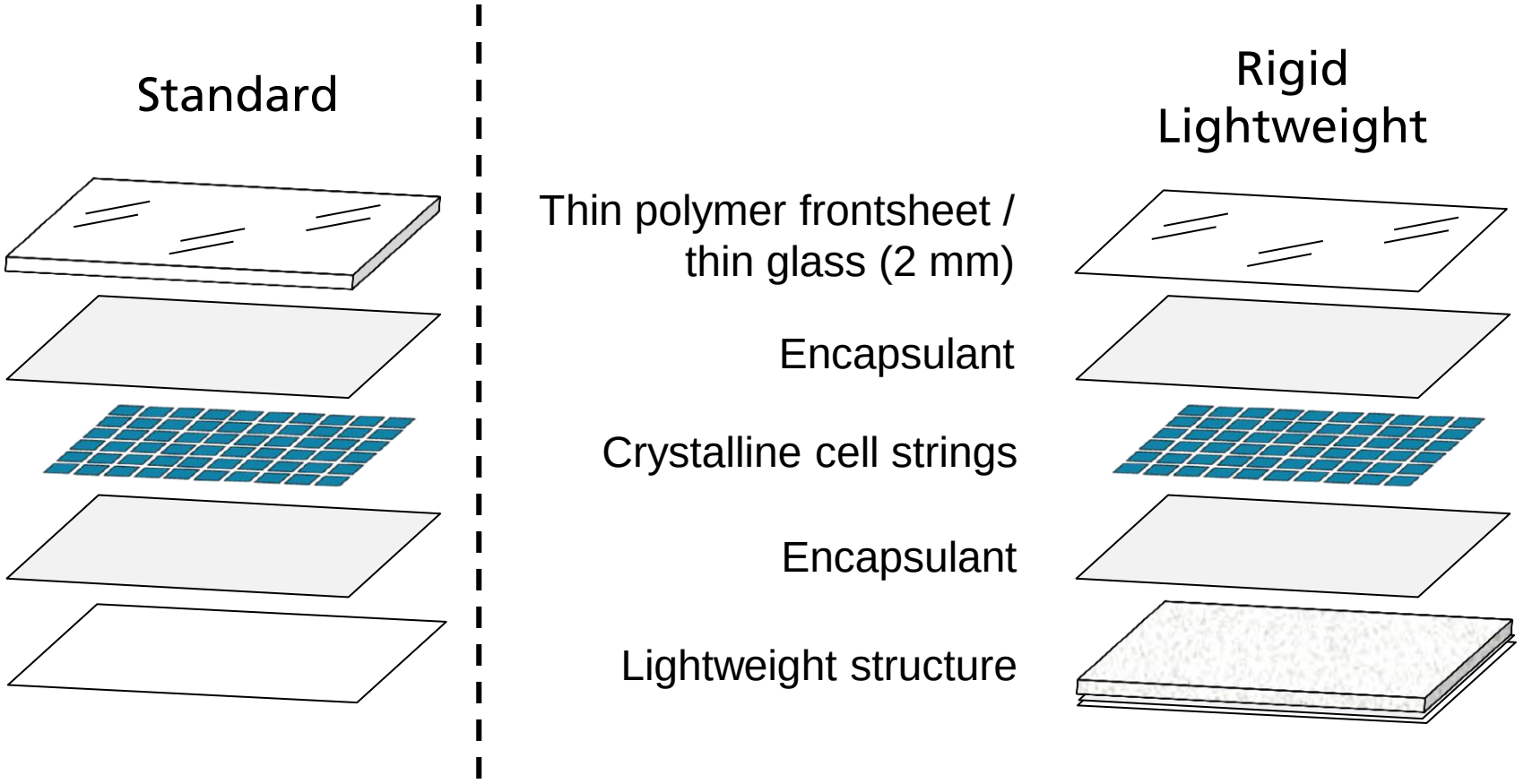
Lightweight approach
Concepts



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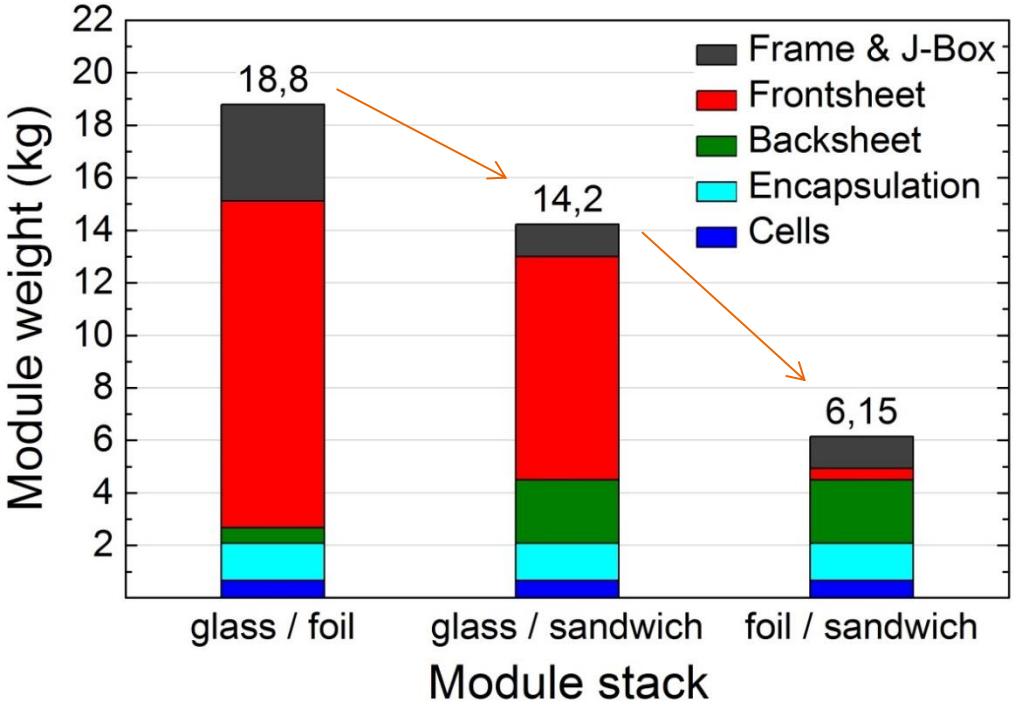
Lightweight approach
Weight



Results:

- Standard modules with about 19 kg total weight (60 cell module)
- Weight reduction to 14 kg through thin 2 mm front glass and light-weight sandwich back structure
- Further weight reduction to 6 kg with a complete polymer module concept

- **Total module weight can be reduced to below a third of standard module weight**

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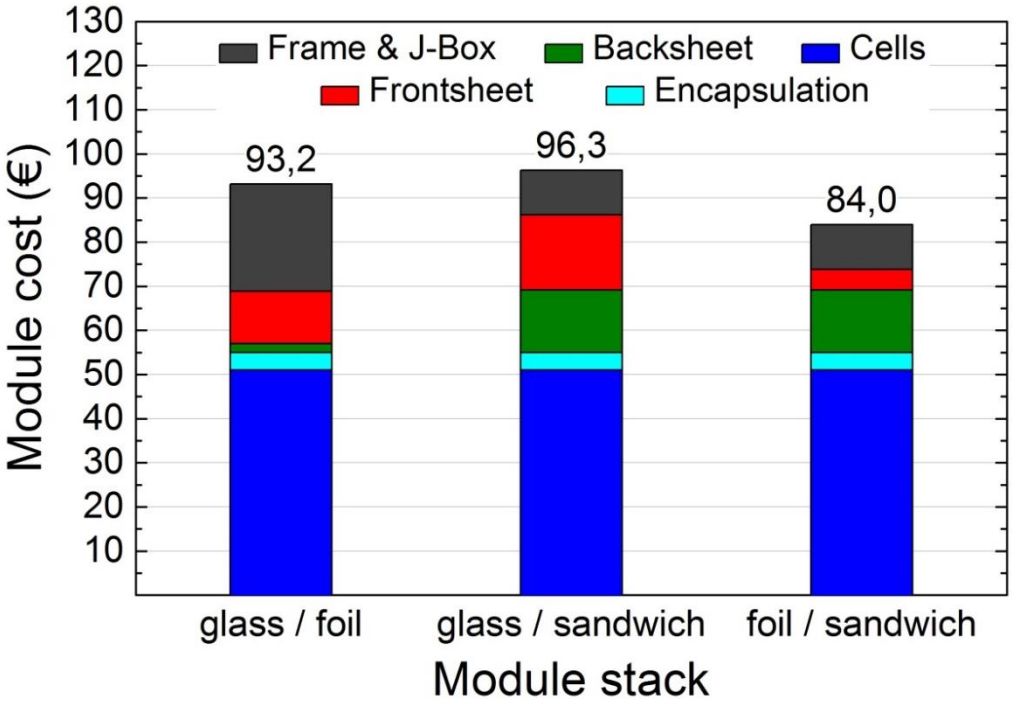
Lightweight approach
Cost



Results:

- Cells are the biggest cost fraction (>50%)
- Further cost drivers in the standard-module are the glass and aluminum frame
- Additional cost through thinner glass and multi layer sandwich-backsheet
- Cost benefit of lightweight concept through thin front polymer foil and polymer frame

- **Lightweight concepts can economically compete with standard modules**

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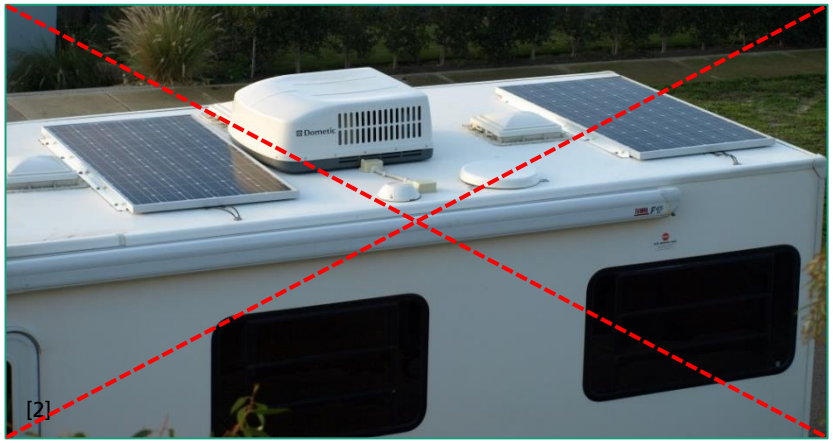
Use cases
Caravaning



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Concept:

- Rigid lightweight modules with foam substrate material
- Thickness variable
- Possibility of component integration
- Demonstrator on standard 60 cell module size realized
- Mounting or skin integration

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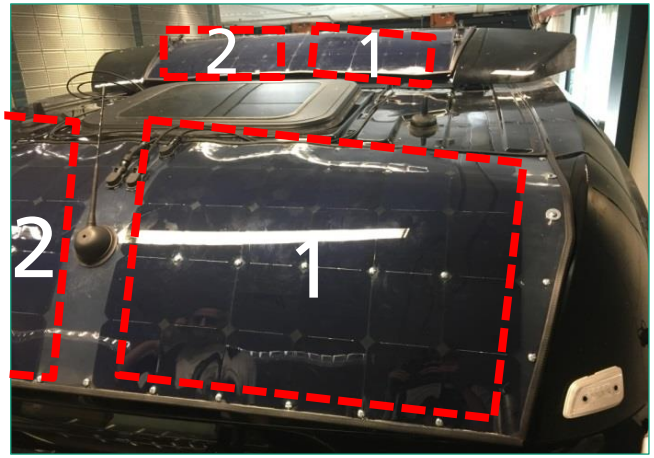
Use cases
Commercial trucks

Project information:

- Cooperation with Continental
- Solar integration in tractor unit of Continental Innovation Truck
- Internal power supply via DC/DC Converter
- Presentation at IAA Commercial Vehicles 2016
- Since then in operation around Europe

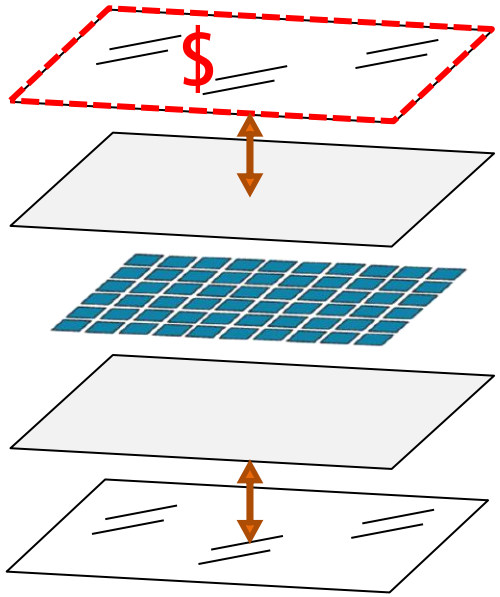


Installed solar module:

- Mounting on roof hood and wind deflector
- Split module sides to match DC/DC Converter
- High-efficiency modules for maximum yield
- Total power of 300W_p
- Lightweight foil/foil structure (t~3mm)
- Flexibility for shape adaptation

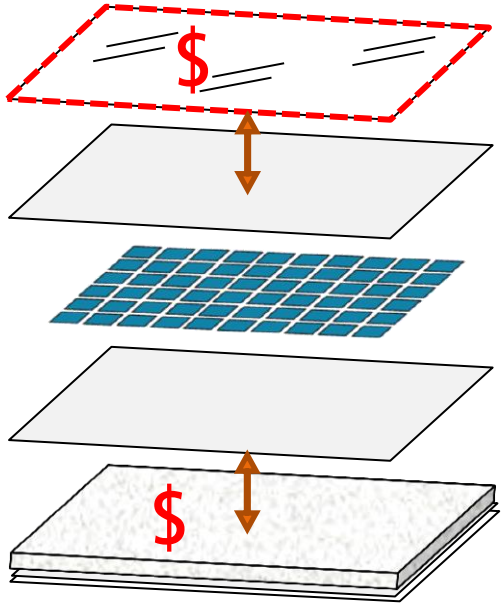
Challenges

Flexible
Lightweight



- Scratch & impact resistance
- Weatherability (especially UV protection)
- Interlayer adhesion
- Thermal distortion
- Cell breakage
- Cost efficiency

Rigid
Lightweight



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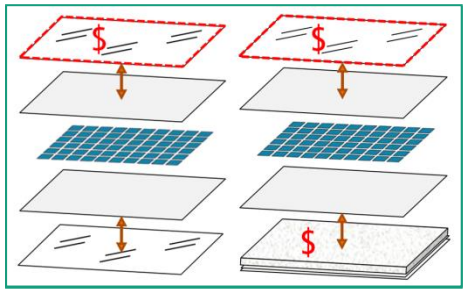
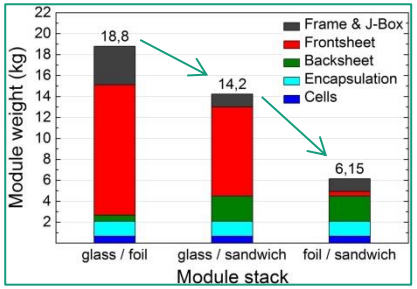
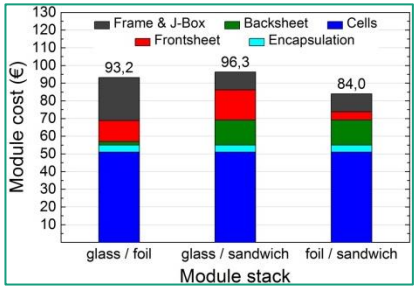
Conclusions

- Electromobility & PV feasible for certain application
- Lightweight modules can be built (semi)flexible or rigid
- Possible weight reduction to below a third of standard module weight
- Use cases available
- Technical challenges have to be overcome
- Lightweight modules can be economically competitive







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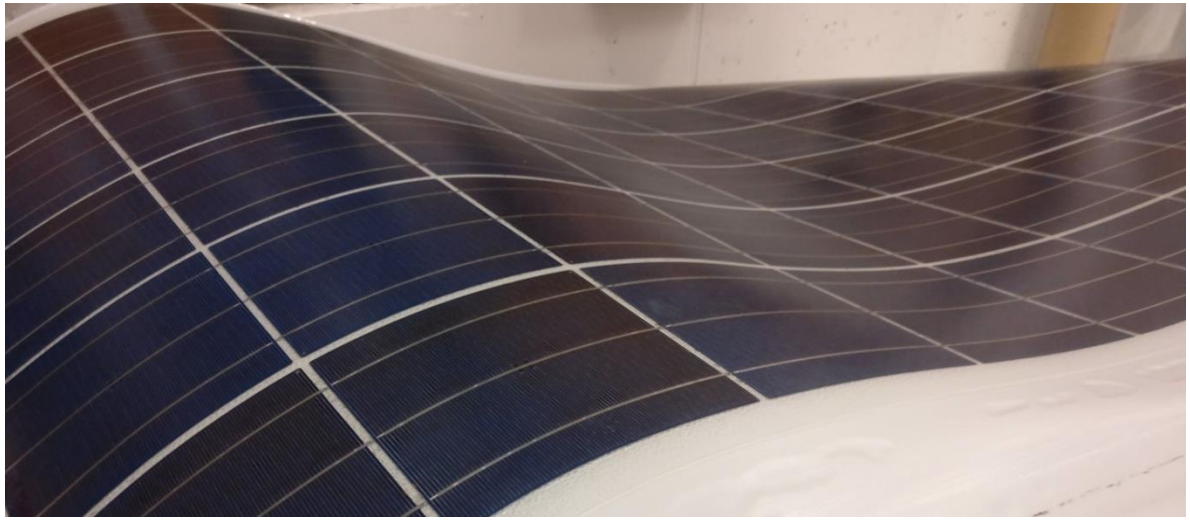
Future works

- Evaluate new markets for lightweight modules
- Reliability testing and optimization
- Introduction of specific power-weight parameter as scientific challenge in preparation



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