FIT-for-Market

Publieke samenvatting / Public summary

Aanleiding

Commercial rooftop installations had a 42% market share of the 3.5 GW PV market in the Netherlands in 2020 . It is expected that the commercial rooftop market segment will continue to grow. The Dutch government strategy is to install PV preferentially on roofs. The commercial rooftop market is characterized by limited available surface and an opportunity of high local electricity demand. Therefore, to support this market growth, innovative PV products with higher power density are highly valuable. The PV sector is dominated by the use of PERC solar cell technology which limits module aperture area efficiency to 22%. For higher efficiency, tandem solar cell technology is required. Tandem solar cells stack separate solar cells for short wavelength light and for longer wavelength light, to increase the electrical power extracted from the solar spectrum. According to the international PV roadmap high volume manufacturing of Si-based tandem PV will be starting in 2023 at an efficiency about 2% abs higher than PERC, and the efficiency difference grows in subsequent years. For low-cost tandems it is expected that perovskite and crystalline silicon solar cells will be combined.

Doelstelling

This project aims to do the final development for entry-level tandem PV modules for the Dutch market, with lower CO2 content and lower cost of electricity compared to PERC modules. This will involve • Optimizing perovskite cell deposition on 6 inch silicon wafers, resulting in 2-terminal tandem cells ready to be integrated in PV modules • Optimizing module processing and make test

Projectinformatie / Project information

Projectnummer / Project number
HER+21-02920432
Subsidiebedrag / Grant amount
€ 18.000,00

Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

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modules to verify stability and energy yield • Achieving about 9% higher energy yield than bifacial PERC modules, and a lower cost per kWh The distinction entry-level entails that the perovskite cell is deposited on a planar wafer surface. This builds on the long experience of TNO in preparing stable perovskite modules on glass substrates. The purpose is to mitigate the risks of the new technology and focus on stable modules. This fits very well with bifacial module design to obtain an optimum current match. Currently bifacial modules provide a quick and easy return of extra investment over monofacial on a flat roof. The project will provide initial LCOE analysis and outdoor energy yield data to contribute to the bankability of tandem technology and its introduction in the Dutch market.

Korte omschrijving

1. The large area perovskite process of TNO will be transferred from 6 inch glass to 6 inch silicon bottom cells with planar front side. STS will develop a model framework for scaling further to multi-wafer processing. A screen printed top contact will be added. This perovskite process incorporates an atomic layer deposition step contributed by Levitech. Hanwha Q CELLS will provide the bottom cells, with contributions by Tempress and TNO for the emitter technology 2. TNO will apply industrial module interconnection and encapsulation compatible with perovskite requirements, based on its processes for double-glass perovskite modules, and its know-how of silicon heterojunction and low-temperature interconnection technologies. Yparex will optimize encapsulants for best compatibility with the perovskite material properties. 3. Large area modules with tandem cells will be tested at TNO to pass the IEC requirements (pre-certification). 4. Tandem laminates will be tested in field conditions of Dutch commercial roofs by Hanwha Q CELLS Benelux. 5. LCOE will be estimated based on pilot scale production data at the partners, the outdoor data from HQC, and energy yield analysis of TNO.

Resultaat

If tandem technology is to reduce the cost per kWh, it is essential that both crystalline silicon (cSi) and perovskite (pk) cells use low-cost process methods and cell architectures. This means that a PERC architecture will be attractive for the cSi part of the tandem cell. The project will result in 1. Technology upscaling. 2T tandem technology will be upscaled to 6 inch solar cell size, with model analysis of scaling of the slot die coating technology to multi wafer processing, and use of in-line spatial ALD processing. 2. Tandem modules that exceed the comparable PERC module energy yield by 9%. The tandem modules will have a bifacial design. This will better match the current generated in the perovskite and silicon cells. The double-glass encapsulation preferred for module stability, will thereby also have an optimal benefit for energy yield. 3. Reliability and stability data of module performance in accelerated degradation tests and in the field. 4. LCOE based on sound production process analysis, outdoor data, and energy yield. The target for cost reduction per MWh is about 2 Euro.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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