DRRES-PV - Drone-based evaluation for a Reuse Strategy of PV Modules

Publieke samenvatting / Public summary

Aanleiding

This project will contribute to the reuse strategy of PV panels and “Het verbeteren van de circulariteit van zonnestroomsystemen (maximaal benutten en hergebruiken van grondstoffen en materialen)” and the National Circular Economy Programme of the Netherlands, which aims to achieve a fully circular economy by 2050. The project supports the “Circular Solar Energy Systems & a Resilient Sector” plan for circular solar energy systems and industry. Recently, large scale PV plant developers with first installations having reached economic End of Life (EoL) show growing interest in repowering. As a result, PV modules are decommissioned before they can be considered at 'physical' EoL. Recycling these still functional modules is not the most sustainable option and instead, “reuse” over recycling prevents unnecessary waste management and reduces the environmental footprint. Therefore, reuse of PV modules is a key strategy to generate higher circular economic value. Despite these benefits, the re-qualification and reliability assessments are still under development.

Doelstelling

The IEC TC82 draft proposal on reusing PV modules proposes multiple tests for each PV module involving considerable time and costs, which limits the reuse due to current low prices of new PV modules. This project aims to develop a cost- and time-effective testing programme based on drone inspections and machine learning to assess the reusability of PV modules. Advanced modelling will

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be developed to predict the power output and remaining lifetime of individual modules using drone inspection data. It will develop a framework that provides support for a PV module reuse decisions-tree to enable faster, cost effective, and scalable qualification for the reuse of PV modules. This is to be developed in particular for the application of revamping and repowering of large PV projects, without compromising technical performance, safety, and market confidence in second-hand PV modules.

Korte omschrijving

In the current market, the testing of reused PV modules starts with onsite visual inspection, followed by dismantling, washing, and testing, including IV measurements, electroluminescence, and other tests. In this project, we propose a drone inspection (infrared and image) and thereafter an advanced modelling approach to assess the power loss and to predict the future power output of the to be reused PV modules. By analysing drone inspection data, modules with clear signs of severe degradation will be identified and directed to recycling. Based on this pre-analysis we will propose new Reuse PV Performance Classes and further testing decision-trees that reflect the performance condition of to be reused PV modules. We will also apply the current IEC-based test programme to benchmark the proposed testing approach in terms of time efficiency, cost, and reliability. Based on the outcomes, a generic business model will be developed and substantiated by the quantitative results obtained in the project. In addition, a complementary model will be developed to estimate what volumes of PV modules will be available for reuse per year.

Resultaat

As a result of this project, a new (pre)-testing methodology will be delivered that is faster, cost effective, and more scalable than current practice, while still providing reliable assessment compared to current practices. The project will deliver an advanced modelling framework that assess PV module power loss and estimates the remaining

operational lifetime based on drone image data. This will provide a reliable, data-driven basis for reuse decision making and significantly improve the accuracy and the efficiency. At the end of the project, we will validate the proposed test programme and propose a sustainable and circular business model.

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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