PRESS RELEASE

March 2026

NEXUS Project Demonstrates Sustainable and High-Performance Perovskite-Silicon Tandem Photovoltaics for Europe's Energy Transition

The EU-funded Horizon Europe project **NEXUS** has successfully demonstrated major technological and sustainability advances in **perovskite-on-silicon (PVSK/Si) tandem** photovoltaics. Over three years, the consortium has developed a new eco-design paradigm for tandem solar technology, combining high efficiency, reduced critical raw material use, environmental sustainability and social acceptance.

Advancing High-Efficiency Tandem Technology

NEXUS aimed to accelerate Europe's transition to clean energy by developing efficient, stable and scalable perovskite-silicon tandem solar cells and modules. The project focused on:

- Developing **solvent-free perovskite** top absorbers with a suitable 1.67 eV bandgap.
- **Reducing the use of critical raw materials** such as silver (Ag), indium (In) and silicon (Si).
- Designing **high-performance tandem cells and modules** with long-term stability.
- Demonstrating outdoor **durability and sustainability** impacts.

The project achieved major technical milestones. Wide bandgap **evaporated perovskite cells reached efficiencies of about 20%**. **Tandem devices** integrating these with SHJ cells based on thin Cz silicon wafers achieved **over 27% PCE**.

The consortium demonstrated reduced reliance on critical materials, achieving 24.6% PCE with aluminium-doped zinc oxide (AZO) rear electrodes. A fully indium-free device, reaching 18.1% PCE, was manufactured to demonstrate the feasibility of complete In suppression.

Durability, Sustainability and Recycling

NEXUS successfully encapsulated tandem devices using industrial bill-of-materials and lamination processes compliant with IEC 61215 damp-heat and thermal cycling tests. **Two proof-of-concept four-cell minimodules** were manufactured, achieving 20% efficiency, while encapsulated single-cell devices achieved a 24.6% PCE. **Outdoor monitoring in four different climates** showed encouraging stability results, with the first generation of devices exhibiting a best year-on-year degradation rate of 14%. In addition to electrical performance monitoring, lead (Pb) leaching measurements were performed to quantify the **environmental impact of the technology in terms of soil contamination**. The quantities measured in the collected rainwater remained consistently below the EU drinking water limit of 10 µg/L.

Beyond device performance, the project conducted **comprehensive lifecycle costing** (LCC), **environmental lifecycle assessment** (LCA) and **social LCA**. Results identified the silicon wafer as the main contributor to most economic, environmental and social indicators, highlighting the importance of reducing wafer thickness and promoting European manufacturing. The consortium also developed **advanced recycling routes** enabling recovery of lead, silver and indium, reinforcing circularity and resource resilience.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe, Widening Participation and Spreading Excellence action, under grant agreement n°101075330.

NEXUS

Supporting European Industrial Policy

NEXUS contributes directly to the objectives of the Net-Zero Industry Act and the Critical Raw Materials Act by reducing raw material dependency, improving sustainability, and modelling scalable GW-level production in Europe. A hypothetical pilot line for cost-effective and sustainable perovskite-silicon tandem production was designed, identifying key cost drivers and opportunities for industrial optimisation.

Further research and supportive European policies will be essential to bring perovskite-silicon tandem photovoltaics to full commercial maturity and strengthen Europe's strategic autonomy in solar manufacturing.

Communication and Dissemination Impact

Throughout the project, NEXUS implemented an extensive communication and dissemination strategy, **reaching both scientific and industrial audiences.**
The consortium members participated in 101 conference contributions across 56 scientific and professional events. As part of NEXUS project, 30 open-access scientific articles, have been published, exceeding initial targets.
Each webinar or workshop attracted a high level of participation, thanks in particular to the popularity of the videos produced and available on the website.

These results demonstrate the strong visibility of NEXUS within the European and international photovoltaic research community and its contribution to knowledge dissemination, stakeholder engagement and policy dialogue.

What are the outcomes of the project?

The NEXUS project has officially come to an end. It has **successfully demonstrated the potential of vacuum-processed perovskite solar cells for integration into monolithic tandem devices** based on industry-relevant silicon bottom cells. Future work by the community will now need to focus on bringing this technology to industrial maturity, particularly through developing production tools suitable for industrial-scale use.

Publically available results and reports can be found on the project's website and on the CORDIS platform of the European Commission.

Project Partners

cea · University of Oxford · eurac research · KIT Karlsruher Institut für Technologie · rijksuniversiteit groningen · SAD · Universitat de València · enel Green Power · Oxford PV The Perovskite Company · Becquerel Institute · NorSun · Fachhochschule Nordwestschweiz · ODTÜ GÜNAM

nexus-pv.eu · info@nexus-pv.eu · @NexusPV

Funded by the European Union

This project has received funding from the European Union's Horizon Europe, Widening Participation and Spreading Excellence action, under grant agreement n°101075330.