# 13th Back Contact Workshop

9-10 December 2025 Amsterdam

NEMO Science Museum

TNO innovation for life

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09 December 2025

# Netherlands Organisation for Applied Scientific Research

- Applied research organization founded in 1932 to support industry and government
- Non-profit & independent research organization
- Focus on top economy sectors and societal challenges


EMPLOYEES
**4408**

TNO TURNOVER (MLN EURO)
**764**

**1345**
Public-private partnerships

**59**
Professors at Universities

**937**
Registered Patents

# TNO Energy & Materials Transition

**Our Vision:** For 2050 we envision a future in which everyone has access to energy and resources without further harming the environment.

**Our Mission:** Working towards achieving the 2050 Climate Goals

## Geological Survey of the Netherlands

**Responsible** for the statutory task of the Geological Survey as well as R&D with and for organizations.

## EMT Industry

**Contributes** to achieving a $CO_2$ neutral and circular industry.

## EMT Energy Supply

**Contributes** to the realization of a climate-neutral, reliable and affordable energy system.

## EMT System Solutions & Environment

**Enables** effective policy and behavioral change in the complex Energy & Materials transitions and climate.

**Key customers & Partners:**

- Governments
- Industry
- Energy supply & infrastructure
- Institutes
- Universities

**Themes:**

- Technological
- Environmental
- Economic
- Societal
- Political

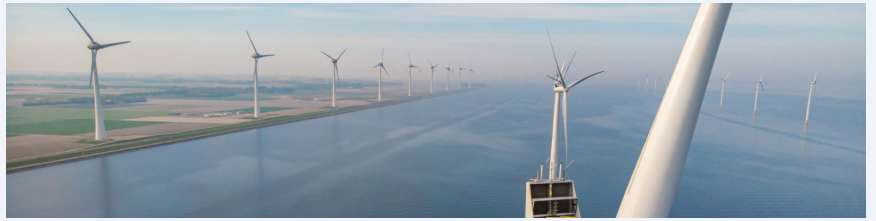
09 December 2025

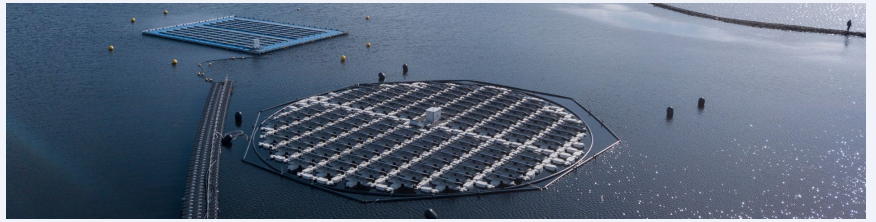
# TNO Energy Supply

**Focuses** on an efficient energy production and storage infrastructure.

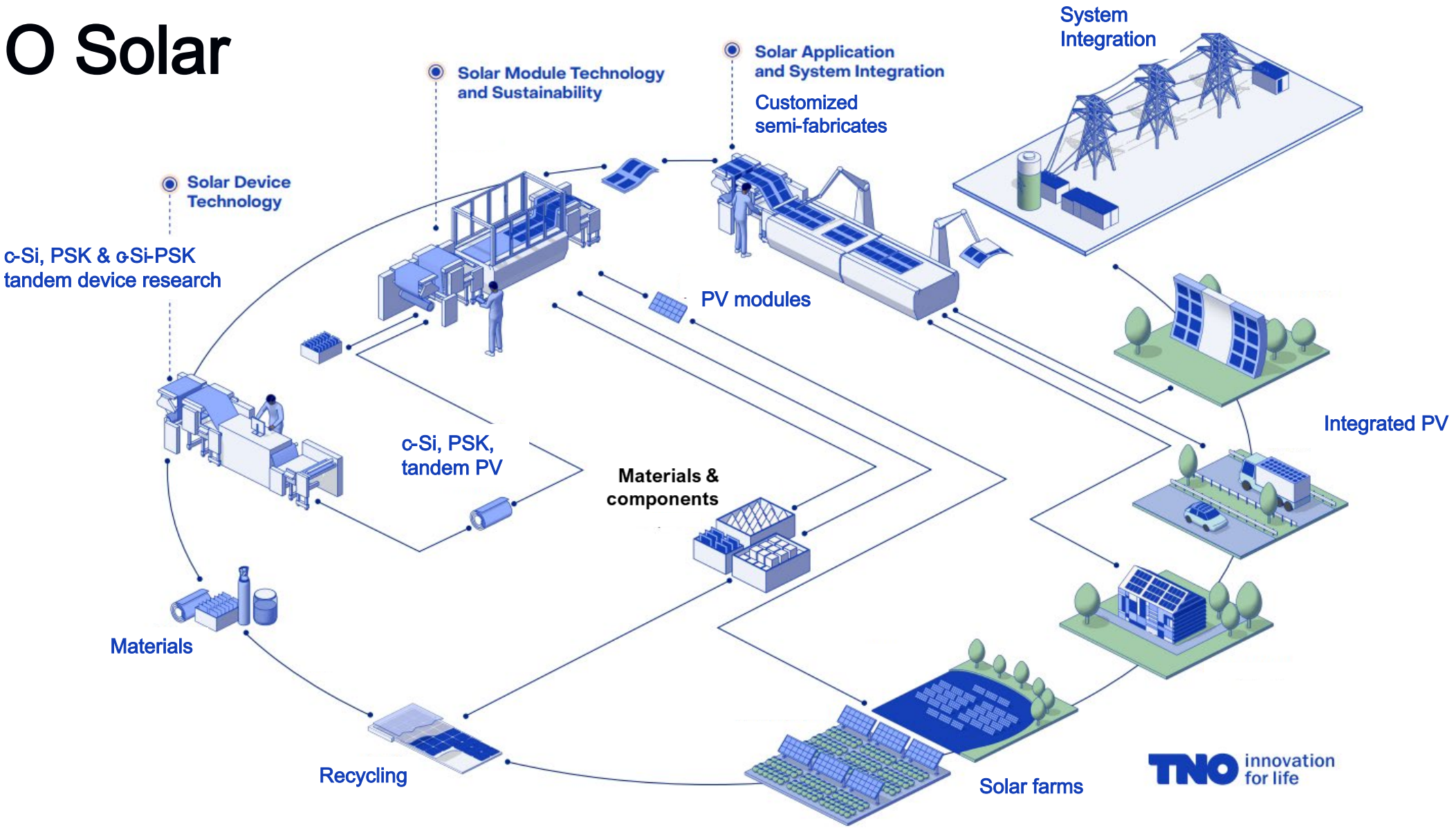
**Key topics:**

- Energy supply (solar, wind)
  - New systems (Agri, Eco, Floating)
  - Urban PV (BIPV, VIPV, I2PV) – PV on all surfaces
  - Device technology & PV manufacturing technologies (mass customization)
  - Off-shore & on-shore wind farms
- Energy system integration (incl. storage aspects)



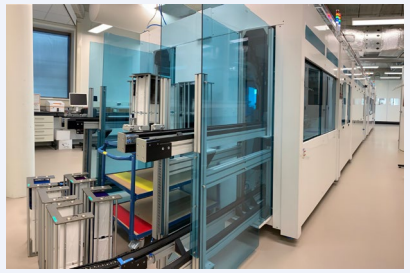


# TNO Solar


System Integration
Solar Application and System Integration
Customized semi-fabricates
Solar Module Technology and Sustainability
Solar Device Technology
c-Si, PSK & c-Si-PSK tandem device research
PV modules
Integrated PV
c-Si, PSK, tandem PV
Materials & components
Materials
Recycling
Solar farms
TNO innovation for life

# TNO Solar Energy (Petten)

- cSi-based cell & module technology
  - Cell R&D: optical layers, Cu metallization, laser processing
  - 2T and 4T (BC) tandems cell and module research
  - Manufacturing technologies for cSi IPV modules
  - Reliability testing & failure analysis
- Outdoor exposure & monitoring facilities
- Modelling (cells, modules, systems)



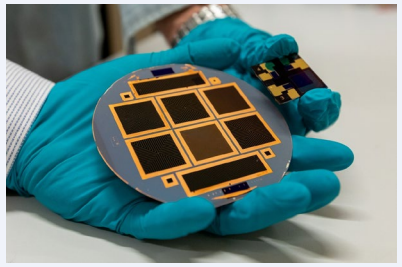
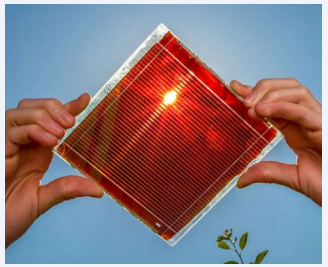




# TNO STA (Eindhoven)

TNO Solar Technology & Application group (STA)

- Scalable PSK manufacturing technologies
  - PSK stack & process development for 1J PSK, 2T hybrid and 4T hybrid tandem devices
  - S2S and R2R packaging
- R2R mass customization platform (IPV)
- Outdoor testing BIPV products (Solar Beat)

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## Scientific committee

Dr. Radovan
**Kopecek**
ISC Konstanz

Dr. Thorsten
**Dullweber**
ISFH

Prof. Dr. Olindo
**Isabella**
TU Delft

Dr. Jonas
**De Rose**
Fraunhofer ISE

Dr. Victor
**Rosca**
TNO

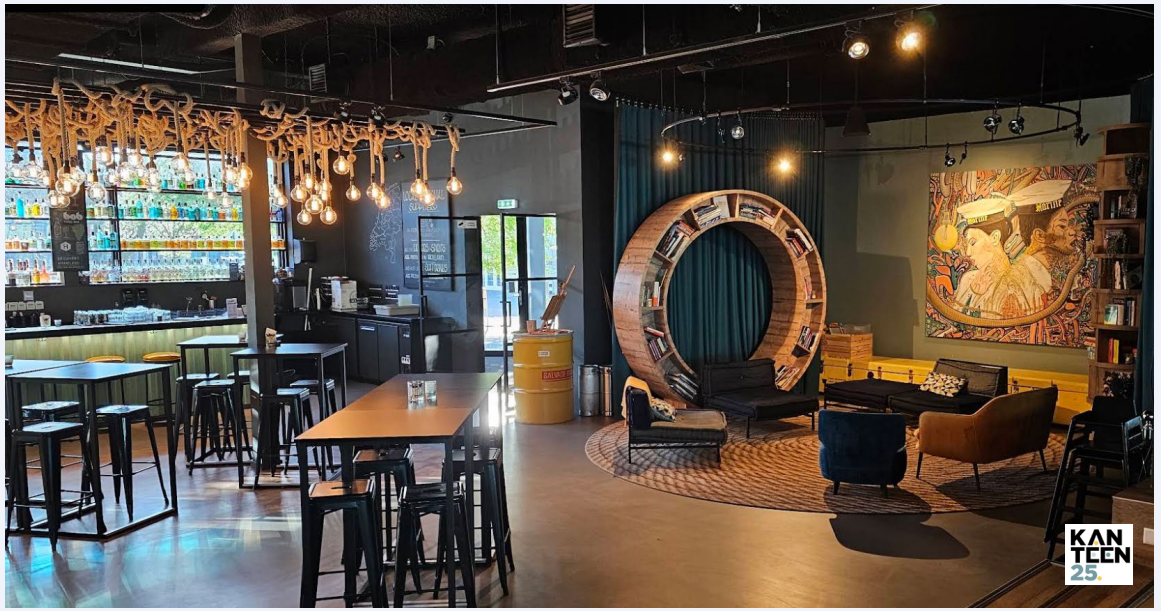
## Organizing committee

Gesche
**Maass**
Solar Promotion
Conexio PSE

Abi
**Benaim**
Solar Promotion
Conexio PSE

# Venue


Amsterdam Drone Lab
Codam Coding College
Codam programmeeronderwijs
NEMO Science Museum
AMS Institute - Amsterdam Institute...
Vita Nova
Passengership Avanti
Kuuma Marineterrein
Special Offer: £17.50 Sauna
Museumhaven Amsterdam
Pension Homeland
Hotelboot Angeline
Top rated
VOC-schip Amsterdam
Stichting Cinekid (kantoor)
Arcam
15 min
1,1 km
Glow MiniGolf Amsterdam
Kattenburgerplein


KANTEEN 25

# Programme (Day 1)



**Tuesday - December 9, 2025**

08:30 - 09:00 // Registration & Coffee

09:00 - 09:20 // Opening

09:20 - 10:40 // **Session 1:** Back contact cells & modules in industry

10:40 - 11:00 // Coffee break

11:00 - 12:40 // **Session 2:** Back contact cells & modules in industry & R&D

12:40 - 14:00 // Lunch & Networking

14:00 - 15:20 // **Session 3:** Materials, processes & tools for BC cells

15:20 - 16:00 // Coffee break

16:00 - 17:40 // **Session 4:** Materials, processes & tools for BC cells and modules

18:00 - 22:00 // Dinner at Kanteen25

# Highlights (Day 1)

*"Whether all companies will switch in 5 years or whether it'll take longer, I'm not too sure, I think everyone will eventually be manufacturing IBC cells" Prof. M. Green*



**Session 1:** Back contact cells & modules in industry

- AIKO
  - Mass production roadmap: 29.1% eff., 750Wp module, 0.125 CNY/W by 2028
  - Two main directions for next-generation technology: photon down conversion and tandems
- Longi:
  - Cell efficiency 27.1% in 2024; mass production cell efficiency >27% target in 2025
  - Bifaciality factor improvement: 78.4% for HPBC 2.0 vs 83.0% for TopCon; energy yield calculations in progress
  - Zero BB and low-T metallization as next steps
- Maxeon
  - >26% cell and 25% eff. module achieved in manufacturing
  - Aluminum metallization is almost here. Promiss of sustainability, low cost and reliability
  - Do not fear overtesting!
- Kalyon:
  - From PERC to TopCon+ : 1.1GW factory to be commissioned in 2026

# Highlights (Day 1)



**Session 2: Back contact cells & modules in industry & R&D**

- FuturaSun:
  - BC is on a sustainable, value-driven pathway to mainstream. Various cell technologies will likely to co-exist (TopCon, IBC, even PERC in certain situations)
  - Rise of multicolor market
- ISFH (Kalyon)
  - 24.5% cell efficiency achieved; technology transfer to Kalyon on-going
- ISC Konstanz:
  - Significantly higher cost gain for Cu-poly-Zebra compared to Cu/Ag-TopCon
- TU Delft:
  - Novel IBC-SHJ solar cells with MoOx blanket layer. Simple fabrication, faster processing and high shunt resistance.
- Gunam:
  - 4% Ag (surface) doping on Ni results in less than 0.45mg/Wp silver usage; 12mg/Wp Ni is used; prototype paste to be available for testing soon

# Highlights (Day 1)



**Session 3: Materials, processes & tools for BC cells**

- RENA (ready to switch to IBC):
  - O3/DI-based cleaning: basis for advantages in CoO => up to 40% savings (TopCON)
- Von Ardenne
  - PVD – key technology for IBC cell production: leaner, lower T, multiple layers within the same equipment
- LAPLACE
  - Laplace toolset is fully compatible with TOPCon+ and XBC integration
- Tongwei:
  - 26.89% cell efficiency and 25% (high-density, 676Wp) module efficiency in 2025
  - PECVD n+poly-Si application for TBC production (as replacement for LPCVD) is now viable

# Highlights (Day 1)



**Session 4: Materials, processes & tools for BC cells and modules**

- DR Laser:
  - A range of enablers for next gen IBC technology: low-T low-damage processing, improved bifaciality, laser activation, laser-induced crystallization
- TU Delft:
  - Proposal for design strategy to maintain high efficiency and optimized break down voltage; experimental verification required
- AirBus:
  - cSi is reintroduced for space applications after 25 years: demand for inexpensive power generations solutions (<1 Eur/W) for large number of low-orbit satellites
  - Challenges: extreme operating conditions, low (on demand) volumes
- Mondragon Assembly:
  - Flexible (R&D and production) tabber-stringer for mBB BB-less stringing of FtB and IBC, including dispensing of the conductive and non-conductive components
- Eternal Sun
  - Steady progress in getting measurements of the tandem devices under control: IEC 60904-1-4 & more standards in development, tandem autocalibration method for spectral balancing, combination of 100% inline with offline sample testing.

# Programme (Day 2)



**Tuesday - December 10, 2025**

08:30 - 09:00 // Walk-in coffee

09:00 - 09:10 // Highlights of the first day

09:10 - 10:30 // **Session 5:** Performance and reliability of BC modules & systems

10:30 - 11:00 // Coffee break

11:00 - 12:20 // **Session 6:** Perspectives of tandem BC technology

12:20 - 13:30 // Lunch

13:30 - 14:40 // **Panel discussions**

14:40 - 15:00 // Coffee break

15:00 - 16:20 // **Session 7:** BC technology for emerging markets (BIPV, VIPV, high-end applications)

16:30 - 16:45 // Closing session

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