



Operation and Maintenance of PV Plants and Grid Integration

- AI-based methods for optimized operation of PV plants
- Forecasts and predictive control to minimize grid loading and energy costs
- Optimized PV solutions for built and natural environment
- Interaction of PV storage systems, heat pumps or charging stations for e-mobility

Collaboration with other ZSW units and external partners

Photos: Alexander Fischer



Contact us

Roland Einhaus
 Head of Solab
 roland.einhaus@zsw-bw.de
 Tel.: +49 711 7870-254
 Cell: +49 162 291 5606

Zentrum für Sonnenenergie-
 und Wasserstoff-Forschung
 Baden-Württemberg (ZSW)
 Meitnerstraße 1
 70563 Stuttgart

www.zsw-bw.de



Quality,
 Reliability and
 Performance of
 PV Modules and
 Systems

ZSW PHOTOVOLTAICS

SOLAB

Module and System Testing



Our mission is to enable durable and sustainable use of PV modules for our partners and clients.



Indoor Testing Facilities

- IV measurement and EL imaging
- Climatic stress tests for temperature, humidity and UV
- Mechanical load tests
- Electrical isolation tests
- Material analysis of polymers
- Measurement and test protocols according to IEC standards and applied beyond



Research and Development

- Performance monitoring and long-term stability
- Accelerated ageing and test-to-failure protocols, adapted to different PV technologies
- Study of particular degradation modes and material faults
- Participation in new test and qualification standards
- Circular economy aspects of PV modules (reuse, repair and requalification)

Participation in national and international R&D projects



The combination of indoor and outdoor test methods and the possibility to correlate the results are unique in this form. Our team can identify degradation mechanisms due to defects or light as well as isolation faults or material problems. State-of-the-art modules ranging from commercial scale to laboratory size are easily handled at the ZSW Solab.

Outdoor Testing Facilities

- High-resolution monitoring of meteorological data
- Test beds with individual IV curve monitoring
- Fixed and tracking mounting systems
- Concentration up to 3 times
- Specialized set-up for non-standard modules

Operational since 1988, the ZSW test sites reflect our long-standing experience with diverse PV technologies and system options.

**Data from
5000+ tested
modules of dif-
fe-ring technol-
ogy available**

