Overview on Norms and Standards for Solar Energy Technology Relevant for CSP Development and Implementation

4th SFERA Summer School, 16th May 2013, Hornberg, Black Forest

Eckhard Lüpfer, DLR / CSP Services, Cologne, Germany
Standards in Solar Energy

• Common definitions and nomenclature

• Common symbols

• Materials and properties

• Test standards
Most Relevant Standards

• ISO 9488 Solar Energy – Vocabulary

• EN 410 and ISO 9050 Glass in Buildings

• EN 12975-12977 and ISO 9806 Solar Thermal Collectors, Systems, Components
  • General
  • Testing
• ISO 9459 Thermal Performance of Solar Collectors

• ISO 9060 Solar energy - specification and classification of instruments for measuring hemispherical solar and direct solar radiation
• ISO 9059 Solar energy - Calibration of field pyrheliometers
Solar Spectrum

- ISO 9845-1  Solar energy -- Reference solar spectral irradiance at the ground at different receiving conditions
- (ASTM E 892: withdrawn)
Materials

• Glass in Buildings
• Optical Glass
• Aluminum
• Coatings (on materials)
• Automotive components
Measurement and Tests

- Temperature
- Radiation DIN 5030 -5036
- Solar Irradiance
- Meteorology (WMO standards)
- Photogrammetry
- Reflectance (see materials aluminum, glass) and Gloss
- Degradation and wear
- Impact, Hail
- Safety
Product Tests PV Modules

- IEC 61215 Crystalline silicon terrestrial PV modules, design qualification, and type approval
- IEC 61230 Safety Standards
- IEC 61730 Electrical Safety, High Voltage Tests - PV module safety qualification, Parts 1 and 2; requirements for construction and testing, including protection class II
- IEC 61646 Thin-film terrestrial PV modules, design qualification, and type approval
- IEC 62108: Design qualification and type approval of CPV (concentrator photovoltaic) modules according to IEC 62108:2007/EN 62108:2008
- IEC 61701: Salt mist corrosion test; requirements of PV modules in salt-laden air
- UL 1703 UL: Standard for safety flat-plate PV modules and panels; extended safety inspections for building-integrated photovoltaics (BIPV)
Solar Thermal Collector Testing

- EN 12975 and SRCC standard 100: Reliability and performance tests and manufacturing site inspections
- Evaluation of open-air weathering
- Pressure testing
- Temperature testing
- Performance testing of warm water storage
- Inspection of absorbers and internal thermal shock test
- Inspection of standardized systems
  Performance and quality testing based on European standard EN 12976, for example, for integrated storage collectors and thermo-siphon systems
- Inspection of customer-specific systems
  Testing of collectors, regulators, and storage systems with component testing system simulation (CTSS) based on the European prestandard ENV 12977
- Solar Keymark (CEN, DIN CERTCO)
Involved stake holders

• National and international standardization organizations
  • AENOR
  • AFNOR
  • UNI
  • SNV
  • DIN/DKE
  • BSI
  • …
  • CEN
  • CENELEC
  • ISO  www.iso.org
  • IEC  www.iec.ch

• Testing institutions, certification bodies
Standards for Solarthermal Electric Power Plants
Other related committees

Europe:
- CEN/TC 312 Thermal solar systems and components
- CEN/TC 312, EN12975-2 “Thermal solar systems and components - Solar collectors - Part 2: Test methods”
- AEN/CTN 206/SC1: AENOR sub-committee on "thermoelectric solar energy systems"

Germany:
- NA 041-01-56 AA Solaranlagen des Normenausschusses Heiz- und Raumlufttechnik (NHRS) im DIN Deutsches Institut für Normung e.V.

US
- ASME PTC 52 Thermo Solar Power Plant Performance Measurement
Status in CSP / STE Standardization

• IEC Technical Committee 117 founded in 2011
• National Committees and Working groups
  • System
  • Components
  • Storage
• Activities
  • Typical Meteorological Year
  • Performance Test for Solar Fields / Acceptance Tests
Status in CSP / STE Standardization (2)

Working Group Activities

Working groups

- Definitions, Tests
  - Receivers (e.g. geometry, materials, optical performance, heat loss measurement, durability testing)
  - Reflectors (e.g. reflectance, shape, durability)
  - Support Structures
  - Tracking
  - Collectors and Testing
  - Heat Transfer Fluids (e.g. properties, safety)
  - Sensors (e.g. angular encoders, irradiance)
  - Joints
Summary

• Basic set of standards are existing from technology areas
• PV module testing is state of the art and has standards
• thermal collector testing is state of the art and has standards

• international activities for CSP technology have started in 2011
  • important contributions from AENOR (Spain) and
  • Solarpaces (Task III)

• International agreement is required to proceed

• Don’t invent your own nomenclature, take what is existing
• Towards product standards and industrialization more work needed