

PV module performance analysis – an integral part of SERIS

Prof. Joachim Luther, CEO of SERIS

The laboratories here in the International Business Park are an integral part of SERIS' research and development in the area of photovoltaic electricity generation.

The purpose of the laboratories – for which we did not find suitable space on the NUS campus - is twofold:

1. They will be used for performance testing in the course of PV module certification. This will be done in cooperation with two valued partners: VDE as a globally active and renowned certification body and Fraunhofer ISE a research institute which has - amongst others – profound technological expertise in PV module performance testing.
2. The laboratories will be used by SERIS for its own research and development work on photovoltaic module technologies. Our aims are (i) to increase the durability of industrial modules – which for certified modules is already more than 20 years - and (ii) to considerably reduce the cost of PV module encapsulation. It is generally little known that module technology represents about 20% of the cost of solar electricity (whereas the contribution of the silicon feedstock is less than 10%).

In the following presentation I will give some brief information on how the laboratory is embedded into the structure and scientific strategy of SERIS.

Research and development at SERIS has two focus areas:

- (i) Photovoltaic electricity generation and
- (ii) Solar and energy efficient buildings.

In the building area we work - amongst other things – on building-integrated photovoltaics.

We also work on solar-powered air conditioning. As a matter of fact, the empty laboratories in which we are having this inauguration today will be transformed during the next months into laboratories for solar powered air-conditioning.

In the area of solar photovoltaic electricity generation, we address several topics:

Silicon solar cells – wafer based and thin-film based; this is by far the largest single activity at SERIS

Nano-structured solar cells

Characterization of solar cells and photovoltaic materials – both wafer and thin-film technologies

PV module technologies – innovations in encapsulation and interconnection of PV devices

Testing and certification of PV modules – our topic today; and

PV systems technology – with a focus on solar electricity generators on roofs or facades of buildings and ground based solar power plants: monitoring of PV systems, increasing system efficiency, assessing the yield of PV installations and so forth.

Thus, research and development at SERIS covers – with the exception of the upstream areas of silicon feedstock and wafer production - the whole PV value chain. PV module testing, PV module certification and quality assurance of PV modules is an essential and integral link in this chain:

- (i) PV installations in the field have to be fully operational for more than 20 years – if not, the economics of PV electricity production suffers accordingly,

- (ii) PV module technology is a considerable cost factor in solar electricity generation – I mentioned already: 20%. If in order to reduce these costs new and cheaper materials or components as well as novel manufacturing technologies are applied, it is essential to conduct careful and extensive testing according to the international standards in order to guarantee their smooth operation for more than 20 years under harsh outdoor environmental conditions.
- (iii) In the case of totally new module concepts – as e.g. the application of wafer cells having all contacts on the rear surface – a careful technical durability analysis of modules or components via “accelerated aging” will become necessary. Our laboratories here at I-Quest will soon enter into this research area.

In short: No large-scale solar electricity generation, and thus no sustainable energy supply system based on solar energy, can be realised without a careful and professional performance analysis and certification of PV modules.

Let me finish with a short remark concerning the laboratory tours: SERIS is strongly focused on industry-oriented research and development. This calls for security measures at SERIS, e.g. with respect to intellectual properties and with respect to samples from industry. In our laboratories you will see PV modules from different companies. These are not samples from our customers. SERIS has purchased these modules on the market in order to test-run our laboratories and in order to do own research on module durability. SERIS is totally dedicated to the protection of information and know-how of our partners.

Thank you very much for your attention and enjoy the laboratory tour.