



# Renewable Energy Research for Global Markets



## REnKnow.Net – Renewable Energies Knowledge Transfer Network



### Capacity Building

1.

#### REnKnow.Net

#### ► Initial Position

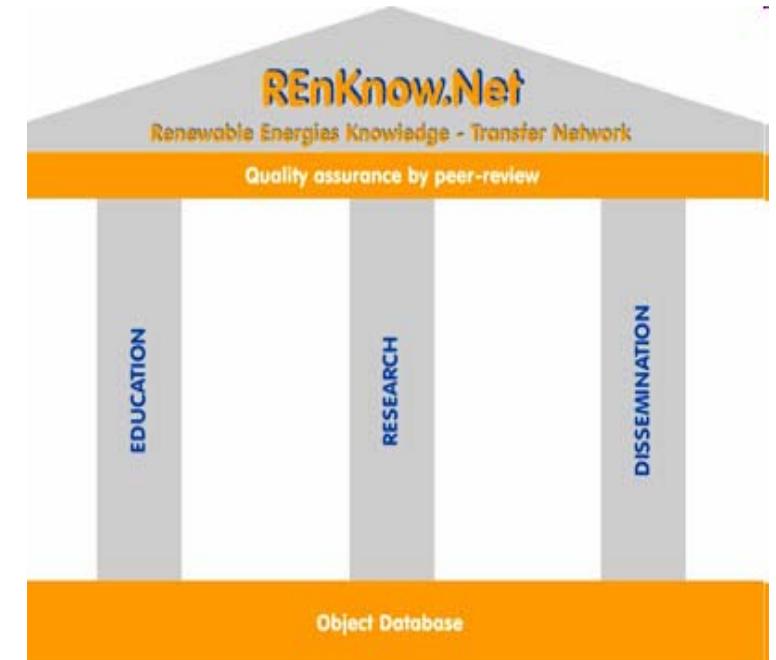
Research

Results

### Initial Position

In June 2007 scientists, representatives of industrial partners and members of the Parliament discussed about a possibility to improve the knowledge transfer of renewable energies without infringing the intellectual property right of research institutions and companies. In this connection the importance of the knowledge transfer via Internet was underlined.

Fraunhofer IWES has installed for the “Networks Basic Research in Renewable Energies and Rational Use of energy“ a worldwide available internet platform for knowledge transfer and for the cooperation in the area of renewable energy and decentralised energy sources – the Renewable Energies Knowledge Transfer Network.



Structure of the internet platform REenKnow.Net



## REnKnow.Net – Renewable Energies Knowledge Transfer Network



**Capacity Building**

- REnKnow.Net**

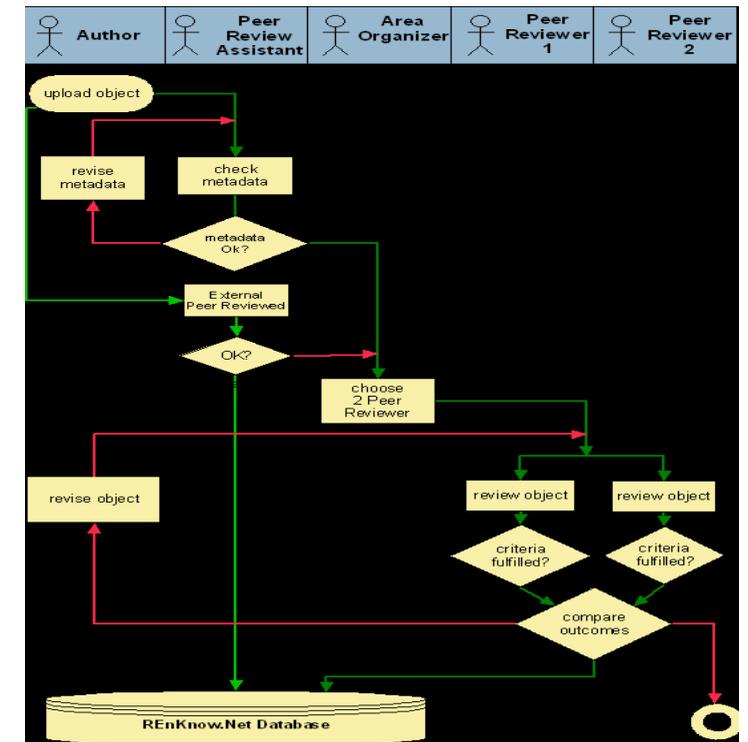
  - Initial Position
  - Research**
  - Results

### Research

The REnKnow.Net platform allows an easy, fast and safe exchange of material as e.g. research reports, publications, presentations, lectures, measurement data, tools for the evaluation and visualization of data and demonstration programmes. Thus it contributes considerably to the dissemination of R&D results from the area of renewable energies.

The unique feature of this platform is the quality assurance of the available material assured by a peer review process carried out by internationally recognized experts. This peer review process awards a seal of approval to the material which had been provided by REnKnow.Net and certifies a scientifically founded presentation of results.

REnKnow.Net supports comprehensively the R&D areas in science and industry (provision of reviewed material, measurement and simulation data, up-to-date research results), the international knowledge transfer (public access to highly qualified material) and education (education material, lecture notes).



The Peer Review Process at a Glance (flowchart)



# Renewable Energy Research for Global Markets



## REnKnow.Net – Renewable Energies Knowledge



### Transfer Network

#### Capacity Building

1.

#### REnKnow.Net

Initial Position

Research

► Results

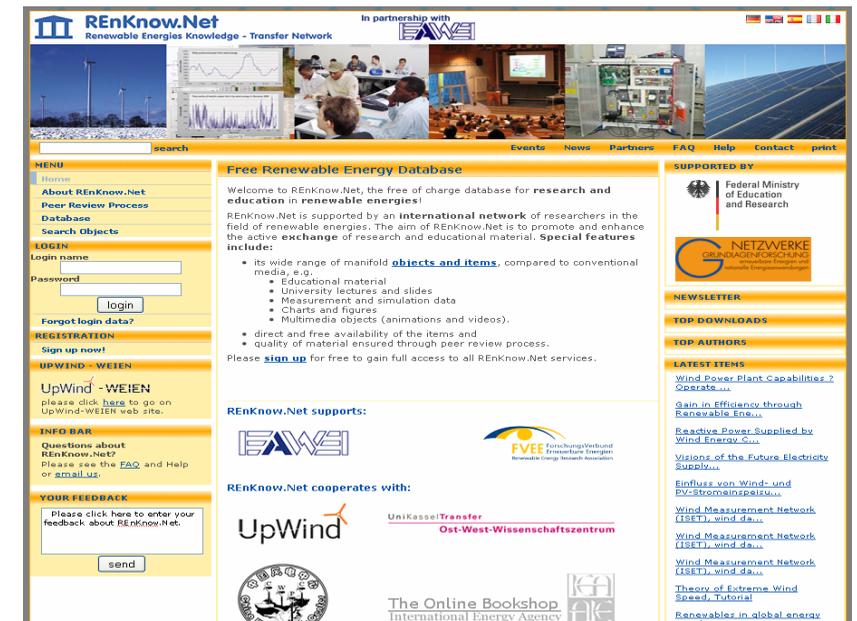
### Results

Distinguishing features of REnKnow.Net are:

- Peer reviewed scientific material, especially measurement and simulation data stored and organized on a high performance data base system
- Fast and easy access to exchange scientific information,
- Sophisticated search functions providing fast comprehensive results
- A platform for preparing publications, tools and materials in a team (Open Source Knowledge Composition)

REnKnow.Net enables new partnerships and co-operations for follow-up activities of (basic) research. The inclusion of university and non-university research institutions as well as industrial partners shall ensure a long-term and application-oriented use.

> [www.renknow.net](http://www.renknow.net)



User interface of [www.REnKnow.Net](http://www.REnKnow.Net)

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## QUARZ

### Test and Qualification Center for CSP Technologies



#### Capacity Building

2.

#### DLR QUARZ Center

#### ► Initial Position

Research

Results

#### Initial Position

- Quality control in concentrating solar power (CSP) plants is of utmost importance for their performance. Optical properties durability and geometric precision of the components and the assembly have very strong influence on the overall energy efficiency and profitability.
- Since no standardized testing procedures and much less certificates for product quality of new components have been available, cost risks are a barrier to market entry for innovative components
- Need for development of test procedures and an impartial test and qualification center



Parabolic trough collector at Plataforma Solar de Almería (CIEMAT), Spain



## QUARZ

### Test and Qualification Center for CSP Technologies



### Capacity Building

2.

#### DLR QUARZ Center

Initial Position

#### ► Research

Results

### Research

In the QUARZ Center quality criteria, test benches and test procedures are developed for key components for solar collectors.

Main research activities concern:

- Mirror shape and reflectivity measurement
- Concentrator structure accuracy
- Absorptivity and thermal losses of receiver
- Durability assessment of mirror and absorber material
- Thermal performance tests of collectors



Solar simulator test bench for the qualification of parabolic trough receiver



## QUARZ

### Test and Qualification Center for CSP Technologies



## Capacity Building

2.

### DLR QUARZ Center

Initial Position

Research

### ► Results

### Results

- Test methods and procedures ensuring the required performance of CSP components and systems have been established or are in preparation
- DLR Institute of Technical Thermodynamics has provided significant contributions by developing quality criteria, test benches and test procedures based on decades of experience in this field of technology at the test sites in Köln, Stuttgart and Almería.
- The developed measurement and evaluation procedures are recognized within international technological collaboration and standardization projects
- Their application promotes successful market entry and cost reduction of CSP plants by achieving enhancements in performance, competitiveness and risk mitigation.

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Outdoor test bench for the qualification of parabolic trough receiver



## NILS - Solar Energy to take part in



### Capacity Building

3.

**NILS-Solar energy to take part in**

► **Initial Position**

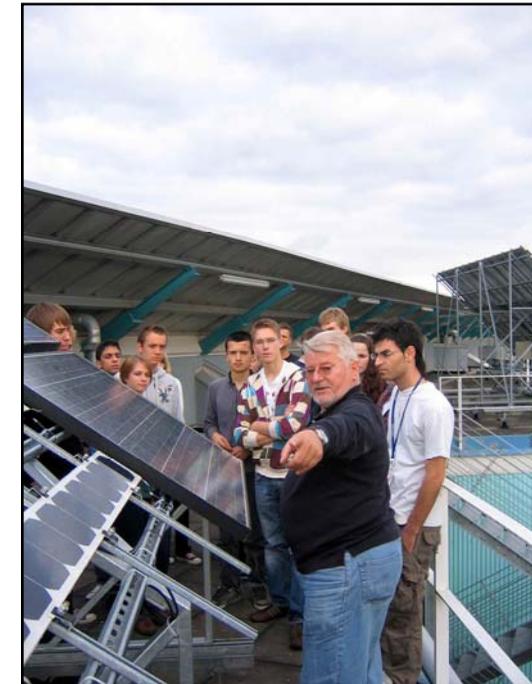
Research

Results

### Initial Position

The Niedersächsische Lernwerkstatt für solare Energiesysteme „Lower Saxon Workshop for learning about Solar Energy Systems“, (NILS) was founded on 1 August 2001 in cooperation between the Lower Saxon Ministry of Education and the Arts and the ISFH.

NILS serves to encourage the exchange of ideas between science and schools in the area of photovoltaics and solar heating, renewable energy and energy technology as well as opto- and semiconductor electronics, and thereby contributes to sustainability and climate protection.



A group of pupils visiting a photovoltaic test site on the roof of the ISFH.



# Renewable Energy Research for Global Markets



## NILS - Solar Energy to take part in



### Capacity Building

3.

#### NILS-Solar energy to take part in

Initial Position

#### ► Research

Results

### Research

Under the aegis of NILS a complete, comprehensive solar school experimentation system has been developed with its own electronic handbooks as most schools do not have any material in their collections for pupil experiments and solar energy is seldom covered by standard school books. At grammar schools, semi-conductor physics, solar cells and thermodynamics are standard content in physics teaching.



Hamelin Sun-Catcher Box: This is a big elementary school box containing PV-, solar thermal- and fuel cell experiments developed by the ISFH especially for schools.



# Renewable Energy Research for Global Markets



## NILS - Solar Energy to take part in



### Capacity Building

3.

#### NILS-Solar energy to take part in

Initial Position

Research

► Results

### Results

NILS has been accepted by schools, teachers and pupils from its beginning. It was a very important project to motivate youngsters to learn about the use and application of solar and regenerative energies.

An important task of NILS is intensively to train pupils to be competent in solar science so that teams of pupils can present solar experimentation projects at conferences, events and fairs in an independent, expert way. Good pupils nearly always participate as assistants at NILS events.

Still NILS is a very successful „school laboratory“ in Lower Saxony.



“Open day“ for new pupils at the Goethe grammar school in Hildesheim: parents and their children were informed about solar experiments.



### Capacity Building

4.

#### PVcomB

#### ► Initial Position

Research

Results

### Long Tradition in Training and Education

- The Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (HZB) is one of the leading research institutions worldwide on developing and improving materials for thin-film solar cells.
- The HZB has a long tradition in training scientists and engineers, all institute directors are teaching at local and regional universities.
- To further its commitment to training skilled PV-personnel, HZB together with the Technische Universität Berlin (TUB) have initiated the Competence Centre Thin-Film- and Nanotechnology for Photovoltaics Berlin (PVcomB) in 2007.
- Here, students as well as company employees are provided with a unique research and education environment.
- PVcomB is located at the Science and Technology park in Berlin-Adlershof, a high-tech location where universities, research institutions and companies from all parts of the PV-sector reside.



Summer students at the Solar energy research (Helmholtz-Zentrum Berlin für Materialien und Energie)



## Education and Training at PVcomB



### Capacity Building

4.

#### PVcomB

Initial Position

#### ► Research

Results

### Finding Synergies in different Technologies

- In a baseline process, two dedicated research-lines will produce thin-film PV modules with an area of 30 x 30 cm<sup>2</sup>. This intermediate size is well suited to address questions arising in industrial production.
- Baseline operation including high-end analytical processes are performed in close co-operation with the HZB und TUB as well as with partners from other institutions and companies.
- Besides research and academic education, PVcomB focuses on hands-on training for companies and other target groups.
- A prime example for these activities is the *Photovoltaics Thin-Film Week*, which has been initiated by PVcomB: this recurring event combines specialized scientific and technological workshops with a practical industry forum. Scientists, technologists and executives from the solar industry and academia meet at this international event in Adlershof.



Technological session at the 1st Photovoltaics Thin-Film Week in April 2009



# Renewable Energy Research for Global Markets



## Leading-edge Research and Innovation



### Capacity Building

4.

#### PVcomB

Initial Position

Research

► Results

### Unique structure for education and training

- In May 2009, PVcomB has been elected as one of the funded projects in the BMBF-program *Spitzenforschung und Innovation in den Neuen Bundesländern* (Leading-edge Research and Innovation in the new German Länder) and will receive 12 million € over a 5 year period, with additional 3 Mio€ co-financing from the State of Berlin.
- PVcomB will conclude building its infrastructure and set up an ambitious research program in this project and improve networking with its partners:



BMBF-program Spitzenforschung und Innovation in den Neuen Bundesländern (Leading-edge Research and Innovation in the new German Länder)