



understanding new
energies

DEVELOPING THE PHOTOVOLTAIC MARKET IN THAILAND by means of training and education

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Introduction and Motivation



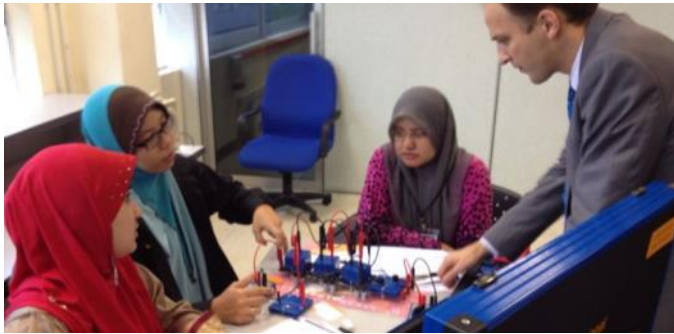
Who is leXsolar?

- Established in 2003 as a spin-off from the University of Technology Dresden
- Focus: Education and Training products for renewable energies



- Today, leXsolar is one of the worldwide leaders for training and education in **renewable energies**

Our Vision - Your Training Success!



leXsolar is *customer oriented*!

- Lecturers and teachers can use our products "out of the box"
- Students get reliable results

leXsolar *delivers highest quality*!

- Made in Germany
- Long lasting for generations of students
- Instructions of highest didactic quality

leXsolar is *highly innovative*!

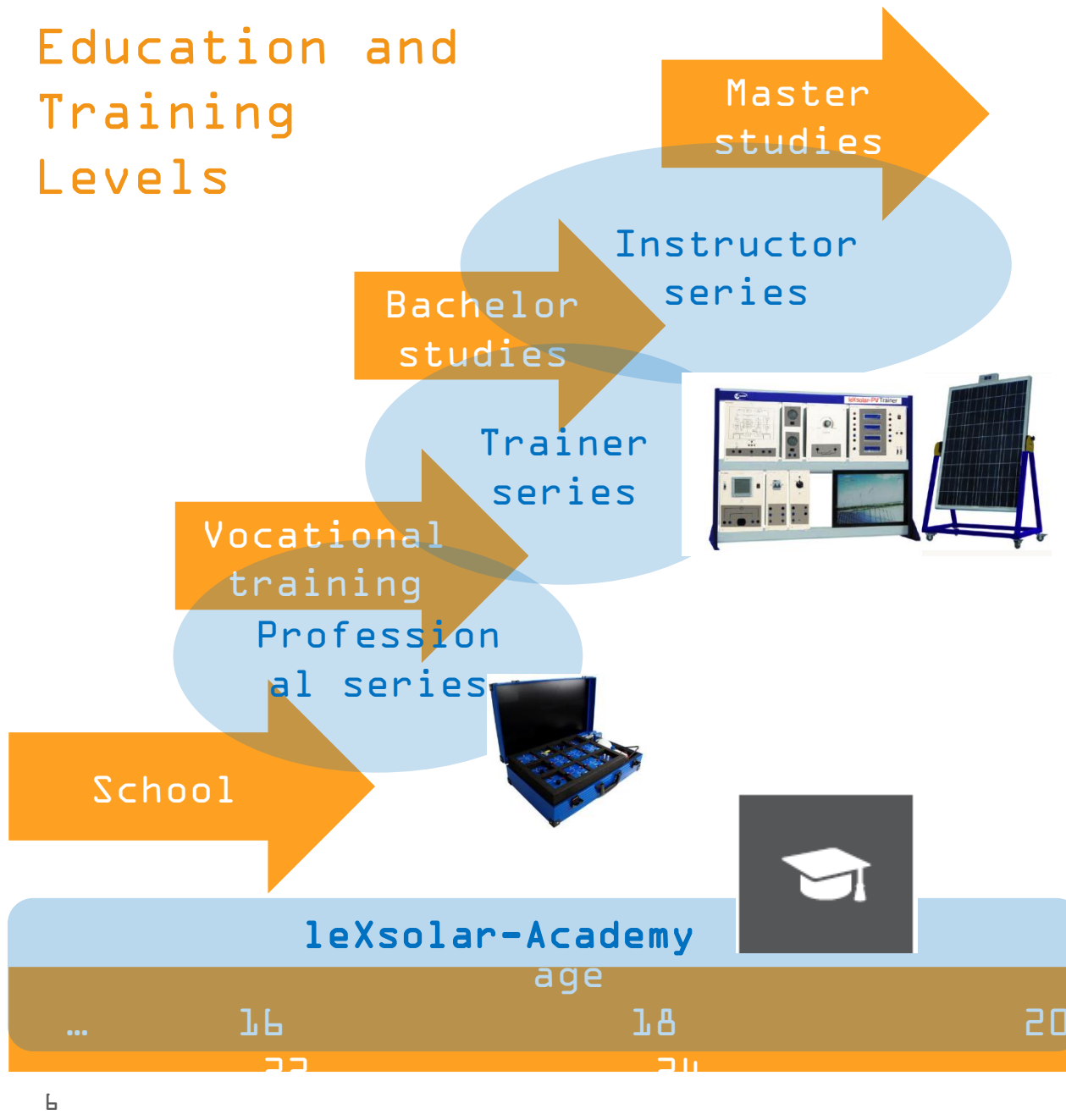
- You always get the latest Technology:
- SOFC-fuel cells, smart grid, electric mobility, ...



Motivation

- Challenges when entering a new market with a new technology:
 - Lack of educated and skilled personnel
 - No awareness for the technology
 - Refusing or even hostile attitude of the people
- leXsolar is offering training solutions
 - For all levels from basic to advanced training level

Education and Training Levels



Result:

Your experts in Photovoltaic for

- Manufacturing
- Installation
- Sales
- Service
- Administration
- ...



Outline

1. Fundamental Photovoltaic Training
2. Technical and Vocational Training
3. NewEnergyLab - one solution for all sources
4. leXsolar-Academy



1. Fundamental Photovoltaic Training

Professional Series



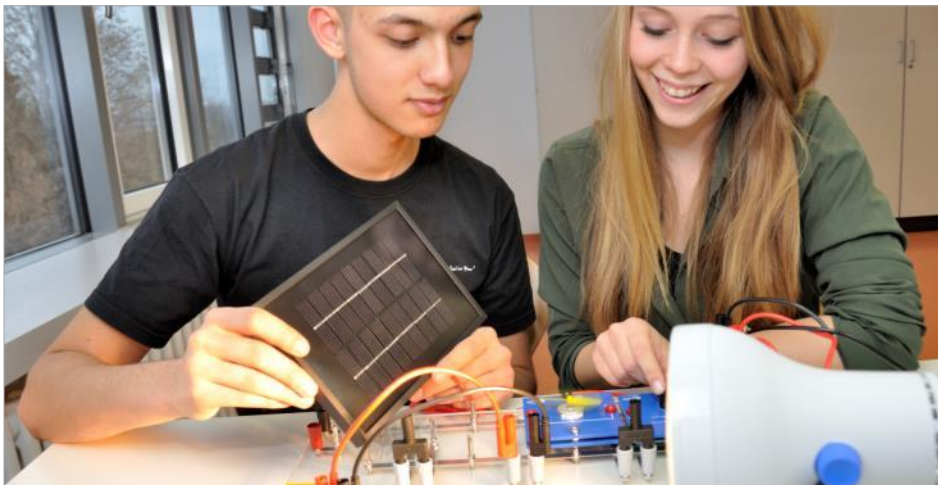


leXsolar-PV Professional

Item-No. 1118



- Subject: Electrical Engineering, Renewable Energies
- User group: Basic Training, Industrial Customers
- Key data:
 - Photovoltaics training system for technical training
 - Basics of photovoltaics
 - Experiments with components of PV-systems
 - Setup of fully equipped PV-systems in laboratory scale



Example: leXsolar-Curriculum

"Fundamentals and Applications of Photovoltaic Technology"

4 consecutive Sections
divided in 15 units

Fundamental Basics [Optional]

- 1.5 hours
- topics: electrical Basics
- objectives: describing and reasoning the behavior of basic electrical circuits; calculate and measure systems of resistors

Basic Solar Cell Properties

- 7.5 hours
- topics: solar cells and environmental conditions; characteristics of solar cells
- objectives: determining basic properties of solar cells; analyzing electrical characteristics of solar cells; measuring and describing the influence of environmental conditions on solar cell parameters

Solar Cells in use

- 6 hours
- topics: connecting solar cells to modules; solar cells as supply
- objectives: building up solar modules; dimensioning and tuning reasonable parts of solar cell modules

Off-Grid systems: Parts and Properties

- 7.5 hours
- topics: Off-grid systems; charge regulators; electrical storage, deep discharge regulators, DC/DC and DC/AC inverter
- objectives: problems and tasks at the designing of photovoltaic power supply systems; different peripheral parts of off-grid systems; reasonable choosing from different standard solutions when building up a system



2. Technical and vocational training

Trainer Series



Product: leXsolar-PV Trainer

Method: Real component small scale training panel system

Target groups:

- Advanced Trainees and apprentices
 - Advanced Bachelor stud
- Occupational profile:
- PV power plant install
 - Service technicians
 - Sales engineers



Major topics:

- Measuring real PV systems
- Off-grid PV systems
- On Grid connection



3. Integration in the leXsolar

NEW ENERGY LAB



- From leXsolar's wide product range we have composed the

leXsolar New Energy Lab

for technical training at

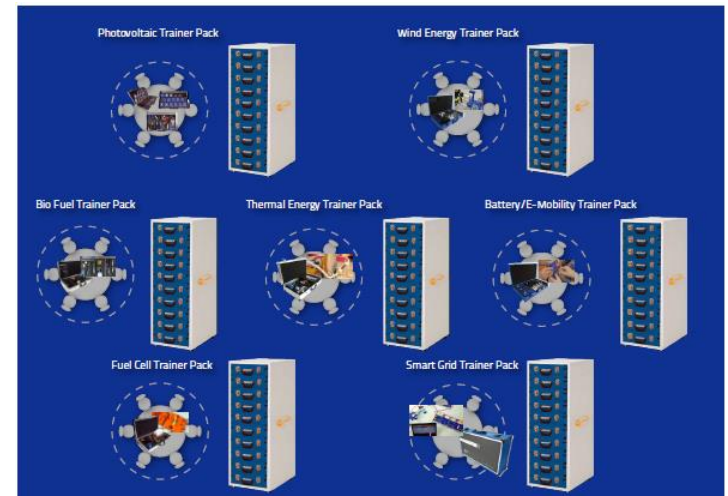
- Universities
 - Colleges
 - Vocational schools
-
- Lab courses for the following study courses / topics
 - Renewable Energies
 - Electrical engineering
 - Automotive engineering
 - Air-conditioning, heating, Energy efficiency
 - Chemical and Environmental engineering

- **Objectives:**

- Students get full insight into all renewable energy technologies
- Students learn about fundamentals of renewables with experiments
- Students are prepared for advanced courses and to learn about sophisticated applications

- **Key facts**

- Comprehensive documentation (student's and lecturers instructions)
- Curricula for lab courses in basic engineering studies included



Photovoltaic Trainer Pack



Wind Energy Trainer Pack



Bio Fuel Trainer Pack



Thermal Energy Trainer Pack



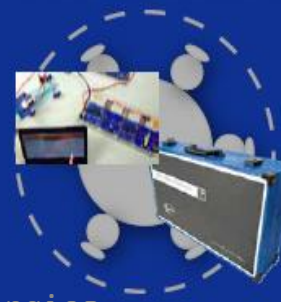
Battery/E-Mobility Trainer Pack



Fuel Cell Trainer Pack



Smart Grid Trainer Pack



Product: leXsolar-Wind Professional

Method:

Lab-scale practical
training system

Target groups:

- Trainees and apprentices
 - Bachelor students
 - Non-technical staff
- Occupational profile:
- Wind power plant installers
 - R&D engineers
 - Service technicians and engineers
 - Sales staff and engineers
 - Administration staff





6. leXsolar-Academy



- Potential types of leXsolar-Academy:
 - In-house trainings
 - Train-the trainer sessions, especially for introducing leXsolar-products
 - Renewable energy lectures and practical courses
- leXsolar-academy for solar energy:
 - **Module 1-3:** Introduction to physics and of physical fundamentals solar cell
 - **Module 5:** Solar modules
 - **Module 6:** PV-Applications: Loads and batteries
 - **Module PV 7:** PV-Applications: Regulators and Inverters for PV systems
 - **Module PV 8:** PV-Systems: off-grid systems
 - **Module PV 9:** PV-Systems: Grid-connected systems





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