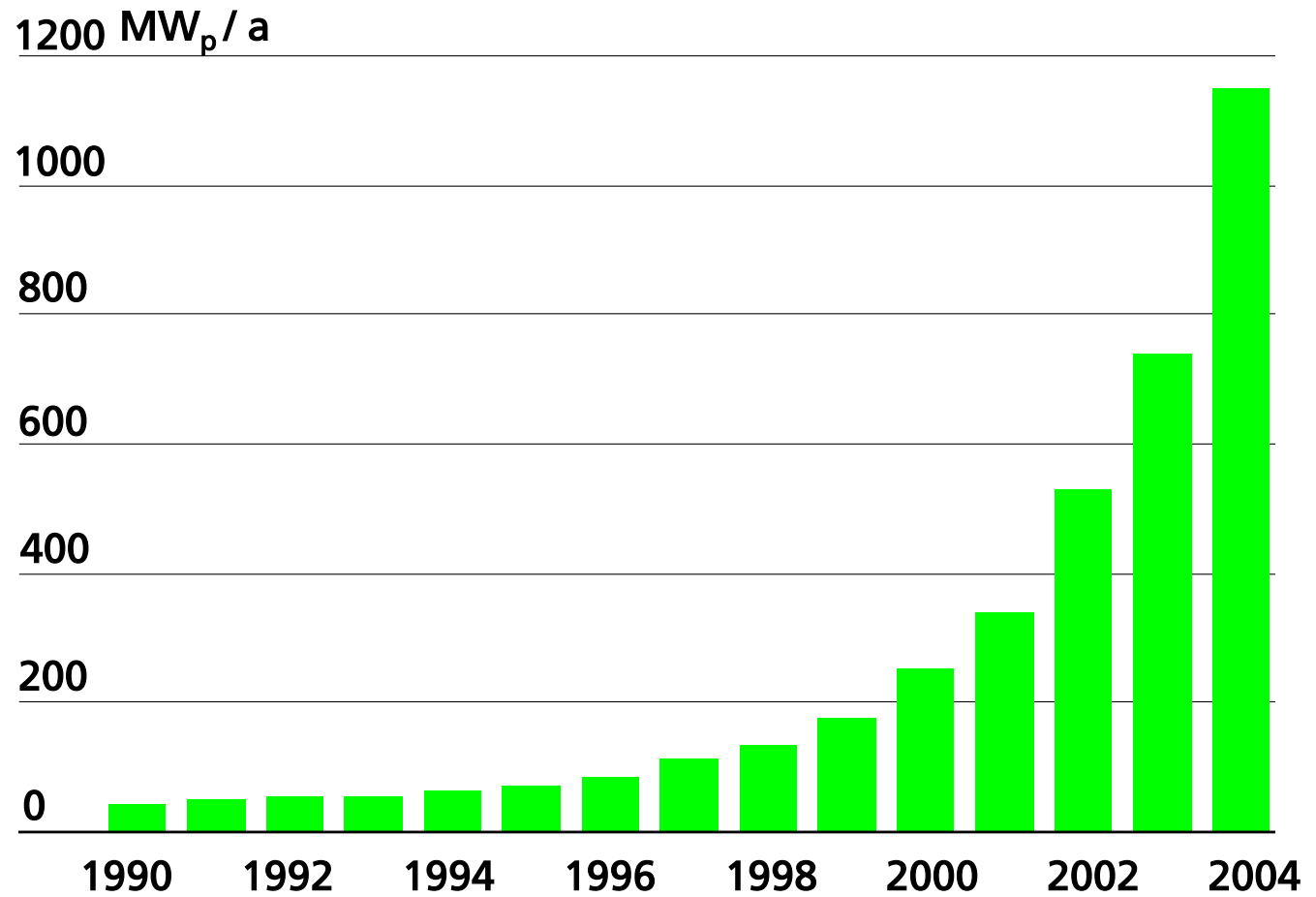

Photovoltaics the Basis for Sustainable Energy Systems and Industrial Innovations

Becquerel Prize Honorary Lecture

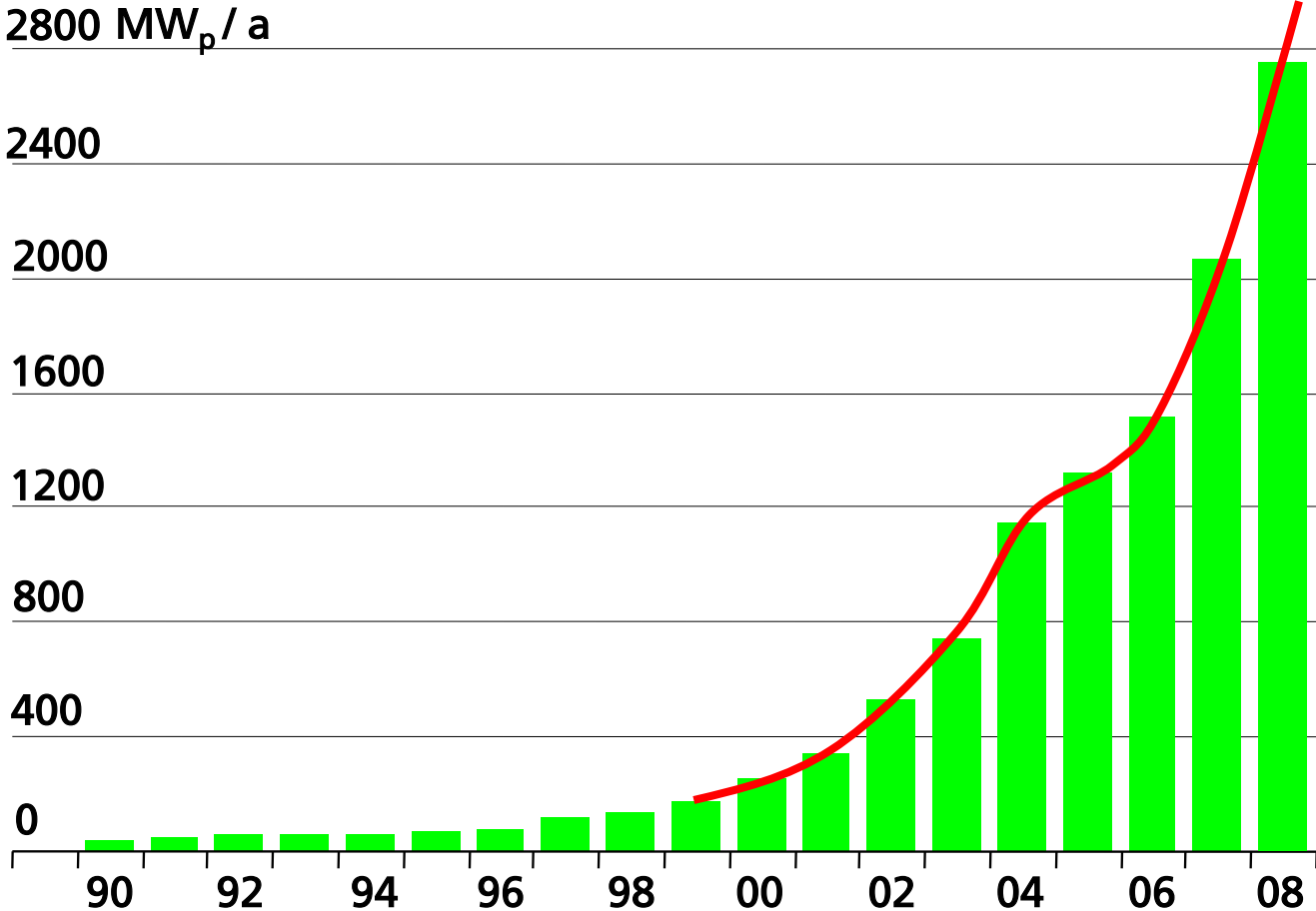
Joachim Luther
Fraunhofer-Institut for Solar Energy Systems,
Freiburg, Germany

Global PV market



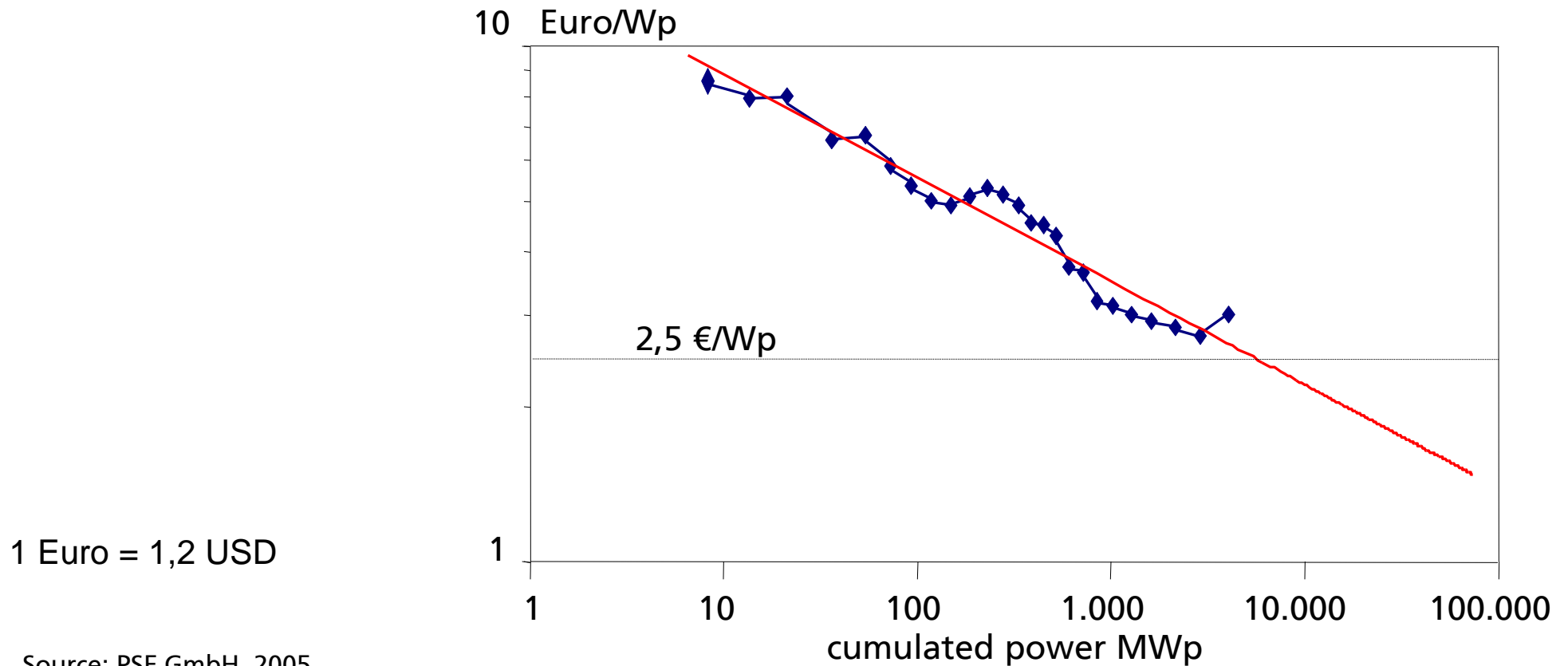
Source: PSE GmbH, 2005

Market development of PV, a likely scenario



Source: PSE GmbH, 2005

Si flat plate PV modules, price experience curve



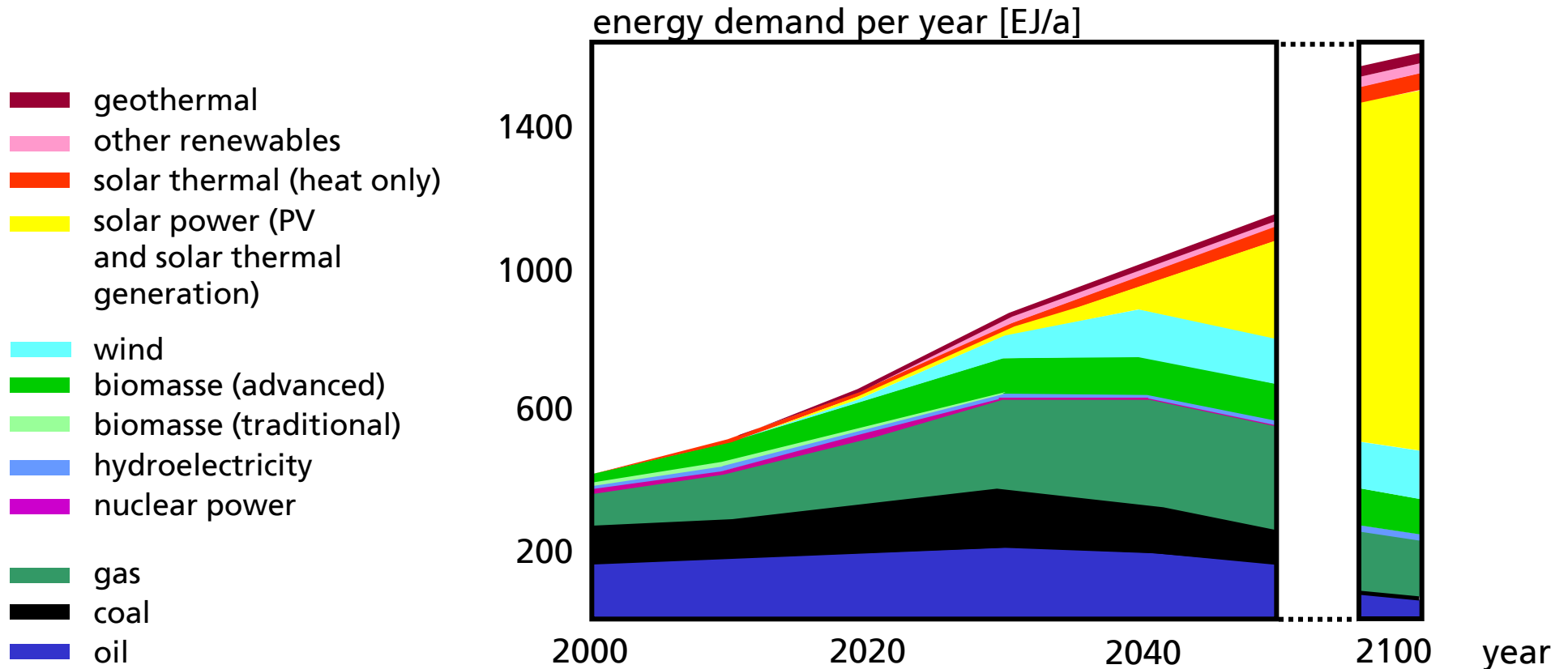
Source: PSE GmbH, 2005

Statement I

Photovoltaic has the potential to supply a quasi unlimited quantity of electricity in a sustainable way. Electricity (hydrogen) will become the most important final energy.

Photovoltaic is ideally suited for eradicating energy poverty in developing countries

Exemplary path, global primary energy consumption



Source: German Advisory Council on Global Change, 2003, www.wbgu.de

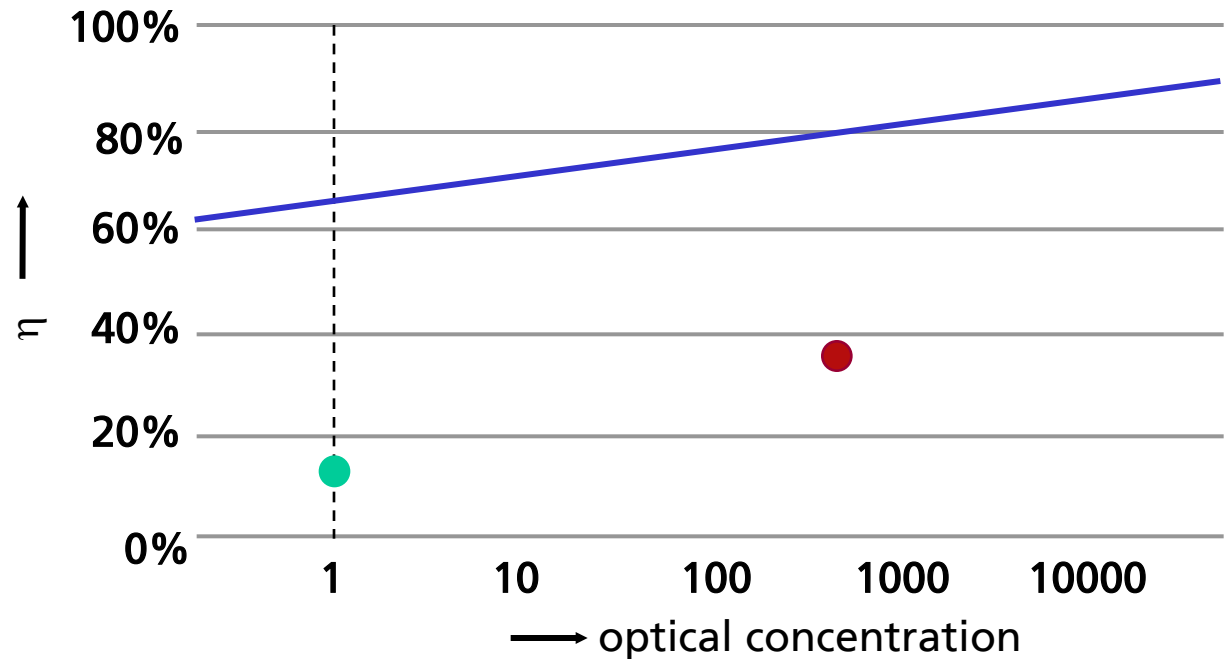
Statement II

Photovoltaic has a large potential for cost reduction through higher efficiency in

- use of material
- manufacture
- energy conversion

Thermodynamical limits of solar photovoltaic energy conversion

$$T_s = 5\,777\text{ K}$$
$$T_c = 300\text{ K}$$



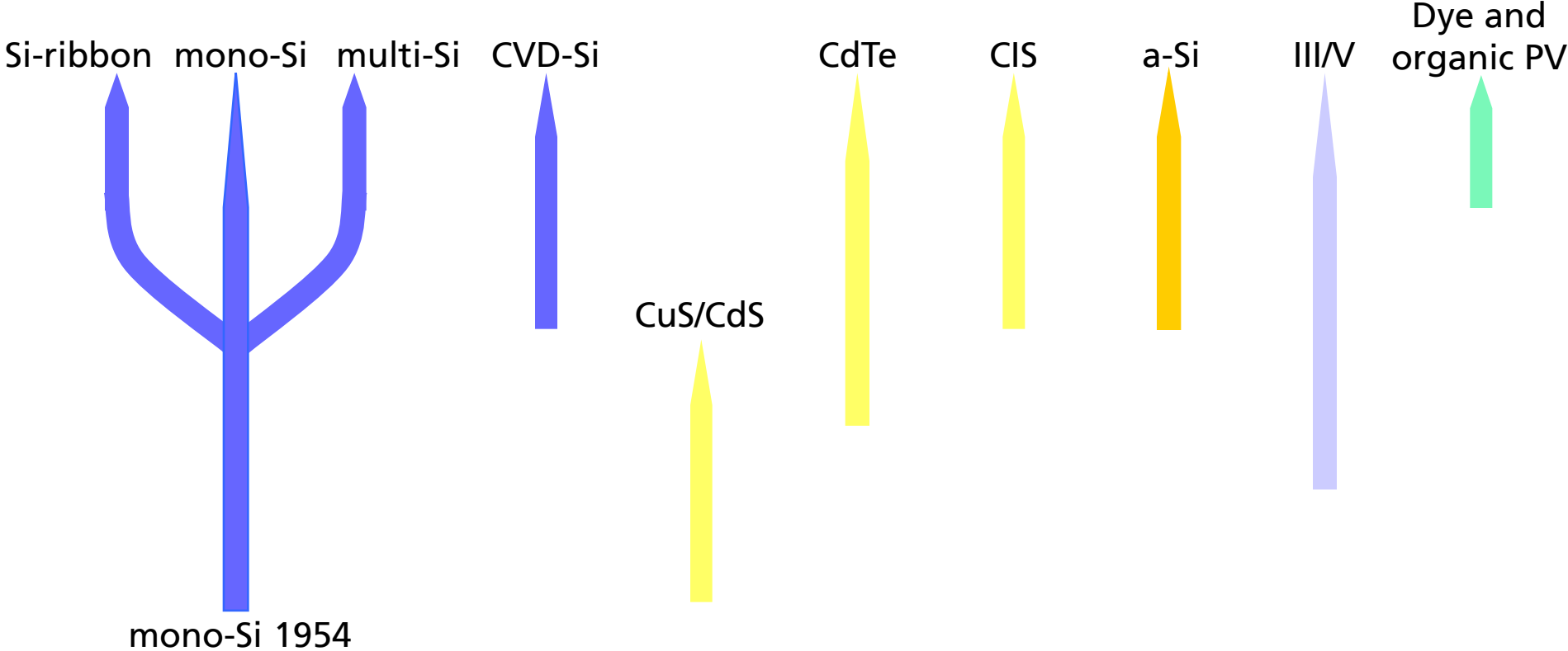
Source: R. Sizmann 1991

Statement III

Photovoltaic is high technology
and thus especially suited for regions
with high cost of labour

Many different PV technologies are
being developed

Evolution of PV technologies



PV concepts under scientific discussion

Up and down conversion of photon energy

Multi-bands cells

Quantum well structure

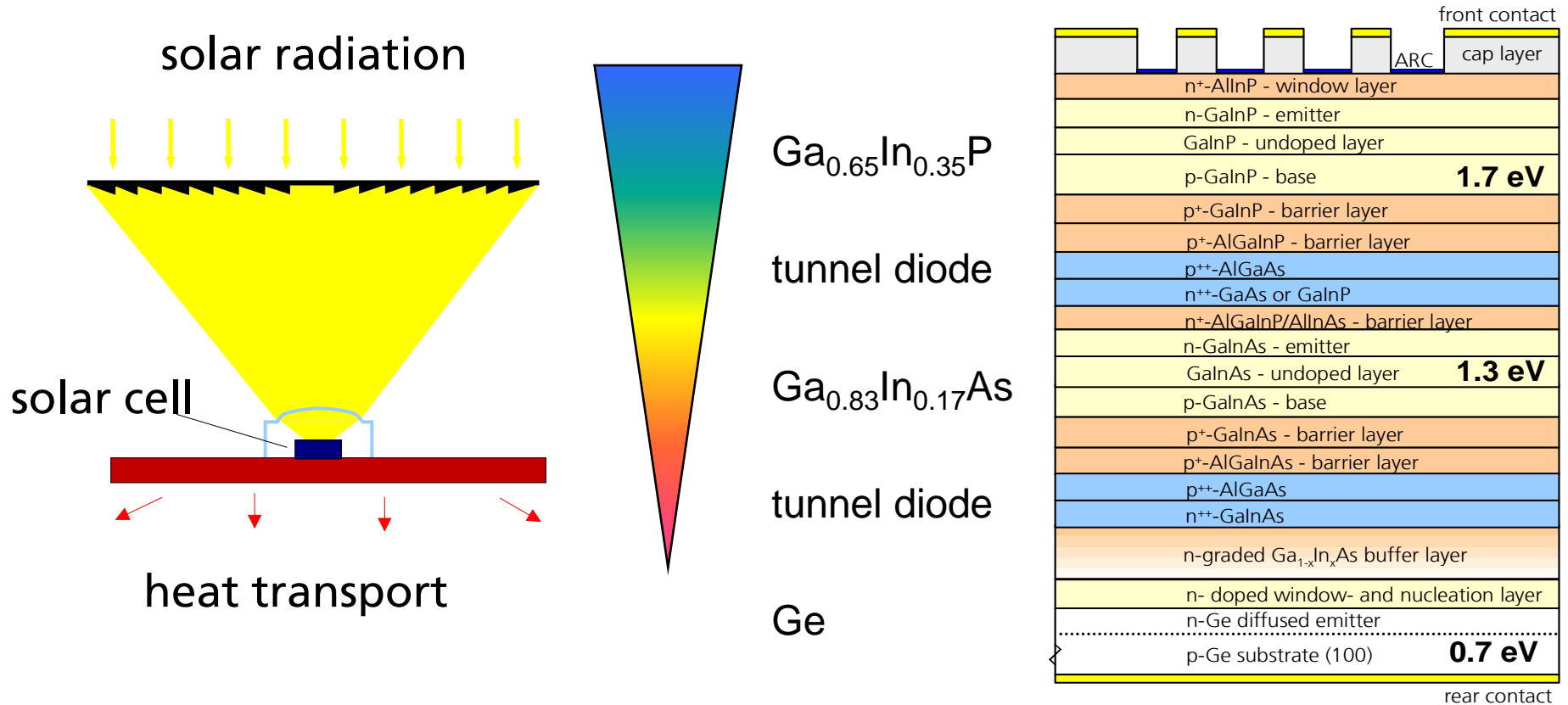
Electromagnetic antenna

Auger excitation

Extraction of hot carriers

Thermophotonics

Photovoltaic optoelectronics



Statement IV

The value-added chain of PV has important high technology links

Semiconductor technology

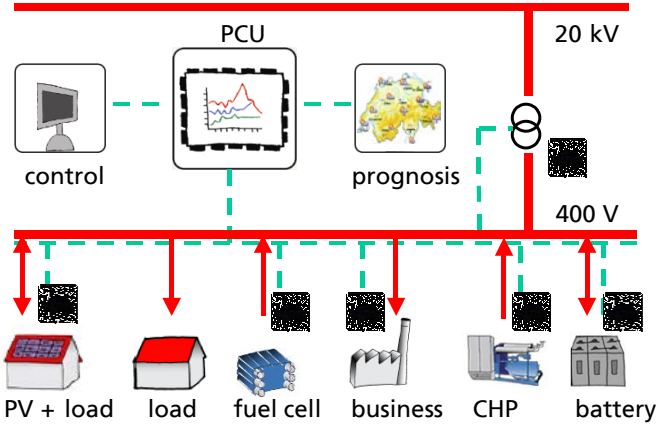
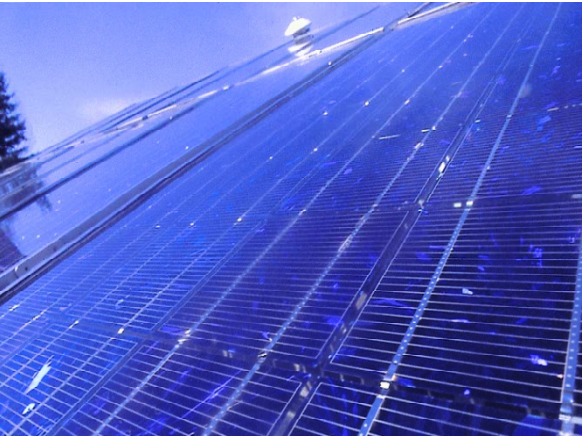
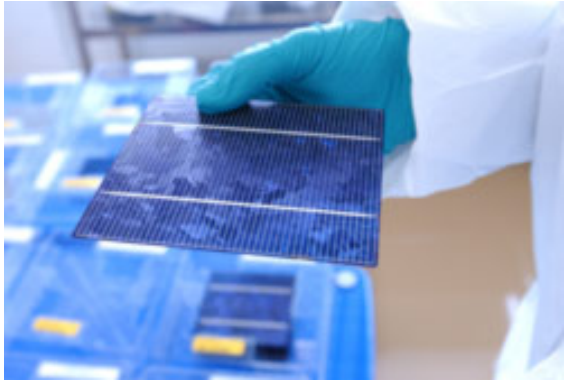
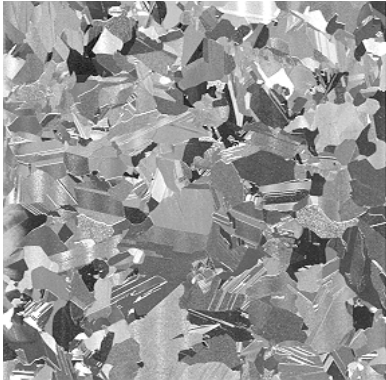
Metallurgy

Packaging

Electronics

Integration

Links of photovoltaic technologies



Most important:

Research, industrial development and market introduction in PV has to be continuously pushed ahead by the European Commission and the national governments in a dedicated way.

Sincere thanks to all members of Fraunhofer ISE

