

# REN-Alliance

## International Solar Energy Society

### “Financing the Renewable Energy Transition”



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8 Dec. 2008

# Overview

- π International Solar Energy Society
- π Solar Energy
  - π Conservation of Energy & Energy Efficiency
  - π Solar Buildings – Active & Passive
  - π Solar Electricity: PV and CSP
  - π Solar Thermal
- π Conclusion



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# International Solar Energy Society

π Founded 1954 in Arizona, U.S.A.

π Non-profit Membership NGO

π Direct & associated members in more than 110 countries  
with National Sections in over 50 countries

π Accredited by the United Nations since 1963

π **Vision:** Rapid Transition to a Renewable Energy  
World



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# Solar Energy

- π Sun – Unlimited energy supply & potential
  - π Delivers 80 times more energy than we use
  - π Each hour the sun delivers more energy to the earth than used by humans in a whole year\*
- π Solar – technologies address all energy sectors
  - π Buildings: passive, solar heating & cooling
  - π Electricity – PV and CSP
  - π Production: concentrated solar thermal, industrial process heat, solar cooking & food processing
  - π Transportation – hydrogen from solar, electric energy from portable storage potential to charge from solar parking stations, home BIPV, etc.

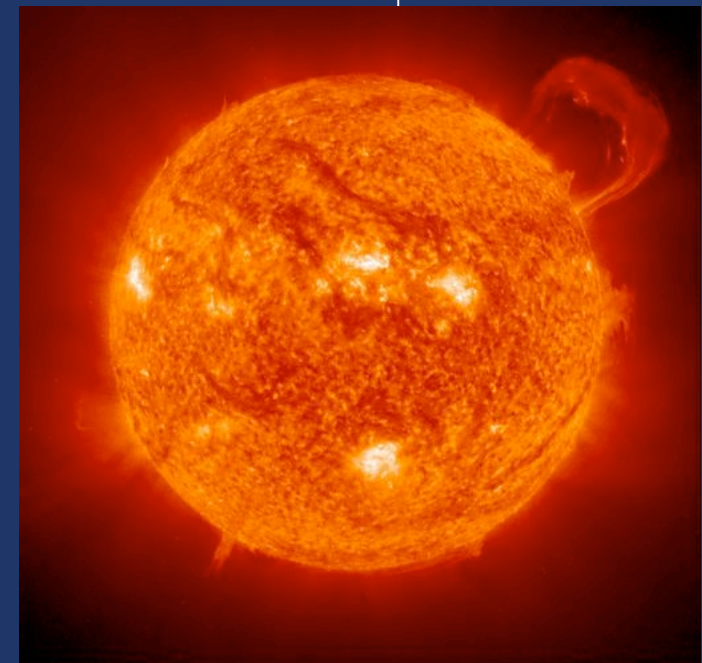
Source: E.Weber, Fraunhofer ISE, „Where are we heading“, Semi 2008

Photo: NASA



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# Energy Conservation & Efficiency

- π Huge potentials in production, transportation and building sectors
- π Key to reducing CO<sub>2</sub> and meeting climate mitigation goals – achieving transition to renewable energy – 100% is possible
- π Converting from centralized to decentralized and creating efficient energy supply crucial to transition to renewable energies



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Photo: <http://keetsa.com/blog/wp-content/uploads/2007/09/cfl.jpg>

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# Solar Energy – Solar Buildings

## π Active and passive building applications

- π Passive – building orientation, design & materials
- π Daylighting
- π Solar heating & cooling
- π DHW
- π Building Integrated PV (BIPV)



## π Buildings part of decentralized energy supply

- π In Germany possible production from rooftop PV installations = ca. 75 TWh/y



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# Solar – Electricity

- π Photovoltaics (PV) – Grid connected application = 94% of installed capacity
- π Grid-connected PV - fastest growing energy technology in the world, 50% annual growth in installed capacity 2006 and 2007
- π Total installed capacity estimated at 7.7 GW in 2007
- π PV has highest cost reduction potential (REO 2030)
- π 2007 US\$ 71B invested in RE power & heating capacity worldwide, of which 31% for solar PV
- π Over \$10 billion invested in new solar PV manufacturing capacity



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Source: E. Martinot, REN21 Renewables 2007 Global Status Report

S. Peter & H. Lehmann, „Renewable Energy Outlook 2030“, 2008, Energy Watch Group

Photo: NREL, D.O.E., USA

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## Solar – Electricity (cont.)

- π PV – potential to grow 10 – 100 times in volume from US\$ 100 – 300 B market
- π Key to reducing costs for PV is increased production volume – modules, inverters, new tech. requirements will reduce material requirements and manufacturing costs
- π Intelligent support mechanisms required = feed-in tariff laws
- π Germany most effective feed-in law and world leader in PV grid tie - half of global market share in 2006 & 2007
- π Feed-in tariffs: stimulates PV sector
  - π Guarantees price of PV electricity without depending on state budgets
  - π Secures financing for PV system
  - π Encourages cost reduction
  - π Forces industry to improve performance



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## Solar – Electricity (cont.)

- π Concentrated Solar Power (CSP)
- π Technology reemerging after 15 years of commercial dormancy
- π 3 new plants completed in 2006-2007
  - π 64 MW parabolic trough plant in Nevada
  - π 1 MW trough plant in Arizona
  - π 11 MW central receiver plant in Spain
- π 2007 - 20 new CSP projects (construction, planning or under feasibility studies)
- π Largest solar power plant in EU - Spain 50 MW under construction
- π Becoming increasingly attractive to investors

Sources: S. Peter & H. Lehmann, „Renewable Energy Outlook 2030“, 2008, Energy Watch Group  
Renewable Energy Focus, „CSP concentrates the mind“, January/February 2008



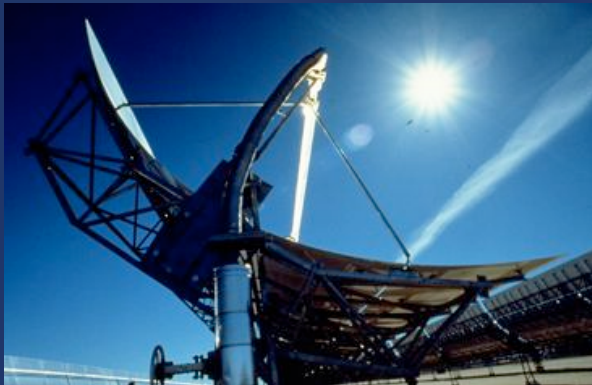
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## Solar – Electricity (cont.)

- π Potential for electricity production is almost 15,300 TWh/year worldwide
- π High-profile projects in Spain & SW USA proving technology's ability to generate significant amounts of electricity & engage utilities
- π CSP plants area measuring ~ 64,000 km<sup>2</sup> (< 1 % of area of Sahara Desert) would produce as much electricity as world currently consumes



Sources: S. Peter & H. Lehmann, „Renewable Energy Outlook 2030“, 2008, Energy Watch Group  
Renewable Energy Focus, „CSP concentrates the mind“, January/February 2008



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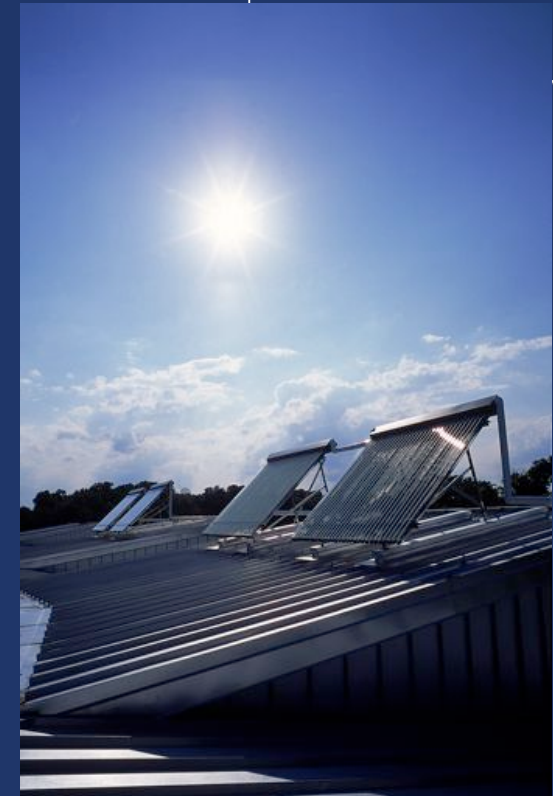
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## Solar thermal (hot water, heating & cooling)

- π Existing solar hot water/heating capacity increased to 128 GWth globally in 2007
- π 20% average annual growth rate over last 2 years
- π Roof-top collectors provide hot water to nearly 50 million households worldwide
- π China 75% of global solar hot water capacity additions/year, 65% of current capacity
- π Austria, Sweden, Germany – 50% annually installed collector area is combined hot water & space heating



Source: E. Martinot, REN21 Renewables 2007 Global Status Report

Photo: NREL, D.O.E., USA

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## Solar thermal (hot water, heating & cooling)

- π Solar hot water installations in EU increased by 50% in 2006
- π Policies for solar hot water growing – ex. Spain, India, Germany & numerous municipal governments have mandates
- π Capital subsidies, grants & tax credits common policy instruments for solar hot water systems – typically range 20-40% of system cost
- π Solar space heating & cooling increasing in commercial and industrial buildings
- π Growing commercial and industrial markets showing strong trends – global capacity to reach 125 – 128 GWth in 2007

Source: E. Martinot, REN21 Renewables 2007 Global Status Report



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# Conclusions

- π Most effective policy to promote renewable energies are feed-in tariffs
  - π Offer an attractive price
  - π Broad target group – anyone can invest
  - π Guarantees annual return on investment
  - π Attractive feed-in rates and **no caps** on total amount of generated power necessary
- π Earth won't wait until the economic crisis is over, ambitious renewable energy targets must be set by all countries to address climate change NOW.



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