

Current Status and Future Prospects of World's Renewable Energy

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What are Renewable Energies (RE)

- Traditional RE : today 18% of global energy supply
 - Large hydro : 6% of global supply
 - Fuel wood and other biomass in poor households (12%)
- New RE : today a few % in Germany, USA, China...
 - Wind power
 - Solar photovoltaics (pv power)
 - Solar heat
 - Small hydro power
 - Bio-energy (power, fuels, and heat)
 - Geothermal power and heat

Why we need RE Now!

- Most conventional energies will by and large have been exhausted by 2050: markets become progressively tight, prices tend to go up - RE are plentiful and inexhaustible
- The import dependence on conventional fuels is increasing in most countries - RE are available everywhere, energy autonomy is a possible outlook
- Environment and climate problems of conventional energies are high on political agenda (World Summits, IPCC) - RE are clean and neutral for GHG emissions
- RE stimulate the global economy by technological innovation, new opportunities in industry (SMEs!) and finance, new jobs, rural development
- A new hope for the 2,000 million 'energy poor' - RE are decentralised, easy to implement

Is the RE Option realistic ?

- RE getting cheaper and increasingly competitive through growing mass production, assisted by R&D
- All RE have already conquered important niche markets where they compete successfully
- Being decentralised and partly intermittent, RE imply a new energy supply and demand system, different from the conventional ones - challenges ahead are gigantic : entrenched conservative assets, attitudes and bureaucracies lay on the way

Global Aspects

- RE are, except geothermal energy, derived from the SUN, our all 'world heritage' : Fossil energies are also derived from the SUN, but they are owned by a few only
- Energy autonomy through RE is a realistic option for all : communities, regions, nations. But as conditions of use are not the same everywhere, trade is important : example, international trade of pv modules exceeds this year 15 billion USD
- » Trade in RE stimulates **PEACE** while the fight for access to the fossil resources tempts to military intervention

RE today : Power Markets (1)

- Wind power : globally installed end 2008 : 120 GW; +/- 25 GW new in 08 (40 x more than new atomic capacity since 05)
 - Market leader in 08: USA with +/-10 GW newly installed
 - For total capacity USA pass Germany in 08, both exceeding over 22 GW each
- Photovoltaics : world capacity end 2008 : 15 GW; +/-5 GW new in 08
 - Market leader in 2008: Spain with +/-1.3 GW newly installed followed by Germany with 1.1 GW, USA, Italy, and Japan with +/- 250 GW each
 - For total capacity Germany is global leader with +/- 5GW inst.

RE today : Power Markets (2)

- Bio power : +/- 50 GW totally installed (increasing trend for small co-generation units (in the EU 2/3 of total), electricity from biogas (from landfill or agricultural biomass)
 - Germany had in 2007 for first time more electricity from bio-energy than from hydro
- Small hydro : +/- 100 GW (20 GW new in 2007)
 - 12 GW in EU
- Geothermal power : 10 GW

RE Heat

- Buildings represent in many countries 50% of total energy demand. Trend towards 'Passive Solar Buildings' (3 litres of heating oil per m² and year), 'Zero-energy houses', 'Energy-producing houses', all relying on solar, and/or bio-energy, and/or geothermal up-graded with electric heat pumps
- Solar heat collectors : over 200 million m² globally
 - 300 million people dispose today of solar heated water (SWH)
 - China has more than half of global capacity installed
- Biomass : in the EU, 10% of the 65 mtoe/y of total solid biomass goes into commercial heat (toe: tonnes of oil equivalent)
 - Wood pellets globally 14 mt/y; Germany 2 mt/y in 2008 (5 x consumption in 2005)

RE Bio-fuels

- Bio-alcohols : in 2008 global production volume +/- 54 mt (million tonnes per year), production costs 30 cent - 60 cent per litre
 - Market leader USA : +/-27 mt/y from corn; 3% of gasoline consumption
 - Brazil : +/-20 mt/y from sugar; 40 % gasoline consumption
- Vegetable oils and bio-diesel : 10 mt/y, production costs 19 cents - 88 cents per litre
 - Market leader Germany (EU) : 3.4 (5.4) mt/y from rapeseed
 - Malaysia : 1 mt/y palm oil for export
- Bio-gas : over 13 mtoe/y for local consumption or, upgraded, for natural gas networks
 - 6 mtoe/y in EU

Cumulative World RE Business in 2008

In billion USD

• Wind power	45		
• Solar pv	35		
• Solar water heater	10		
• Small hydro	30		
• Geothermal	3		
• Bio-energy	91		
		<i>Bio-energy</i>	
		- <i>Bio-electricity</i>	35
		- <i>Heat</i>	10
		- <i>Bio-gas</i>	6
		- <i>Bio-liquids for transport</i>	40
		• <i>Alcohols</i>	34
		• <i>Oils/Diesels</i>	6
<u>Total</u>	<u>214</u>		

China's *Leadership* in RE

- China has the world's biggest solar pv industry
- China has the world's largest park of installed Solar Water Heaters
- The growth rate of wind power installation is globally the highest
- China leads the world in the small hydro market

Global *RE* Technology Outlook

Short-term by 2010

- Wind power : cumulative 200 GW (40 GW/y)
- Solar pv : production capacity 20 GW; market volume only 1/2 or 1/3 of industry capacity ? World investments will reach level of electronic chip manufacturing industry by 2010
- Geothermal power : 13.5 GW

Global RE Political Outlook

Short-term by 2010

- EU Directive : 21% electricity share from RE sources
- EU Directive : 5.75% bio-fuels (alcohols and bio-diesel/vegetable oils) in all transport fuels
- California law : 20% electricity share from RE sources
- USA : applications for +/- 70 GW solar plants on a million km² in the South-West are on the table
- China : over 10 GW wind, 10% RE electricity target
- Spain : over 3 GW solar pv, 30% RE electricity goal

Global RE Outlook

Medium-term 2017-2020

- Shell Study : 31% RE supply to energy consumption globally by 2020
- EU Draft Directive : 20% RE as part of over-all EU consumption by 2020
- Total world's wind capacity by 2017 : 700 GW
- USA :
 - AL Gore demand : all US electricity from RE within 10 years
 - US law : 5 x the current volume of bio-fuels for transport (36 billion gallons by 2020)
 - RE investment tax bill extended October 2008 could trigger 440,000 new jobs and 230 billion USD investments by 2016

Global RE Outlook

Long-term 2050

- World Energy Council's policy scenario sees doubling of global energy supply need. Share of electricity could increase three fold
- Shell scenario finds 65% RE contribution to consumption by 2060
- Politicians and RE experts in Europe, including the World Council for RE, see realistic option of 100% RE supply in a commercial energy market free of any subsidy by 2050

Renewable Energies :

*Join the March into the Solar
Age, for a better World*

Welcome