Current Status and Future Prospects of World's Renewable Energy 2009

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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: the stars on today's energy heavens**
  - **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 while RE are plentiful and inexhaustible**
- **The import dependence on conventional fuels is increasing in most countries, but 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), but 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' as 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 shares on the global energy 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 exceeded $15 Billion in 2009**

» **Trade in RE stimulates *PEACE* while the fight for access to the fossil resources tempts to military intervention**

Costs, Political Tariffs, Market Prices

Prices in the Global Energy Markets can be far apart from production costs

Examples are the Petroleum and Natural Gas prices that are by and large political

The Solar PV Market shows also such characteristics:

- **The height of a 'Feed-in-Tariff' that is fixed by law can be very much inadequate for the actual market situation. Example: the events of the Spanish market in 2008**

  And: PV world market prices could decrease faster if they were not distorted by political support that may be overdone in cases

- **The spot-market prices of silicon feed-stocks in 2007 and 2008 reached up to a 100 times production cost!**

Energy Subsidies

- **Subsidies are a general characteristic of the over all energy market**
- **The conventional energies get globally a yearly subsidy of up to $300 Billion**
- **RE investments may also benefit from subsidies and preferential loans, e.g. via the EU structural funds; but they are only a minor player there**
- **The RE 'Feed-in-tariffs' raise considerable expenses to the electricity consumers (e.g. in Germany) or the state budget (e.g. in Spain) In Germany, in 2008 the extra cost amounted to about 5 Billion €, 1/2 or so for wind and 1/4 of it for PV, i.e. an increase of 5% of the kWh cost to all clients of the grid. But on the macroeconomic level this is largely compensated by benefits from job creation, avoided imports of fossil fuels, avoidance of GHG emissions, dampening of electricity prices on the spot market**

RE today : Power Markets (1)

- **Wind power: globally installed end 2008: 120 GW; +/- 25 GW new in 2008 (40 x more than new atomic capacity since 2005)**
  - **Market leader in 2008: USA with +/-8 GW newly installed**
  - **For total electricity production from wind USA passed Germany in 2008, although Germany keeps the number one position in capacity terms with over all 24 GW installed at end 2008**
- **Photovoltaics: world capacity end 2008: 15 GW; +/-5.5 GW new in 2008. PV silicon has passed the market volume of semiconductor silicon**
  - **Market leader in 2008: Spain with +/-3.7 GW newly installed followed by Germany with 1.3 GW, the USA, Italy, and Japan with +/- 250 MW each**
  - **For total capacity Germany is global leader with +/-5 GW installed**

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 the 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 par m2 and year), 'Zero-energy houses', 'Energy-producing houses', all relying on solar, and/or bio-energy, and/or geothermal upgraded 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 million toe/y of total solid biomass goes into commercial heat**
  - **Wood pellets globally 14 million t/y; Germany 2 million t/y in 2008 (5 x consumption in 2005)**

RE Bio-fuels

- **Bio-alcohols: in 2008 global production volume +/-54 mt/y, production costs 30 cents - 100 cents per litre**
  - **Market leader USA: +/-27 mt/y from starch (corn); 7.8% of gasoline consumption**
  - **Brazil: +/-20 mt/y from sugar (cane); 45 % 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**

Total 214

Bio-energy

- ***Bio-electricity 35***
- ***Heat 10***
- ***Bio-gas 6***
- ***Bio-liquids for transport 40***
  - ***Alcohols 34***
  - ***Oils/Diesels 6***

RE in the European Union

All RE:

Now 9% of gross final energy consumption
2020 target: 20%

All Electricity: 2010 20%

- **Wind Capacity:**
  Now 65 GW in total (8.5% of EU'S overall power capacity)
  2012 projection 130GW
- **Photovoltaics:**
  Now 10.7 GW in total
  2020 projection 50 GW ???

Bio-fuels:

2010 6% of gasoline consumption
2020 10%

ALL Buildings :

Mandatory energy pass
By 2015 minimum levels of RE imposed

RE in Germany, Spain, Ireland

	All RE RE Electr. now (2020)	Total Wind Power inst. now (2012)	Total PV installed % of Electr.	Buildings
Germany	9% RE Electricity 15% (47%)	23.9 GW (33 GW) 80% export	5 GW 1%	8% of all; 10 mil m2 collectors
Spain	9% RE Electricity 18%	18 GW (26 GW) 26%of Elec. in Dec 08	4.5 GW 1%	+/-1 mil m2 collectors
Ireland	4% RE Electricity 9%	0.9 GW	0.0005 GW	+/-0.005 mil m2 collectors

China: a Strong Newcomer 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**

DREAM: Obama's America

DREAM: Doubling RE in America

Obama's Speech on January 10, 2009

- **Doubling RE share of 9% within 3 YEARS!**
- **500 000 new jobs**
- **Improving the energy efficiency in 2 million homes**
- **Modernising 75% of federal buildings**

Within the $819 Billion Stimulus Package

- **$2 Bil for RE manufacturing tax credits**
- **$8 Bil for loans for RE power generation**
- **$2 Bil for R, D, & D, & Deployment**

In Comparison: N.Sarkozi wants France to spend 90 Bil € on RE by 2020

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 ?**
- **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**

Global RE Outlook
Medium-term 2017-2020

- **Shell Study: 31% RE supply to energy consumption globally by 2020**
- **EU Directive: 20% RE as part of over-all EU energy 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**
  - **California: 33% RE electricity goal**

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