European Policy for RES

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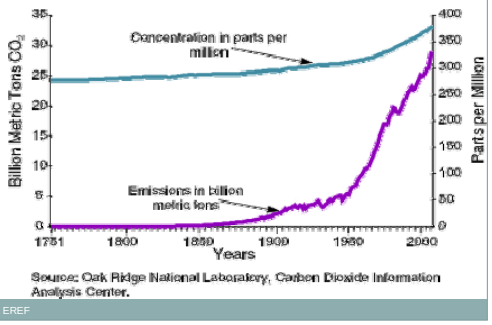
http://www.inforse.org/europe/seminar09_Artefact.htm

Global Dioxide Emissions and Carbon Dioxide Concentrations (1751-2004)



Source: Oak Ridge National Laboratory, Carbon Dioxide Information Analysis Center.

Sir Nicholas Stern's Report 2006

- Stabilising below 450ppm CO2e (in order to remain below 2° Celsius Temperature increase) would require emissions to peak by 2010 (at the latest – following recent scientific research) with 6-10% p.a. decline thereafter.
- If emissions peak in 2020, world can stabilise below 550ppm CO2e if we achieve annual declines of 1 – 2.5% afterwards.
- A 10 year delay may double the annual rate of decline required.
- Stern recently in Copenhagen during scientific conference in March '09 was less optimistic and calls for a lower temperature increase goal than -2°Celsius
- Stern Review on the Economics of Climate Change, www.sternreview.org.uk

European success in RES too much in the hands of very few MS

- Example – Germany: **2007**:
  - Indicative **12,5 % target** of gross electricity consumption **for 2010 already passed** (14.2 % in 2007)
  - 9,8 % share of total end energy consumption (Electricity, heating, fuel) (2006:8,1 %)
  - 278.000 people working in RES in 2008 (170.000 in '05)
  - Gross Turnover: 28,7 bio. Euro in 2008 (18,1 in '05)
- More than 6 % of this growth in RES in electricity was reached in only 6 years; 90 % of this increase comes from IPP
- *Forward Estimate by Germany (BMU):*
- 2050: 77 % share *feasible*
  - Source: (German Ministry of the Environment, BMU, Press Service 055/ 07, 27.02.2007 and "Erneuerbare Energien in Zahlen, (BMU,Internet Update 2009); press declaration of 5th of July 07, BWE, Germany)
- **10 Years of Cap and Trade Mechanism in the United Kingdom:**
  - RES share below 2%
  - Only restricted technology spread (wind, co-firing of –imported- biomass)
  - UK will not be able to reach indicative target in 2010

Average 11 % RE increase per year in Germany 1997 -2007

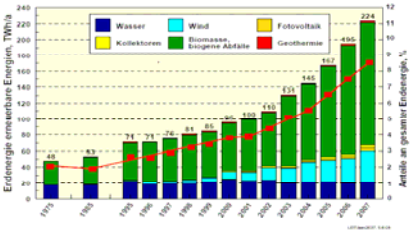


Abbildung 1: Endenergiebeitrag erneuerbarer Energien nach Energiequellen 1975 – 2007

Leitstudie 2008, BMU

The new RES Directive a good tool

- Sets **mandatory national targets** for renewable energy shares, including 10% biofuels share in transport, in 2020
- Requires **National Action Plans,**
- **Gives flexibility** for Member States to reach part of their target through
  - **Statistical** transfer
  - **Joint projects** between Member States and third countries with existing or planned interconnector capacity (under certain conditions and provided RES energy reaches the EU))
- Encourages **joint Support mechanisms between MS**
- **Sets clear rules** for disclosure quality of **Guarantees of origin**
- Requires **reduction of administrative and regulatory barriers**, improvements in provision of information and training and improves renewables' access to the electricity grid
- Creates a **sustainability regime** for biofuels

Europe's new Commitment

- **20% GHG reduction compared to 1990**
  - **Independent commitment**
- **30% GHG reduction compared to 1990**
  - **In context of international agreement**
- **20% renewables share of final energy consumption**
- **10% bioenergy in transport, with**
  - **production being sustainable**
  - **second generation biofuels commercially available**
  - **Electricity from RES**

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EU 27's homework

- National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020* (ANNEX I of RES Directive)

	2005 (1)	2020 (2)		2005	2020	
Belgium	2,2 %	13%	Lithuania		15,0 %	23%
Bulgaria	9,4 %	16%	Luxembourg	0,9 %	11%	
Czech Republic	6,1 %	13%	Hungary		4,3 %	13%
Denmark		17,0 %	30% Malta		0,0 %	10%
Germany		5,8 %	18% The Netherlands	2,4 %	14%	
Estonia	18,0 %	25%	Austria	23,3 %	34%	
Ireland	3,1 %	16%	Poland	7,2 %	15%	
Greece	6,9 %	18%	Portugal	20,5 %	31%	
Spain	8,7 %	20%	Romania		17,8 %	24%
France	10,3 %	23%	Slovenia	16,0 %	25%	
Italy	5,2 %	17%	Slovak Republic	6,7 %	14%	
Cyprus	2,9 %	13%	Finland	28,5 %	38%	
Latvia	32,6 %	40%	Sweden	39,8 %	49%	
United Kingdom	1,3 %	15%				

(1) Share of energy from renewable sources in ***gross*** final consumption of energy,

- (2) Target for share of energy from renewable sources in ***gross*** final consumption of energy

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Renewable Industries' Pride and Challenge

- Globally, renewable power capacity expanded to 280 GW in 2008
  - = 75-percent increase from 160 GW in 2004, excluding large hydropower.
- Top SIX:
  - China (76 GW),
  - United States (40GW),
  - Germany (34 GW),
  - Spain (22 GW),
  - India (13 GW), and
  - Japan (8 GW).
- The capacity in developing countries grew to 119 GW, or 43 percent of the total, with China (small hydro and wind) and India (wind) leading the increase.

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Milestone in 2008

- Added power capacity from renewables in both the United States and the European Union exceeded added power capacity from conventional power (e.g. gas, coal, oil, and nuclear).
- That is, renewables represented more than 50 percent of total added capacity. (Including large hydropower, global renewable power capacity reached an estimated 1,140 GW in 2008.)
- Investment in Infrastructure worldwide crucial

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Renewable Industry- global player

- Among new renewables (excluding large hydropower), wind power again largest addition to renewable energy capacity.
- Existing wind power capacity grew by 29 percent in 2008 to reach 121 gigawatts (GW), more than double the 48 GW that existed in 2004.
- The 2008 increase was led by high growth in the strongest markets of the United States (8.4 GW added), China (6.3 GW), India (1.8 GW), and Germany (1.7 GW).
  - (REN21 , Global Status Report 2009 Update)

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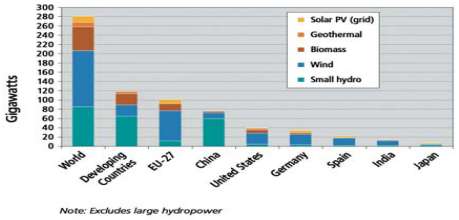
Success is not limited to the richer world

Figure 4.
Renewable Power Capacities, Developing World, EU and Top Six Countries, 2008



Note: Excludes large hydropower

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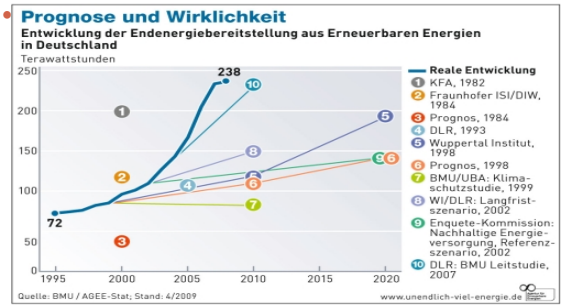
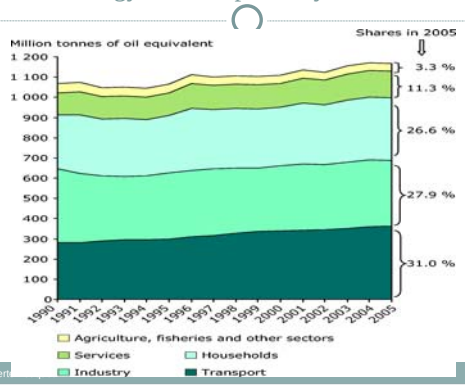
RE Industry delivers faster than augurs think



The current tasks for energy in Europe

- In EU 27 and over the coming decades around 400 GW, or 50%, of the existing installed electricity capacity, is expected to be retired.
- Much of this old park is nuclear and coal powered.
- How these are replaced - crucial to EU's future climate and energy policies
- Strict priority for Renewables is necessary also in evaluating applications for new nuclear, new coal and for prolongation of lifetime of existing nuclear and coal in Europe

Final energy consumption by sector - EU-27



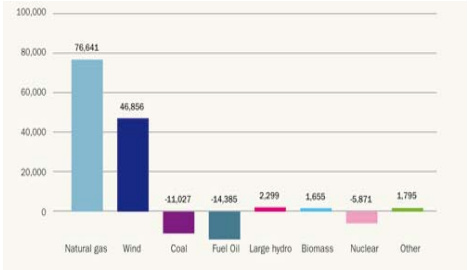
The discrepancy with incumbent energy: Nuclear and Coal

- Nuclear energy still benefits from EU investment rules and funding sources, notably the fact that there is a separate framework programme for research in nuclear energy, which has more funds than other energy sources combined.
- The lack of community wide rules to include the environmental costs of nuclear power in its price - i.e. third party insurance, radioactive waste and decommissioning costs - is also a form of financial support.

The imbalance

- "It is worth noting that wind power has received 0.03% of all IEA government energy research expenditures since 1974, while nuclear power received 60%, or $175 billion, in the same period, according to the International Energy Agency." (EWEA)

Net Increase/Decrease in Power Capacity EU 2000-2007 (in MW)



Source: Prioritising Wind Energy Research Strategic Agenda, EWEA; Platts

The mandate for efficiency and RE

- Renewable Energy must
- (i) urgently replace most fossil and nuclear fuel use,
- (ii) be increasingly implemented for development, environment and sustainability. The technology, economics and politics of renewables have equal importance.
- Greatest challenge is for individuals and organisations to make choices within their own responsibilities.

Cost Digression Capability

- Example PV: First Solar thin film producer is driving towards grid parity at $2.50/W (System) and $0.08/kWh before 2012
  - Source: Thin Film Technology: the pathway to Grid Parity, 2009 (Benny Buller, Director of Device Improvement First Solar)
- Support mechanisms in general contain review clauses and digression obligations
- *Mike Ahearn, CEO, First Solar, quoted in: Thomas Friedman, Hot, Flat and Crowded, p 389:*
- "Every year- and this was really smart- new solar projects coming on line in Germany have a feed-in tariff that is 5 percent lower then the previous year's tariff to account for, and to stimulate improvements in efficiency. Research around learning curves says that when sales double, you usually get a roughly 20 percent reduction in price. So volume matters here. The more volume, the quicker and further you move down the learning curve toward the price that will scale in China and India. After we made the initial market test in Germany, we realized that the feed-in program had created a centre of technological excellence, with a lot of budding innovators.."

New Technologies need good Research

- 1998 OECD study "Improving the Environment
- through Reducing Subsidies" :
- **"Support is seldom justified and generally deters international trade, and is often given to ailing industries. ...support may be justified if it lowers the long-term marginal costs to society as a whole. This may be the case with support to 'infant industries', such as producers of renewable energy."**

Research for Renewables- FP7 Commission's Credo

- Renewable energy supported under the headings of
- renewable electricity generation,
- renewable fuel production, renewables for heating and cooling, while some of the other energy themes such as smart electricity networks include cross-cutting research themes relevant to renewables such as distributed generation.
- All renewable energy sources will be supported –
- biomass, photovoltaics, wind, ocean, solar thermal, small hydro, and geothermal
  - But is there enough funding??

Research tasks for 2020

- R&D priorities for Renewable Energy Technologies, in light of recent developments at EU level (e.g SET-Plan and adoption of Climate and Energy package) according to three end-user sectors:
  - Electricity generation for RES
  - Heating and Cooling from RES
  - Renewable Energy in Transport Applications
  - Technologies for renewable electricity production are at a different stage of development, but all require some R&D with a view to reducing their cost, and facilitating their integration into the grid to increase their consumption
  - R&D to increase the adoption of RETs into the heating and cooling sector should include the improvement of building technologies and energy efficiency measures
  - R&D for transport applications should focus both on improving the fuel production processes, and to create the requested infrastructure for the uptake of renewable-based fuels
    - see EUREC, **EUREC Agency publication- Main R&D priorities by 2020**

Research for RE needs structure and not "a little bit of everything"

- System Change Research:
- Necessity of flexible power stations and intelligent management
- Classical base load power stations are inadequate for modern demand side management with high input from renewable technologies
- Investment in new base load power nuclear or coal is an entrance and investment barrier for RE and for modernised grid management

Sustainable renewable Energy is nature and therefore

- It is fluctuating following the natural resources and their availability
- Current electricity structure is exactly the opposite, not just outdated but illiterate

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Base load is anti RES

- Classic base load is the most inflexible technology known in energy
- They can only be well regulated in small bands
- Not possible to easily and swiftly increase and decrease their output, linked with high costs
- Unsustainable base load forces wind energy in peak times to be given away and production to be lowered

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New Management for Energy

- With more deployment of RE production of electricity will depends from demand and from sun and wind availability.
- All energy not produced from renewables will be produced from flexible POWER stations, e.g. some of the current classical average load utilities (Gas, GuD, interim lignite) and from Gas turbine power stations and Pump Storage units
- Together with rapid increase of intelligent management of the energy flow , the increased use of housing and car sector for storage and balancing, back up by hydro and biomass

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New Intelligence

- Storage units are the key to success in future
- Grid extension and grid education is necessary but only when following the decentralised distributed agenda and not wildly running after new dependencies
- Load management
- Production management
- Dual use of storage facility (such as batteries in cars)
- BUT:
- Research needed to bring down costs:
- Water related storage costs: 3-10 ct kWh
- Air based storage: 38 ct kWh
- Batteries and E-Mobility. 20- 40 ct kWh

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Necessities

- Distributed Power Systems and electricity storage
- **Europe's electricity transmission and distribution networks were designed in an**
- **age of large central power stations.**
- **Renewable energy generators are smaller and**
- **are usually distributed across the network.**
- **The areas where the renewable energy resource is most abundant (ie where winds are strong, waves high, solar radiation or biomass plentiful) are not necessarily those where the electricity grid is strong.**
- **Without research into the issues that surround Distributed Power Systems (DPS)**
- **and strategies to cope with delivering electricity to weaker grids, many parts of**
- **Europe will be unable optimally to exploit their renewable energy resource.**

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Tasks

- The grid integration of huge percentages of fluctuating sources such as wind and solar photovoltaics equally needs further scientific and technical research.
- Scenario requires more research and development into the large scale grid integration of renewable energies as well as better regional meteorological data to optimise the mix of different sources.
- Renewable energy contributes to sustainable economic growth, high quality jobs, technology development, global competitiveness and industrial and research leadership.

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All RE technologies need research and support

- Example: Advanced heat and power cogeneration plants will also improve the economics of geothermal electricity.
- Tidal and wave energy costs still by 15-55 €cents/kWh, and for initial
- tidal stream farms in the range of 11-22 €cents/kWh.
- Generation costs of 10-25 €cents/kWh are expected by 2020.
- Key areas of research:
- Concept design, optimisation of the device configuration,
- Reduction of capital costs by exploring the use of
- Alternative structural materials,
- Economies of scale and learning from operation.
- Learning factor is estimated to be 10-15% for offshore wave and
- 5-10% for tidal stream.

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Established Res will leave support systems soon

- Especially onshore wind and PV, but
- Nuclear:
- "New nuclear power stations will not be built in Britain unless the government provides financial support for the industry... Vincent de Rivaz, chief executive of the UK subsidiary of EDF, told the Financial Times that a "level playing field" had to be created that would allow the nuclear industry to compete with other low-emission electricity sources such as wind power." May 26 2009

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The future is coming

- EDF is also concerned that the additional incentives for renewables will lead to so much wind capacity being built that nuclear power stations will have to be shut down at times of high wind power output, jeopardising the economics of new reactors.
- **Exactly that is why the old base load attitude is outdated!!**
- Ed Miliband, the UK energy secretary, recently told the Financial Times that the government's policy was not to subsidise nuclear power. "I think we are right not to subsidise new nuclear power stations because we have an obligation to get to a low-carbon future at the lowest cost to the billpayer," he said.
- Source: Financial Times

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Sustainable future - ante portas?

- **RWE CEO Says New Coal-Fired Projects "On Hold"**
- May 27, 2009--RWE Power
- Building of new coal-fired plants is no longer economically feasible. Dr. Johannes Lambertz, President and CEO of RWE Power, announced that new coal-fired power plant are now too expensive to build because of
- rising construction costs,
- fluctuating electricity and fuel prices in a liberalised marketplace, and the cost of implementing carbon capture and storage (CCS) technologies.
- http://www.industrialinfo.com/showAbstract.jsp?newsitemID=147100

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SET and SETIS – still low carbon and nuclear

- **SET-Plan**

  Adopted by the Council of the European Union in February 2008, is a "first step to establish an energy technology policy for Europe and serves as the principal decision-making support tool for European energy policy, with the ambition to:
  accelerate knowledge development, technology transfer and up-take;
- maintain EU industrial leadership on low carbon energy technologies;
- foster science for transforming energy technologies to achieve our Energy and Climate Change goals for 2020; and
- contribute to the worldwide transition to a low carbon economy by 2050."

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SET

- **Key technologies and activities to be financed**
- The Commission, together with industry and the research community, has drawn up technology 'roadmaps' which identify key low carbon technologies with strong potential at EU level in six areas: wind, solar, electricity grids, bioenergy, carbon capture and storage (CCS) and sustainable nuclear fission. The additional costs would cover basic and applied research, demonstration and early market take up, excluding deployment activities. A new initiative on energy efficiency for up to 30 cities ('Smart Cities Initiative') has been proposed as first enabler for the mass market take–up of energy efficiency, renewables and energy network technologies.

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SETIS

- Online Strategic Energy Technologies (SET-Plan) Information System, aiming at information on the
- latest research results on the status, forecasts and R&D investment figures for low-carbon technologies.
- It wants to support the effective strategic planning, conception and implementation of EU energy technology policy and serves to the implementation of the Strategic Energy Technology Plan (SET Plan).
- SETIS assesses and monitors those technologies that have a significant potential to help Europe meet its energy and climate change targets, such as **wind power, solar power, CCS or bioenergy**.
- The Information System offers interactive tools to compare the maximum potential and energy production costs foreseen for the different technologies over time
- http://setis.ec.europa.eu/

SET Priorities

- Six European Industrial Initiatives: these public-private initiatives, bringing together researchers and the industry, target sectors for which working together at EU level will add most value.
- The **European wind initiative** has to accelerate the reduction of costs, increasingly move offshore and resolve the associated grid integration issues if it is to fulfil its huge potential.
- Objective: up to 20% of EU electricity to be produced wind energy technologies by 2020. The programme is estimated at 6b€ over the next 10 years. More than 250 000 skilled jobs could be created.
- The **solar Europe Initiative** including photovoltaics and concentrated solar power has to help these technologies become more competitive and gain mass market appeal. Objective: up to 15% of EU electricity to be generated by solar power in 2020. The programme would cost an estimated 16b€ over the next 10 years. More than 200 000 skilled jobs could be created.

SET Priorities (II)

- The **European electricity grid initiative** has to respond to three interrelated challenges – creating a real internal market; integrating a massive increase of intermittent energy sources; and managing complex interactions between suppliers and customers.
- Objective: by 2020, 50% of networks in Europe operate along "smart principle" effectively matching supply and demand. The programme is estimated at 2 b€.
- The sustainable **bio-energy Europe initiative** has to bring to commercial maturity the most promising technologies, in order to permit large-scale, sustainable production of advanced biofuels and highly efficient combined heat and power from biomass.
- Objective: At least 14% of the EU energy mix would be from cost-competitive, sustainable bio-energy by 2020. The initiative will need about 9 b€ for its implementation. More than 200 000 local jobs could be created.

SET Priorities (III)

- The European **CO2 capture, transport and storage** initiative has to allow a wide commercialisation of Carbon capture and storage (CCS) technologies. The pressing need is to demonstrate at industrial scale the full CCS chain for a representative portfolio of different capture, transport and storage options.
- Objective: to reduce the costs of CCS by 2020. The total public and private investment needed in Europe over the next 10 years is estimated as 13 b€.
- The **sustainable nuclear fission initiative** has to move towards long-term sustainability with a new generation of reactor type that improves safety measures, optimise the use of fuel and reduce the volume of radioactive waste – the Generation-IV reactor. They will be designed to maximise inherent safety, increase efficiency, produce less radioactive waste and minimise proliferation risks. Commercial deployment of these reactors is foreseen for 2040, but to achieve that target, work has to start now.
- Objective: the first Generation-IV prototypes should be in operation in 2020. The investment for the next 10 years to come will be about 7 b€.

SETIS Mapping

SETIS Mapping (II)

Hydrogen and fuel cells

Technology Description
- R&D capacities
- Key Figures
- Energy Cost

Smart grids

Technology Description
- R&D capacities
- Key Figures
- Energy Cost


Thank you for your attention
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