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National Renewable Energy Action Plan for Germany and other actions for Greenhouse Gas reduction

Seminar "National Renewable Action Plan – implementing local and regional energy actions for achieving the EU RES Directive
Gdansk, 24th February 2011

Outline

- National RES targets 2020
- National RES targets 2050
- NREAP – sector paths
- Electricity
- Biomass
- Heating & Cooling
- Transport
- Flexibility Mechanisms
- RES support instruments
- Discussion

National RES Targets 2020

- Share of RES in final energy consumption in 2005 5.8%
- Until 2020 Germany is obliged to increase the share of RES to at least 18.0% of FEC
- Final energy consumption of 8,255 PJ expected for 2020, thus a minimum of 1,486 PJ from RES
- Share of RES in transport needs to rise to 10%

National RES targets 2050

- Germany defined further targets for its energy strategy
- Energy Concept: comprehensive energy strategy until 2050
  - 80-95% reduction of GHG emissions
  - RES should account for the biggest share in future energy mix
- New targets for renewable energies until 2050
  – 2020: 18% RES 35% RES-E
  – 2030: 30% RES 50% RES-E
  – 2040: 45% RES 65% RES-E
  – 2050: 60% RES 80% RES-E

National RES targets 2020

- Directive 2009/28/EG specifies two scenarios for the development of the gross final energy consumption of the National Renewable Energy Action Plan
- "Reference scenario":
  - Taking into account energy saving and efficiency measures that have been implemented by the end of 2008
- "Additional energy efficiency scenario":
  - Taking into account all measures to be adopted from 2009 on
- The "additional energy efficiency scenario" will be used as a basis for the predicted development path of renewable energies

National Renewable Energy Action Plan – Sector Paths

Table 1: Expected target path for energy from renewable sources in the sector heating and cooling, power production and transport in Germany, as well as minimum value for the target path by Directive 2009/28/EG (in per cent)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating & Cooling	6.6	9.0	9.4	10.0	10.5	11.1	11.7	12.4	13.1	13.9	14.7	15.5
Electricity	10.2	17.4	19.3	20.9	22.7	24.7	26.8	28.8	31.0	33.3	35.9	38.6
Transport	3.9	7.3	7.5	7.6	7.0	7.0	7.0	7.1	9.3	9.4	9.7	13.2
Total Share of Renewable Energies	6.5	10.1	10.8	11.4	12.0	12.8	13.5	14.4	15.7	16.7	17.7	19.6
			2011 – 2012		**2013 – 2014**		**2015 – 2016**		**2017 -2018**			**2020**
Minimum Value for the Target Path according to the Directive			8.24		9.46		11.29		13.73			18.00

Without additional energy efficiency and energy saving measures in the "reference scenario" the share of renewable energy of TFEC will be about 18.2% in the year 2020 (compared to 19.6% in the "additional energy efficiency scenario").

National Renewable Energy Action Plan – Sector Target: Electricity

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Table 2: Estimated gross power generation (in GWh) from renewable sources

Power Generation (GWh)	2005	2010	2020
Hydropower	19687	18000	20000
Geothermal Energy	0	27	1654
Solar Energy	1282	9499	41389
Wind Energy	26658	44780	104435
Biomass	14025	31296	49457
Total	**61653**	**103602**	**216935**

- Almost fourfold increase of share of electricity from renewable sources from 2005 to 2020
- Wind is and stays most important RES for electricity generation
- Almost threefold increase of share of electricity from biomass sources from 2005 to 2020
- In 2005, biomass has the third largest share of renewable electricity production (first: wind, second: hydro), in 2020 it has the second largest share (largest: wind)

National Renewable Energy Action Plan – Sector Target: Electricity - Biomass Shares

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Table 2a: Estimated share of gross power generation from biomass of all renewable electricity production

Power Generation	2005	2010	2020
Solid	16.3%	16.7%	11.3%
Biogas	5.9%	13.2%	10.8%
Liquid	0.5%	1.4%	0.7%
Biomass total	22.7%	31.2%	22.8%

- Solid biomass stays most important resource for electricity production
- Importance of biogas is growing

National Renewable Energy Action Plan – Sector Target: Heating and Cooling

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Table 3: Estimated generation of heating and cooling from renewable sources

Heat Generation (ktoe)	2005	2010	2020
Geothermal Energy	12	34	686
Solar Energy	238	440	1245
Biomass	7260	9092	11355
Heat Pumps	196	465	1144
Total	7706	10031	14431

- Almost doubling the share of heating and cooling from RES between 2005 to 2020
- Biomass remains most important renewable energy source for heating and cooling, but the share will decrease

National Renewable Energy Action Plan – Sector Target: Heating & Cooling – Biomass Shares

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Table 3a: Estimated generation of heating and cooling from biomass sources

Heat Generation	2005	2010	2020
solid	88.2%	74.9%	62.0%
Biogas	2.0%	9.1%	11.7%
Liquid	4.1%	6.6%	4.9%
Biomass total	94.2%	90.6%	78.7%

- Largest share solid biomass
- Biogas from 2% in 2005 to 15% in 2020

National Renewable Energy Action Plan – Sector Target: Transport

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Table 4: Estimated amounts of renewable energies in transport

Transport (ktoe)	2005	2010	2020
Bioethanol	144	639	857
Biodiesel	1598	2790	4443
Electricity from Renewable Energies	169	217	666
Others (Biogas, BtL, Vegetable Oils)	177	102	173
Total	**2087**	**3747**	**6138**
Total biomass without electricity	1918	3530	5472

- Increase of bioenergy in transport by almost a factor of three from 2005-2020
- Biodiesel plays key role and maintains its share of over 70% of renewable energies in transport

National Renewable Energy Action Plan – Sector Target: Transport Shares

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Table 4a: Estimated shares of renewable energies in transport

Transport	2005	2010	2020
Bioethanol	0.3%	1.2%	1.8%
Biodiesel	3%	5.3%	9.2%
Electricity from Renewable Energies	0.3%	0.4%	1.4%
Others (Biogas, BtL, Vegetable Oils)	0.3%	0.2%	0.4%
Total	**3.9%**	**7.3%**	**13.2%**

- The separate target of the EU-Directive for transport of 10% will be achieved and even exceeded with 13.2%

Flexibility Mechanisms

- Germany welcomes the flexibility mechanism of Art. 6 and 12 of the Renewable Energy Directive
- Cooperation to reduce costs and create synergies helps to reach the targets and ensures that growth of RES will be effective and efficient
- Germany is not expected to be dependent on using flexibility mechanisms
- Germany is expected to be able transfer between 2011 and 2019 a total amount of 128 PJ to other Member States

National Renewable Energy Action Plan – Biomass Resources

Table 5: Estimated resources of biomass for primary energy generation

Primary energy generation (ktoe)	2006	2015*	2020*
From forestry	9792	12086 - 12943	11966
From agriculture and fishery	7357	7715 - 7978	8789 - 9482
Biomass from waste	955	2126	2317
Total	**18104**	**21927 - 23047**	**23072 - 23765**

* spread depends on successful implementation of second generation biofuels (higher value) and accordingly decelerated development (lower value) and wide exploitation of national potential, additional import demand

National Renewable Energy Action Plan – Biomass Availability and Imports

- Expected difference of 9,500 ktoe (about 400 PJ) between biomass demand and domestic supply by 2020
- Possibilities to close this gap:
  - Demand for imports taking into account sustainability criteria
  - Further yield increases of energy crops (e.g. improvements in cultivation)
  - Increased use of forest biomass and landscape conservation material
  - Cultivation of fast growing tree species on agricultural land as well as energy plants on ecological compensation areas
  - Cultivation of short rotation coppice on agricultural areas
  - Future cultivation of energy crops on compensation areas for nature conservation

RES Support Instruments in Germany

- Renewable Energy Sources Act (EEG)
  > Priority access and feed-in tariff system
- Renewable Heat Act
  > Obligation and incentives
- Market Incentive Programme
  > Grants and loans
- Biofuels
  > Blending obligation
- Research and Development

Electricity

- **Renewable Energy Sources Act (EEG)**
  • Priority access for RE to the power grid
  • Priority transmission and distribution
  • Obligation of grid operators to purchase the electricity produced from RE
  • Fixed price ("tariff") for every kilowatt hour produced from RE for 20 years
- Fixed basic payment rates differing according to the type of RES, the conversion technology, and the capacity of the plant. The feed in tariffs are guaranteed for a period of 20 years and subject to annual degression for new installations.
- Various *cumulative bonus payments* for compliance with further quality and sustainability criteria (e.g. for utilisation of renewable raw materials ("Nawaro" bonus), for the utilisation of surplus heat in CHP plants (CHP bonus), and for the use of innovative technologies, such as Stirling engines, fuel cells, or upgrading biogas to natural gas quality (biomethane).
- In 2009, an additional bonus for the use of manure and landscape conservation material was introduced.

Heating & Cooling

- **Renewable Heat Act**
  - Obligation to use renewable energy sources in new buildings
  - Alternative measures: energy saving, CHP, waste heat
  - Progress report in 2011
- **Market Incentive Programme (MAP)**
  - grants and low interest loans for biomass, solar and geothermal energy
  - 2009: MAP released investments of 3 bn. €

Transport

- **Biofuel obligation**
  - Obligation to sell a legally specified minimum share (quota) of biofuel as petrol
  - Energy quotas
    - 2009: 5.25%
    - 2010-2014: 6.25%
  - From 2015 on energy quotas will be transformed into minimum net GHG reduction targets
    - 2015-2016: 3%
    - 2017: 4.5%
    - 2020: 7%
- **Electric vehicles**
  - Target: 1 mio. vehicles in 2020

Nuclear Power – as Bridging Technology?

Slogan **"Nuclear power as bridging technology"** means:

- Bridge to energy future founded on renewables
- Implies **common view: renewables will be the future.**

Until recently, this view was not common at all.

- Until the first oil price crisis 1973/74, energy community + governments were convinced of an immense nuclear potential, and did not at all consider renewables a serious option.

This paradigm worked in the 1960s/70s as self fulfilling prophecy:

- enormous resources spent on development of nuclear,
- absolutely no R&D on renewables until 1973,
- thereafter only modest R&D budgets.

Nuclear contribution to global TFEC

World Final Energy Consumption 2008

- share of electricity 17,2 %
- of which nuclear generation 13,5%
- result: share of nuclear electricity 2,3%

Nuclear Contribution to world energy supply, thus to climate protection**: rather modest**

If nuclear energy shall in future contribute substantially, worldwide **nuclear capacity needs large increase**

Source: IEA key world energy statistics 2010

IEA 2008: Perspectives Energy Technology

Scenario energy revolution 2050

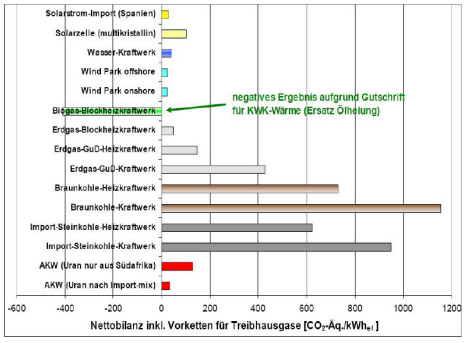
Final energy consumption	- 48%, due to
Renewable energy	- 21%
CO_2- separation/disposal	- 19%
Nuclear energy	- 6%

Required nuclear capacity

2005 – 2050, 32 new NPPs 1000 MWe each year
(2005-2010 = 160 new NPPs? – only 16 realised)

Result 2050: 1440 new NPPs, 1440 GW, i.e. 3.3 times the present world nuclear capacity (442 NPPs)

Greenhouse Gas Emissions of different technologies



Nuclear Power - as Bridging Technology in Germany?

- What happens to nuclear waste – today 6,000 t high radioactive nuclear waste
- Additional nuclear waste according to nuclear phase-out law – 4,800 t
- German NPPs produce annually 450 t nuclear waste
- Instead of 10,800 t more than 16,000 t burned fuel rods will exist
- Additional profit for NPP operators – about 94 bn. €
- Skimming off by the German state – ca. 27 bn. €
- Loss of innovation pressure for renewable energies
- Danger for security of investment in renewable energy facilities
- Inflexible NPPs

Thank's for the attention

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