

## Instruments for the Promotion of Renewable Energies

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Climate Change is one of the most powerful drivers also to promote renewable energy sources (RES). National scenario projections till 2050 are designing possible pathways to achieve CO<sub>2</sub>-reduction to limit temperature increase to 2° C according to IPCC scenarios, taking into account the overwhelming importance of industrialised countries concerning man made CO<sub>2</sub> emission. This results in a 80 % CO<sub>2</sub> reduction target until 2050 drawn by a projection study prepared for the German Parliament. From the scenario projections one can draw the following conclusions:

- An increase of world primary energy consumption (PEC) by at least 50 to 100 % until 2050 has to be faced.
- To achieve the CO<sub>2</sub> reduction targets extensive efficiency efforts are needed for end-use (efficient user-technologies) and conversion (e.g. Combined Heat and Power) to limit the increase of PEC world-wide, in Germany a reduction of about 50 % of 1990's values is necessary.
- RES have to cover at least 50 % of the remaining PEC.
- Achieving climate rescue goals does not mean that such energy system is sustainable already, further development is required like e.g. 100 % RES.

By 2005 Germany already avoided about 84 million tonnes or 10 % of the national carbon dioxide load by the use of renewable energy sources. Almost 70 % of those 84 million tonnes were induced by a shift to electricity from renewable sources.

Climate protection is just one important objective to be achieved by renewable energy use. Nevertheless an energy system that contributes to achieving the IPCC goal is not necessarily sustainable. In the growth-scenario fossil fuels are still a relevant source, and they are not sustainable. Nuclear power brings about relevant risks concerning terror attacks or final treatment of hazardous residues.

All countries all over the world virtually have access to any of the RES sun, wind, water, biomass or geothermal energy and can be used to generate electricity, heating or cooling locally. Use of RES has the potential to mitigate social and economic problems resulting from the inequitable distribution of fossil fuel resources around the globe and reduce the dependency on fossil fuel imports.

Therefore the risk of international crisis and conflicts concerning availability of energy resources or terror attacks is in general avoided. RES involve very moderate risk for human beings and for the environment. Renewable energy use supports local economy and employment. With the help of technology transfer it can supply the majority of nations with locally available energy as one important basis for economic and social development. Renewable energy also fosters industrial potential and export, if promoted with appropriate policy instruments. In Germany policy instruments have also encouraged a strong export of renewable energy and resulted in a sound build-up of industrial infrastructure. At the end of 2005 about 170,000 jobs existed in this field, a potential growth to 300,000 is expected by 2020. The national turnover in 2005 was more than 16 billion Euro.

Since the 1970s, Germany has established policy instruments to encourage the use of renewable energy. As the most powerful policy instrument the Renewable Energy Sources Act, in German, Erneuerbare-Energien-Gesetz or EEG, was put into force in 2000 supporting electricity produced by installations converting RES.

The principle of the EEG is guaranteed feed-in tariffs for electricity fed to the electricity grid. They are technology and location specific. To be effective feed-in tariffs should be high enough to cover the extra costs of the relevant renewable energy conversion technology. They are paid consistently for periods long enough to provide security for investors. Last but not least tariffs should decrease over time for new installations as a precaution against windfall profits and to enforce cost reductions and technology learning.

The EEG requires grid operators to connect renewable energy installations to the grid, to purchase their electricity with priority and to pay technology-specific tariffs to the operators of the respective installations. The feed-in electricity and respective tariffs paid to producers by grid operators have to be distributed equally to all consumers nationwide. The EEG establishes a private legal relationship between plant operator and grid operator independent of public authorities. Due to this characteristic the EEG is independent of public budgets, which is an essential feature in view of today's tight national budgets. Transfer costs in general and especially for public budgets are very low. To prevent misuse and encourage development of specific renewable energy conversion technologies the "exclusive-use" principle ensures that feed-in tariffs only apply to electricity generated exclusively with renewable sources.

The EEG has initiated an intensive growth of electricity production from renewable energy in Germany. Wind energy, biomass and photovoltaic increased almost four-fold between 2000 and 2005. The amendment of the EEG in 2004 further improved the effectiveness of the above-mentioned characteristics. In the end of 2005 about 10.2 % of national electricity demand was covered by RES, half of it by wind energy. The specific advantages of feed-in tariffs and the success of the German system have encouraged almost all member states of the European Union and other countries around the world to establish feed-in tariff systems.

Critics in Europe claim that the support system of the EEG is expensive and distorts the energy market. They prefer market-based instruments like quota systems with tradable green certificates. Studies performed by the European Commission and by UBA show that out of the policy measures used in the EU member states quota systems like those used in the United Kingdom and Italy are less effective and cost for consumer is higher than with feed-in systems used in Germany and Spain. Calculations for Germany show that the additional costs for consumers due to the EEG will rise from 1.5 € per average German household and month in 2005 to a maximum of 2.8 € per month in 2017 and will permanently decrease thereafter. Fossil fuel prices can be expected to rise further and the costs of wind energy and other renewable energy technologies will decrease due to technology learning. They will be competitive and subsidies under the EEG will start to be phased out within the next decade.

The success story of the EEG has to be continued to also cover support for heating, cooling and fuels based on renewable energies. In this field Germany still has much homework to do.