4. Recommendations for political action

The 2050 Energy Concept for Germany, which extends to 2050, envisages a complete change in the current fossil-nuclear, climate damaging, centrally-aligned energy supply system, which is also primarily built on energy imports, to a sustainable energy supply system which uses 100% renewable energy, energy efficiency and energy storage, and which is therefore secure, reliable and cost-effective.

The Energy Concept makes the following assumptions for the year 2050:

- Global energy demand for energy services will continue to rise
- Fossil and nuclear energy will no longer be anywhere near sufficient to meet global energy demand,
- There will still be no commercially applicable nuclear fusion power plants available,
- Electricity, heat and fuels from renewable energy will be significantly cheaper than electricity from fossil and nuclear energy sources.
- New technologies will be available which will make an energy supply system which is built on 100% renewable energy more secure and cost-effective.

This assessment concurs with the evaluation of the governing parties, who in the coalition agreement have formulated the goal, "that renewable energy will take over the major part of energy supply."

Such a wide-ranging Energy Concept needs for its implementation a transformation concept, as set out in Chapter 2. The following recommendations for action are derived from this.

4.1 Market introduction measures

Energy policy has the task of stimulating or speeding up the necessary transformations in the energy system which do not happen by themselves, or not at the desired speed.

Energy efficiency measures and renewable energies have for years been ready for use, and the transformation process with a continuously increasing share of renewable energy in energy supply has already begun. To some extent some unexpected major successes have been achieved, e.g. in wind power and photovoltaics.

But implementing the Energy Concept requires political support for continued market introduction, where this is successful, and for extending and strengthening this, where the pace of transformation has so far been inadequate. Technological leadership happens above all through consistent and early market introduction, as most innovative ideas originate in the production of technology and its application in practice.

4.1.1 Stimulating energy efficiency measures

Until now, stimulating energy efficiency measures has proved to be particularly difficult. So, for example, the renovation rate in the building stock, at below 1% a year, has so far lagged well behind the political goals. The stimulation of efficiency measures must be encouraged by a range of different measures:

- Implementation of the European Energy Performance of Buildings directive (EPBD) and strengthening the Energy Saving Regulation (EnEV)
- Implementation of the European Energy End-Use Efficiency and Energy Services Directive

- Conversion of the building energy certificate into a compulsory demand-led energy pass
- Expansion of the building renovation programme
- Clear expansion of CHP by increasing support for local and regional district heating networks
- Reduction in legal constraints and problems of acceptance in implementing local and district heating networks
- Increase in efficiency of electricity use e.g. through the Top Runner Programme
- Implementation of the EU directive on Energy End Use Efficiency and Energy Services (EDL) [39][13]
- Establishment of an energy efficiency fund to finance efficiency programmes

4.1.2 Stimulating the market introduction of RE power generation

The greatest successes in the market introduction of renewable energy have so far been achieved in the power sector, where the Renewable Energy Act EEG has proved to be extremely effective.

The continued market introduction of RE power production requires the following measures:

- The maintenance and continued development of the EEG
- Conserving rules on giving priority to the feed-in of renewable electricity into the power grid
- Compensation payments for regulated renewable electricity only as an interim arrangement until the network and storage has been expanded
- A bonus for demand-led energy supply (Combined cycle renewable power plants)
- The introduction of a seasonal energy storage bonus as an incentive to develop energy storage technologies and systems

13 The EU member states have agreed on a common directive with an ambitious energy saving target: the EU directive on Energy End-Use Efficiency and Energy Services (2006/32/EG, EDL-Richt- linie) was adopted on April 5 2006. Under this EDL directive, in 9 years, 9% of end energy should be saved in comparison with a reference period, using targeted measures.

As a result of the great success of the EEG, the FVEE is advocating that the German Federal Government should support the Europe-wide introduction of instruments that are similar to the EEG.

4.1.3 Stimulating the market introduction of RE heat production

Although more than 50% of energy use occurs in the heat sector, and in many areas of heat use efficiency and renewable energy technologies are available and advantageous, so far the speed of transformation in this sector has not been nearly adequate enough. With the Renewable Energy Heat Act (EEWärmeG) a start has been made which must now be pursued forcefully.

The following measures are suitable for accelerating market introduction in the RE heat sector:

- Strengthening the Federal Emission Control Regulation (BImSchV)
- Amendment to the Heating Cost Regulation
- Continuation of the market incentive programme (MAP) with adequate financial provision, particularly to stimulate new market segments like solar housing, heat networks using renewable energy etc.
- Extension of the obligation to use renewables in the EEWärmeG in the building stock
- Possibility of allocating renewable energy when fulfilling the requirements for renovating old buildings

4.1.4 Stimulating the market introduction of RE mobility concepts

The transformation of the transport sector is very expensive and protracted, also because the electric vehicles and mobility systems that are required are not yet available today.

As well as the increased research and development in the field of biofuels and electromobility, the following market introduction measures make sense:

- Pilot projects to introduce electric vehicles
- Pilot projects to convert innovative mobility concepts

4.2 Increasing resource productivity

A sustainable energy supply must not only have regard to power generation, but also the materials cycle that is required. A condition for realising the Energy Concept 2050 is a radical improvement in the resource productivity of elements and materials, which play a role in a mass market for renewable energy technologies, such as, for example, elements for ferrous alloys, copper, platinum and lithium. However, all other materials that are used should be included in a materials cycle, from an efficient use of materials to, if possible, complete recycling. Both the more economical use of materials, and recycling processes to reuse materials, are linked to research and development, which must become an interdisciplinary subject, and which is an integral component of all plans.

4.3 Infrastructure and general conditions

4.3.1 Converting and expanding networks

The condition for increasing efficiency and the integration of growing amounts of fluctuating renewable energy is the conversion and expansion of our supply networks. Amongst other things, this requires the following measures:

- The rapid and systematic expansion of the power network to receive and transport renewable electricity to population centres
- Support programmes for measures to adjust power consumption to fluctuating power generation, e.g. through the personal use bonus in the EEG
- Further development of centralised to decentralised power networks
- Introduction programme for ITC-technologies
- Targeted expansion of local and district heat and cooling networks in centres of population to achieve the expansion goals for CHP and renewable energy
- Pilot programmes to introduce intelligent grids (Smart Grids)

4.3.2 Integrating storage

In the medium-to long-term, high shares of fluctuating energy sources require the integration of short-, medium- and long-term storage in the power-, heat-/cooling and gas networks. Even if many storage technologies are still in the research and development phase, a start should be made today with the gradual integration of existing storage technologies. Amongst other things, the following measures would be good for this:

- Expansion of pumped storage power plants and other electrical storage
- Expansion in seasonal heat storage in heat networks

4.3.3 Expanding gas-fired power plants with CHP

In order to replace coal-fired and nuclear power plants during the transformation phase, gas-fired power plants and gas and steam power plants that can be quickly adjusted – preferably with combined heat and power and decentralised small combined heat and power plants (engines, microturbines, fuel cells) – should be widely introduced.

4.3.4 Integration into a European energy concept

An important requirement for a Sustainable Energy System 2050 is the compatability of national strategies with a pan-European approach. Here, above all, national expansion targets for renewable energy should be identified for their effect in relation to the resulting load flows into the electricity and gas networks. A European strategy for expanding these networks can be derived on this basis.

An important element of a European network is a new, very intelligent and very efficient power transmission network, which balances the fluctuations which arise in local power generation within a large area. This is because it is beneficial from an energy and an economic viewpoint to connect decentralised energy supply structures with each other via “Backbone” networks. Through these networks, using information and communications technologies,

load fluctuations or demand fluctuations can also be balanced over long distances and additional power suppliers can be incorporated (e.g. hydro power from Scandinavia, wind energy from Portugal or solar power from North Africa).

4.3.5 Training and continuing education for specialists

A successful transformation of energy supply requires specialists to implement this technically. These will only be available if the training of specialists for a renewable energy supply system is specifically expanded in all fields of application, in cutting edge research, product development, planning, distribution, installation and energy advice, as well as for the authorities which have corresponding planning duties. These include the establishment of Bachelor and Masters study programmes in the field of renewable energy, as well as more integration into professional training.

4.4 Increasing acceptance and strengthening public relations for renewables

The complete transformation of the energy supply system in a few decades requires the acceptance and active participation of the population, both as investors, e.g. in building insulation, as well as consumers, operators and as political sovereigns. For this reason it is essential that the Energy Concept and the transformation concept should be communicated and explained in detail by intensive and continued public relations work for the relevant target groups. Generally speaking, the social and sociopolitical constraints in the transformation process should be investigated and overcome. The following communications goals should be followed in particular:

- Understanding of the absolute need for sustainability criteria for a future energy supply (ecological, economic and social)
- Clarification of the potential for energy efficiency and renewables which safeguard security of supply
- Information on technical-scientific innovations, which facilitate the new energy efficiency techniques and conversion techniques and make well-known technology more cost-effective
- Clarification measures to persuade building owners to implement energy saving measures and to join local heating networks.
- Information on the economic potential of energy efficiency and renewables: the potential to reduce costs, create jobs, export potential, advertising for young acadmics for research and development for renewables.

4.5 Developing technologies through research and development

Every new energy supply system requires many developed and new technologies, which is why energy research must be significantly expanded. The focus of research and development in the coming years will be described in the 6th Energy Research Programme, which should be adopted in 2011.

The challenge in energy research consists of keeping open different possible development pathways, and at the same time using the scarce financial and research resources in a sufficiently targeted way to achieve the necessary successes.

The Energy Concept 2050 advocates that funding for research and development should be divided up between the different technologies in terms of their long-term importance. In line with the goals of the ruling coalition and the proposed Energy Concept 2050, priority should be given in research funding to renewable energy and energy efficiency.

Research and development is also to be understood as an industrial policy measure. This is because only there, where German producers are global technology leaders in the field of renewable energy and energy efficiency, is there an opportunity to keep production of the components of the new energy supply system in Germany. For this reason, market introduction and research policy must go hand in hand.