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DOES THE GERMAN RENEWABLE ENERGIES ACT
FULFIL SUSTAINABLE DEVELOPMENT OBJECTIVES?



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Development Objectives?**

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1 Introduction

Economists are concerned with the question of how to allocate scarce resources in the most efficient way. This is also the criterion for the assessment of current policies and their setting of secondary objectives, in the considered case addressing ecological objectives by the promotion of renewable energies. The objective of a sustainable development in Germany is broadly recognised and forms part of the official agenda of the German Government, and is defined in the Sustainability Strategy of the German Government (SSGG). In the context of the SSGG the question arises, if the applied instruments and chosen secondary objectives are adequate to reach a high degree of sustainability. The paper focuses on the aspects related to energy policy. First, an overview will specify the meaning of “sustainability” and the relevant aspects the SSGG focuses on. As this paper shows, promoting electricity from renewable energies sources (RES) forms part of this strategy. The German Renewable Energies Act (EEG), explained in chapter three, is the main instrument designed to implement the energy objectives of the SSGG.

Bringing together the objectives of the SSGG and the EEG the paper intends to answer in its principal part following questions: Is the EEG really the adequate instrument for the promotion of the requirements of the SSGG? Does the EEG consider both, the aspect effectiveness and efficiency? Are the different aspects of sustainability evenly addressed? Finally, possible alternatives regarding changes towards other promotional systems or shifting from a national to a European approach are outlined shortly.

2 The concept of sustainability

In the definition of the World Commission on Environment and Development (WCED) sustainability means the maintenance of a capital stock, sufficient to secure a certain level of consumption for future generations: “Sustainable Development is a form of development which meets the needs of the generation of today without jeopardising the chance for future generations to meet their own needs”¹. Securing chances for the next generations means at least preserving the capital stock, with a very broad understanding of capital, including natural

¹ World Commission on Environment and Development (1987).

capital and man-made capital as well as knowledge. The concept of sustainability incorporates three aspects:

- Ecological sustainability asks for preserving the natural environment.
- Social sustainability means social cohesion, the possibility of individuals to lead a self-determined life within the framework set by institutions.
- Economic sustainability is closely linked with the concept of efficiency, regarding both, the static and the dynamic aspect, and is to be understood as the search for instruments to reach a determined goal in a way, which is less resource-intensive than other alternatives.

2.1 Ecological sustainability

The preservation of the environment is indispensable for maintaining human well-being.² The environment can not be substituted in its four essential functions.³

- Firstly, the natural environment supplies resources. Raw materials are the basis for industrial production and any form of economic activity.
- Secondly, natural environment serves as receptacle for emissions from economic activity.
- Thirdly, the intrinsic value of the mere existence of nature increases the quality of live.
- Lastly, the natural environment is necessary for the ecosystems in general, being the base for life on earth.

The basic idea of ecological sustainability is to stay with the scale of economic action below the “carrying capacity”⁴ of the environment. If the limit of assimilative capacity is ignored, damage might not be reversible. Disregarding the assimilative capacity could either take place by depleting natural resources or by overloading the natural environment as a receptacle. In addition to the concerns about the already known “old” scarcity, the general depletion of basic resources,⁵ which can not be substituted easily, there is a “new” scarcity within the function of

² The concept of strong sustainability stresses the necessity of conserving the natural capital stock, due to the multi-functionality of natural assets, see Klaassen/Opschoor (1991), p. 94. Neo-classical economics resolve the problem by means of the assumption, that (external) technological progress will supply the necessary substitutes.

³ See Pearce (1988), p. 599.

⁴ See Harborth (1989), p. 28.

⁵ E.g. coal, oil and natural gas. The near future of exploitation is more a matter of cost considerations, as raw materials are less accessible. Another concern is the concentration of the remaining energetic raw materials in the Middle East and the former Soviet Union due to the depletion of petroleum and natural gas in Europe and

natural assets to store waste from human activity, e.g. the limited capacity of the atmosphere to store CO₂.⁶

The reduced ability of natural assets to fulfil their ecosystem-function could have severe effects on human well-being. An example is deforestation and its negative impacts on the ecosystem, depending on the function of forests as green lungs. For assumptions on the possibility to substitute natural capital, the distinction between the substantial and the functional substitution is necessary. As the substantial substitution might be possible, the functional substitution of environmental assets is often difficult; wood can be substituted in its substantial function as raw material, but the forests can not be substituted in their function as green lungs of the earth.⁷

The following “management rules” for natural assets have been formulated in order to postulate conditions for political decisions aiming at the sustainable use of the environment.

- Harvest of resources should not exceed the natural regeneration rate.
- Waste flows should always stay below the assimilative capacity.⁸

Taking into account these management rules, the stock of non-renewable resources should not be reduced at all, because their regeneration rate is zero. But, as far as the natural assets do not fulfil basic functions in the ecosystem, the strict conservation of raw materials has no intrinsic value.⁹ Pearce/Turner outline two possible solutions: Compensation of the exhaustible resources by an increased stock of renewable raw materials or rising efficiency with the objective to maintain a certain standard of living from a declining resource basis.¹⁰

Northern America. The assumption of the development of so called backstop-technologies, which substitute raw materials is discussed controversially, see Harborth (1989), p. 55.

⁶ In 1972 the Club of Rome already mentioned in “The Limits to Growth” not only the restrictions by depletion of raw materials, but also by the environmental assimilative capacity. See Meadows et al. (1972). Contrarily to the predicted shortages of raw materials, the latter argument has not been refuted.

⁷ See LÖbbe (1996), pp. 140.

⁸ See Pearce/Turner (1990), p. 44; Daly (1990), p. 2. More detailed management rules have been formulated by Bartmann (1998), p. 278.

⁹ Especially as next generations can not use these resources either, if they follow the principles of sustainability, too.

¹⁰ See Pearce/Turner (1990), p. 45.

2.2 Social sustainability

Social sustainability asks for the possibility of individual self-determination within a social structure which impedes social disruptions. In order to guarantee social sustainability, institutions are indispensable. A broad definition of institutions includes apart from social or public organizations the acceptance of policy measures, public participation in political processes, social security, etc.¹¹

State interventions aiming at the enforcement of political decisions must be justified because of the interference with individual self-determination; therefore the degree of public approval is an indicator of social sustainability. If it is communicated to the public, that consequential costs of lacking political interference might be enormous, policy instruments will earn more support. Social acceptance depends further on implications of state intervention for individual situations (e.g. job losses) and their repercussions on social institutions (e.g. social security systems). Efficient solutions to clearly specified problems are more adequate for long time public support.¹²

2.3 Economic sustainability

In economic theory market solutions are considered the most efficient way to reach favourable results. However, environmental problems are examples of external effects, where market prices, which refer to the individual costs, do not reflect social costs. Consequently, possible adverse effects on the natural environment require state intervention in order to correct market failure by an adequate framework setting.

Equal to the economic concept of efficiency, economic sustainability requires the achievement of a determined goal with a minimum of resources. In a long-term view, furthermore efficient allocation of resources is required for the maintenance and public acceptance of institutions and policy measures. This also means the search for policies, which are in line with the market-based economic system and do not exceed the capability of existing institutions.

¹¹ For considerations about definition and importance of institutions see North (1990).

¹² See Heins (1994), p. 20.

Furthermore, efficient resource spending is central for preserving and increasing the man-made capital-stock. Thereby, efficiency incorporates two aspects: The concept of static efficiency asks for applying the least costly instrument to reach determined objectives. To obtain dynamic efficiency, in a long-term perspective framework setting must also foster the development of new solutions for environmental and social challenges, giving leeway to private enterprise.

2.4 The Sustainability Strategy of the German Government

The sustainability strategy of the German Government (SSGG)¹³ is based on the following principles:

- Fairness to forthcoming generations or intergenerative justice (preserving the functions of the environment, social institutions and capital for following generations).
- Quality of life (ecological, social and economic requirements for human welfare).
- Social cohesion (individual self-determination and efficient resource employment).
- And international responsibility (intragenerative justice).

The ecological, social and economic aspects of the above described sustainability debate are incorporated in these policy fields.

The SSGG does not deny the possibility to substitute exhaustible resources. The relevant management rules stress:

- The use of RES has to stay below their regenerative capacity.
- Exhaustible materials should only be used within a framework allowing for their substitution.
- The assimilative capacity of the ecosystem should not be exceeded.
- Energy and resource use have to be decoupled from economic growth.¹⁴

Differing from the above mentioned definition of Pearce/Turner, which aims to sustain a fixed living-standard by a reduced use of exhaustible resources, the German Government applies a rather soft rule: Decoupling resource use from economic growth does not necessarily implicate a real decline of resource use.

¹³ The considerations of the following section are based on the strategy paper of the German Government. See Bundesregierung (2002). For the historic development of the SSGG see German Advisory Council on the Environment (2002), pp. 161.

Regarding social sustainability, the SSGG stresses public acceptance of policy measures by a broad social participation. Social cohesion should be obtained by functioning institutions, especially regarding social security.

In the German point of view economic sustainability is linked strongly with the attempt to reduce public spending in order to avoid additional burdens for future generations, applying the principle of sustainability as well on man-made capital.

To measure sustainability the SSGG lists 21 indicators in order to clarify the state of sustainability. Among them are as different subjects as quantity of land use for housing and transport, a balanced budget, air pollution and the number of burglaries.¹⁵ The indicators which are interesting regarding the congruence of reality with the management rules are the productivity of raw materials as well as greenhouse gas emissions and the share of energy from renewable energy sources.

3 Effects of energy use on the environment

The objective of sustainability is to prevent that corollaries of human action lead to irreversible effects, affecting the quality of life of present or future generations. From the ecological point of view the functions of the environment have to be preserved in order to obtain sustainability. But consequences of unsustainable human economic activity are also interesting from an economic point of view, when they have repercussions on human health and living conditions because they can create high subsequent costs.¹⁶

Using fossil energy sources, the environment is challenged by the

- supply of energetic raw materials for economic activities, both, fossil and regenerative,
- emissions to the atmosphere from fossil energy use e.g. greenhouse gases or (nuclear) waste,
- power plants, transmission grids, surface mining, windmills etc. as they are considered to affect the aesthetic function of landscape,
- possible negative effects on the ecosystem function of the environment (climate-change).

¹⁴ See Bundesregierung (2002), pp. 50.

¹⁵ The German Advisory Council on the Environment criticises this range of themes and the blending of objectives and indicators in its 2002 Environmental Report as inefficient, see German Advisory Council on the Environment (2002), pp. 168.

4 Requirements of the SSGG for energy policy

4.1 Ecological implications of the SSGG

One focus of the SSGG is energy policy, aiming at the avoidance of irreversible adverse effects on the environment, especially regarding climate change.

- The long-term objective for the energy sector is to increase the efficiency of resource use by the “Factor 4”¹⁷.
- Further, the SSGG aims at not exceeding the carrying capacity of the atmosphere; the mid-term objective is a 21% reduction of greenhouse gas emissions by 2008-2012 as compared to 1990.
- As the use of fossil energy sources requires their functional substitution by RES, changing the structure of the energy supply is indispensable.¹⁸ By 2010 the renewable energies share should amount to 4.2% of total energy consumption and 12.5% of electricity consumption.¹⁹

Regarding energy efficiency, a distinction between efficiency of energy use and efficiency of energy production has to be made. For energy production, feasible efficiency gains are limited. Regarding energy use, growing energy demand shall not exceed efficiency gains.²⁰

As long as the use of fossil energy sources is necessary, energy sources with low emissions should be preferred. Among fossil fuels, natural gas leads to less CO₂ emissions than coal or oil. The consideration of the limited assimilative capacity of the environment requires in the long run the employment of renewable energy sources or the development of clean technologies using fossil energy sources. Considering the unresolved question of how to store nuclear waste, which can not be assimilated by the environment, nuclear power is no alternative although it has very low CO₂ emissions.

¹⁶ For the assessment of potential subsequent costs of global environmental risks see e.g. the 1999 Environmental Report of the German Advisory Council on Global Change.

¹⁷ The vision of a quadrupled energy efficiency stems from Weizsäcker/Lovins/Lovins (1995).

¹⁸ This conclusion, which stems from the third management rule of the SSGG is important, as it answers for the case of the German Government the essential question, whether the use of renewable energies is considered indispensable for sustainability.

¹⁹ The actual share of renewable energies of electricity consumption amounts to 10%, see Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004b).

Applying the ecological management rules as formulated by the German Government the main result is that in a long-term view only renewable energy sources and reduced energy consumption by efficiency gains are adequate for sustainability. The question is *how* the incentives to promote RES should be designed in order to obtain a maximum of ecological soundness while also fulfilling the requirements of social and economic sustainability.

4.2 Social and economic requirements of the SSGG

The support for policies depends strongly on public perception. Energy prices and possible consequences for labour markets and economic performance are direct effects of changes in energy policy. Measures which lead to increases in prices, e.g. the promotion of renewable energies, must be especially well communicated to the public. In order to prevent climate change, political decisions have to be taken which are based on a high degree of uncertainty. If political decisions and the underlying concept of the precautionary principle are not broadly understood and accepted, social sustainability can not be achieved.

Efficiency is the major claim of economic sustainability. If the necessity to promote renewable energies is recognized for ecological reasons, economic sustainability requires the cost efficient achievement of the objective of promoting renewable energies.

To fulfil social and economic sustainability requirements, efficiency has to be considered, both in the design of the promotional system and in the production and consumption of energy.

²⁰ See Bundesregierung (2002), p. 56. Rising international energy demand especially from India, China and Brazil will probably exceed efficiency gains. Since 2003 China is the second largest oil importer next to the USA, see Matthies (2004), pp. 110.

5 The German Renewable Energies Act

The so called “Gesetz für den Vorrang erneuerbarer Energien” (EEG), the German Renewable Energies Act, adopted in March 2000, has been designed to implement a sustainable energy policy.²¹ It follows the “Stromeinspeisungsgesetz”, the Electricity Feed-In Act, from 1990 promoting the supply of electricity from RES. In December 2003 the German Government has proposed an amendment to the EEG, changing especially the minimum feed-in tariffs for renewable energies. The amended form of the EEG came into force on first of August 2004.²² The amendment stems from the necessity to adapt German legislation to the directive 2001/77/EC of the European Union²³ and from adjustments made due to the results of the 2002 monitoring report.

5.1 Objectives

The explicit objective of the law is to develop a sustainable power supply. This objective is explained with the protection of climate, nature and environment. As the direct reference to the objective of lowering social costs of energy supply shows, renewable energies should be promoted with the implicit objective to reduce the use of fossil energy sources and the related harmful effects on environment and health. The precise objective to contribute to the further development of technologies for the promotion of renewable energies forms also part of the first paragraph of the EEG.²⁴

In addition, the EEG has clear quantitative objectives: a share of at least 12.5% electricity from renewable energy sources by 2010 and 20% by 2020.

²¹ The EEG is not the only instrument designed to promote renewable energies. For the different instruments promoting RES in Germany see Grotz (2002), pp. 111.

²² The considerations of this paper are based on this actual version of the EEG, including the changes of August 2004.

²³ Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity from renewable energy sources in the internal electricity market. Official Journal L 283 of 27. 10. 2001. This directive sets a specified contribution to the EU-target for each Member State. By 2010 a share of 22.1% of total electricity consumption shall be produced from renewable energy sources.

²⁴ See EEG, §1. The last objective is part of a strategic industrial policy, which means the attempt to promote a certain industry by using regulations, e.g. tax incentives. The motivation for industrial policy is to develop a favourable market position for both, national demand and export. For the critical assessment of industrial policy see e.g. Starbatty (2004).

5.2 Design and mechanisms

The EEG is based on guaranteed feed-in prices. The local grid operator is obliged by law to buy power from RES.²⁵ The law sets a minimum price for each technology, ranging in the actual legislation from 3.70 Euro-Cent/kWh for large hydro power to 62.4 Euro-Cent/kWh for photovoltaic power plants integrated in facades. The average feed-in tariff in 2002 amounted to 8.9 Euro-Cent/kWh.²⁶ Feed-in tariffs are set nominally for a determined duration (between 15 and at most 30 years, differing between technologies) and except for small hydro power plants promotion declines gradually.²⁷

The four German transmission grid operators²⁸ are obliged to compensate local operators for the EEG-promoted electricity. With many wind power plants in the north and hydro plants in the south the feed-in of electrical power from renewable sources varies regionally.²⁹ Therefore the financial burden is equally distributed at the level of transmission grids. The power supply industries which finally provide the power to the consumers are obliged to buy the EEG-power and compensate it with the average rate. Rising consumer prices are a consequence. There is no limit for the total amount of obligatory payments for electricity from RES.

For energy-intensive industries with an electric power consumption exceeding 10GWh and electricity costs of more than 15% of the gross value added, there is the possibility to apply for an exemption. Every second year a monitoring report by the German Government on the effectiveness of the EEG is obligatory (§20 EEG). Based on this report, amendments shall increase efficiency and effectiveness of the EEG.

5.3 Feed-in tariffs

The underlying idea of differing feed-in tariffs is to level off technological differences between renewable energy sources in order to encourage investment. These predictions about

²⁵ Included is electricity gained exclusively from photovoltaic, hydro power, wind power, biogas or biomass, state-owned power plants and additional electricity obtained from upgrading big hydro power plants are included since 2004. See EEG §2.

²⁶ See VDEW (2003).

²⁷ The tariff reduction is fixed as a percentage of the original tariff, which means that the absolute reduction of the remuneration is declining annually, inflation is not taken into account.

²⁸ RWE, E.ON, EnBW and Vattenfall Europe.

the level, duration and development of tariffs necessary to stimulate investment are necessarily imprecise. Technologies which are less competitive and small scale power production receive the highest tariffs. For technologies being at an early stage of technological development, as off-shore wind power and geothermic plants, the annual decrease of remuneration is suspended for the first years.

Table 1: Overview feed-in tariffs of the EEG

Energy Source	Tariff depending on	Minimum feed-in tariff, Euro-Cent per kWh	Annual decline	
Hydro EEG §6	- ≤ 500 kW - ≤ 5 MW - 5-150 MW	9.67 6.65 3.70-7.67*	- 1% 1%	*Feed-in obligation only for additional electricity obtained by refurbishment. Tariffs depend on the size. Maximum promotion: Up to 5 MW 30 years, > 5 MW 15 years.
Gas, Coal Mine Methane EEG §7	- ≤ 500 kW - ≤ 5 MW - > 5 MW*	7.67-9.67** 6.65-8.65 6.65-8.65	1.5% 1.5% 1.5%	*Only Coal Mine Methane. **Depending on extraction procedures.
Biomass EEG §8	- ≤ 150 kW - ≤ 500kW - ≤ 5 MW - 5-20 MW	11.5-17.5* 9.9-15.9 8.9-12.9 8.4-12.4	1.5% 1.5% 1.5% 1.5%	*Depending on origin of biomass and treatment. Maximum promotion: 20 years.
Geothermal EEG §9	- ≤ 5 MW - ≤ 10 MW - ≤ 20 MW - > 20 MW	15.0 14.0 8.95 7.16	1%* 1% 1% 1%	* Only for power plants installed after 2010.
Wind (On Shore) EEG §10	- year 1-5* - following years	8.7 5.5	2% 2%	*Duration of the higher tariff: 5 years for power plants with a 150% average yield. The period with higher tariffs is extended for plants with poorer yields (not below 60%). Maximum promotion: 20 years.
Wind (Off Shore) EEG §10	- year 1-9* - following years	9.1 6.19	2%** 2%	*Depending on the distance to the shore and the year of construction. **Beginning 2008.
Photovoltaic (not integrated into a building) EEG §11		45.7	6.5%*	*Beginning 2006. Maximum promotion: 20 years.
Photovoltaic (integrated into a building) EEG §11	- ≤ 30 kW - ≤ 100 kW - > 100 kW	57.4-62.4* 54.6-59.6 54.0-59.0	5% 5% 5%	*Higher tariffs for plants integrated into the facades. Maximum promotion: 20 years.

²⁹ An extreme example is the region of Papenburg, Lower Saxony, with a 54% of wind power share.

6 Does the EEG meet the sustainability requirements of the SSGG?

6.1 Management rules

As pointed out in section two, the management rules of the German Government require a reduced use of exhaustible resources, the avoidance of emissions and additionally rising energy efficiency. To neutralise the ongoing depletion of fossil resources the SSGG claims their substitution by RES. The underlying condition for the substitution is the existence and application of adequate technologies.

Installation of capacities

The EEG is adequate to promote high increases in investment in renewable energies. Favourable for the maximal installation of capacities are

- long time horizons of up to 30 years (small hydro-power), giving planning security to investors,
- feed-in obligations which release producers from entrepreneurial risks,
- differentiated feed-in tariffs, considering poorer yields of less favourable sites (e.g. midland sites),
- differentiated feed-in tariffs for each technology, considering the production costs,
- special promotion for small power plants.

Considering the effectiveness of the installation of power plants, the EEG is highly successful. Installation rates of wind power plants grew considerably within the last years.³⁰ These growth rates exceeded most expectations. If the growth rate would have been determined by a quota, it is not likely that the determination of such elevated growth rates would have been politically possible.

Substitution of fossil energy sources

In order to avoid the depletion of exhaustible resources and the related emissions their substitution is decisive. But regarding the essential role of energy in economic production processes, the constant security of supply must be guaranteed in order to avoid outages of

³⁰ According to VDEW (2004) installations of wind power plants in Germany rose from 2.800 MW in 1998 to 14.300 MW in 2003.

electricity. The contribution of electricity from RES to energy supply is still quite small; the share of consumed electricity promoted by the EEG amounted to 6.64% in 2003.³¹

Nevertheless, high growth rates of wind power exceed capacities of existing grid structure. Unpredictable feed-in caused by seasonal fluctuations and irregularities challenges the existing infrastructure. Grid operators are obliged to hold spare capacities which guarantee the uninterrupted supply and help to compensate feed-in fluctuations. At the same time they have to avoid overloads resulting from an unexpected supply of wind energy. These peculiarities might lead to an interrupted supply through blackouts.

Decisive for the substitution of fossil energy sources is not only the installation of power plants but also their technological integration into the grid system and the regular provision of electric energy. The unexpected boom in wind power shows that the EEG is not setting incentives for these requirements: In order to achieve secure supply based on volatile renewable energies, the problem of energy storage must be resolved. The EEG provides no incentives for regular feed-in. The enhanced promotion of technologies, which are adequate for base load, as electricity from hydro, biomass or geothermal plants, fosters substitution, but does not resolve the lack of incentives for the development of storage technologies.

Ecological effectiveness

The immediate substitution of fossil energy sources is not possible, but the gradually substitution should take place in an ecologically effective manner. By promoting renewable energies, emissions should be reduced considerably.

By the instrument of the feed-in obligation the EEG replaces electricity from fossil energy sources, if the increase in renewable energies exceeds the growing electricity demand.³² Without other instruments, e.g. emissions trading, it is not possible to control, which fossil energy sources are replaced by RES. Not highly polluting but expensive technologies will probably be displaced first. The existence of external effects impede, that real social costs are

³¹ The gap between 6.64% EEG promoted electricity and the 7.9% of electricity from renewable energies stems from the fact, that big hydro power plants have not been included in the promotion until August 2004. Regarding the future contribution of RES there are differing predictions, e.g. the European Commission expects in its EU-15 Baseline Scenario for 2030 with only 18.9% of electricity from RES (including waste) compared to 15.8% in 2000, see European Commission (2003), p. 149.

³² In Germany energy demand is declining whereas the electricity share of energy consumption rose from 17.4% in 1990 to 19.3% in 2002, see www.ag-energiebilanzen.de

shown by the prices of non-renewables. Additionally, state regulation distorts the relative prices between the commodities. An example is subsidies for German coal.³³

Regarding the problem of irregular feed in, the positive ecological effects of the EEG are diminished, because powering up carbon or gas plants in the case of lacking wind supply causes rising energy costs and greenhouse gas emissions.

Concentrating on climate policy, the ecological efficiency of the EEG can be measured by the abated emissions due to renewable energy promotion. According to the Federal Ministry for the Environment applying the EEG reduced greenhouse gas emissions by about 23 million tons of CO₂-equivalents in 2003. If the objective of the EEG, namely to double at least the renewable energies share by 2010, is reached, emission abatement is expected to amount to 42 million tons in 2010.³⁴ But these numbers are discussed controversially: A recent study of the Ministry of Economics and Labour shows, that the EEG will no longer be adequate for abating greenhouse gas emissions as soon as the European Emissions Trading Scheme starts in 2005.³⁵ Renewable energies should consequentially firstly replace the most polluting fossil energy sources. To cope with this objective, changes in the promotional system or the combination with mechanisms, which are adequate to internalise external costs, are indispensable for maximal ecological effectiveness.

Rising energy efficiency

Generally, rising energy prices tend to stimulate energy-saving technologies. Increasing the share of renewable energies will lead to rising energy prices. Considering the ambitious targets of the EEG for the promotion of renewable energies, industries will in the long run opt for energy-saving in order to control energy costs. A favourable side effect of rising energy prices might therefore be the compliance with the German Governments third management rule, which requires the decoupling of energy use and economic growth.³⁶ But extended exceptions for energy-intensive industries contradict to this objective. For large hydro power plants efficiency gains are stimulated by the feed-in of additional electricity obtained by efficiency gains in the generation process.

³³ The agreed subsidies within the period of 2006-2012 will amount to 15.87 billion Euro, see FAZ (2004).

³⁴ See Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004c).

³⁵ See Federal Ministry of Economics and Labour (2004).

³⁶ This effect of the high costs of promoting RES by a feed-in scheme as the EEG is certainly an unintended side effect. A possible consequence is unemployment due to uncompetitive production costs. The exceptions for energy-intensive industries intend to diminish this effect.

Summing up, the results of the EEG regarding ecological sustainability show that

- substitution is going to be a very long process, but the EEG contributes to the installation of capacities and the development of a market for electricity from RES,
- secondary effects on the grid structure possibly put security of supply in danger and due to the related need of spare capacities the positive effects of the EEG are lowered,
- the design of the EEG can not guarantee that the most polluting energy sources are substituted first,
- there are no direct effects on rising energy efficiency.

6.2 Social sustainability

Due to the visual effects of windmills on landscape, public support for wind power plants is declining. Habitants of coastal areas are especially affected. But two thirds of German citizens are still in favour of further promotion of wind energy by the EEG.³⁷

While monthly additional costs due to the EEG promotion for an average household amount to approximately one Euro,³⁸ industrial energy consumers face serious competition disadvantages due to rising energy prices. Exceptions for energy intensive industries possibly prevent job losses but are not in line with the polluter-pays-principle and hinder efficiency gains in the concerned industries.³⁹ Regarding social sustainability it is positive that the even distribution of additional costs caused by the EEG impedes that habitants of certain regions are more affected by the additional costs.

Due to differing numbers, there is no evidence, if the EEG has the positive effects on labour markets as claimed by the German Government.⁴⁰ The administrative burden of the EEG is

³⁷ See Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004a); Die Zeit (2004).

³⁸ See Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2003).

³⁹ Thus, the costs of the EEG are distributed among other industries and households, but the allowed increase in costs are limited to 10%.

⁴⁰ The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety claims 130 000 additional jobs created by the promotion of renewable energies. These numbers do not refer only to electricity but also to heat and biofuels. A study of the Bremer Energie Institut comes up with different numbers. According to Pfaffenberger et al. the labour displacement due to rising energy costs for industry is higher than the positive labour effects of the EEG. The result is a negative balance of 19 000 lost jobs, see Pfaffenberger et al. (2003).

quite small, e.g. compared to tendering fixed quotas of electricity from RES, where the administrative task is much more complicated.

The EEG is highly mandatory: By setting minimum prizes and feed-in obligations, the market mechanism has been suspended and consumer and producer sovereignty is narrowed seriously. The political strategy to enhance specific technologies does not leave room for the implementation of individual or innovative solutions. Apart from efficiency losses the mandatory character of the EEG is hardly compatible to social sustainability. Incentives rather than obligations would be more sustainable, regarding both, social consequences of rising energy costs and a shrinking leeway for individual decisions.

Ecological consciousness is still high in Germany. For ecological concerns the public is willing to raise funds, but rising unemployment and uncertainty about the effectiveness of political measures tend to decrease public support. In order to guarantee ongoing support, efficiency of the EEG has to rise and possible dangers of climate change must be communicated to the public.

6.3 Economic sustainability

Static efficiency

Regarding static efficiency of the underlying feed-in system, the EEG has to be judged rather critically. The feed-in tariffs are based on anticipations about investment costs and desirable rates of return for investors in order to create investment incentives. As the feed-in tariff is not based on market mechanisms, efficient resource allocation is not obtained. The efficiency of the EEG is subordinated to the direct effectiveness focussing mainly on the maximum installation of power plants. Considering wind power, promoting maximum installation means that very favourable sites which are nearly competitive are promoted as well as capacities on unfavourable sites which probably never reach competitiveness. The installation rates of renewable energy plants are very high, but the real costs of the EEG, which amounted to estimated 1.94 billions in 2003,⁴¹ are high, too. The lack of market mechanism leads to the inefficient use of these resources. Abating greenhouse gas emissions by the substitution of fossil energy sources is in a static view very costly. Reducing emissions by rising efficiency

in energy use or by cleaner power plants would be more cost efficient even if at the long run the ecological management rules ask for the change to renewable energies.

Dynamic efficiency

In order to promote future cost reductions the EEG is not the adequate instrument for enhancing innovations by competition. Because of the feed-in obligation, operators of renewable energy power plants do not have to face competition. Investor's security leads to high installation rates but different feed-in tariffs for each technology impede competition among technologies. The declining feed-in tariffs of the EEG are generally adequate to foster innovation, but a sharper decline would be more stimulating and would increase acceptance of the EEG among consumers and industries. On the level of plant producers market participants compete internationally, which stimulates innovations.⁴²

As a positive incentive for innovation, the long term horizon of increasing the renewable energies share gives investors the possibility of adaptation and capacity building. On the level of framework setting the constant monitoring and changes of the legal framework reflect the political attempt to come closer to an optimal regulation.

6.4 Development tendencies

The assessment of the EEG has been quite ambiguous. As the act is under constant monitoring and subject to frequent changes, it is important, in which direction these changes tend to develop. This will be qualified regarding the changes, which took part from the EEG 2000 to the EEG 2004 and which are based on the results of the 2002 monitoring report.⁴³ Apart from the extension of exceptions for energy-intensive industries, which contradict the polluter-pays principle as well as it lowers ecological effectiveness; the development can be qualified as positive.

⁴¹ See VDEW (2003).

⁴² The learning-curve in the production process of windmills is especially remarkable regarding the size of the power plants: After windmills with 10-50 kW in the 1980s, the average windmill in 1992 had 182 kW and amounted to over 1500kW in 2003, whereas costs dropped by approximately 30% between 1990 and 2000. For photovoltaic power the average costs per kW dropped from 15339 to 6012 between 1990 and 2000, see Wüstenhagen/Bilharz (2004), pp. 11.

⁴³ Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2002).

- Regarding the substitution of fossil energy sources: biomass, which is agriculturally grown, gets special promotion, geothermic power is included in the EEG as well as the promotion of additional electricity from large hydro power plants. These technologies can provide base load electricity. In order to reduce problems arising from the overload of grid systems in peak situations, the amendment introduces the possibility of a common management between grid operators and power producers. (EEG §4).
- Regarding static efficiency: Tariffs for wind power plants have been reduced, unfavourable sites, which do not earn 60% of the average yield, will not be promoted any longer. In the dynamic view a sharper decline is also a step towards more efficiency. The use of innovative technologies gets additional promotion.
- Furthermore, investor's security is enhanced by a better framework regarding more specified definitions of renewable energies, more transparency and legal regulations which favour producers rather than grid operators.

The enhanced promotion of offshore wind power and geothermal plants can not yet be qualified, as these technologies are still at the very beginning of their development.

7 Possible amendments for more sustainability

7.1 Changing the promotional system

With the beginning of the feed-in system in Germany a policy shift took place. Support policy no longer aimed at financing the development of technologies applying RES by R&D, but at the broad market introduction by stable investment conditions. Regarding wind and photovoltaic power, this objective has been reached. Politicians must now consider the question, whether the entrance in a new phase of the product cycle would justify a fundamental change of the promotional system. A possibility would be the change to a quota system, combined with certificates. Annually increasing quotas are adequate to secure, that the aspired share of electricity from RES will be obtained. Market mechanisms provide at the same time the efficient achievement of this objective, as the certificates guarantee that producers with the lowest marginal costs supply the required amount of electricity.⁴⁴

⁴⁴ But if the system aims at promoting all different technologies, the market share of each technology has to be politically determined. For an assessment of the promotion of renewable energy sources by quota systems see Bräuer/Bergmann (2001).

7.2 A European regulation

In economic theory the existence of negative external effects justifies state intervention. Negative external effects of energy use are multiple, among which some are transnational, e.g. the effects of climate change are global, thus it is not important which country or industry reduces emissions. The decisive factor is the total sum of abated emissions. If marginal costs of reducing emissions differ and reductions take place in the industry with the lowest abatement costs, efficiency and therefore economic sustainability are provided.⁴⁵

The European Union considers in its 2001/77/EC directive a common policy of RES.⁴⁶ If the promotion is enforced at the European scale, certificates could ensure a cost effective solution as well. Power plants will be firstly constructed on the most favourable sites. With a rising quota or feed-in tariff the construction of plants in other areas will be profitable, too. Consequently, photovoltaic plants would be built mainly in southern Europe, where yields are higher than in northern countries. Therefore, on European scale efficiency gains could be realised. In order to guarantee social sustainability transparency and social participation must be realised as well.

8 Conclusions

To cope with the ecological requirements of the SSGG, the promotion of renewable energies is necessary. Social and economic sustainability require an efficient resource use. Promoting renewable energies does not necessarily contradict to social and economic sustainability, but it is neither indispensable for the achievement of these aspects of sustainability. The essential aspect is the design of the promotional system.

The EEG focuses mainly on requirements for ecological sustainability. It is highly effective for installing capacities of RES. Nevertheless the substitution of exhaustible energy sources is still limited. Reducing emissions might at least in a mid-term view be achieved more

⁴⁵ The design of the European Emission Trading Scheme follows this idea. For a detailed discussion see Svendsen/Vesterdal (2003).

⁴⁶ See Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity from renewable energy sources in the internal electricity market. Official Journal L 283 of 27. 10. 2001. For the energy policy of the European Union see Eickhof/Holzer (2004).

efficiently by other instruments. Rising energy prices possibly enhance energy saving technologies, innovations and sustainability.

In order to reach the ecological aspect of the German sustainability strategy the focus should shift from installation of capacities to a steady power supply and the effective substitution of the most polluting fossil energy sources. Therefore the EEG has to be further amended and combined with other instruments, e.g. the immediate ending of subsidising fossil energy sources, or by pricing emissions. Nevertheless, the amendment to the EEG is a first step in the right direction, reducing wind power tariffs and focusing more on hydro power and biomass.

Social and economic sustainability ask for higher efficiency, regarding the high costs of the EEG. Market-based instruments could better fulfil these requirements. A change to a quota system with certificates in order to guarantee efficient production of green power should thus be seriously considered. Especially, as the German sustainability strategy explicitly requires that “...the various areas of policy are to be integrated in such a way as to ensure that economic growth, high employment, social cohesion and protection of the environment go hand in hand.”⁴⁷

⁴⁷ Bundesregierung (2002), p. 13.

References

Bartmann H. (1998): Anliegen und Aspekte der Ökologischen Ökonomie, in: Das Wirtschaftsstudium, 27. Jg., pp. 275-280.

Bräuer, W./H. Bergmann (2001): Ordnungspolitische Bewertung von Quotenhandelsmodellen zur Förderung erneuerbarer Energien im Stromsektor, in: ZfE - Zeitschrift für Energiewirtschaft, 25. Jg., pp. 205-215.

Bundesregierung (2002): Perspectives for Germany: Our strategy for Sustainable Development, online publication, www.bundesregierung.de.

Daly, H.E. (1990): Toward some operational principles of sustainable development, in: Ecological Economics, Vol. 2, pp. 1-6.

Die Zeit (2004): Mehrheit der Deutschen für Ausbau der Windenergie, 30.9.2004, No. 41, p. 36.

Eickhof N./V. Holzer (2004): Energiepolitische Kompetenzen in der Europäischen Union, in: Wirtschaftsdienst, 84. Jg., pp. 443-449.

European Commission (2003): European Energy and Transport Trends to 2030, www.europa.eu.int

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004a), Press Release No. 128/04.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004b), Press Release No. 243/04.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2004c), Press Release No. 231/04.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2003), Press Release No. 077/03.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2002): Erfahrungsbericht EEG, 28. Juni 2002, www.bmu.de

Federal Ministry of Economics and Labour (2004): Gutachten des Wissenschaftlichen Beirats zur Förderung erneuerbarer Energien, www.bmwa.de

FAZ (2004): Weniger Subventionen für die Kohle, 19.05.2004, No. 128, p. 13.

German Advisory Council on the Environment (2002): Environmental Report 2002, Berlin.

German Advisory Council on Global Change (1999): Environmental Report 1999, Berlin.

Gesetz für den Vorrang Erneuerbarer Energien (EEG), BGBl. I, 31.07.2004, pp. 1918.

Grotz, C. (2002): Germany, in: Reiche, D. (Ed.): Handbook of Renewable Energies in the European Union, Frankfurt/Main, pp. 107-121.

Harborth, H.-J. (1989): Dauerhafte Entwicklung (Sustainable Development) Zur Entstehung eines neuen ökologischen Konzepts, WZB-Papier FS II 89-403, Berlin.

Heins, B. (1994): Nachhaltige Entwicklung - aus sozialer Sicht, in: Zeitschrift für angewandte Umweltforschung, 7. Jg., pp. 19-25.

Klaassen, G./J. Opschoor (1991): Economics of sustainability or the sustainability of economics: different paradigms, in: Ecological Economics, Vol. 4, pp. 93-115.

Löbbe, K. (1996): Substituierbarkeit versus Komplementarität von Umweltgütern, in: G. Pfister/O. Renn (Eds.): Indikatoren einer regionalen nachhaltigen Entwicklung, Stuttgart, pp. 138-157.

Meadows, D. et al. (1972): The Limits to Growth, New York.

Matthies, K. (2004): Asian Demand Pushes Up Commodity Prices, in: Intereconomics, Vol. 39, pp. 109-112.

North, D. (1990): Institutions, Institutional Change and Economic Performance, Cambridge.

Pearce, D. (1988): Economics, Equity and Sustainable Development, in: Future, Vol. 20, pp. 598-605.

Pearce, D./K. Turner (1990): Economics of Natural Resources and the Environment, New York.

Pfaffenberger, W. et al. (2003): Ermittlung der Arbeitsplätze und Beschäftigungswirkungen im Bereich Erneuerbarer Energien, online publication, www.bremer-energie-institut.de

Starbatty, J. (2004): Braucht die Soziale Marktwirtschaft Industriepolitik? In: Orientierungen zur Wirtschafts- und Gesellschaftspolitik 100, pp. 33-38.

Svendsen, G.T./M. Vesterdal (2003): How to design greenhouse gas trading in the EU? In: Energy Policy, Vol. 31, pp. 1531-1539.

VDEW (2004): Mehr Strom aus Windenergie, online publication, www.strom.de

VDEW (2003): 1,7 Milliarden Förder-Euro für Ökostrom, online publication, www.strom.de

Weizsäcker, E. U. v./A. B. Lovins/L. H. Lovins (1995): Faktor Vier: doppelter Wohlstand – halbiertes Naturverbrauch; der neue Bericht an den Club of Rome, München.

World Commission on Environment and Development (1987): Our common future, Oxford.

Wüstenhagen, R./M. Bilharz (2004): Green Energy Market Development in Germany: Effective Public Policy and Emerging Customer Demand, IWOe Discussion Paper No. 111, St. Gallen.

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