Deutscher Rat für Landespflege

Die Auswirkungen erneuerbarer Energien auf Natur und Landschaft

Gutachtliche Stellungnahme und Ergebnisse des gleichnamigen Symposiums vom 19./20. Oktober 2005 in Berlin

Die Veranstaltung und die Veröffentlichung wurden gefördert durch das Bundesamt für Naturschutz mit Mitteln des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit und durch die Lennart-Bernadotte-Stiftung.

BfN Bundesamt für Naturschutz

LENNART-BERNADOTTE-STIFTUNG

Heft 79 - 2006

SCHRIFTENREIHE DES DEUTSCHEN RATES FÜR LANDESPFLEGE

sionsreduzierte Braunkohlekraftwerk[28], können dabei bestehende Umweltprobleme verringern. Ein Mix aus verschiedenen Energiequellen wird jedoch vorläufig notwendig sein, um auf den schwankenden Bedarf an Strom (Grundlast, Spitzenlast, jahreszeitlich bedingte Schwankungen) reagieren zu können.

Der DRL geht in seiner Stellungnahme von der Voraussetzung aus, dass die Vorteile erneuerbarer Energien im Vergleich mit fossilen und nuklearen Energien deutlich überwiegen könnten, wenn die *derzeit noch vorhandenen Gestaltungsspielräume* bei ihrer Einführung konsequent im Sinne einer „Ökologisierung" der Landnutzung ausgenutzt werden. Die Empfehlungen können dabei allen Entscheidungsträgern im Umgang mit erneuerbaren Energien eine Hilfe sein. Allerdings sieht er auch die Gefahr, dass im Gefolge der derzeitigen „Goldgräberstimmung" bei den möglichen Nutzern Sachzwänge geschaffen werden, die diese Gestaltungsmöglichkeiten einschränken.

12 Summary[29]

Energy prices are mounting, the content of CO_2 in the atmosphere is increasing, the global annual average temperature is rising, weather fluctuations are becoming more extreme. All of this, as it is becoming progressively certain, is caused in part by our untamed consumption of fossil fuels.

In addition to the two most important measures, *energy conservation* and *increasing energy efficiency*, the *use of renewable energy sources* is an important element of climate protection and helps to reduce greenhouse gas emissions.

In order to increase the share of renewable energies in *power generation*, the German Renewable Energies Act was created to form an important promotional instrument for regulating feed-in tariffs. In 2005, renewable energy sources took up 4.6 % of the total primary energy consumption in Germany (14,238 PJ).

The objective of the German Federal Government is to increase the percentage of renewable energies in power generation to 12.5 % by 2010 and to at least 20-25 % by 2020. In addition to climate protection, the objectives of landscape management and biological diversity are to be met with a sustainable, ecologically compatible energy supply. We therefore need strategies to minimize conflicts and to control the different spatial claims. In order for society to accept the continued expansion of renewable energies, their advantages and disadvantages, risks, requirements and prospects must be laid open and discussed so that possible conflicts between this expansion and nature conservation and landscape management can be mitigated or avoided.

The greatest changes in the landscape are anticipated from the future increased cultivation of biomass, which competes with the goals of sustainability (e. g. organic farming, habitat systems, and soil and water protection).

Biomass consists of plants and plant parts (e. g. various species of tree and shrub cultures, field crops, various grass species and plants previously used for feed and oil, starch and fibre crops), but also of waste and by-products of plant and animal origin, such as waste wood, cuttings resulting from landscape management or liquid manure. Biomass can be used to provide heat, power and fuel in solid form (e. g. plants), liquid form (alcohols and rapeseed oil methyl ester (biodiesel) produced from biomass) or as gas (e. g. produced from gasification, pyrolysis or fermentation of biomass). Biomass can be cultivated on farmland, forestland and grassland.

In 2004, 9.4 TWh of electricity, 59.8 TWh of heat and 11.3 TWh of fuel produced from biomass was used. The technically possible potentials are estimated many times higher, however they depend on the type of biomass and how it is produced and used. Biomass production is highly accepted among farmers („energy farmers"), since this type of production agrees with the cultural pattern of farming. Compared with pure landscape management, biomass farming generates a directly marketable product, which can also serve to create jobs and increase added value in rural regions.

Agricultural production of biomass can differ a great deal from conventional production. The two-crop system, for example, involves cultivating and harvesting the total biomass from two cultures in the course of one year. A winter and a summer crop are grown in succession and the entire plants harvested and used for energy. A comparison with the various agricultural uses shows that the two-crop system is clearly superior both ecologically and economically to other crop systems, at least in regions with precipitation levels higher than 600 – 700 mm/a. In addition, it fulfils important requirements of soil and nature conservation and of good practice. In regions where two-crops are not possible due to unfavourable local conditions, the agronomic measures used for growing energy crops must always fulfil the same minimum requirements of „good agricultural practice." Energy crops can also be grown organically.

Energy forests are a land use system similar to coppicing that can be grouped between agriculture and forestry. Usually, chemical treatment agents are employed only for plantation establishment, i. e. only once for a use duration of approx. 30 years; an ecological advantage. Varying amounts of nutrients are stored in the individual biomass parts of the forests, which are returned to the soil via litter fall (incl. deadwood) in a cyclical system. Therefore, compliance with removal thresholds is essential for sustainable management. Fertilization of commercial forests used for energy production is permissible on principle only in the scope of good practice.

An energy forest consists of different age classes according to the rotations chosen for the annual harvest. Shade intolerant open land species each have their opportunity on the respective last-harvested areas. For energy timber plantations in particular, linear, open structures in the stand, the outer boundary structures and connections to existing structures in the surroundings make major contributions to nature conservation. The plantations could also fulfil biotope-connecting functions. When managing a composite forest, the underwood is used commonly and traditionally for energy production in intervals of approx. 30 years. Depending on the density of the up-

28 Bei der Verbrennung von Kohle entsteht stets CO2 , das bei den so genannten CO2 -freien Kraftwerken durch technologische Prozesse (Abscheidung und Lagerung) entzogen wird, so dass es nicht in die Atmosphäre emittiert wird. So wird beim Oxyfuel-Verfahren Braunkohle mit einem Gemisch aus reinem Sauerstoff und rezirkuliertem Rauchgas verbrannt. Das bei der Verbrennung anfallende CO2 soll dann in geologischen Speichern wie erschöpften Öl- und Gasfeldern, tiefen Salzwasser führenden Gesteinsformationen oder tiefen Kohleflözen, aber auch in den Ozeanen eingelagert werden. Die Frage der dauerhaften Speicherung ist allerdings noch nicht gelöst, da nicht auszuschließen ist, dass das Gas im Laufe der Zeit an die Erdoberfläche (beispielsweise durch Bohrlöcher von ehemaligen Erkundungsbohrungen) und damit in die Atmosphäre zurückkehren kann. Der Energiekonzern Vattenfall testet derzeit das Verfahren der CO2 -Abscheidung gemeinsam mit universitären Forschungsgruppen in einer Pilotanlage am Standort Schwarze Pumpe in Spremberg (Brandenburg).

29 Übersetzung/Translation: Faith Gibson-Tegethoff

per storey, which can fluctuate considerably, the forest character of the stands is not lost.

Nevertheless, the increased use of timber as fuel should not be a detriment to deadwood, biotope trees and other structures relevant to nature conservation. With the use of weak assortments, which could perhaps be profitable at first, it is possible to increase structural diversity in same-aged pure stands through stronger interventions. As long as the biomass use is limited to early phases of stand development and no strong potential biotope or deadwood trees are used, there is hardly any danger of a decrease in biodiversity.

Other possible sources of energetically utilizable timber are undesired growth and stumps grubbed up on lands that are valuable to nature conservation (e. g. shrub-invaded bogs, moist grasslands, heath land and dry meadows), whose degree of canopy and therefore shelter has exceeded a critical threshold with regard to the conservation objective. The proceeds from this material could at least decrease the costs of landscape management.

A further possibility for producing energy timber is to plant hedgerows (e. g. in intensively farmed regions), which divide up the landscape and take up structural and trophic functions.

It is difficult to assess biomass production on grassland. In some regions, particularly so-called absolute grassland regions, this may preserve the endangered grassland. However, for profitable energy production, energy rich growth of fertile meadows is required, hence not the cuttings from low-yield, crude fibre-rich, herb- and therefore blossom-rich rough pastures. This can result in species protection problems. The biomass boom in grassland farming in particular requires intensive expert nature conservation monitoring and planning, in order to not accelerate the loss of species-rich grassland. Different plant species are suitable for cultivation and can be mixed; even old varieties could experience a „renaissance." This increases the possibility of great structural and colour diversity in the region. Since each crop species also has specific associate plants, there is the possibility to offer field weed communities new habitats. Allowing boundary ridges, planting of linear structures in and between the fields and the establishment of flowering strips can have considerable effects for promoting associate plants, wild flora and some animal species groups.

Biomass production, whether on the field, in forests or on grassland, changes the accustomed appearance of landscapes. Some of the species used can grow to enormous heights; for example, maize 3 to 4 m, hemp and zebra grass up to 4 m. In conjunction with the regional model development, research should be done on which forms of biomass cultivation could be integrated in familiar characteristic landscapes and social practices. It is highly probable that biomass agroforestry systems or growing methods that can be interpreted as a „return" to earlier types of land use (such as coppices) and that do not run counter to widespread landscape perceptions, including aesthetic sensitivities, would be particularly favourable with regard to aesthetic and cultural acceptance. In this respect, alley cropping also seems a very appealing option.

In 2004, *wind power* held the largest share of power generation (26.5 TWh) of renewable energies with approx. 4.6 %. The suitable sites for wind power plants on land have been developed to the most part. In coming years, the focus of further development will be on so-called repowering and the construction of offshore plants. Due to technical challenges, high development and construction costs and special environmental requirements, the first offshore wind power plants will not be completed and functional until 2010. Questions concerning the location of transport routes and grid connection are presently still not clarified. The present debate revolves around the landscape appearance, species protection and subsidization. Under certain circumstances, wind power plants on land can lead to disturbances and increased mortality rates for birds and bats. Carrying out the required grid connection of offshore wind power plants may have negative ecological effects (e. g. laying cables, warming of layers near the ground, heavy metal pollution in the surroundings, electro-technical impairments to fish due to cables). The erection of wind power plants on land is often very critically assessed by adjacent owners. They fear effects on their health from noise and subsonic noise, from shadow flicker and the so-called disco effect as well as impairments to the landscape appearance.

When we speak of *solar energy,* we differentiate between solar thermal energy and photovoltaics. The former is employed by using or converting solar radiation into heat predominantly on the roofs of private homes to produce warm water for home requirements. In photovoltaics, sunlight is converted by solar cells directly into electrical energy. This type of energy use can be employed decentrally. Reimbursement of electrical power is promoted for a certain period in order to get the technology ready for the market. Photovoltaic *open space* plants in particular can have effects on nature and the landscape (covering the landscape with reflective surfaces, possible effects on the landing behaviour of breeding or migrating birds, massive fencing in of the plants, „cutting up" landscapes). Only relatively recently the trend is not only in highly sunlit regions of southern Germany, but also sites in other areas, as the increasing number of proposals from the *Länder* demonstrate. Even if the reimbursement of produced energy is for a limited duration, the plants remain part of the landscape for many decades and change its appearance.

After wind power, *hydroelectric power* takes up the second-highest share of the renewable energy sources in Germany. It can be used to produce electrical power according to demand both to safeguard the base load and for the peak load. Because of the relevant surface forms, most river power plants are located in the south of Germany. Further expansion is problematical because of the geographical location and for nature conservation reasons (particularly small-scale hydroelectric power). Potentials for increasing power generation lie in modernizing and increasing the efficiency of outdated large-scale power plants and less in the development of new sites. Interrupting the watercourse continuum with groynes and dams primarily impedes fish migrations as well as dissemination of aquatic and semi-aquatic invertebrates and alters the erosion and deposition processes and discharge behaviour. This applies chiefly with regard to the general requirements for example of the European framework directive for water policy, which demands good ecological conditions. The future establishment of small-scale hydroelectric power plants is not suitable for most regions of Germany.

There is no alternative to the increased use of a prudent mixture of renewable energies. First, all technical possibilities for decreasing energy consumption and for increasing energy efficiency of all energy sources used at present must be exploited, further developed and applied. In general, the same applies for the renewable energy sources: that they are efficient and – depending on their specific properties and based on extensive life cycle assessments – used sustainably.

Regional and land use planning should play a major role in evaluating suitable si-

tes for all further developments and uses of renewable energies. In the future land use and regional planning of the *Länder,* the search for suitable sites for biomass production, wind power plants, solar/photovoltaic plants and hydroelectric power plants will rely more on regionalization and spatial differentiation that are harmonized to demographic change and its socioeconomic and ecological consequences. The prerequisite for this is that land use and regional planners are able to involve the public in the scope of their procedures and thus ultimately create a harmony between the objectives of nature conservation and landscape management and the objectives of the production and use of renewable energy sources.

In order to reach sustainable, justifiable solutions that meet broad regional acceptance, it is advisable to monitor and steer such processes using the instruments of environmental communication. Landscape planning in accordance with the Federal Nature Conservation Act can offer the instrumental framework for this.

The situation in intensively used cultivated landscapes is a grave problem in particular for central Europe, since natural biotopes are surrounded by anthropogenic-dominated structures and cannot adapt to climatic change through „migration." This underscores the great importance of linked biotope networks including corridors, stepping stones and widely unbroken spaces and the necessity to reduce the extent and speed of climate change as best as possible. In this respect, „nature-friendly" species for biomass production could offer opportunities to reconcile climate protection and nature conservation with one another. More extensive and nature- and landscape-friendly forms of biomass cultivation are another option to be pursued with regard to the adaptation to climate changes.

The DRL (German Council for Land Stewardship) assumes the prerequisite that the advantages of renewable energies could clearly outweigh those of fossil and nuclear energies if the *existing creative margin* is consistently exploited in their introduction in the sense of an „ecologization" of land use. The detailed recommendations the DRL presented can be helpful to all decision makers for dealing with renewable energies. Nevertheless, he also recognizes the risk that in the wake of the present „gold-digger attitude" practical constraints will be created for the possible users that restrict these creative possibilities.

Freiburg, den 31. Juli 2006

Der Sprecher

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