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Policies to support renewable energies in the heat market

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ABSTRACT

Whereas the contribution from renewable energies in the electrical power market is increasing rapidly, similar progress in the heat market is yet to be made. A prerequisite for progress is the development of innovative support instruments that transcend the usual support through public subsidies or tax reductions. We present an overview of the various classes of possible instruments. Some particularly interesting instruments will be selected and evaluated, comparing them qualitatively and quantitatively for the case of Germany. The most favourable model is found to be a new, allocation-financed[1] model known as the Bonus Model. This model will be described in more detail.

1. Introduction

During the EU summit March 9, 2007, the heads of governments of the 27 EU member states agreed to a mandatory target of a 20% minimum share of renewable energy in total primary energy consumption by 2020 throughout the EU. Thus far, it is not clear how this overall goal will be distributed among the individual member states, and how the individual member states will then apportion their respective shares between the heat, electricity production, and transport sectors. These sectors developed different dynamics in the proliferation of renewable energy in the past. In the power sector a highly dynamic development in terms of newly installed capacities can be observed in the last years, which has been supported by highly advanced policy instruments. The heat sector, however, lacks significantly behind, both in terms of installations and sophisticated political instruments.

Against this background, this contribution introduces suitable models and instruments, evaluates them both juristically and economically, and compares them with each other. The goal is to identify particularly promising models and instruments and sufficiently specify the details for the decision makers. The details and results are based on a study for the German Environmental Ministry (Ministry of Environment, Nature Conservation and Nuclear Safety) on budget-independent instruments for the diffusion of renewable energy in the heat market by Nast et al. (2006).

The organisation of this contribution is as follows. Section 2 shows a brief overview of the framework conditions of the diffusion of systems for the use of renewable energy in the heat market and highlights a scenario for a sustainable future development path. Section 3 discusses the international experiences with the support of renewable energy in the heat sector and shows that most of the success in the proliferation of heat from renewable sources was rather small. For a systematic development of feasible instruments, Section 4 classifies the available political instruments by giving a comprehensive overview. Section 5 selects certain instruments for closer inspection applying juristic and economic criteria. In Section 6 suggestions for the design of a suitable instrument are derived from a detailed analysis of the advantages and disadvantages of the selected instruments in Section 5. The article concludes with a summary and recommendations.

2. Framework conditions

The share of heat from renewable energy sources (RES-H)[2] in the total heat demand (including cooling) currently amounts to

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[1] Some economic terms are explained in the glossary.

[2] RES-H in this paper denotes energy from renewable sources for heating *and* cooling purposes.

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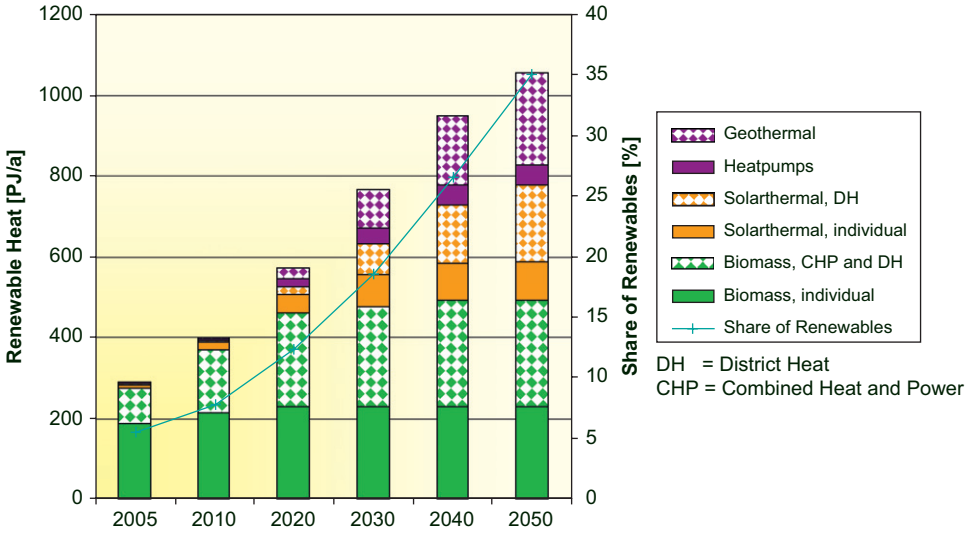

Fig. 1. Quantitative goals for renewable heat in Germany (Nitsch et al., 2004; Nast et al., 2006).

less than 10% in the EU (CEC, 2007). In Germany it is only about 6%. The European Community has not yet enacted any explicit regulation for promoting the use of renewable energy sources (RES) in the generation of heat and cold. However, in 1997 the goal of 12% from RES has been set, implicitly also creating an incentive to increase the share of RES-H. Thus far, biomass is the most prominent RES for heating purposes, with the largest share due to heat generation with wood in private households. The implementation of efficient hearths and boilers for wood combustion or for using biomass in combined heat and power (CHP) generation, as well as solar-thermal and geothermal systems, has grown only slowly in Europe. As a result, the contributions so far from the heat sector will not be sufficient to even fulfil the 12% goal set for 2010, let alone the later, more ambitious 20% goal.

In Germany, instruments based on ambitious expansion goals have been under consideration for several years now (see e.g. Nast et al., 2000). It would be desirable that these achieve similar success as the Renewable Energy Sources Act (EEG, Erneuerbare-Energien-Gesetz)[3] in the area of renewable power generation. A sustainability scenario (Fig. 1) for the German heat market that fulfils the climate-protection requirements, i.e. a reduction of the CO_2 emissions by 80% of the reference value from 1990, foresees about 1060 PJ of renewable heat in the year 2050—twice the amount produced today (Nast et al., 2006). The share of renewable heat in the overall heat demand (including process heat) would then amount to a total of 35%. If the heat demand that is met by renewable electricity (e.g. the renewable share of electricity used to operate heat pumps) is included in the calculation, then this share swells to 46%. These calculations already take into account that the heat demand between 2005 and 2050 will decrease by 44% due to improved thermal insulation and a more efficient use of energy.

A decisive condition for realising these shares is that about 2/3 of the renewable heat is distributed to the end consumers through local heat networks (Nitsch et al., 2004) because:

(1) Extracting large amounts of geothermal heat from depths greater than 2000 m is only economically feasible if a larger number of consumers are supplied at the same time, i.e. if they are connected to a local heat network.
(2) Storing solar heat in the larger heat stores of a local heat network is cheaper and can be done over a longer period of time than for individual buildings. Only in this way is it possible to store the summer heat of the sun cost-efficiently into the winter.
(3) CHP generation is only efficient for larger biomass plants. Furthermore, inexpensive, problematic biomass sources like straw, which require more effort to clean the flue gas, can be used in larger furnaces.

According to these results, the policy instruments for realising such an ambitious target-oriented scenario must accommodate various technologies and their specific learning curves and also incorporate the construction of the necessary infrastructure for heat networks.

3. International experience with support schemes

This section summarises the experience gained in European countries and Israel with instruments in the heat market in order to reflect upon the recommended support schemes in the light of observations made in the past. Until now only very few non-budgetary instruments have been implemented, the majority of them being use obligations.

Current measures in EU Member States for promoting RES-H production offer only limited incentives for dynamic, lasting growth. To date, they concentrate on three classes of budget-financed instruments. These instruments include investment incentives, tax measures (investment-based and fuel-based), and low-interest loans (Table 1 provides an overview for the EU-15). Such instruments, which in most cases are applied at the national level, are often combined with comparable local and regional policies. In the past, the greatest effectiveness in promoting heat production from renewable energy has been achieved in Germany and Austria, via investment incentives for solar-thermal collectors

[3] The EEG specifies that the producers of electricity from renewable energy sources can demand that the nearest power grid operator purchases the entire renewable electricity for a period of 20 years at a fixed rate (whereby the individual grid operators are obligated to equalise the burden amongst them and to distribute it in equal proportions to the final consumers). For more information about this feed-in tariff system and other instrumental approaches in the power sector, please see the communication from the EU commission from 7/12/2005 (KOM (2005) 627) on the promotion of electricity from renewable energy sources as well as the publication from the German Ministry of the Environment (2007): EEG—The Renewable Energy Sources Act. (http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/eeg_brochure_engl.pdf).