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Feed-In Tariffs, Support Policy and Legal Framework for Geothermal Energy in Germany

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ABSTRACT

Germany's efforts to develop renewable energy sources include the harnessing of geothermal energy. The development of both deep and shallow geothermal energy is being supported. However, geothermal energy is still in the initial stages of its development and currently lags behind the success already achieved by both wind and solar energy. For this reason, support measures have been expanded and made more sophisticated over the last few years, and this continues today, too.

The main mechanism for promoting deep geothermal energy in Germany is the legally stipulated feed-in tariff structure for electricity from geothermal energy. Since 2009, this legal framework has been supporting not only geothermal power generation, but also the combined generation of heat and electricity.

A new measure is the obligation to provide heating for buildings from renewable energy sources. This obligation can be fulfilled by shallow geothermal systems or by central heating from a geothermal heating station.

Direct state support is governed by a market incentive programme which provides state subsidies for the construction of geothermal heating stations, district heating infrastructure and for shallow geothermal systems. As a recent addition, state support is now available to cover drilling and exploration risks.

1. CURRENT STATUS AND DEVELOPMENT OF GEOTHERMAL ENERGY IN GERMANY

There have been increasing efforts to develop both deep and shallow geothermal energy in Germany in recent years. Deep geothermal energy is still in its infancy, whereas shallow geothermal energy is already established on the market.

1.1 Deep Geothermal Energy

The use of deep geothermal energy in Germany has been limited to the exploitation of deep hot-water aquifers with temperatures of up to around 160 °C. Deep geothermal energy is mainly used to generate heat. At the moment, there are around 167 plants for pure heat generation in operation. Direct use in thermal baths and in the heating of the associated buildings dominates here. There are 13 heating stations for district heating. In total, approximately 100 MW of thermal capacity has been installed. Electricity is also generated in three of these plants (installed capacity: 7.4 MW). In addition, at least seven projects for electricity generation are in construction, mostly in combination with heat generation (BMU 2009a).

1.2 Shallow Geothermal Energy

There has been a boom in shallow geothermal energy in recent years. Sales figures for heat pumps using geothermal energy have risen from around 7,000 in 2003 to about 34,000 in 2008.

1.3 State Subsidies

State measures to support the introduction of renewable energy sources to the market have played a crucial role in this market development. These measures always include support for geothermal energy.

In contrast to the situation regarding research support, the goal here is not to develop new technologies, but rather to create favourable framework conditions for market entry. Only when appreciable market shares have been achieved will the potential cost-savings due to economies of scale and ongoing practical improvements to products be realised. State subsidies are supposed to be phased out in the long term, when renewable energy sources have been successfully established on the market.

To support market entry, different mechanisms are being employed: Electricity generation from deep geothermal sources is supported by legally binding feed-in tariffs, which plant operators have to be paid by grid operators (see 2.). Since 2009, principals have been obliged to use renewable energy sources for heating buildings (see 3.). The market incentive programme provides for direct financial support from the state for both deep and shallow geothermal energy (4.).

1.4 Legal Permission

The law regarding the granting of permission provides further legal framework conditions for the use of geothermal energy.

For deep geothermal energy plants, mining regulations must be observed first and foremost. Geothermal heat is considered to be a natural resource, which means that the same legal provisions apply to the exploitation of geothermal energy as hold for the extraction of crude oil, for example. The right to exploit geothermal energy using deep geothermal energy plants is not part of real estate property, but has to be granted by state authorities for certain areas (claims to explore and exploit). Moreover, drilling may only be carried out according to the specifications of an approved operating plan.

In addition, the provisions of laws relating to water, construction, planning and nature conservation must also be observed. Thus a number of special, separate approvals from different authorities is necessary for any given project.

Shallow geothermal systems are mainly subject to laws relating to water. There are differing regulations in the German federal states. Usually a permission from a local

environmental authority is necessary. Limitations mainly apply in the catchment area of drinking water plants.

The laws relating to permission will not be dealt with here in further detail. The law is unnecessarily complicated and not tailored for geothermal plants, but it has so far generally been possible to find solutions for the associated problems in practice.

2. RENEWABLE ENERGY SOURCES ACT (EEG)

The successful market introduction of renewable energy sources for electricity generation is strongly dependent on the feed-in tariffs provided for by the German Renewable Energy Sources Act (EEG). The tariff structure's main result has been the successful development of electricity generation from wind, solar energy and biomass.

2.1 How the EEG Works

The basic principle of the EEG is that the operators of electricity supply grids are obliged to accept and give priority to electricity provided by renewable energy sources and to pay minimum prices stipulated by law for a 20-year period. The additional costs which arise for grid operators are ultimately borne by all electricity consumers in accordance with an apportionment system specified in the EEG.

The state itself is not involved in financing, but instead merely controls the framework conditions and checks at regular intervals whether the regulations are having the desired effect.

The tariffs are specified for each renewable energy source so that an appropriate level of profit can be made. The tariff amounts depend on the plant size and other factors; various bonus payments create incentives for certain technologies which are particularly favourable to the environment or are particularly innovative. The tariffs currently range from 3.5 cents per kilowatt-hour (for large hydroelectric plants) to 43 cents per kilowatt-hour (smaller solar power systems on buildings).

The minimum tariff is specified in such a way that it is reduced by a pre-defined percentage (degression) for plants that go online later. The percentage is between 1% and 11% for plants that begin operation from 2010 onwards. This creates an incentive to complete projects as early as possible. At the same time, cost savings due to increasing market entries are passed on to consumers.

These regulations mean that project developers, investors and operators can reliably calculate yields for the first 20 years of operation.

2.2 Geothermal Energy

The feed-in tariff is 20 cents per kilowatt-hour for electricity from geothermal energy plants that have an electricity capacity of up to 10 MW and go online by 2015. In addition, there has been a heating-use bonus of 3 cents per kilowatt-hour since 2009 when electricity generation is combined with high-quality provision of heating energy. A further bonus of 4 cents per kilowatt-hour is paid when electricity is generated using petrothermal technology, which is still in its development stages.

The system of legally stipulated feed-in tariffs first introduced in 1990 has led to successful market entries of wind, solar and biomass plants, exceeding the original targets and expectations of politicians in all cases. It was thus possible to continuously reduce the feed-in tariffs for these systems.

The feed-in tariffs for geothermal power, which have only been valid since 2000, have not yet fulfilled expectations. For this reason, the tariffs were increased in 2004 and 2009. In contrast to other renewable energy sources, the high capital costs and the drilling and exploration risks for geothermal plants represent a barrier to investment which has obviously not yet been balanced out by the feed-in tariffs. It remains to be seen whether the feed-in tariffs which were recently increased in 2009 will lead to the targeted breakthrough.

This will also depend on how the two geothermal power plants in Landau and Unterhaching which began operation in 2007 perform, and on how other projects currently in construction will develop. So far, the continued interest in mining claims, which are a prerequisite for developing a project, confirms the ongoing interest in geothermal power generation.

3. RENEWABLE ENERGY HEAT ACT (EEWAERMEG)

One of the most important potentials for preventing climate change is decreasing the heat requirement of buildings and providing renewable energy heat for buildings.

However, incentives for building developers and building owners to use renewable energy sources are often insufficient, as they generally must pay the usually higher initial investments themselves and immediately, while high current energy costs are a long-term effect and often payable by others, e.g. purchasers or tenants. The higher initial investments may apply not only to the power generating system itself, but also to the entire heating system (low temperature heating). District heating requires investments in the infrastructure. Calls by politicians for increased renewable energy heating of buildings thus always meet considerable resistance from building owners.

3.1 How the EEWaermeG Works

The Renewable Energy Heat Act (EEWaermeG), which took effect in 2009, is a first step towards utilising the potential offered by the use of renewable energy sources to heat buildings. It obliges building developers to source a minimum percentage of the energy requirement for heating and hot water from renewable energy sources.

The minimum percentages for each type of energy are set down in law such that no particular technology is favoured. The minimum percentage can also be achieved by combining different types of energy. Particularly efficient thermal insulation can also be used as an alternative.

The obligation can be fulfilled using decentralised systems for the building in question as well as central systems for multiple buildings or an entire building area (district heating).

The obligations of the EEWaermeG only apply for new buildings. However, the German federal states can also oblige the owners of existing buildings to use renewable energy sources. For example, a regulation in Baden-Wuerttemberg requires that at least 10°% of the heat requirement must be supplied via renewable energy sources when the heating system in an existing building is replaced.

3.2 Geothermal Energy

Shallow geothermal systems meet the obligations if at least half of the heat energy requirement is generated by a sufficiently efficient heat pump. If half of the heat energy of a district heating system is obtained from deep geothermal sources, district heat supply fulfils the legal obligations, too.

It is too early to evaluate whether the EEWaermeG promotes further development of geothermal energy. It also remains to be seen whether it leads primarily to the use of individual shallow systems, to what extent it supports classic centrally sourced district heating networks which can be supplied with geothermal heat, or whether it leads to an increased development of local supply networks which are supplied via multiple decentralised sources. In any case, the law will facilitate the implementation of geothermal energy use which had already been taken into consideration.

4. MARKET INCENTIVE PROGRAMME (MAP)

EEG and EEWaermeG are intended to increase the utilisation of renewable energy sources without state subsidies. Where this is unsuccessful, or politically non-implementable, the state shall provide supplementary financial support to aid the market introduction of renewable energy sources.

The measures are grouped in a so-called Market Incentive Programme (MAP) which consists of multiple modules tailored for each type of renewable energy and specific use aspects. It is established in Directives of the Federal Ministry for the Environment on the Promotion of Measures for the Utilisation of Renewable Energies in the Heat Market. These directives are adjusted on an annual basis. Where appropriate, gradual decreases in the subsidy levels are implemented. The MAP is now also legally grounded in the EEWaermeG.

4.1 Deep Geothermal Energy

The MAP contains three different modules for promoting deep geothermal energy.

Pure geothermal heat generating systems are eligible for a repayment subsidy of up to € 2 million for construction and expansion, and up to € 2.5 million per borehole. Systems which also generate electricity, or which generate electricity only, are excluded because they are seen as sufficiently subsidised via the feed-in tariffs as laid out in the EEG (see 2. above). Thus the MAP incentives take the place of the EEG subsidies for pure geothermal heating stations.

The drilling and exploration risks can be covered both for electricity generation systems and for pure thermal use. Deep boreholes with special technical drilling risks may be granted a repayment subsidy of 50% of the additional expenses above the planned figures, max. € 1.25 million.

In order to cover the exploration risk, a new, separate credit programme has been on offer since February 2009. The operator receives a loan to finance up to 80 % of the drilling costs. If previously defined yields are not reached, the he is released from repaying the loan. The subsidy module was developed in cooperation of the German Federal Ministry for the Environment with the insurance industry.

Guarantees for drilling and exploration risks are subject to strict application conditions and comprehensive audits of individual cases. The exploration risk is evaluated by independent experts, and the overall economic viability of the project is examined before granting the loan.

A further subsidy module is the promotion of district heating infrastructure, which is supplied with heat from renewable energy sources. Subsidies of up to € 1.5 million can be awarded for infrastructures powered by geothermal energy.

The funds are applied for via the respective principal bank and awarded by the state Reconstruction Loan Corporation (Kreditanstalt für Wiederaufbau, www.kfw.de).

The extent to which these funding measures, some of which are very new, are availed of cannot be evaluated with certainty yet. According to an overview by the Federal Ministry for the Environment (BMU), no loans for geothermal plants or boreholes were approved between January 2008 and April 2009; however, a significant amount was approved for district heating infrastructure (approx. € 80 million between September 2008 and April 2009) (BMU 2009b).

4.2 Shallow Geothermal Energy

The use of shallow geothermal energy is also promoted via a specific MAP module. Subsidies of up to € 1,500 per residential unit are available for new buildings, and up to € 3,000 per residential unit in existing buildings. Additional bonuses are paid for particularly efficient buildings, for combination with a solar collector system and for particularly efficient systems. The funds are awarded as an investment subsidy by a federal authority (www.bafa.de).

As a result of the obligation to use renewable energy sources in new buildings under the EEWaermeG, the subsidies for new buildings have been reduced. Under the EEWaermeG, only measures which go beyond the minimum requirements of the EEWaermeG are eligible for funding.

5. OUTLOOK

The development of use of electricity and heat from deep geothermal energy sources has not met the expectations during the last years. For this reason, significant additional incentives were provided, most recently in 2009 by increasing the feed-in tariffs under the EEG and the guarantees for drilling and exploration risks in the MAP. However, only practical application will reveal whether and with which economic success the currently planned projects can be implemented. New challenges include the finance crisis and potential use competition with carbon capture and storage (CCS), the extent and importance of which cannot yet be evaluated with certainty. Irrespective of this, the development of CCS technologies in Germany and Europe pushed on by great financial and regulatory efforts shows the forces that could be mobilised for geothermal energy if it had greater backing in the energy industry.

At first glance, the promotion of shallow geothermal energy appears to be fully effective. However, one of the greatest potentials for protecting the climate is the replacement of heat supply to buildings based on fossil fuels with renewable energy sources such as geothermal energy. Additional efforts are required, whether by increasing obligations of those who cause pollution, or via state subsidies. Geothermal energy must prove itself as an efficient and cost-effective energy source compared with other renewable energy sources.

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