Energy Policy 59 (2013) 71–81

Contents lists available at SciVerse ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

The assessment of the regulatory and support framework for domestic buildings in Germany from the perspective of long-term climate protection targets

Veit Bürger*

Öko-Institut e.V., Merzhauser Straße 173, DE-79100 Freiburg, Germany

HIGHLIGHTS

- Analysis of the German building policies against modelled long-term development needs.
- Current regulations and support measures not sufficient for achieving 2050 climate targets.
- Regulatory requirements need to be tightened, financial support to be enhanced.
- Long investment cycles found in the building sector require immediate action.

ARTICLE INFO

Article history:
Received 19 December 2010
Accepted 8 June 2012
Available online 6 July 2012

Keywords:
Buildings standards
Renewable heat policy
Support instruments

ABSTRACT

In order to limit global warming to 2 °C, industrialised countries like Germany are obliged to de-carbonise their energy systems extensively by the middle of the century. The building sector – particularly the building stock – plays a pivotal role in the long-term climate protection strategies for Germany. Key control variables in this context are building standards, heat supply technologies and the sector allocation of limited renewable energy potentials. Based on existing normative long-term scenarios for the heating sector and using the residential building sector as a case study, this article assesses the current German policy framework for the building sector against the modelled long-term development needs.

1. Introduction

In climate research there is a general consensus that an increase in the global average temperature to 2 °C above pre-industrial levels would have a radical and irreversible impact on nature and society. For this reason many countries have made the two degree target a general condition of their climate policy. The German federal government has also made the two degree target the official target of its climate policy.

To fulfil the two degree target it is necessary to reduce global anthropogenic greenhouse gas emissions (hereafter GHG emissions) radically. According to calculations made by the German Advisory Council on Global Change for the German government on the basis of Meinshausen et al. (2009), only a maximum of approx. 750 bn t CO_2 can be released globally into the atmosphere between 2010 and 2050 if the 2 degree target is to be met with a probability of 67% (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU), 2009). If this emission budget is distributed fairly amongst the world's population (budget approach), Germany has a remaining carbon budget of approx. 9 bn t up to 2050. This budget has to be seen in relation to annual emission levels of approx. 0.9 bn t CO_2 in Germany.

Industrialised countries like Germany will therefore have to decarbonise their energy systems substantially by the middle of the century. This also holds for the heating sector and, more specifically, for the building sector. Approx. 40% of the final energy demand in Germany originates from space heating and hot water supply, mainly in residential and non-residential buildings. Although the efficiency of buildings has been addressed by a number of regulatory and support measures in Germany in recent decades, there has been no significant reduction in GHG emissions in this sector (Graichen et al., 2011). Long-term climate protection scenarios which aim to show the transformation of the German energy sector under the normative target of an 80–95% reduction in GHG emissions demand in unison a drastic reduction in emissions in the building sector at the same time.

This paper aims to align the development paths and needs which can be derived from the long-term decarbonisation scenarios for the

* Tel.: +49 761 4529559; fax: +49 761 4529588.
E-mail address: v.buerger@oeko.de

0301-4215/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.enpol.2012.06.017

German building sector with the regulatory and support framework to which the building sector is currently subject. In the first section both some current development trends in the German building sector and an overview of the current regulatory and support framework are presented. This is followed by the presentation of three current climate protection scenarios which develop different transformation paths for the German energy system under the normative target of a radical reduction in GHG emissions. The analysis will concentrate on whether and to what extent robust development trends for the transformation of the building sector can be identified and in which areas there are uncertainties. In a third step requirements arising for future policy instruments and measures for the German building sector are derived from these future visions. In the final section the current, sector-related regulatory and support frameworks are assessed against the long-term requirements of instrument development.

The primary focus of the analysis is on the space heating and domestic hot water supply in residential buildings in Germany. Both the power consumption of buildings (apart from that for space heating and hot water supply) and the whole non-residential building sector in Germany will not be discussed in more detail. However, as regards the latter, most development trends and statements on necessary policy interventions can be carried over more or less in their exact design from the residential building sector.

2. Background

2.1. Development of the building sector in Germany

In 2009 the approx. 82 million inhabitants of Germany are dispersed among approx. 40 million private households (Statistisches Bundesamt (Destatis), 2010a). These households lived in turn in approx. 18 million residential buildings. The total living space amounted to approx. 3.5 billion m^2. In the last 10 years the number of residential buildings and the absolute living space both increased to approx. 7.3%. The specific living space increased in the same period from 39.5 to 42.5 m^2 per inhabitant (Statistisches Bundesamt (Destatis), 2010b).

Approx. 70% of all residential buildings in Germany were constructed before 1978, i.e. prior to the first German Ordinance on Thermal Insulation (*Wärmeschutzverordnung*) (Statistisches Bundesamt (Destatis), 2008). The buildings – which have not been subject to energy rehabilitation since then – reflect the lack of thermal insulation requirements enforced at that time (see Figure 1).

In 2008 more than half of the private households in Germany (57%) lived in rented properties. Germany has the residential market with the lowest rate of home ownership within the EU. Both the rate of home ownership and the absolute number of owner-occupied households increase with the age of the occupants. In the case of private households in Germany the rate of home ownership is greatest (53%) when the principal income earner is between 60 and 64 years old (in comparison: the ownership rate is only 30% for 30–39 year-olds). In the case of approx. 15% of all owner-occupied flats in Germany, the owner is older than 65 years-old (Statistisches Bundesamt (Destatis), 2008).

The average thermal final energy consumption (space heating and domestic hot water supply) of the residential building stock can be estimated based on data taken from the German energy balance for 2007 at approx. 160 kWh/m^2a related to squared metres of living space. Data collected according to a bottom-up approach (890,000 buildings) specifies a value of approx. 170 kWh/m^2a for 2009 (2007: 181 kWh/m^2a) (CO2-online 2010). Due to energy rehabilitation measures, specific thermal energy consumption has steadily decreased in Germany in recent years. However, while it was possible to reduce the specific thermal energy consumption by approx. 17% between 1998 and 2008 living space in Germany increased by 10% within the same period. In spite of the partial success of policy interventions aimed at reducing specific thermal energy consumption in Germany, the corresponding efficiency gains were partly compensated by growth in living space.

There is also a substantial need for the modernisation of heating systems. Approx. 40% of gas-fired boilers and 45% of oil-fired boilers in Germany are older than 15 years and thus not

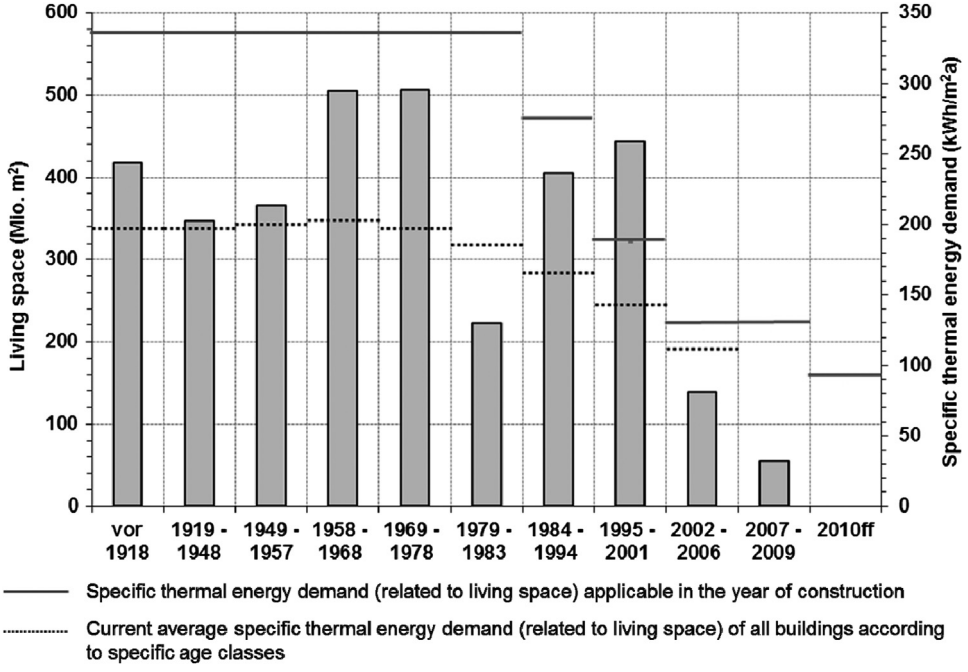

Fig. 1. Distribution of living space area and building standards according to specific age classes.
Source: Statistisches Bundesamt (Destatis) (2008).