



Programme Area: Smart Systems and Heat

Project: Value Management

Title: Overcoming barriers to smarter heat solutions in UK homes - Annexe 1c:
Energy efficiency and low-carbon heating in Germany

Abstract:

This document was prepared at the time to contribute to ETI internal thinking and planning only.

Context:

This project studied how value can be delivered across a smart energy value chain - in the context of the UK. It built a clear understanding of how smart energy systems can deliver combined consumer value alongside commercial value for market participants - producers, suppliers, distributors. The analysis will help to make the commercial deployment of smart energy systems more likely. This £600,000 project was delivered by Frontier Economics, a leading economic consultancy.

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Overcoming barriers to smarter heat solutions in UK homes

Annexe 1c: Energy efficiency and low-carbon heating in Germany

PREPARED FOR THE ETI

March 2015

1 Energy efficiency and low-carbon heating in Germany

Germany is a world leader in energy efficiency, including low-carbon heating. Germany is one of the few countries in the world whose rate of primary as well as end user energy consumption has been falling for years despite increased economic output.¹

Uptake of low-carbon heating interventions is strong in Germany. In Germany, about 20% of annual sales of heating appliances today are low carbon technologies, compared to only about 2% of low carbon heating appliances in the UK.²

In 2009 more than 75% of the German housing stock had insulated roofs or ceilings, 42% insulated exterior walls, and 4% triple-glazed windows.³

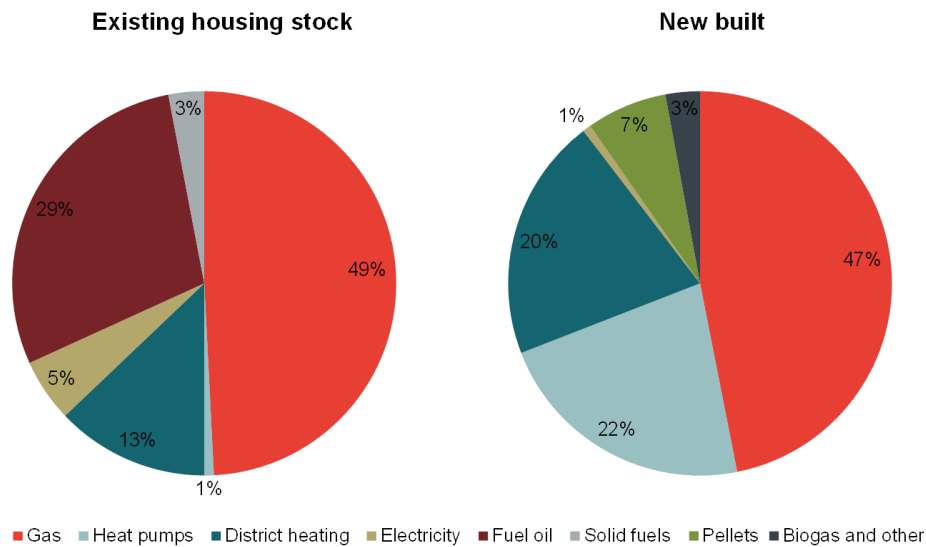
Germany also has a pioneering role for smart home solutions with an annual growth of 13% between 2009 and 2011. 50% of the European market volume is generated in Germany.

Figure 1 displays the shares of different heating technologies in the existing housing stock as well as in newly built properties in Germany in 2013. The regulatory framework has led to a considerable uptake especially of heat pumps and of district heating in new builds. Every new building in Germany must be constructed to high energy standards (see section 1.1.2 below), but energy-retrofitting of buildings is not mandatory by law (only if the owner decides to renovate the building).

¹ As in many countries decreasing primary energy consumption is partly caused by an increase in renewable generation.

² See delta-ee (2014).

³ Compare Bremer Energie Institut and Institut Wohnen und Umwelt (2010).

Figure 1. Heating shares by technology in Germany (2013)

Source: Frontier based on BDEW numbers

The category “Biogas and other” of newly built also includes a 0.7% share of fuel oil.

1.1.1 Key drivers of high uptake in Germany

Policy measures and instruments are a key driver of the comparably high uptake of energy efficient and low carbon systems in Germany. Building regulations mandate adoption of lower carbon heating solutions and of thermal insulation in newly built properties in Germany. Various other policy measures also support voluntary uptake, such as funding as set out in the National Energy Efficiency Action Plan.

Policy in Germany also supports certain heating technologies by “indirect subsidies”. If customers decide for instance to install a heat pump in their newly built property they have to fulfil less strict insulation measures than with conventional gas heating. Electricity tariffs for consumers with heat pumps are also less expensive than general electricity tariffs for households. Similarly, combined installation of gas heating with solar thermal energy in new builds is also promoted by less stringent insulation requirements.

Other drivers of uptake are high (residential) energy and fuel prices, replacement of old buildings and demographic changes followed by urban restructuring.

The promotion of cogeneration (combined heat and power) is another package of measures to increase energy efficiency. This also affects conditions for using local and district heating. High-efficiency CHP plants are exempted from energy

tax and there exist funding programmes for various types of investment.⁴ Revenues for CHP have also been improved by paying a surcharge for electricity generated from CHP and exempting locally generated electricity from the EEG allocation.⁵

The next sections set out an overview of policies in Germany that have led to high energy efficiency in Germany. We summarise the key policy instruments provided by government that promoted high uptake of low carbon heating solutions and supported retrofit and insulation.

1.1.2 Key policy measures

Political instruments and measures to increase energy efficiency have a huge impact on the development of energy consumption and energy efficiency alongside general political and economic conditions in a country. We now summarise the most important policy measures in terms of impact on insulation/retrofit and low carbon heating in the EU and in Germany.

EU level

On a European Union level, the new Energy Efficiency Directive (2012/27/EU) by the European Union entered into force on 4 December 2012 and establishes a common framework of measures for the promotion of energy efficiency for all Member States. The Union's target is a reduction of primary energy consumption of 20% by 2020 and mandatory energy savings for the Member States of 1.5% on average per year between 2014 and 2020.⁶ The Directive included further cross-sectional provisions to increase energy efficiency at European level to be transposed into national law by 5 June 2014.

In line with the Energy Efficiency Directive, each Member State has to submit a National Energy Efficiency Action Plan (NEEAP) which documents the efforts made and progress achieved in the past few years. The three consecutive NEEAPs in Germany were published in 2007, 2011 and 2014:

- The first German NEEAP (2007) was created in the context of obligations arising from the EU directive on end-use efficiency. The NEEAP (2007) formulates precise national energy saving targets (intermediate and final targets) and strategies to achieve these targets.

⁴ E.g. Kreditanstalt für Wiederaufbau (KfW) programmes.

⁵ Combined Heat and Power Act (2002).

⁶ EU Energy Efficiency Directive (2012/27/EU), Article 7 "Energy Efficiency Obligation Systems".

- The second German NEEAP (2011) shows that Germany exceeds the indicative end-use energy saving target of the EU directive of 9%. Another focus of the report is the state of the market for energy services in Germany.
- The third NEEAP (2014) describes the essential existing instruments and measures to increase energy efficiency and to save energy in Germany. The report also covers an assessment of the development of energy consumption in Germany by 2020.

Germany

Since the 1980s (even before the EU Energy Efficiency Directive was adopted) Germany has implemented a wide range of instruments for increasing energy efficiency and is one of the few industrialised countries that have achieved a decoupling of energy consumption and economic growth.⁷

Germany has a large number of instruments with a special focus on regulatory measures and funding. It is among the countries with the largest number of instruments with regard to consumer information, increasing transparency and the elimination of lack of information. Germany has focused on a large number of specific instruments that are adapted for each individual consumption sector and some measures even exceed EU regulations (e.g. Energy Saving Ordinance, see next section).⁸

Prioritised instruments and measures have already been emphasized in the first NEEAP (2007):⁹

- accelerate the development of massive potential energy savings in the building sector (particularly in residential buildings);
- promote energy-efficient technologies for heating and insulation of buildings; and
- increase the pace of innovation for new buildings and energy refurbishment.

The goal is to decrease energy consumption in buildings by 80% by 2050.

Cost-effectiveness needs to be taken into consideration while achieving energy savings. Therefore, state initiatives and activities aimed at reducing energy consumption continue to concentrate on those areas where economically viable

⁷ NEEAP (2014).

⁸ dena/Frontier (2012).

⁹ NEEAP (2007).

potential energy savings have not yet been exploited for the purpose of achieving targets in a cost-effective manner.¹⁰

We now consider key energy policy measures for private households in Germany separately for mandating, incentivising, and enabling policies.

Mandating – the role of the Energy Saving Ordinance

Germany has several acts and ordinances that promote energy efficiency. In the private building and heating sector the most important ordinance is the Energy Saving Ordinance. The Energy Saving Ordinance regulates the minimum energy standards that new buildings and existing buildings undergoing large-scale modernisation must meet. The purpose of the Energy Saving Ordinance is the limitation of energy consumption of new buildings and refurbishment requirements for existing buildings.

The Energy Saving Ordinance has been in place since February 2002 and its latest amendment took place in 2014, introducing tighter standards. The key element of the revision is a one-off 25% increase in the energy efficiency requirements for new builds from 1 January 2016. The Energy Saving Ordinance arose from the union of the Heat Systems Ordinance (introduced in 1978) and the Thermal Insulation Ordinance (introduced in 1977).

If customers build a new property, there is an allowed maximum annual primary energy consumption for the new building according to the Energy Saving Ordinance (e.g. the energy consumption for heating, water heating, ventilation and cooling). The requirements and the procedure for calculating the valid threshold for a specific building is set out in the Energy Saving Ordinance. It considers how much primary energy is consumed, and also what energy sources are used (renewable energies have a more positive influence on the primary energy balance than fuel oil, gas or electricity). Thus, the Energy Saving Ordinance assesses each building as a whole (i.e. assesses the total outcome of a building) by combining building and technical requirements. This approach allows poor thermal insulation to be compensated with an efficient heating system and vice versa.¹¹

Incentives – the role of KfW funding

Germany's energy policy sets numerous incentives to increase energy efficiency. Our focus is on government funding programmes for private buildings as they

¹⁰ Potential energy savings might have not yet been exploited due to existing market constraints such as scarcity of capital, investment risks, lack of information or excessive transaction costs. The policy measures target those areas.

¹¹ This is approach leads to “indirect subsidies” of certain heating technologies if end customers want to save money on insulation matters.

have a huge impact on energy savings in private buildings. For more information on heat pump funding we refer to Box 1 at the end of this section.

The German funding programme is meant to mobilise the most cost-effective potential efficiencies. There have been numerous state, regional and municipal funding programmes in place for many years. The Federal Government provides funding for “onsite consultation” and the energy upgrade measures under the “Energy-efficient Retrofits” programme conducted by the Kreditanstalt für Wiederaufbau (KfW)¹², Germany’s government-owned development bank. The programme offers building owners financial support in the form of grants or loans.

The KfW funding programmes for energy-efficient construction and renovation established under the CO₂ building renovation programme support:

- comprehensive renovation work on the existing stock and new builds to ‘KfW-Effizienzhaus’ standards; and
- energy-efficient individual measures to increase energy efficiency and savings.

The funding takes the form of low-interest loans, repayment grants or investment grants, particularly for owner-occupiers.¹³ For this, EUR 1.5 billion a year have been provided by the Energy and Climate Fund. From 2013 onwards, the German Government also established an additional programme of grants totalling EUR 300 million to supplement the existing CO₂ building renovation programme over an eight-year period.¹⁴

There have been various KfW programmes in place regarding building refurbishment, housing modernisation and energy-efficient construction and renovation. The KfW has been providing long-term, low-interest loans and funding programmes for measures in recent years like:

- extensive refurbishment with the aim of reducing CO₂ and saving energy in old buildings; and

¹² Kreditanstalt für Wiederaufbau means Reconstruction Credit Institute.

¹³ For instance, current conditions of the Energy Efficient Refurbishment credit are a reduced interest rate during the first 10 years of the loan term and part of the loan debt is cancelled after proof of refurbishment of a so called KfW Efficiency House (which involves even more ambitious standards with regards to energy consumption than required by the Energy Saving Ordinance). The interest rate currently amounts to a 1.00% annual percentage rate of charge up to 75,000 Euro for a KfW Efficiency House per residential unit (or 50,000 Euro respectively for single measures like insulation, new windows and others). See website (18th of November 2014):

[https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestandsimmobilien/Finanzierungsangebote/Energieeffizient-Sanieren-Kredit-\(151-152\)/](https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestandsimmobilien/Finanzierungsangebote/Energieeffizient-Sanieren-Kredit-(151-152)/)

¹⁴ NEEAP 2014, p. 52.

- various measures for housing modernisation and refurbishment.

The federal CO₂ building renovation programme – along with the KfW programmes for energy-efficient building and renovation which provides loans and grants in the residential area – is the highest volume funding instrument in Germany.

- Between 2006 and March 2014 the KfW initiated investments of about 162 billion EUR on behalf of the government. The funds were used to renovate more than 3.5 million homes or to build particularly energy-efficient new homes and to renovate over 1,940 buildings for municipal or social bodies.¹⁵
- Between 2006 and 2011 the KfW funding amounted to 7.8 billion EUR.

Box 1: Example – funding of heat pumps by BAFA¹⁶

One driver for the high uptake of heat pumps in Germany is funding of heat pumps. The Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)) provides funding of heat pumps which fulfil certain energy efficiency conditions.

- **Base funding:** funding of between 1,300 Euro to more than 2,800 Euro (depending on kW and technology of the heat pump).
- **Bonus funding:** bonus for additional solar thermal system of 500 Euro.
- **Efficiency bonus:** if the heat pump is used in a particularly efficient insulated residential building an extra efficiency bonus might be provided.

Enabling

The Federal Ministry of Economics and Technology emphasizes the interplay between information, advice and support coupled with a necessary but reasonable degree of regulation. As set out above Germany has a leading role in providing a variety of measures to increase awareness of and therefore energy efficiency through information and advice, including the various programmes run by the Federal Government in the field of energy consulting.¹⁷

¹⁵ NEEAP 2014, p. 24.

¹⁶ Federal Office for Economic Affairs and Export Control website as of 18th of November 2014:
http://www.bafa.de/bafa/de/energie/erneuerbare_energien/waermepumpen/

¹⁷ NEEAP 2014 and dena/Frontier.

Energy consulting services are a very diverse market with different players and types of consultation. The available energy consultations services cover a broad range of measures such as:

- on-site energy consultations in buildings,
- issuing of building energy certificates (high volume),
- detailed energy advice provided on-site over one or more days and
- creation of complex energy concepts.¹⁸

¹⁸ NEEAP 2014.

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