

Financing Energy Efficiency in Buildings – The German Experience

Background dossier on KfW's promotional activities

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I. Background

Common market failures and barriers in building energy efficiency

Improving energy efficiency is key to mitigating climate change and maintaining energy security. Yet despite the high relevance of energy efficiency there is a lack of investments due to market failures and barriers that have to be overcome.

a. Financial barriers

Energy efficiency is often not a major concern for consumers or firms because energy costs are relatively low compared to many other cost factors (such as labour costs). For example, in a high-quality office building in Germany, heating and electricity make up less than 5% of the total operating cost of the building, including rent and maintenance (about €1.1 of out of every €23.3 spent). Consequently, there is little incentive to invest in energy efficiency improvements.

There are also many examples of split incentives or principal-agent problems in the building sector, where the decision maker may be (partially) detached from the price signals. The most visible example is in rental markets, where building owners are responsible for investment decisions but tenants pay the energy bills. Misplaced incentives are also found in new-construction markets, where decisions about building design and features are made by people who are not responsible for paying the energy bills, such as architects, builders, and contractors.

Furthermore, energy market prices are usually too low since they do not reflect all environmental and social costs. The latter include the costs of pollution, greenhouse gas emissions, resource depletion or insecurity of energy supply.

In combination with the aforementioned the high level of initial investment costs represents a significant financial barrier to the use of energy efficient technologies, especially for private home owners. Many households have limited resources and limited access to credit, which restricts their ability to invest in energy efficiency measures. In addition, small businesses in particular might have insufficient capital or borrowing ability. Also, the relatively small size of energy-efficient projects compared to other investments increases the transaction costs related to energy efficiency projects.

b. Information and other barriers

Information failures also inhibit the deployment of energy efficient technologies. Consumers, vendors, manufacturers, banks and policy makers often have inadequate information about energy efficiency technologies and their costs and benefits. There are different forms of information obstacles: Asymmetric access, the mere lack of available information, and its highly technical nature. As a consequence, consumers and firms are frequently unaware of cost effective practices and technologies available to save energy. This is compounded by the fact that many actors in the building sector do not have adequate training and knowledge regarding energy efficiency issues.

There is also a high 'inconvenience' barrier linked to building renovation, especially for 'deep' renovations. This includes the 'cost' involved in preparing a project, obtaining permits and financing, finding contractors, supervising their work, possibly moving out during the renovation, etc. Finally, the energy efficiency market is diverse and covers a range of end-users, technologies and market sectors, which makes it complex to address these barriers.

Private investors sometimes have biased financial perceptions about initial costs and pay-back periods which disadvantage energy efficiency investments with long pay-back times. The information failure is also present in the financial sector. The absence of awareness and knowledge among financiers is still an important barrier to increased energy efficiency investments. So lending remains primarily asset-based and financial institutions are still cautious with cash-flow based lending. This extends to the receivers of funding, such as local or regional authorities, which often lack the knowledge, resources and capacity to plan viable energy efficiency projects.

Framework conditions in Germany

The German Government has declared the objective to reduce CO₂-emissions by 80 percent until 2050. At the moment, forty percent of primary energy in Germany are consumed by buildings. Hence improved energy efficiency in buildings is essential to achieve the objectives.

In the housing sector, there are basically four elements that are meant to make a contribution to the German CO₂ reduction goals and the new energy concept of the government. The first element is information and consulting, which helps to improve awareness as well as knowledge and propensity to invest in energy efficiency. The second element is regulation, which sets standards and gives a legal framework for investors. The third element refers to energy prices. We have seen over the last years that high energy prices are a very important economic stimulus to invest in energy efficiency and are thus highly relevant. The fourth and most important element is promotion. By offering financial support, the German Government aims to stimulate voluntary investments in insulation, modern appliances and use of renewable energy. Within the German climate action plan, half of the contributions to the CO₂ reduction targets are envisaged to be triggered through promotional measures.

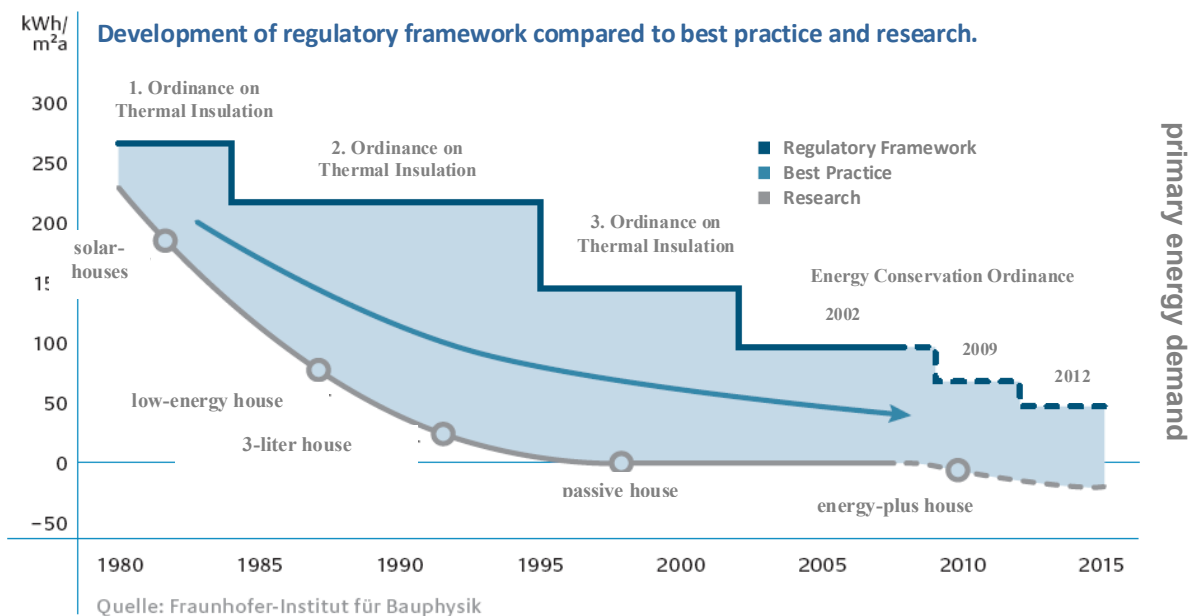


Figure 1: Development of Regulatory Framework

Promoting and regulating building energy efficiency has a strong tradition in Germany (see graphic above, upper line). With the oil crisis in the seventies the awareness grew that saving energy is a feasible option to reduce the dependency on oil imports. One result of this process was the first German ordinance on thermal insulation, which became effective in 1979. Today there are 39 million housing units in Germany. 29 million or 75% the building stock were built before 1979. So far,

9 million housing units have been rehabilitated. There is still a huge potential for rehabilitation of another 20 million units.

Today the key regulation within the housing sector is the “Energy Conservation Ordinance” (called EnEV). The EnEV defines the energy efficiency requirements for new and existing buildings and is setting the benchmark for KfW’s promotional criteria. To measure energy efficiency, two key criteria are set up within the EnEV. These are the primary energy demand and the specific transmission heat loss. The primary energy demand is the energy input - referring to the complete chain of supply - that is required for the heating of a building and for the supply of warm water. The specific transmission heat loss is, roughly speaking, a measurement parameter of quality of the thermal insulation of a building shell. The primary energy demand is the leading criterion. In Germany the absolute primary energy demand that is allowed for a new building according to EnEV depends upon the type of building. For example a range from 94 to 55 kWh per square meter and year is allowed for new buildings.

The regulations on energy efficiency provide the basis and framework for KfW’s EECR programme, described in part 2. The EECR programme both crucially depends on and is a prime example for KfW’s overall business model.

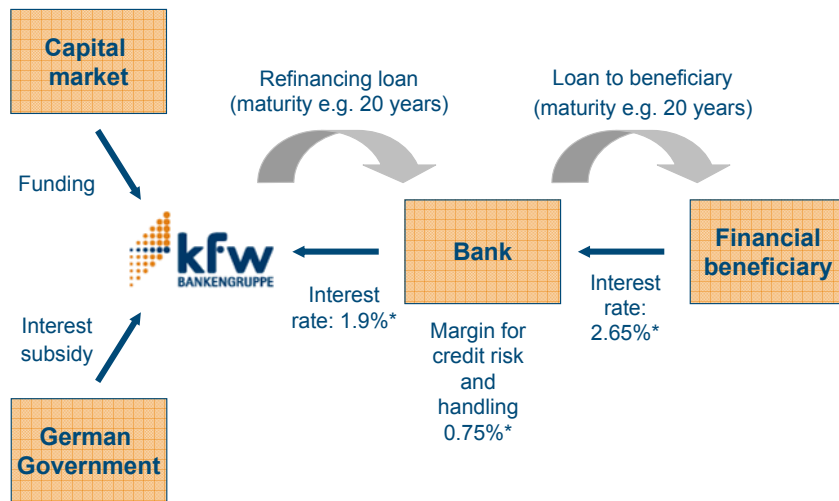
Basic information on KfW’s business model

a. Funding

KfW raises funds for its promotional activities via the capital markets. Due to a guarantee from the Federal Republic of Germany KfW has a AAA rating and an excellent refinancing capacity. This helps to minimize the costs of interest subsidies and secures the flow of capital necessary to operate promotional financing schemes with high volumes.

b. Distributional network

KfW has no distributional network of its own. The promotional loans are distributed via the branch network of the German banks (commercial banks, savings banks and cooperative banks). That mechanism is called “on-lending-system”. Within this system, the bank that has the business relationship with the beneficiary handles the credit application, takes the credit risk and concludes the credit agreement. There is no legal relationship between the final beneficiary and KfW. KfW itself assesses the eligibility criteria of the application and commits a refinancing loan to the on-lending bank that is widely identical to the loan agreement between the bank and the final beneficiary except for the interest rates. To ensure that the on-lending bank passes the very attractive interest rate (in some programmes below market level) to the investor, KfW’s refinancing rate plus a margin add up to a compulsory maximum interest rate that the on-lending bank is allowed to charge. With the on-lending-system KfW secures a broad distributional channel for its loans without having a branch network on its own.



* p.a. eff.

Figure 2: On-lending System

The interest rates above are only given as an example and do not correspond with actual rates.

II. KfW's promotional activities in energy efficiency

Approach and instruments

a. Information and consulting

As guidance for its promotional activities, KfW defined the “KfW-Efficiency House” standard, which is directly linked to the German regulatory framework, the EnEV. The standard benchmarks the primary energy demand of a house against the permissible energy efficiency level of new buildings according to the German building directive EnEV. For example, there is the “KfW-Efficiency House 55” (or KfW-EH55). The maximum primary energy demand of a “KfW-Efficiency House 55” is not allowed to exceed 55% of the demand allowed for a new building according to the EnEV. The smaller the number (e.g. KfW-EH85, KfW-EH40), the higher is the level of energy-efficiency.

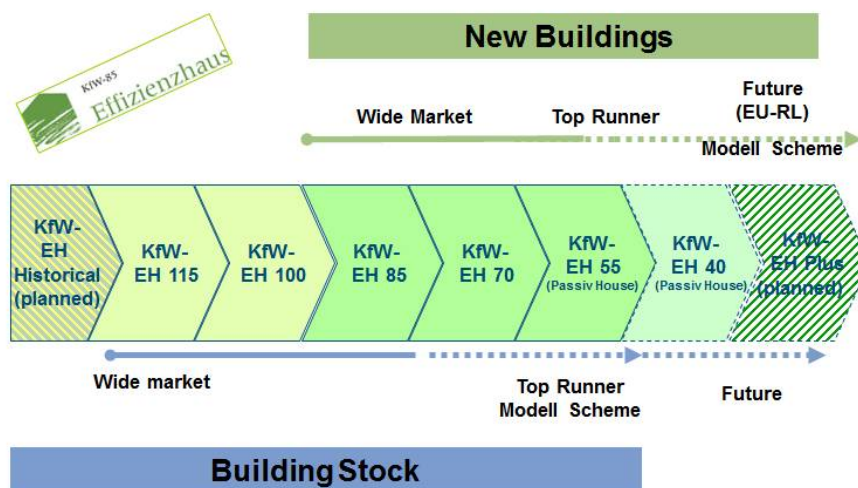


Figure 3: Promotional standards for new buildings and building stock

Besides primary energy demand and in line with the approach of the EnEV building directive, there is a second parameter of the efficiency house defining permissible transmission losses.

The “Efficiency House” label has been broadly accepted and has become a standard in the real estate market. KfW has also developed a quality assurance system providing information on the qualification of energy advisors.

Other activities comprise information campaigns, e.g. by publicising “KfW awards” for outstanding rehabilitation measures. Experiences from quality monitoring are not only being fed back into KfW's own operations, but also into the training of energy advisors and architects as well as to the developers of software tools accessing the energetic quality of buildings.

b. Structure of the Energy Efficient Construction and Rehabilitation (EECR) programme

The EECR is implemented by KfW on behalf of the German Federal Ministry of Construction and Urban Development. The objective of the EECR is to promote the implementation of energy efficiency in building construction and renovation on a voluntary basis and in the broad market.

In the EECR, KfW offers long-term loans with subsidized interest rates significantly below market level. All groups of investors can apply, since there are no predefined target groups within the eligibility criteria.

The component of EECR for new buildings promotes only houses that consume significantly less energy than the EnEV demands. The construction of a KfW-EH70, a KfW - EH55 and a KfW - EH40 standards will be promoted within the programme. To achieve those standards, innovative heating technologies based on renewable energies (such as solar, geothermal, biomass) and a very good thermal insulation are necessary. The additional costs caused by these investments compared to the minimum standard for a new building according to EnEV are covered with a promotional loan from KfW. The maximum loan amount is capped at EUR 50,000 per housing unit.

Energy Efficient Rehabilitation promotes rehabilitation to a level where an existing house does not reach or only slightly exceeds the specific energy requirement for a comparable new house according to EnEV. Therefore, rehabilitation to KfW-EH115, KfW-EH100, KfW-EH70, and KfW-EH55 standards are eligible for promotion through the programme. To achieve those standards, investors need an individual investment plan that has to be developed by involving an energy advisor. In order to meet the high energy standard of a KfW Efficiency House, extensive investments such as the renewal of heating systems, thermal insulation or new windows are usually required. KfW finances up to 100% of the investments referring to energy efficiency. The maximum loan amount is EUR 75,000 per housing unit. This amount is calculated to cover the complete rehabilitation costs on average.

If the planned KfW Efficiency House standard is achieved for the newly built or retrofitted house and this is confirmed to KfW by an energy advisor, KfW grants a partial debt relief on top of the below-market interest rate. Depending on the achieved level of energy efficiency, the outstanding debt is cut by a percentage ranging from 2.5% to 12.5% of the original principal. The principle of the programme is to sanction higher energy efficiency levels with better financial conditions.

Rehabilitation can also be done step-by-step. KfW offers promotion for a catalogue of single measures. These measures comprise thermal insulation of outer walls, the roof, storeys, refurbishment of windows, installation of a ventilation system and replacement of the heating system. KfW's energy efficiency requirement for each single measure is very ambitious and lies above the standard for the correspondent part required by EnEV. A specialised craftsman has to verify that the envisaged retrofitting measure fulfils KfW's requirements. These ambitious requirements secure a deep and sustainable retrofitting of the respective part of the building. Combining the single measures over the years to a comprehensive retrofitting of the building leads

in the end to a KfW-Efficiency House standard. That standard can be higher than the new building level according to EnEV. The maximum loan amount for single measures is EUR 50,000 per housing unit.

In any case of retrofitting, owners of single or semi family houses can opt for a grant instead of a loan. The grant is calculated as a percentage of the investment sum. Depending on the type of retrofitting, single measures or KfW-Efficiency House, and the achieved efficiency standard of the house, the grant can range from 2.5% to 17.5%. The underlying investment sum for the grant calculation is capped at EUR 50,000 for single measures or EUR 75,000 for the KfW-Efficiency House standard.

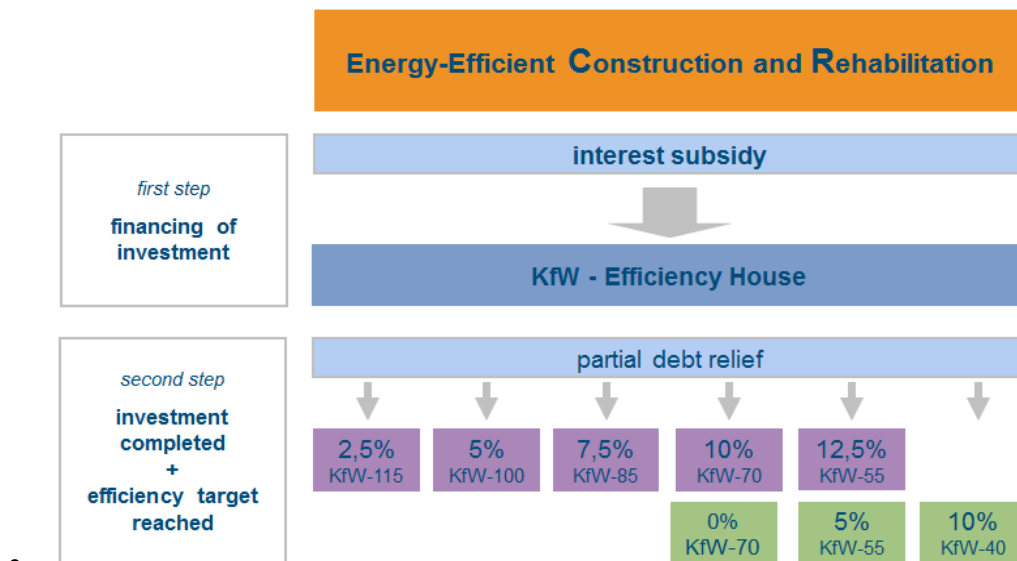


Figure 4: Energy efficiency and financing conditions in the EECR

c. EECR application process and funding

Before starting building or renovation activities, investors apply at their local bank for a KfW loan. The bank has to demand a certified statement of an energy advisor on the expected energetic level of the building after completion. After KfW has approved the proposal, the owner would start the implementation. As changes of concept or design during implementation are normal, a second assessment of an energy advisor is required after completion. For works that aim at higher efficiency levels, the use of specially certified advisors and the involvement of an advisor during implementation of the works are mandatory. Substantial attention is being paid by KfW to quality assurance. Loan applications are being screened on a plausibility basis, sample checks are being made on the energetic calculation by a KfW energy advisor, a system of ex-post spot-checks is in place. Also, a data base of energy advisors for demanding retrofit activities is being established.

Costs for the programme occur through interest subsidies, debt relief and grant. In the past those costs were funded through the federal budget. In future, costs will be covered by the Energy and Climate Fund, funded by the proceeds from carbone certificates and by power plant duties. The Government supported the programme in 2011 with EUR 934 million from the federal budget. However, research suggests that, in fact, those costs might be offset by additional tax income from the increase in economic activity (source tax).

Evaluation and lessons learnt

a. Impact

From 2001 to 2011 KfW's EECR programme has resulted in approximately 740,000 loans with a volume of roughly 45 billion Euros, reaching 2.1 m housing units under the EECR programme.

In 2010 alone, the programme has financed measures in 0.3 million flats (0.7 percent of the total stock) and has co-financed approximately 50 percent of all new houses. This indicates that most renovations in Germany are now being executed under consideration of substantial energetic aspects and more than half of all new residential buildings are being constructed at a level significantly better than the legally required standard. The programme's impact on economic activity was considerable. Total investments of some 18 billion Euros were triggered and 247,000 jobs secured. This also generated additional tax income. At the same time, measures financed in 2011 will save more than five hundred thousand tons of CO₂ emissions annually from now on. If the trend continues, by 2020 the programme alone will have accounted for half of the CO₂ emission reduction that the Government is targeting for the building/household sector.

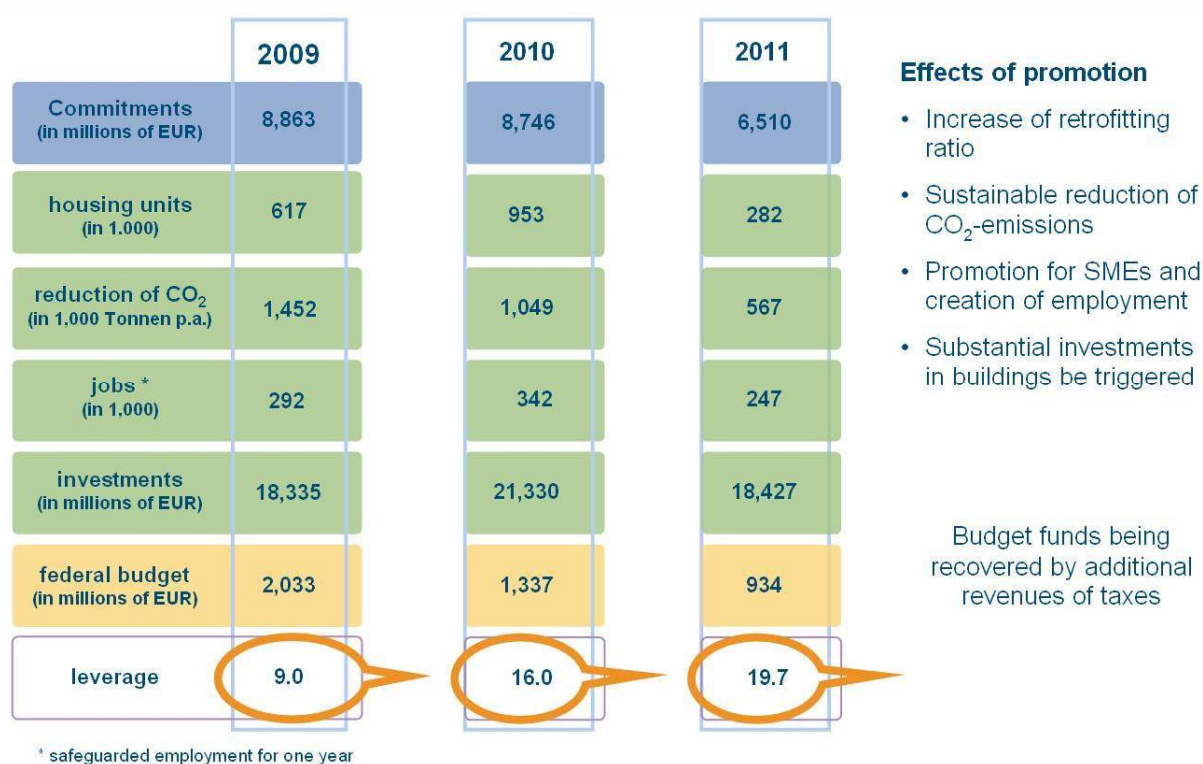


Figure 5: Effects of the EECR

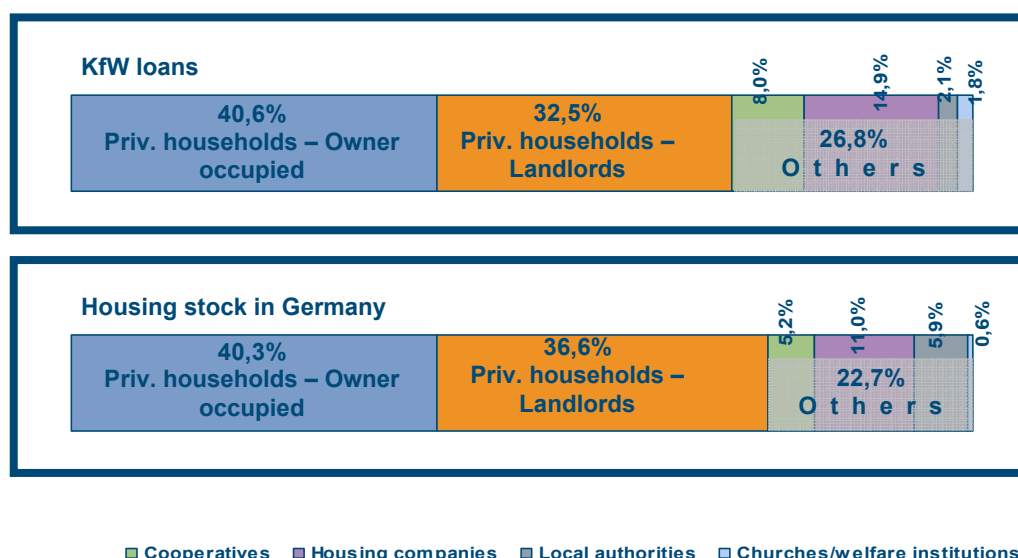
The promotion of energy efficiency in buildings through the EECR has had vast positive effects in Germany. In particular, the programme has produced a considerable stimulus to economic activity, while contributing strongly to climate protection targets. Research suggests that from a budgetary perspective, the programme has been highly efficient, if not cost neutral due to secondary effects.

The macroeconomic impacts of the EECR programme are evaluated on a yearly basis by an independent research institute ("Bremer Energieinstitut"). The reports are available in German language under www.kfw.de/evaluationen. It draws random samples of each year's commitments under the programme and calculates from these samples the amount of CO₂ emissions saved, investments triggered and jobs created. The evaluation shows that since 2006 the average CO₂ reduction accumulated to 7.7 Mio tons per year. In sum, the programme triggered investments of over 70 billion Euros. Accumulated savings in heating costs were EUR 1.5 billion Euros, contributing to a reduced dependency on fossil fuels. The success and effectiveness of the EECR

has also been internationally acknowledged, e.g. by the WWF. Recently, the Climate Policy Initiative has confirmed the relative effectiveness of the KfW approach, also compared to alternative approaches working with tax incentives.

b. Distribution

The programme is designed to reach all types of owners of the German building stock evenly. In order to examine the distribution among different owner types of the building stock, the shares of owner types in KfW's loan portfolio (commitments of the year 2009) were compared with the building stock in Germany in 2006 (depicted below). The share of private households with owner-occupied houses is almost the same in KfW's portfolio and the building stock. Private landlords are still slightly underrepresented in the KfW portfolio, but their share in the KfW portfolio increased significantly in 2009. Among the other owner types, cooperatives and housing companies have the biggest share. They are still somewhat overrepresented in the KfW portfolio but their share decreased in 2009. In sum, KfW's portfolio is almost a perfect mirror of the ownership structure of the German building stock, which indicates that there is no bias in the eligibility criteria of the programme. The comparison also shows that incentives within the existing programmes are sufficient to also attract housing companies.



The percentage values refer to housing units promoted by KfW's programme Energy Efficient Rehabilitation 2009 (loans and grants) and to the housing stock in Germany in 2006.

Figure 6: Distribution of KfW's loan portfolio among owner types

c. Lessons learnt / crucial success factors

The German EECR programme has been and will continue to be a crucial factor in the implementation of energy-efficiency practices in the German construction and housing sector. The programme provides the required marginal incentives for investors to go beyond the legally defined energy efficiency standards. By doing so, it prepares the ground for stricter energy efficiency regulation of the building sector. It also advances research and development of new energy-efficient technologies in the housing and construction sector, and does so cost-efficiently or even profitably for the German taxpayer.

In particular, five crucial factors can be identified:

1. The programme is not restricted to a special group of investors. This helps in generating significant broad-scale effects.

2. The programme has a strong focus on loans. It provides capital and promotional incentives for investors to adjust the energy efficiency performance of their investments in buildings.
3. The “KfW-Efficiency House” standard, which is closely linked to the regulatory framework, is perceived as a strong brand and transparent guide by investors. Moreover, it contributes significantly to making energy efficiency performance of buildings understandable and comparable within the German housing sector.
4. Higher energy efficiency is rewarded by better financial conditions. This stimulates investors to optimise their rehabilitation and construction plans and investments in terms of energy efficiency.
5. KfW’s on-lending system, in which the loans are allocated through well-established intermediaries, ensures a broad distributional network and broad-scale effects. At the same time, that distribution model ensures a cost-efficient handling of the low-interest loans programme.

Outlook

New promotional standards are about to be introduced. They comprise a programme specially targeted at historical buildings and a programme for the construction of houses which generate more primary energy and end energy than they consume (Efficiency House Plus). New promotional levels are field-tested by model schemes in cooperation with the German Energy Agency dena, where home owners receive special financial and technical support.

Other approaches in preparation or currently in implementation are focusing no longer on individual buildings, but on urban quarters. The goal is to achieve significant synergy effects or economies of scale. Promotion and implementation schemes are focussed on entire districts rather than individual buildings. They also include the supply side of energy systems like district or neighborhood heating systems and combined heat and power.