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ENERGY TRANSITION WITH ARCHITECTS –

FEDERAL CHAMBER OF GERMAN ARCHITECTS (BAK) STRATEGY FOR A CLIMATE-NEUTRAL BUILDING STOCK

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CONTENTS

Die Bundesarchitekten-kammer e.V. vertritt als Bundesgemeinschaft der Architektenkammern der Länder, Körperschaften des öffentlichen Rechts, die Architekten und Stadtplaner in Politik und Gesellschaft.

PREFACE

COMPLEX BUT REWARDING: HOLISTIC PLANNING OF THE ENERGY TRANSITION

The previous Federal Government was aware of the key role that the building sector plays in the energy transition and had formulated ambitious conservation targets. The building sector is expected to be climate neutral by 2050. The energy transition is rightly presented as a macrosocial task from which an entire range of challenges arises.

However, implementation is progressing very slowly. With a renovation rate of 0.7%, the building sector in Germany lags far behind the targets. If anything, the housing industry and municipal umbrella organisations are demanding a reduction of what they see as excessive energy standards, and the Buildings Energy Act got held up in the Cabinet. Noble intentions collapse in the face of reality: “All in all, the effects of the energy transition are viewed critically by the opinion leaders in the energy industry”, concludes a 2016 study conducted by KPMG.

What hinders legislators, municipalities, businesses and developers from translating such a positive task as the energy transition into practice? What leads to the fact that, depending on what interests may be at stake, the goal of sustainable climate protection is so fundamentally put at risk in favour of competing issues?

It is the complexity of the task; decision-making processes in planning and construction are already complex without targeting the energy transition and climate reversal in urban planning through a) new mobility concepts, b) the inclusion of urban sociology, c) citizen participation or d) the Smart City concept, or in building construction through a) enormous pressure on costs, b) adaptation to demographics and much more.

In an innovative knowledge-based society, we must insist that all these goals be achieved at the same time; however, our task is to render the resulting complexity manageable for the various stakeholders. Only then can incentives take effect. It is important not to limit ourselves to individual aspects, but rather to keep an eye on the overall requirements, necessary restrictions, opportunities and ideas. Architecture is the key to the socially,

ecologically and economically responsible and acceptable development of our constructed environment that makes it worth living in. Holistic thinking and planning are required for the necessary synthesis of architecture and energy policy. This is precisely where one of the core competences of architects lies.

This paper merges the positions of the German federal-state associations of architects into a common guideline. It raises open questions for discussion and presents proposals for action on how climate reversal can be spurred on in the building sector:

- By considering energy in tandem with the city, district, building stock and cultural landscape.
- Through the detailed consideration of planning instruments and the statutory framework.
- Through the macrosocial handling of the climate protection goals.

The Federal Chamber of Architects, as a representative of the federal-state chambers, would like to make a future-oriented, optimistic contribution to the debate on energy policy in Germany. This discussion is certain to be controversial and will require courageous decisions to be made in an environment fraught with tension and conflict

- between the macrosocial financing of climate protection, e.g. through a carbon tax, and individual interests,
- between fundamental obligations for the building stock in order to activate its potential and *laissez-faire*,
- between verification procedures in a more holistic approach involving life cycle assessment (ecobalance) and bureaucratisation,
- between coordinated energy consulting and industrial disputes over market share.

1. THE STATUS QUO

The term "energy transition" is generally perceived as the transition from nuclear and coal power to renewable energies. This is an understatement of the scope. Electricity counts for only one fifth of the final energy consumption in Germany. More than 50 percent of the final energy is used for generating heat1. The energy transition can only succeed if heat consumption is reduced, and the remaining demand is covered by renewable energies.

1.1 THERMAL ENERGY TRANSITION REQUIRES TRANSFORMATION OF THE EXISTING BUILDING STOCK

However, significant reductions in the heat demand can only be achieved in the building sector, as the proportion of room heating and water heating in buildings alone 2 accounts for 32 percent of total final energy consumption.

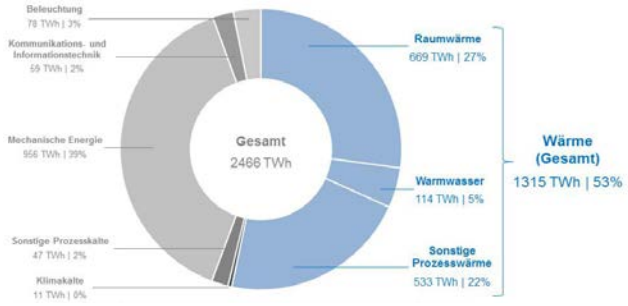


Figure 1: Proportion of final energy consumption in Germany attributed to thermal energy

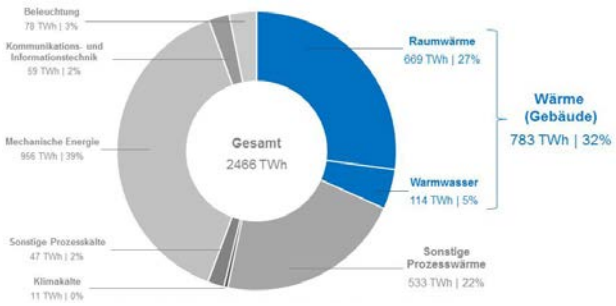


Figure 2: Proportion of final energy consumption attributed to thermal energy for buildings

Most of the building stock consumes too much energy. Approximately 64 percent of the residential buildings were3 built before the first thermal insulation ordinance of 1977, which was often unenforced, and are therefore often in poor energetic condition. In order to reach the climate protection

[1] AGEB, 2017 | Final energy is the energy obtained from primary energy sources such as lignite, anthracite, petroleum, natural gas, water or wind by conversion. The primary energy is converted into a form that the consumer can use, e.g. electricity, heat or fuels.

[2] UBA, 2015

[3] Destatis, 2013

targets, the federal government had formulated the requirement to make the building stock roughly climate-neutral by the year 2050. This necessitates increasing the energy efficiency of buildings. The energetic modernisation of existing buildings is one of the most difficult challenges. With 40.3 million flats 4in 18.4 million residential buildings and almost 3 million non-residential buildings5, compared to approximately 300,000 new housing units every year, the existing building stock is the decisive lever for achieving the climate protection targets.

[4] Destatis, 2017b

[5] BMVBS, 2013

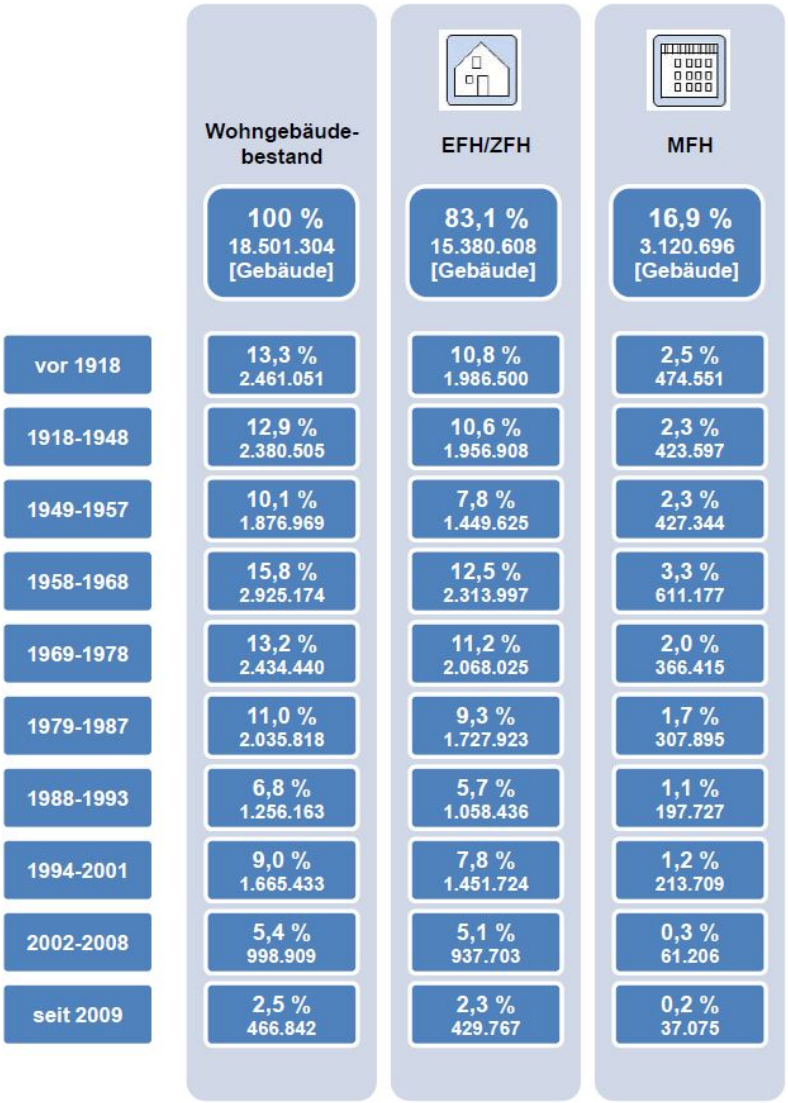
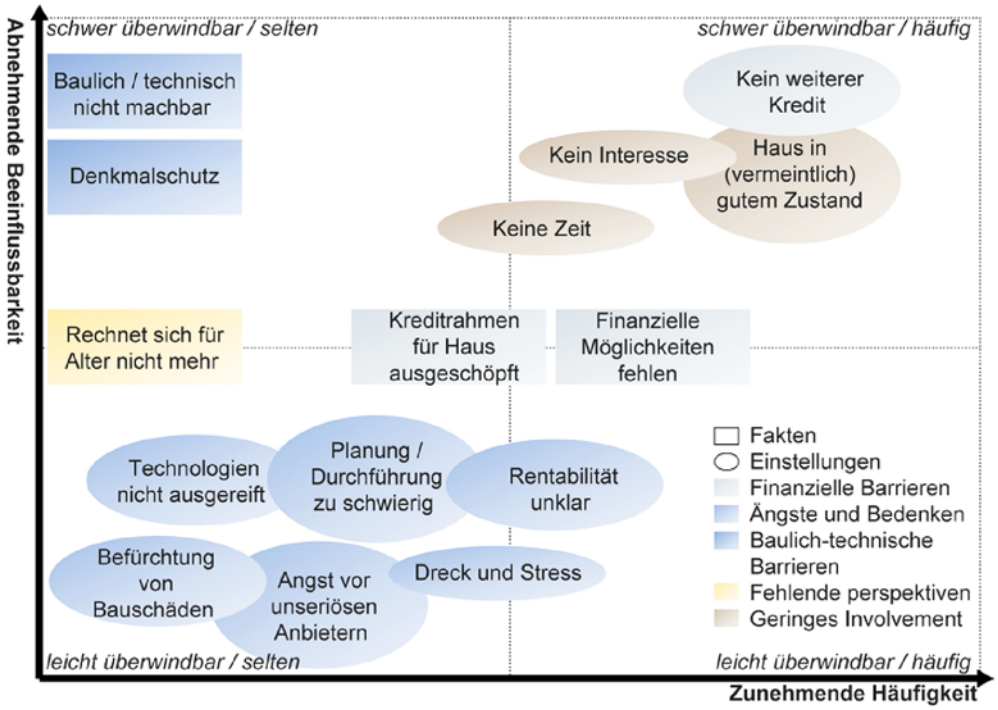


Figure 3: Composition of the German residential building stock *(Source: ARGE 2016)*

1.2. CAUSES OF STAGNATION OF THE ENERGY TRANSITION IN THE BUILDING SECTOR

The reasons why the energy transition has ground to a halt in the building sector are complex. It can hardly be attributed to technical feasibility. By now, a wide range of technically advanced solutions are available for the energy-efficient, low-carbon provision of room heat, hot water and thermal insulation. A fundamental impediment is the heterogeneous composition of the building sector. Exacting energy standards cannot be easily enforced

in existing buildings. The success of the energy transition is highly dependent on the willingness of the building owners to invest. However, for a variety of reasons, it is precisely this willingness that is deficient:



1.2.1 COSTS

In view of the high costs associated with comprehensive energetic rehabilitation, financial and economic considerations undoubtedly play an important role in such an investment decision, but they differ considerably depending on the type of owner, i.e. whether they are homeowners, condominium owners' associations, small private landlords, the housing industry or the operators of commercial or production facilities.

- *Homeowners* in the low to middle income brackets are not able to afford to invest heavily in energy-related renovations. In these cases, energetic rehabilitation will only be carried out if the building is being renovated anyway. For older homeowners in particular, the payback period for investments such as these is often too far in the future, and banks refuse to provide financing based on the age of the homeowners.
- In the case of *condominium owners' associations*, modernisation decisions can generally only be made by consensus. However, differences

in income and asset situations, age-related differences in planning horizons or different priorities make decision-making more difficult.

- *Small private landlords* run the risk that they will not be able to add enough of the investment costs for energy-efficient rehabilitation to the basic rent. They benefit only indirectly from the renovation through the increased value of the property. Conversely, increases in rental costs due to renovation work, which are not offset by savings in associated costs, represent an excessive financial burden for many tenants.
- The *housing industry* finds itself in the difficult situation of being financially overburdened by the demands for energy efficiency and renewable heating in regions with a low housing demand. In regions with a high demand for housing and correspondingly high rents, there is capital available for energy-efficient renovations. Often, however, an additional increase is not socially acceptable due to the already high rent level.

1.2.2 INFORMATION DEFICITS

Although the vast majority of homeowners have positive attitudes towards energy efficiency, many of them do not recognise the possibilities and benefits of energy-efficient renovation or are not convinced of its benefits. Subsidies and consultation services are often not taken into account. Renovation measures that are already needed in order to remedy acute damage are still used far too seldom as an opportunity for making buildings climate-friendly and energy-efficient.

1.2.3 RISK AVERSION

The information deficits are compounded by uncertainty and excessive demands. The complexity of the topic and the methodical difficulties in terms of determining the economic efficiency of renovation measures lead to a level of high risk aversion among building owners. They are often unsure of what kind of state funding will be available and the statutory framework with which they will be confronted in the future and therefore hesitate to implement even economically feasible rehabilitation measures.

1.2.4 MOTIVATION DEFICITS

Some aspects cannot be expressed in monetary terms. Comfort, health concerns or habits that have been ingrained for decades can give rise to reservations about new energy-efficient technologies. Some consumers prefer to rely on proven products and services, thereby delaying the market penetration of energy-saving solutions.

1.2.5 LEGAL HURDLES

Barriers to the energy-efficient renovation of buildings are inherent in *tenancy law*, particularly with regard to regulations on rent levels, to which the landlord-tenant dilemma is essentially attributable.

1.2.6 LOW ENERGY PRICES

High oil and gas prices constitute an important driver for investments in energy-saving buildings. Incentives for possible investments have been lost in recent years due to the trend towards falling prices for these fossil fuels, consequently stifling the replacement of oil-fuelled boilers with low-CO_2 heating systems. This trend is favoured by the change in the primary energy factor over recent years.

1.2.7 LOW INTEREST RATES

Germany has been experiencing a period of low interest rates for many years, and this is expected to continue in the coming years. The funding programmes aimed at reducing interest rates, for example KfW (Credit Institute for Reconstruction), scarcely exert any effective impetus on the renovation rate in an interest-rate environment such as this. The remaining financial benefits are further reduced by the increased and costly documentation required.

In view of the wide array of the obstacles described above, it becomes clear that there is no such thing as a "miracle instrument" in terms of policy for an energetic yet architecturally compatible transformation of the building stock, even with a fundamental system change. Nonetheless, individual sets of measures that should be considered from the perspective of the

Federal Chamber of Architects (BAK) in the forthcoming energy policy decisions are emerging.

2. PROGRAMMATIC REQUIREMENTS FOR THE ENERGY TRANSITION

2.1 RECONCILING ENERGY POLICY AND ARCHITECTURE

It is certain that the energy transition will change the appearance of our towns and villages, the landscape and the character of regions in the coming years. What is uncertain, however, is the nature of the changes. This will depend significantly on the relationship between architecture and the energy transition, i.e. whether they affect one another as incompatible antipodes or whether they benefit from each other symbiotically. The energetic retrofitting of the stock does not necessarily mean that our cities and communities will disappear behind a wall of insulating materials. Architecture can evolve, if investing in alternative building materials and processes, as well as initiating research and pilot projects that use culturally compatible methods for taking the necessary steps to reduce emissions are seen as advantages. Simply working through a catalogue of energy requirements is not sufficient for implementing the energy transition in the building sector; rather, a holistic approach is called for. Converting buildings, districts and municipalities into energy producers and energy savers is not primarily the job of the energy experts but of architecture. Holistic architecture of this type requires a network of supporting stakeholders and institutions. It requires the appropriate training with diverse interdisciplinary and transdisciplinary emphases. It requires a political framework. And, of course, it requires architects with various areas of expertise as well as urban planners.

2.1.1 EMBEDDING ARCHITECTURE MORE FIRMLY IN THE PUBLIC CONSCIOUSNESS

The BAK is committed to promoting awareness of the value of the constructed environment. The implementation of the energy transition in the

building sector is concerned with more than achieving good U-values or the replacement of inefficient versus efficient heating technology. In the end, our constructed environment should not only be energy-efficient, but also satisfy design and architectural requirements in the broadest sense. Architecture comprises a balanced juxtaposition of ecological, social, economic and functional requirements, including historical architectural contexts and negotiations between public and individual interests. Therefore, in order to achieve the climate protection targets, long-term viable solutions must do justice to the complexity of the task while simultaneously reaching the conflicting targets. In order to be able to recognise or adapt constructed qualities, stakeholders at all levels must first be qualified to do so. This level of awareness regarding the importance of design is required by professional actors as well as the general public. This includes decision-makers from politics, administration, and the planning and building sectors as well as representatives of local businesses, traders, project sponsors, investors and developers.

2.1.2 FLEXIBLE, INNOVATIVE HANDLING OF EXISTING STOCK

An essential requirement of the energy transition is the activation of the potential of the building stock and its transformation. However, buildings are not exclusively defined by their energetic quality. Urban planning, functional, constructive and, last but not least, historical architectural characteristics can outweigh energy deficiencies. The social balance of measures must also be guaranteed. The differentiated consideration of the stock is a prerequisite for the lasting acceptance of climate reversal.

The BAK recommends defining standards for the designation of building stock that is deemed “particularly worthy of preservation" (PWP). The PWP group accounts for approximately 25 to 35% of the building stock. Through their interplay, these buildings have a great impact on the atmosphere of districts, neighbourhoods and settlements. In view of the conflicting requirements of preservation and energy efficiency, it is important to find and codify an appropriate way of dealing with this conflict. For this

purpose, the BMUB (Federal Minister for the Environment, Nature Conservation, and Nuclear Safety) has published a tool called "The most valuable building stock in integrated urban development", which is intended to provide municipalities with support in identifying and differentiating the preservation-worthiness of buildings and the appropriate way of dealing with them. The BAK applauds this. Determining which buildings belong to the PWP category is the responsibility of the municipalities. While there are binding standards for the identification and structural handling of monuments for the architectural monuments group, the qualified registration of PWP in the municipalities has been the exception up to now, because there are no uniform criteria for this. The BAK suggests making the options for meeting energy requirements for the building stock more flexible and allowing a project-specific selection of measures. The legal regulations for existing buildings should be based on the CO_2 reduction target and should not prescribe blanket, schematic measures. Instead of ambitious requirements for transmission heat loss or efficiency-enhancing measures on the building envelope, it often makes more sense to focus on climate-friendly system technology or composite solutions. Therefore, extending the possibilities of meeting the requirements with supply side measures for the existing building stock is something that needs to be looked into.

2.1.3 PLANNING QUALITY CRUCIAL TO ACCEPTANCE OF THE ENERGY TRANSITION

The BAK is committed to preserving the most important principle in construction: the clear separation of planning and implementation. What is often sold as an advantage – planning and execution by one and the same provider – can quickly become problematic in practice. An entrepreneur who plans as well as builds always has to keep an eye on his own return. He often works with fixed contractors instead of tendering services. In such cases, there is no third, independent entity that controls quality and prices. In addition, risk premiums, which are calculated independently of actual costs incurred, are usually added. An architect, on the other hand, works as this independent "third party", so to speak, as the trustee of the developers. He ensures that the quality is right and the costs remain transparent. He advises developers based on his extensive expertise. He

coordinates and controls all those involved in the construction. At the same time, the architect can be seen right in the wallet right from the very beginning. This is because the architects' fees are clearly and bindingly stipulated by the legislature in the fee structure for architects and engineers (HOAI). This means that all architects work on the same fee basis. The competitiveness of their services is only in terms of quality, not in terms of price.

2.1.4 MODERATION OVER ABSTENTION

Despite well-insulated buildings and energy-efficient plant engineering, energy requirements have been increasing steadily up to now. So far, energy legislation has focussed on efficiency (i.e., building insulation, efficient technologies) and consistency (i.e., renewable energy). In order to achieve the necessary savings in energy consumption and CO_2 emissions, a third approach must be pursued – sufficiency; the increasing individualisation and ageing of society has been accompanied by an inevitable decline in the occupancy rate of housing. The per capita demand for living space has been growing for years and has doubled in Germany since 1960, which means that a large part of the energy saving effects achieved have been cancelled out again. "Less is more": Optimised floor plans and new living arrangements that enable cohabitation and sharing of functional areas are a good approach to solutions that contribute to meeting people's needs in a targeted and efficient manner. Architects are increasingly concerned with the idea of sufficiency, and for good reason.

Moderation in land requirements is insufficiently taken into account in current energy policy but would mitigate a number of other problems (e.g. lack of housing), particularly in conurbations. Of course, it cannot be a matter of setting regulatory ceilings. The BAK relies on incentives for this; appropriately designed financial support for intelligent housing projects could set incentives for land sufficiency. There are a variety of ways to reduce specific space requirements for housing. For example, a premium paid for moving to a smaller home could provide incentives for the individual reduction of living space requirements. Other possibilities include flat-sharing and housing communities with communal indoor and outdoor spaces or layouts with differentiated temperature zones in which the vol-

ume of space to be heated in winter can be reduced. The embedding of the sufficiency principle in housing policy funding programmes offers an opportunity to combine the promotion of housing quality with climate policy objectives while addressing more far-reaching social issues, such as demographic change or housing shortages in conurbations.

2.1.5 GETTING THE COMMUNITY INVOLVED

The BAK sees participation and communication as crucial precursors for the successful implementation of the energy transition. Today's municipalities are faced with the challenge of actively shaping the sustainable supply and use of energy and providing planning for the use of regenerative energies and for more energy efficiency. As a decision-maker, the municipality must respond to the approval applications and planning intentions of investors and, in doing so, deal constructively with different interests and potential conflicts. A large number of stakeholders are involved in a municipally organised energy supply; these include government and administration, municipal enterprises, private households, trade, agricultural cooperatives and environmental and nature conservation associations as well as public opinion leaders such as the press, churches, trade unions, etc. Energy concepts should involve these stakeholders in order to take concerns seriously, take up ideas and jointly shape climate protection. Projects involving the successful participation of the relevant stakeholders gain in legitimacy, and solutions worked out in cooperation with an engaged civil society gain in acceptance and sustainability.

2.2 LIFE CYCLE – REGARDING BUILDINGS HOLISTICALLY AS A SYSTEM

With increasing requirements for the energetic properties of buildings, an exclusive focus on energy conservation during the operating phase is no longer expedient. The "grey energy" and the integrated CO_2 emissions which are required, among other things, for the production of building materials, during the construction or removal of a building are still inconsequential under the current regulatory and

subsidy law framework. The potential of the building sector to reduce emissions of gases which cause harm to the climate is not being fully exploited in this way. The unilateral focus on energy conservation during the usage phase leads to questionable construction solutions; with 40 to 50 kWh/m^2, the grey energy in contemporary new buildings accounts for up to a quarter of the total primary energy for construction, operation and mobility[6], depending on the lifespan of the buildings. In the medium term, therefore, we should be seeking an approach that applies a transparent, comprehensible methodology based on all phases of a building's life cycle. In addition to the temporal expansion of the observation parameter from the operating phase through the entire life cycle, a systemic expansion from the isolated view of the building sector to a cross-sectoral view is necessary.

2.2.1 CROSS-SECTORAL CONSIDERATION OF ENERGY AND CO_2

From the BAK's perspective, it is no longer necessary to consider the electricity, heat and transport sectors separately from one another in the context of the resource-efficient and cost-effective enforcement of the climate targets. An efficient transformation of the energy system will succeed only through the coordinated interaction of the various sectors. This would facilitate the leveraging of synergies in the generation, storage and use of energy. The heating sector is increasingly interconnected with the electricity sector due to the increased expansion of heat pumps, cogeneration and power-to-heat technologies. In order to increase the permeation of the heating sector with electricity from renewable energies, the statutory framework has to be adapted; electricity from renewable sources has considerable competitive disadvantages in the heating market compared to fossil fuels due to an additional burden with various electricity cost components (network charges, EEG levy, electricity tax, etc.). Comprehensive, cross-sectoral CO_2 pricing could send out the necessary price signal in this regard.

[6] BFE, 2017

2.2.2 CONSIDERATION OF THE ENERGETIC AND ECOLOGICAL FOOTPRINT OF THE BUILDING

The energy performance of a building depends on many factors: not only the insulating effect of the building material, the built-in technology, and the behaviour of the users, but also the available supply networks or the building materials used, their manufacture and their disposal or reuse after demolition. The ecological footprint of the building for its entire useful life already shape design decisions during the early planning stages. Usage-neutral concepts can help ensure that buildings can be adapted to different needs for as long as possible This can reduce the rate of energy-intensive and resource-intensive replacement construction measures in favour of maintaining existing buildings.

The BAK proposes that the energy assessments of buildings include the previously neglected life cycle assessment and the energetic and ecological footprint of building materials and technical installations in terms of the sustainable use of resources. Up to now, only the technical properties in terms of thermal insulation have been used for the energetic assessment. This approach falls short of the mark; important aspects, such as CO_2 emissions, resources used and energy consumption in the production process, as well as the reusability and problem-free disposal of building materials must be given greater prominence. In order to promote the use of building materials with the smallest possible energetic and ecological footprint, the advantages in terms of climate protection and sustainability should also be reflected in the policy-related funding instruments. The statutory framework for the use of renewable insulation materials and recycled building materials should also be improved.

2.3 TAKING A CLOSER LOOK AT THE BUILDING ENVIRONMENT – IMPLEMENTING THE ENERGY TRANSITION IN THE DISTRICT

Regulatory and funding laws are currently focused on individual buildings, specifically on their primary energy requirements and efficiency. With an eye to the future, this focus on individual buildings

needs to be questioned. The interconnectedness of the city district or the property offers enormous possibilities for integrating energy conservation into other tasks; approaches developed at the district level enable a balance to be struck between various issues, e.g. demography, social viability, population structure, urban development, energy supply and energy efficiency measures. The district establishes the link between individual owners and the policy-making level. It is the key arena for assembling citizens and companies and actively involving them in the energy transition. In the district, more owners can be won over for energy-efficient renovations through appropriate communication and information as well as through a direct, outreach approach and consultation.

2.3.1 INVOLVING CITIES AND MUNICIPALITIES MORE STRONGLY AS STAKEHOLDERS IN THE HEATING MARKET

The BAK recommends strengthening the involvement of cities and municipalities as stakeholders in the heating market. Up to now, regulatory law and funding have been aimed primarily at building owners. Cities and municipalities in particular could, however, use urban land-use planning to make important decision regarding, for example, grid-bound heating supply, renewable energies or energy efficiency. Municipalities have far better possibilities for thermal design than individual building owners who can only optimise their own houses. The municipal administration may be more likely to get an overall view of what is available in the municipality, both in terms of the local potential of renewable energy and in terms of settlement structure and suitability for heating networks. It also has the means to make the decisions necessary for the economic operation of a heating network because of the high initial connection rate required. Municipalities are also frequently involved in municipal utilities that can develop sustainable heating supply as a business sector.

2.3.2 CONTAINING URBAN SPRAWL

When it comes to climate protection measures in the building sector, the focus of regulatory law and funding up to now has primarily been on ther-

mal insulation for buildings and the use of renewable energies. This approach disregards the fact that the location of a building, its infrastructure connection and settlement density are also highly relevant factors and that urban sprawl has an indirect negative impact on climate protection. To be sure, there is now an appreciation of this problem. For example, the German Council for Sustainability has called for a reduction in the progressive consumption of land for years.

The BAK urges a more decisive approach to the issue of urban sprawl and proposes that, in addition to the operating energy, a climate pass should display location-dependent mobility, and this should be included in the overall assessment of a building. The coalition agreement of February 2018 includes the target of consuming only 30 hectares per day. But we are a long way from reaching that goal. This is also due to the fact that there are still a number of misguided incentives. For example, the commuting allowance drives urban sprawl, because it subsidises longer commutes and passes the resulting environmental costs on to the general public. In this case, for example, the subsidising of home office models could be considered as a sensible alternative to the commuting allowance. Increased urban sprawl generates additional traffic and, in addition to increasing pollutant and noise emissions, leads to increased energy consumption in areas with low settlement densities. Due to the steadily decreasing settlement density (users per km² of settlement area), the profitability of local and district heating networks and thus the potential for the future use of cogeneration is declining, because the network lengths per inhabitant are increasing, and the per capita costs for the construction and maintenance of the infrastructure are increasing. This reduces the medium-term options for reducing CO_2 emissions.

2.3.3 STRENGTHENING HEATING NETWORKS AND LOCAL SUPPLY

The BAK sees an important prerequisite for the area-effective and cost-effective use of locally available, environmentally-friendly heat potentials in the expansion of heating networks. This requires local solutions. Heating networks not only offer starting points for the technical integration of various climate-friendly energy sources but are also fields of activity for citizen

energy cooperatives which can only function with local acceptance and high connection rates. A particular challenge in the coming years will be to convert the large district heating networks to climate-friendly energy sources as well. These district heating networks are often connected to large fossil-fuel power plants. An important instrument which, in Denmark for example, leads to a high level of district heating supply (over 60% of households) is the municipal heating plan. As an example, a heating law which would have obligated the larger municipalities to develop this type of heating plan was presented in the Thuringian state parliament. However, this approach was not pursued. Such a policy package for heating networks could emerge along with the continuation of federal support for heating networks in the Combined Heating and Power Act and the Market Incentive Programme, a necessary revision of primary energy factors (see Section 3.1.2 "Readjusting primary energy factors") and targeted state campaigns for innovative heating networks (e.g. in Baden-Württemberg (solar heating networks), in Bavaria (deep geothermal energy and biomass), and in Schleswig-Holstein (wind-heat pumps).

2.3.4 STRENGTHENING DISTRICT-BASED RENOVATIONS

District-based renovations achieve optimal energetic solutions. The aim is a collective energy balance of the housing stock and its adaptation to climate and socio-political requirements and needs. Municipal responsibility for a land register of the housing stock and the determination of rehabilitation needs and targets based on nationwide regulations in federal and state climate protection laws is a prerequisite. The utility and necessity of a district-based approach are not limited to furthering the exploitation of the energy conservation potential; more than anything, it is important not to diminish the efficiency effects achieved at the level of individual buildings. Experience gained from pilot projects in recent years shows that failure to reduce the energetic modernisation of individual buildings can reduce the overall energy efficiency, for example due to the under-utilisation of existing supply networks. The BAK proposes that the Energy Conservation Act be developed in such a way as to allow alternative measures for individual buildings, if the energy efficiency of the overall measure and its contribution to climate protection are adequately ensured within the framework of

an integrated local concept. In addition, from the point of view of the BAK, it would make sense to coordinate building-specific renovation roadmaps with municipal energy-efficient urban district rehabilitation concepts, insofar as these exist.

3. STATUTORY FRAMEWORK AND PLANNING TOOLS

3.1 CONTINUED DEVELOPMENT AIMED AT ENERGY SAVINGS – SWITCHING FROM ENERGY CONSERVATION TO CLIMATE PROTECTION

The coexistence of the two regulatory systems of the Energy Conservation Act (EnEG and EnEV) and the Renewable Energies Heat Act (EEWärmeG) has proven to be an obstacle in practical terms. The required calculations are very complex due to different scales and parameters and come at the expense of comprehensibility, traceability and acceptance of the regulations. The climate protection effects generated by the regulatory requirements up to now have been limited. In addition to bringing the laws and ordinances together under a uniform statutory framework, the content needs to be further developed from energy-saving regulations to climate protection regulations. An additional shortcoming in the structuring of the EnEG/EnEV and EEWärmeG lies in the very different implementation practices throughout Germany.

3.1.1 COMBINING EnEG / EnEV AND EEWärmeG INTO ONE POLICY

The BAK considers the combination of the two regulatory systems EnEG / EnEV and EEWärmeG into a single policy to be indispensable. The purpose of the consolidation should be to simplify the statutory framework by reducing the scope, harmonising the requirements and clarifying the wording in the application.

3.1.2 READJUSTING PRIMARY ENERGY FACTORS

In order to give a stronger directional impulse for climate protection, the BAK recommends readjusting the primary energy factors (PEFs) on the basis of the greenhouse gas (GHG) emissions specific to energy sources while taking the use of resources, economic efficiency and scarcity of renewable energy sources into account. The currently prevalent practice of excluding only the non-renewable primary energy component is understandable, considering the fact that the use of renewable energy sources should be promoted. However, this does not ultimately lead to the desired result. In addition, such low PEFs lose their directional impulse towards energy-efficient buildings. Therefore, with the installation of wind and hydroelectric power plants, structural interventions in different ecosystems (forest and river) are necessary, and the generators and auxiliary structures used must be produced using energy and resources. The use of renewable resources requires their production in the first place, i.e. the management of suitable areas with the problems that accompany monocultures, including any measures for pest control and the use of energy for harvest and transport. All these factors must be taken into account when assessing the use of renewable energies.

3.1.3 CONSIDERING CO_2 AS A CLIMATE PROTECTION INDICATOR

The BAK advocates the inclusion of CO_2 as a climate protection requirement in the Energy Conservation Act. Despite the CO_2 reduction targets, EnEG / EnEV and EEWärmeG are not directly related to CO_2 emissions. Instead of requirements for "permitted" CO_2 emissions, they place static demands on the primary energy requirement, the insulation and renewable solar fractions instead of assessing an overall concept for CO_2 reduction. However, climate change is linked to CO_2 emissions and not to primary energy consumption. It has also been shown that an indication and assessment of different energy sources based solely on the primary energy requirement can lead to misinterpretation and misdirected development.

3.1.4 INCLUDING GREY ENERGY IN THE ASSESSMENT

The holistic assessment of buildings and their building materials over their entire life cycle, and therewith the amount of energy tied up, which is necessary for climate protection, must be included as a criterion. For this purpose, manageable and practice-oriented methods and tools for sustainability certificates in a future Energy Conservation Act must be provided in the calculation programmes. Starting points for the classification can be provided by ÖKOBAUDAT which stores evaluation points for the use of resources. A climate certificate, which is expected to replace the current energy certificate in the future, would require the overall assessment of the building to map out and integrate not only the operating energy but also the grey energy. The BAK refers to eLCA as a rating system developed by BBSR. This should be developed further and made public or generally accessible for further use.

3.1.5 MANDATORY USE OF RENEWABLE ENERGIES IN THE EXISTING BUILDING STOCK

The BAK considers it advisable to discuss more far-reaching requirements for the existing building stock as well as the issue of new construction in the context of a future consolidated energy law for buildings. Baden-Württemberg established an obligation to use heat from renewable energies several years ago[7].

3.1.6 KEEPING AN OPEN MIND IN TERMS OF DESIGN AND TECHNOLOGY

The BAK recommends continuing to refrain from imposing technological specifications in regulatory law. The only way to economically achieve climate protection targets in a socially compatible manner is if there is competition for the best solutions for CO_2 conservation with no restrictions on technological innovation. Nonetheless, forgoing restraints does not necessarily mean equal treatment of all technologies and energy sources when it comes to funding which should be differentiated based on the CO_2 emis-

[7] An analysis of the funding statistics for the market incentive programme MAP (Fichtner, 2016) up to 2014 shows that, based on the number of installed systems per million inhabitants, in Baden-Württemberg, considerably more funded systems are usually put into operation than on average throughout all of Germany. That speaks for the positive effect of the law.

sions. Accordingly, the funding of heating technologies that are not compatible with the targets in the long term should be discontinued.

3.1.7 HARMONISING PRACTICAL IMPLEMENTATION

The BAK recommends harmonising practical implementation as part of the revision of the regulatory canon. Certification and monitoring in EnEV and EEWärmeG differ greatly. In some cases, very different approaches are used for the manner in which evidence is provided or in which random checks are carried out. The aim should be to merge a common definition of compliance into one document. This would make the associated calculation transparent for those involved in construction and planning and facilitate subsequent reviews.

3.2 IMPROVING PLANNING TOOLS – CREATING DEMONSTRABLE CERTIFICATION CONDITIONS FOR PRACTICAL IMPLEMENTATION

At this time, there are a number of planning tools in the field of energy-efficient planning and construction that are not practice-oriented and too many certification methods that are not fully congruent. The different calculation procedures are not just the result of the coexistence of the Energy Conservation Act and the Renewable Energy Heat Act. Even a single regulatory system may encompass several procedural alternatives. The EnEV makes provisions for at least three alternatives for calculating the annual primary energy demand Q_P for residential buildings: DIN 4108-6 / DIN V 4701-10, DIN V 18599 or the EnEV-Easy procedure. A major disadvantage to this is that allowing different calculation procedures leads to differing results, which calls the comparability of the results into question.

3.2.1 REDUCING AND SIMPLIFYING CALCULATION PROCEDURES

The BAK advocates a reduction in the number of specified certification procedures. For example, the energy certification should be conducted by

means of a single defined calculation procedure based on a corrected and considerably simplified DIN V 18599 which achieves the same results as the previous calculation procedure pursuant to DIN 4108-6 and DIN 4701-10. This reduction is also necessary to rule out different calculation results and lack of transparency. The aim must be to maintain calculation methods and their underlying standards and rules over a long period of time in order to guarantee comparability and ensure legal certainty in the future. This also includes the renunciation of primary energy factors for certain energy sources that have been changed by decree. In addition, the calculation procedures for subsidies must be brought into line with those for public-law evidence.

3.2.2 DEFINING AN IMPLEMENTABLE REFERENCE BUILDING

The BAK recommends retaining the reference building system, as it has proven to be useful in the residential sector and even appears to be without alternative in the non-residential building sector due to the extremely wide range of different usage profiles. The aim, however, should be to use the reference building to depict an implementable, practical building in the future, so that it is possible to estimate the costs to be incurred early in the planning phase. For this purpose, the energy requirements should be specified without discount factors, unlike in the EnEV which has been applicable since 1 January 2016. Individual requirements for the planning should be derivable directly from the reference building.

3.2.3 PROVIDING A UNIFORM CPU CORE FOR COMPUTATION SOFTWARE

The BAK recommends that an official calculation engine, such as the current one from the Fraunhofer IBP be provided for future calculation procedures. [www.ibp.fraunhofer.de and Gütegemeinschaft der Softwareanbieter (Quality Association of Software Vendors) www.18599siegel.de] The providers of the calculation software offered on the market should regularly and, above all, promptly adapt their software to this core. This is to prevent the results for one and the same building from differing for different calculation programmes in the future.

3.2.4 FACILITATING FREE ACCESS TO THE STANDARDS

In accordance with the principle that those to whom the law applies must be able to freely inform themselves regarding regulations of all kinds, the BAK advocates free (online) access to all standards, compliance with which the legislature attaches importance, in whole or in part, or which it declares binding within the framework of the EnEG/EnEV and EEWärmeG or a future Buildings Energy Act (GEG).

3.2.5 DEFINING THE NEARLY ZERO-ENERGY BUILDING STANDARD

The BAK urges the federal government to point out a path to the obligatory introduction of the EU's demand for the "nearly-zero energy building standard" which will lead to a very efficient, economical building stock under various future energy price scenarios as soon as possible. In order for planners and building owners to be able to adapt to the new standard in good time, it is important to communicate the expected escalations in good time, if only to ensure planning reliability. At the same time, the KfW 153 "Energy Efficient Construction" programme should be further developed or additional instruments introduced in order to avoid restricting market participants' access to new financing.

3.2.6 TOWARDS A CLEARER STRUCTURING OF BUILDING-SPECIFIC RENOVATION ROADMAPS

The BAK welcomes the individual renovation roadmap (iSFP) instrument, which was developed by BMWi and dena for residential buildings and which has been funded since July 2017. In the view of the BAK, the iSFP, as a long-term and building-specific tailored concept, is suitable for communicating long-term policy objective on the topic of energetic rehabilitation to homeowners and clarifying the need for action on the basis of comprehensible proposals for measures. From the BAK’s perspective, the next step should be to intelligently link the renovation roadmap with KfW funding in order to increase the implementation rate. The software for creating iSFP should be made available to planners and consultants free of charge.

The continued development of a comprehensive, sustainable approach to a rehabilitation roadmap is expressly welcomed.

In order to provide developers with a reliable framework of support, the BAK believes that it is necessary to establish a legal entitlement to funding. The dependence of the current funding of energetic rehabilitation on the budgetary situation of the federal government has a number of disadvantages. Reliability and legal certainty, however, are essential for the systematic planning of the energy-efficient renovation of buildings over long periods of time.

3.2.7 DEFINING A BINDING COMPUTATION METHOD FOR COST-EFFECTIVENESS

The BAK calls on the legislature to stipulate an economic efficiency calculation procedure that is publicly accessible and free of charge, either in the Energy Conservation Act itself or alternatively in a supplementary ordinance, and to specify uniform boundary conditions for the calculation on the basis of which the issuer of the certificate can make plausible assumptions and document them. This is necessary in order to ensure a uniform and legally valid proof of economic efficiency or undue hardship. The calculation tool which is available in addition to the BBSR (Federal Institute for Research on Building, Urban Affairs and Spatial Development) cost-effectiveness tool, but reserved exclusively for the registered dena experts, is not effective as an alternative tool, because it is incomprehensible to third parties.

3.3 CREATING A COHERENT STATUTORY FRAMEWORK – ORIENTING APPLICABLE LAWS TOWARDS CLIMATE PROTECTION

In order to advance the energy transition in the building sector, tangible laws and ordinances must be more effectively geared towards climate protection targets in addition to a future GEG. For example, tenancy law and energy law should be more closely linked. In addition, cities and municipalities could and should be better empowered

to create conditions for greater energy efficiency and renewable energies with the formal and informal planning tools at their disposal. Moreover, effective and reliable price signals would have to be set with policies, for example a CO_2 tax, in favour of the decarbonisation of the heat supply.

3.3.1 CREATING STRONGER LINKS BETWEEN TENANCY LAW AND ENERGY LAW

The BAK believes that tenancy law should set the framework conditions in such a way that building owners have incentives to provide money for the energetic renovation of their buildings without increasing the economic burden on tenants at the same time. Action in this regard is particularly urgent, because the proportion of rented residential units in Germany is relatively high at around 55 %.8 In its current form, tenancy law is not in a position to resolve the landlord-tenant dilemma and motivate building owners (in cooperation with tenants) to invest in the ecological conversion of buildings. The solution is that the leeway for rent increases in the modernisation levy after rehabilitation should not be a lump sum of 11%, or of 8% as in the coalition agreement of February 2018, but should be linked to the tenants' heating cost savings. Admittedly, however, there is the difficulty of estimating the savings in advance as accurately and practicably as possible, because tenants usually demand more heating energy after an energy modernisation (rebound effect), and the incentives for more economical heating behaviour are reduced. To improve the interaction between energy law and tenancy law, the landlord's right of tolerance for measures could also be cancelled, if he does not comply with energy requirements. The energetic state of a building should also be bindingly integrated into the rent levels and become a clear competitive factor. There must be no automatism between rent increases tied to the energetic renovation of some apartments and the increase of the local reference rent for all apartments.

3.3.2 ESTABLISHING THE PROSPECT OF REGULATING ENERGY EFFICIENCY IN CONSTRUCTION PLANNING LAW

[8] ARGE, 2016

The BAK recommends creating a clear legal basis for enshrining energy efficiency into construction planning law. In urban land use planning in particular, there has been no legally sound option for stipulating energy efficiency measures; this has led to a very cautious use of these types of instrument by cities and municipalities. Up to now, special urban planning legislation has enabled the federal government to provide financial support for climate protection purposes, which restricts the funding opportunities for cities and municipalities.

4. THE MACROSOCIAL APPROACH TO CLIMATE PROTECTION

4.1 MACROECONOMIC DISTRIBUTION OF CLIMATE PROTECTION COSTS

In the future, the costs of the macrosocial objective of "climate protection" must be reliably borne by society as a whole. An erratic financing framework and complex requirements for funding lead to uncertainty and a “wait-and-see” attitude amongst owners and developers. In connection with the current low-interest phase, therefore, subsidies have been insufficiently used and accessed. Funding applications should be less bureaucratic and more comprehensible. Funding measures should be able to be established steadily over longer periods of time; they should also be reliable and build trust. Energy efficiency must become affordable; the question of whether we can afford climate protection largely depends on whether it is possible to make energy-efficient renovations and economical new buildings a standard feature across the board. Architects contribute to significant increases in the sustainability of the building and reduce construction and follow-up costs through early conceptual and design decisions and cooperation with other specialist planners.

4.1.1 INTRODUCING CO_2 PRICING

The BAK considers comprehensive CO_2 pricing for electricity, heating and transport to be an essential instrument for advancing the decarbonisation of the building sector as well as the other economic sectors. Given the very low prices, particularly for fossil fuels, most of the economic viability promises have recently become untrustworthy. A CO_2 tax could equitably reward the environmental costs of different energy sources with a price tag, thereby ultimately increasing the competitiveness of energy efficiency measures and renewable electricity and heating applications. Pricing such as this would not necessarily cost businesses and consumers more. Several options would be conceivable for the establishment of a CO_2 price. For example, the existing energy taxes could be expanded to include a CO_2 component. Other burdens, such as the allocation of network charges to the consumer under the Renewable Energy Act (EEG), could be eliminated in return. On the other hand, fluctuations in the price of electricity, particularly those stemming from the daily trade in cheap electricity from renewable energies, must be passed on to the end user. Pricing of the follow-up costs for nuclear energy must be realistic. For social acceptability, it is important to examine possible distribution effects between social groups and to use part of the revenue from energy taxes for the financial relief of low-income households (e.g. heating subsidy and free efficiency advice). A solution that would prevent tenants from being burdened with higher energy costs, even though they have no influence on the energy source or decisions on modernisation investments, must be found for the rental housing sector.

4.1.2 INCREASING AND STABILISING FUNDING

In order to provide property owners with a greater degree of investment security, the BAK considers it important that a sufficiently large volume of funding be guaranteed with the regular budget funds for a long period, preferably by law. This applies to both construction measures through KfW funding and BAFA (Federal Office of Economics and Export Control) funding for the use of renewable energies and innovative technologies. The magnitude of the funding volume ultimately needed to adapt the speed of rehabilitation to the targets depends on the question of whether tax incentives are also created for energy modernisation.

4.1.3 HARMONISING FUNDING PROGRAMMES

The BAK believes that the aim should be to reduce the sometimes confusing number of funding programmes and harmonise programmes with each other. Although the application for KfW or BAFA funding has been optimised in many places during recent years, there is still much potential for simplification. The aim must be a uniform, centralised application and not at different submission offices as has sometimes occurred with previous programmes. The demarcation between KfW and BAFA funding can also be streamlined even better. Some of the individual programmes can be combined, while others must be chosen by the property owner. There is also a distinction between the two providers of funding for renewable energies in that BAFA offers grants and KfW loans. In addition, there are approximately 600 different funding programmes throughout Germany which are based on KfW and BAFA funding and, for example, offer additional direct subsidies for heating and ventilation technology or for construction supervision. In this context, the BAK applauds the funding strategy presented by the federal government in May 2017. The planned merger of KfW and BAFA funding is a long overdue step towards greater transparency and simplification of the previously complicated system of funding offers. It would also be desirable to design the funding strategy in the medium and long term on a cross-departmental basis and to extend it to other funding programmes relevant to the theme such as the BMUB's urban development funding programme with its district concepts or funding programmes for mini-CHPs.

4.1.4 "REQUIRING AND ENCOURAGING" RATHER THAN "REQUIRING OR ENCOURAGING"

The BAK recommends that funding not necessarily be tied to over-compliance with legal standards. Rather, with the increasing scope and depth of the usage obligations and efficiency requirements, it is necessary to provide additional support in some areas for the property owners who are obliged to implement the constitutional principle of proportionality. However, the Federal Budget Code (BHO) may make it necessary to enshrine such funding in law in order to legally secure it.

4.1.5 INTRODUCING TAX INCENTIVES

In addition to the existing funding from KfW and BAFA, the BAK believes that socially acceptable tax deductibility for rehabilitation measures should be established in future. Low-interest loans are not a sufficient incentive to renovate their buildings for the purposes of making them more energy-efficient, particularly for the large group of home owners who are potentially willing to renovate their buildings but are unable or unwilling to take out a loan at a later stage in their lives. For these building owners in particular, a tax subsidy would be a sensible financing option that could generate considerably more investment potential than before. In principle, tax benefits should be based on comparable energy requirements (for example KfW funding programmes).

4.1.6 INCORPORATING SUSTAINABILITY CRITERIA IN FUNDING

The BAK calls for a stronger focus on sustainability criteria in funding. The energy standards achieved in new buildings and renovations are no longer the only factors that play a role. Equally important are the ecological quality and the carbon footprint of the materials used. The advantages of renewable or recycled building materials must be reflected in the funding instruments. The current focus on technical properties does not go far enough and ignores aspects such as the additional reduction of CO_2 emissions, the conservation of resources used, energy conservation in the manufacturing process and reusability or problem-free disposal.

4.2 EXPANDING INDEPENDENT, HOLISTIC ENERGY CONSULTING

Qualified, comprehensive and independently conducted energy consulting which individually addresses various hindrances and motivational situations offers property owners well-founded answers to the question of which renovation measures are technically and economically sensible for a particular building. It removes any concerns or

reservations the property owners may have and enables a sound investment decision, which is not easy due to the large number of options and the often considerable costs.

4.2.1 UNIFORM SPECIFICATION OF QUALIFICATION REQUIREMENTS FOR ENERGY CONSULTANTS

The unmanageable variety of consulting services with very different levels of consultation must be replaced by a comprehensible system that uses simple criteria to determine the background and qualifications which are required to handle a specific consulting service. These qualifications should be derived from a "stratification" of the requirements of the task. Qualification as an energy consultant can remain open to all qualified, independent building experts, architects, interior designers, engineers and craftsmen. The qualification must, first of all, be based individually on the existing vocational training, take vocational qualifications such as those of the state-recognised expert into account and be tailored to the future activities of the energy consultant. The following distinction would be useful for this:

- Rehabilitation of monuments and rehabilitation of other buildings worthy of preservation,
- KfW Efficiency Houses,
- On-site consultation and individual renovation roadmap,
- Individual KfW measures.

In addition to a holistic view of the building trades, comprehensive knowledge of architectural history is required, particularly for the implementation of rehabilitation measures on monuments and other buildings worthy of preservation. Basically, the contexts related to building physics must always be understood.

In this context, the BAK considers the **definition of a nationwide qualification standard** and a **uniform mandatory examination** for energy consultants planned by the previous federal government to be the right step to ensure that quality requirements will continue to be at a high level in the future and to harmonise them throughout Germany. At the same time,

however, it is important that energy consulting should not become a new profession. Irrespective of the basic qualification and the continuing education based on it, the level of knowledge of the energy consultants at the end of the continuing education should be at a uniformly high, verifiable level. The content of the examination should be adjusted to current developments in technology and the market at regular intervals. However, the system of certification and recertification should not be excessive. Many qualified persons are already withdrawing, because the necessary evidence beyond the requirements of the EnEV is disproportionate to the economic yield of the activity.

Professional liability insurance is another essential requirement for energy consultants in the opinion of the BAK. There is currently no obligation in this regard for craftsmen and chimney sweeps. However, it is precisely because the risk of damage in the field of energy-efficient renovations is constantly growing with the increasing legal requirements that liability towards developers is indispensable. The BAK disapproves of the fact that, according to the guidelines for subsidised energy consultation as amended in November 2017, this can only be proven by means of self-declaration. Binding proof must be requested for this.

4.2.2 CONCRETISING AND DEFINING ENERGY CONSULTING STANDARDS

The BAK recommends standardising the scope, content and procedure for energy consulting and graduating the content according to the qualifications of the energy consultant, so that consumers can be sure of what they can expect from the service, and so that consultants cannot be selective and, for example, only refer to areas in which they hope to receive follow-up orders. A binding definition of the analysis, advisory and reporting services to be implemented is required, at least for the state-funded energy consultations. This particularly applies to the initial consultation. These standards are intended to ensure that certain services that are necessary for the building analysis, the preparation of recommendations for rehabilitation and the consultation and documentation are compulsory in energy consulting. The consultation report should, in any case, be linked to the preparation of an individual renovation roadmap in order to present the

energetic state of the building and the recommendations for rehabilitation in a clear and easily understandable manner.

4.2.3 SECURING THE ECONOMIC INDEPENDENCE OF ENERGY CONSULTING

The BAK attaches great importance to the independence and product-neutrality of the advice in order to preclude any connection between personal business interests such as the consultant's own executing company which is eager for an order or interests related to energy suppliers. The consultation process and results should therefore be transparent and verifiable at all times. In this context, the BAK is critical of the expansion of the Energy Consultancy Circle, which was implemented in November 2017, with the adaptation of the Energy Advisory Guidelines. A mere self-declaration is an insufficient measure for reliably ruling out the economic self-interest of the energy consultant in the interests of the consumer.

4.2.4 INTRODUCING NON-BUREAUCRATIC QUALITY ASSURANCE MEASURES

The BAK recommends introducing simple, non-bureaucratic quality assurance measures, at no cost to consultants and property owners, for federally funded energy consulting services and renovation roadmaps. These measures should ensure the quality and correctness of the analysis and consulting services. The system could be based on the following elements:

- Documentation of the federally funded energy consultations in a database (including the building data gathered, consultation reports, recommendations for rehabilitation and economic efficiency calculations), at no additional expense to the energy consultants, e.g. by transmission of the accounting file.
- Review of data and recommendations, e.g. electronic plausibility check.
- On-site inspection at random intervals.

In this context, the software products must also be adjusted for the execution of calculations in accordance with the Energy Conservation Act. The current practise of inputting building data into different software products can lead to different calculation results.

4.2.5 STRENGTHENING THE LINKS BETWEEN CONSULTING AND IMPLEMENTATION

The BAK recommends linking consultation more closely with the implementation of the recommended measures. Often the problem is that, although energy consultations take place with recommendations for measures being developed, those recommendations are then not implemented. A bonus system could provide incentives for building owners to actually implement the recommended measures.

4.2.6 CONDUCTING AN INFORMATION CAMPAIGN FOR ENERGY CONSULTING

The BAK is of the opinion that the reputation of energy consulting for buildings must be significantly improved, and its value must be conveyed. To this end, a motivation campaign which sets impulses for high-quality energy consultation should be launched in order to provide information about the possibilities, quality and benefits of energy consulting.

4.2.7 TRADE QUALIFICATIONS AND QUALITY ASSURANCE

In addition to the expansion of energy consulting, a qualification offensive is needed among the trades concerned in order to ensure an increase in the renovation rate and high-quality execution with highly-qualified specialists. To this end, job profiles must be developed for modernisation and cross-disciplinary cooperation, and existing education and ongoing training must be improved in terms of quality. This will also help keep the building professions attractive and increase the number of apprentices thereby securing the necessary junior staff. An increase in construction supervision as well as increased efforts for quality assurance in terms of implementation are needed.

4.3 PROMOTING TRANSPARENCY AND COMPREHENSIBILITY – RAISING CONSUMER AWARENESS

The real estate markets are characterised by fragmentation and opacity. The energy performance certificates which were introduced in 2003 for new buildings were intended to ensure greater transparency on the market in terms of the energetic state of the buildings. Transparency is important for making potential buyers or tenants aware of the energetic state of a house or apartment. Unfortunately, acceptance of the energy certificates is low; therefore, they have not been able to become established on the market, at least up to now. The primary reasons for this are the high level of complexity and deficiency of the certificates. There have been difficulties with the policy for a long time, even with a commitment, and a mandatory submission requirement for inspections was introduced only when EnEV came into force in 2014. Moreover, there are still several different approaches to calculation.

4.3.1 INTRODUCING A UNIFORM, MEANINGFUL CLIMATE PASS

The BAK advocates the creation of a uniform, meaningful climate pass with suitable climate protection classes and consumption information. A uniform, meaningful climate certificate would be characterised by a holistic view of energy consumption and GHG emissions.

4.3.2 CONTINUED DEVELOPMENT OF ENERGY EFFICIENCY CLASSES INTO CLIMATE PROTECTION CLASSES

In the opinion of the BAK, the energy efficiency classes according to Annex 10 EnEV should be further developed into climate protection classes that take both the primary energy demand and the efficiency of the building into account. At the same time, there must be a CO2-oriented readjustment of the energy factors. In the future, every building should be assigned to a climate protection class. Analogous to the EU energy label for electrical appliances, the climate protection class reflects the position of the building on a permanent scale of energy quality levels. What is needed here is a system whose scale would remain unchanged over time and which would unify the various energy certificate systems that currently exist side by side. Moreover, the existing energy efficiency classes for resi-

dential buildings relating to final energy are based on a demand parameter that is different to the remaining specifications of the EnEV which stipulates the primary energy requirement as the principal demand parameter.

4.3.3 EVALUATING THE EFFECTIVENESS OF MEASURES AND MAKING CONSUMPTION TRANSPARENT

In order to minimise the discrepancy between theoretically determined demand values and actual energy consumption or actual CO_2 pollution, steps taken shall be evaluated by means of random samples on the basis of actually measured values and their effectiveness appraised in the overall assessment. Additional monitoring can contribute towards making different conservation effects transparent to the user and provides the property owner or operator with important information. Malfunctions or misconduct can also be identified and corrected.

An essential contribution to the achievement of climate protection targets is the acceptance of the user who must adapt his behaviour to the structural and technical conditions as well as to the climatic conditions. In order to ensure, firstly, that the increase in efficiency and, secondly, climate-friendly construction methods or changes in energy supply (consistency) actually have effects on climate and resource protection and are not cancelled out by rebound effects, everyone must strive for the lowest possible consumption of raw materials and energy; this must be accompanied by a macrosocial change in values (sufficiency). Specifications for guidelines and user instructions are conceivable approaches.

Heating bills should provide more transparent information on energy consumption for heating, so that users can purposefully reduce their energy consumption, and property owners can be motivated to introduce rehabilitative measures. Heating bills could also reliably inform building owners and tenants as to the relationship between the energy status of the building and the respective target level of the renovation roadmap. Regular provision of invoices for heating and hot water costs or a permanently available and easily understandable overview of the company's own energy consumption or energy production help consumers track their own sav-

ings efforts and react more quickly to changes. To this end, the heating cost regulation must contain a rule which guarantees this. It should also include a comparison of current energy consumption with that of the previous year and a comparison of the consumption in the flat with the total consumption of the building.

5. CONCLUSION: FROM ENERGY CONSERVATION TO CLIMATE PROTECTION

The transformation to a climate-neutral building stock requires a fundamental change of direction. The focus should not be on energy conservation but on climate protection. In addition to energy conservation in the area of heating, this includes sustainable material cycles and the economical use of material and surface resources. What is needed is a holistic view of the building and a holistic strategy for reducing CO_2. "Holistic" means an extension of the system boundary in three respects.

1. From the usage phase to the life cycle: Energy consumption during the use of a building must be not reduced by means of a disproportionate shift towards the manufacturing process or the recycling of buildings and building materials; rather, the energy and CO_2 balance of buildings must be considered and reduced accordingly over the entire life cycle.
2. From the individual building to the district: To effectively improve the overall energy situation in the building's environs, the observation horizon must be broadened from the individual building to the neighbourhood or district as an observation parameter. The current focus of the Energy Conservation Act on the individual building falls short of the goal.
3. From the individual view of the building sector to a cross-sectoral view: The energy system can only be efficiently and successfully transformed through the coordinated interaction of the various sectors. This is the only way to exploit synergies in the generation, storage and use of energy. And this is the only way to prevent undesirable developments such as the much-cited energy-saving, but energy- and resource-intensive passive house settlement on the greenfield site which can only be reached by car.

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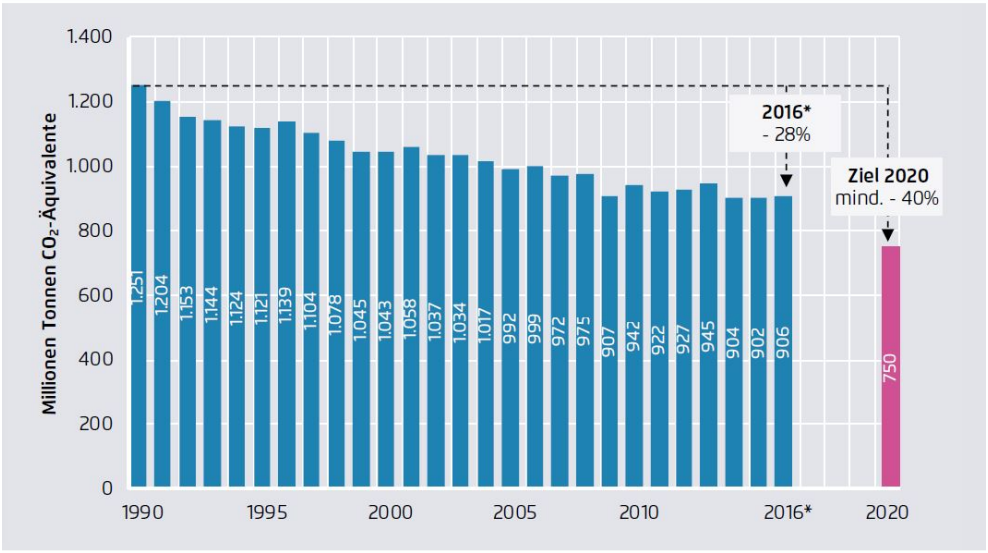
7. ILLUSTRATIONS AND DIAGRAMS

Treibhausgasemissionen in Deutschland

Handlungsfeld	Ausgangswert	Bisherige Entwicklung *gemäß Projektionsbericht der Bundesregierung 2017 für Deutschland*		Prognose *gemäß Projektionsbericht der Bundesregierung 2017 für Deutschland*		Zielsetzung *gemäß Klimaschutzplan 2050 des BMUB*	
	1990 *(in Mio. t CO2-Äq.)*	2016 *(in Mio. t CO2-Äq.)*	1990 - 2016 *(Veränderung in %)*	2020 *(in Mio. t CO2-Äq.)*	1990 - 2020 *(Veränderung in %)*	2030 *(in Mio. t CO2-Äq.)*	1990 - 2030 *(Veränderung in %)*
Gebäude	209	127	- 39 %	113	- 46%	70 - 72	- 67% - - 66%
Energiewirtschaft	466	343	- 26 %	292	- 37%	175 - 183	- 62% - - 61%
Verkehr	163	166	+ 2%	158	- 3%	95 - 98	- 42% - - 40%
Industrie	283	188	- 34 %	173	- 39%	140 - 143	- 51% - - 49%
Landwirtschaft	88	71	- 19 %	71	- 19%	58 - 61	- 34% - - 31%
Sonstige	39	11	- 72 %	9	- 77%	5	- 87%
Summe	**1248**	**906**	**- 27 %**	**816**	**- 35%**	**543 - 562**	**- 56% - - 55%**

Abbildung 1: Entwicklung der Treibhausgasemissionen in Deutschland 1990 – 2016



Umweltbundesamt (2017) *vorläufig