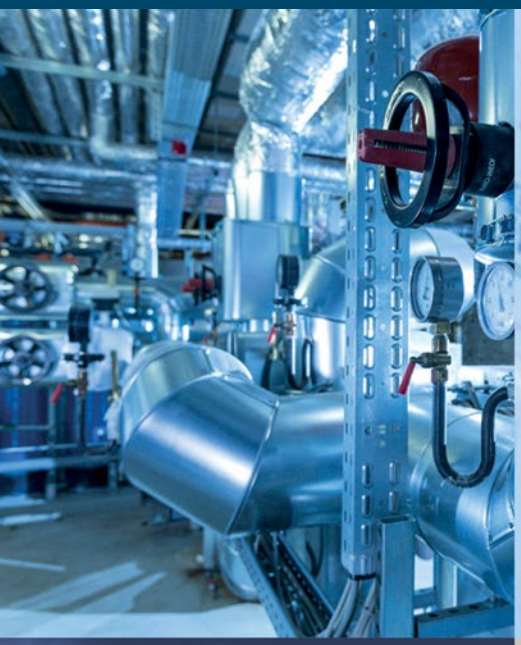
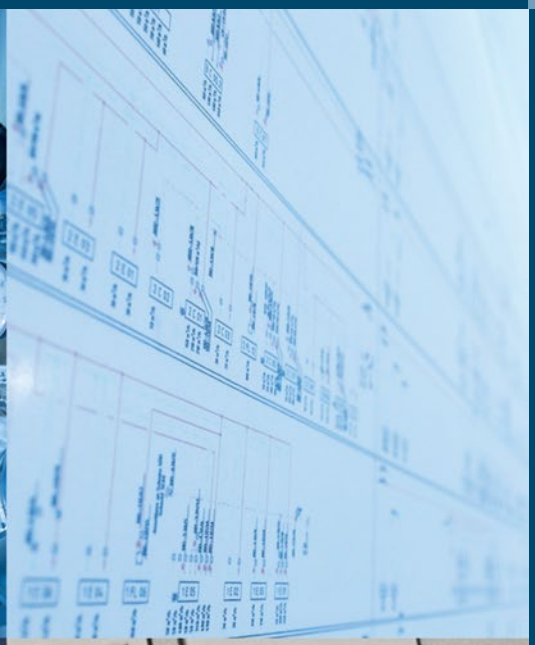
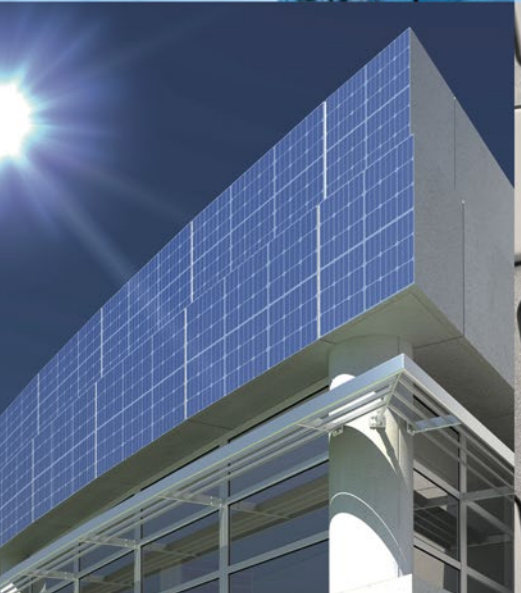
Federal Institute for
Research on Building,
Urban Affairs and
Spatial Development

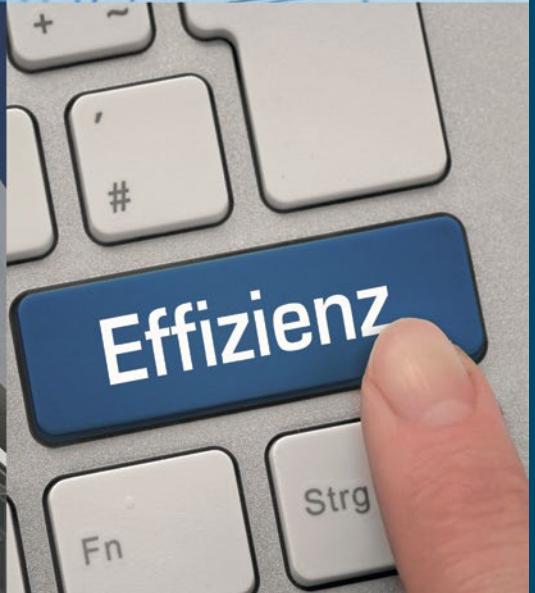
within the Federal Office for
Building and Regional Planning

On the Road to Zero-Energy Buildings: Commercial and Municipal Properties









Summary Report to the Conference of the Federal Ministry for Economic Affairs and Energy (BMWi) in cooperation with the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) on 19 and 20 May 2015 in Berlin

Abstract

The conference, which took place in the Maritim proArte Hotel Berlin on 19 and 20 May 2015, was organized by the Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) within the Federal Office for Building and Regional Planning (BBR).

The energy-efficient construction and renovation of so-called non-residential buildings – commercially used buildings as well as buildings of municipal and social infrastructure – is gaining in importance and receiving attention as well as support. It is against this background that representatives from politics, the business world and science discussed the following topics:

- Energy efficiency in non-residential buildings: Requirement, economic efficiency, realization
- Energy consultancy and energy audits for municipalities and businesses
- Investing in energy efficiency: financing and contracting

Several examples from the field and research were presented and discussed during the conference, in particular the research results with regard to model projects "Energy-efficient construction of municipal and social non-residential buildings" as well as exemplary projects from the field of renovation of the commercial and public building stock.

Two days of conference were divided into four sessions with the focus on:

Session 1: Energy efficiency strategy for buildings – From a political and business point of view

Session 2: Energy efficient non-residential buildings in research and practice

Session 3: Ecological and economical planning and investing: Energy management and funding in municipalities and companies

Session 4: City – district – building: More energy efficiency and sustainability through cooperation

The agenda for the first day focussed on political framework conditions and the economic implementation. In the afternoon, the results of the model projects for energy-efficient new public buildings served as practical examples for a successful implementation of political funding programmes. The focus of the second day was placed on the practical experience from the industry and cities. The following issue was at the heart of the discussion: Which are the essential factors for an ecologically and economically optimized planning of energy-efficient (new) buildings?

A total of 250 experts attended the public event, among them mainly (specialized) political representatives, representatives of the authorities, science, associations and professional experts.

Mr. Beckmeyer, Parliamentary State Secretary, emphasised the importance of the topic at the beginning of the conference: "Apart from the challenging task of renewable energies, which we are strongly promoting, energy efficiency is the second big pillar of Germany's 'energy transition'." Mr. Beckmeyer continued that it was one of the German government's main projects to achieve a climate-neutral building stock – in the residential as well as non-residential sector. Special attention had to be directed to municipalities: Of the approx. 1.7 million non-residential buildings in Germany, about 300,000 are municipal property. This is where the German government could set an example: "It is important to strengthen the energy expertise of the municipalities."

After Mr. Beckmeyer had presented several already existing as well as planned funding programs of the German government (among other things in cooperation with the Kreditanstalt für Wiederaufbau (KfW), he warned: "At the beginning it's funding – but sooner or later it turns into a requirement that we here in Germany have to take into account." Business world, in particular, had to make contributions to the energy transition as there would be good incentives since building and redeveloping efficiently would mean to use funds profitably and future-oriented.

Session 1: Energy efficiency strategy for buildings – From a political and business point of view

At the panel discussion with participation of representatives of the Wuppertal Institute, Federal Industrial Association Technical Building Systems (BTGA), the German Association of Cities- and Municipalities (DStGB), the Confederation of German Industry (BDI), Central Real Estate Committee (ZIA) as well as the Federal Ministry of Economics and Technology (BMWi), the diversity in non-residential buildings was addressed and, on the other hand, it was discussed, from very different perspectives, what kind of obstacles existed as well as possible incentives to overcome these.

A central result of the discussion is that the non-residential building sector is highly diversified, a fact that makes an individual approach necessary. Very different and partly very complex types of buildings and usage requirements have to be taken into consideration. It

was stated that in order to use appropriate efficiency measures sensibly, every building itself and with regard to its specific usage had to be considered. The participants were unanimous that this diversity and complexity would also lead to difficulties in designing specific instruments. In the course of the discussion, the point was raised that there were barriers to municipalities as well as industry when implementing energy efficiency measures in building sector.

The municipalities have to face huge challenges to make the corresponding expertise available in order to be able to implement an energy management system efficiently. Regarding the financing it is even more complicated as funding programs are often not known well enough. Expertise has to be strengthened in this respect. A further aspect, which is difficult from the municipalities' point of view, are the regularly changing framework conditions. There is no time to implement measures in the long run if their existence cannot be relied upon.

From the commercial building users' perspective, the return on the building projects or their amortization period is the most important thing. In the case of new buildings, however, the limit of economic viability has already been reached due to the more stringent Energy Saving Ordinance (EnEV). It is pointed out that a great deal is technically feasible but the efficiency rule impedes the implementation. Another central aspect from the economic point of view is that cost-optimization has always been important, which is why the property industry has designed a self-initiated sustainability codex. According to the codex, it is clearly stipulated that the users should have more choice in implementing measures on the one hand and that political experts better understand the specific requirements of the non-residential building industry, on the other hand. This is why policymakers have to integrate those affected more in the development of the instruments – not only on a federal but especially on an EU-level.

Session 2: Energy-efficient non-residential buildings in research and practice

The second group of topics was introduced by a panel discussion with representatives of the BBSR, the German Energy Agency (dena), the Federal Ministry for the Environment, Nature Conversation, Building and Nuclear Safety (BMUB) as well as the BMWi. The role of politics in providing impetus for research and business was a central topic of these discussions.

Generally, it has been stated that in order to realize the ambitious goals of the Federal Government as far as the disassembling of Renewable Energy and power efficiency is concerned, capital expenditures in research and development are indispensable. Against this background a budget of up to 1 billion euros per annum is available for Energy Research – for basic research but especially for the short-term advancement of projects. In this regard, it has been emphasized that the advancement of an integral building approach is of central importance.

Model projects offer the opportunity of carrying out practice-oriented tests of such holistic approaches. With regard to these model projects it was critically discussed whether and how those approaches to finding a solution can be made mass market compatible – it still remains a challenge especially in the case of non-residential buildings. Several analyses have shown that not every approach and technology tested within the framework of model projects is ready to be launched on the market or suitable to become part of everyday life.

Nevertheless, model projects still play an important role as they, for instance, can act as an example and a model for planners. Given the challenging and complex requirements, however, the technical realization often poses a problem due to a lack in expertise and experience. Against this background, the topic of networking is of major significance. The construction industry is highly dependent on learning from each other as otherwise a nationwide information transfer can hardly be ensured due to the construction industry being strongly segmented with a huge number of micro-companies.

The last topic of discussion in this second round addressed the question of how to tackle the problem of this know-how deficit. One problem is that the term "Energy Consultant" is not legally protected and thus there are no uniform standards. This is why the German Energy Consultants-Network (DEN e.V.) is eager to find a fast and practicable solution.

The fact that these model projects have a role model function and that knowledge was gained was emphasised by the presentation of the results from the "Energy-efficient new constructions of non-residential buildings of municipal and social facilities" research project by the BBSR as well as the subsequent discussions with representatives of the 14 model projects.

The research project is part of the German government's Energy Concept and was initiated in the context of scientifically preparing the application of the EU Building Directive. The Directive stipulates that new buildings have to comply with the nearly-Zero Energy Building standard by 2021, public buildings even by 2019. It is against this background that model projects provide insight into which measures have proved to be efficient and practicable with regard to planning and implementation as well as a later management of non-residential buildings with a highly energy-efficient standard.

The central research issues of the model projects are, among other things, energy conversation and efficiency, economic efficiency and additional costs

as well as the quality and flexibility of use. The variety of topics emphasizes the holistic research approach, pursued by the model projects. All in all, it was shown in the 14 initiated model projects that despite a huge number of challenges, encountered when carrying out these projects, the expectations were at least met. With regard to the primary energy demand, the lower deviation in energy demand, according to EnEV 2009, was higher than 60 per cent for more than half of the projects. Figures ranged between 42 and 88 per cent with regard to CO_2 savings. However, it has to be paid attention to the fact that it is not always possible to compare the individual model projects.

Following the results of the model projects had been presented, there was an interactive discussion with representatives of the individual projects. The focus here was placed on the difficulties which were encountered during the project realization, e.g. missing reference values, financing and long amortisation periods. Furthermore, it was very often the case that political decisions behind the non-residential buildings were frequently based on standard values taken from the residential sector. A further important aspect of using energy management successfully was that the staff has to be able to operate the technical devices and interpret the values correctly, which is often not the case.

After that, the challenges during planning, constructing and using highly-energy-efficient or zero-energy buildings were discussed together with representatives of Project Management Jülich (PtJ), TU Darmstadt, EGS-plan Ingenieurgesellschaft für Energie-, Gebäude- und Solartechnik and the Federal Office for Building and Regional Planning. The main points of discussion were the cooperation of those involved in the planning, which was frequently in need of optimization and the usage pattern and usage acceptance during operation.

The architect is of major importance during the planning phase as he has to keep an eye on many different aspects – from aesthetics, via function and usage to technology and energy. This complex task is increasingly becoming part of an architect's training and education. However, those who already work as an architect frequently have a knowledge deficit in this respect. Not only does the architect have to have interdisciplinary knowledge, but the developer also needs to have relevant expertise. It is important, however, that this knowledge and expertise are pooled in time, i.e. at the beginning of the planning phase, which is often not done for non-public buildings.

Furthermore, the participants discussed the question regarding the necessary level of automation for highly-efficient building projects. It was stated that for reasons of cost reduction and manageability a Low-Tech-Approach might be suitable depending on the type of building and its intended usage. In order to find the right level of automation, the users have to be integrated early in the planning process as sophisticated technology is only sensible if it is used and applied correctly.

Session 3: Planning and investing ecologically and economically: Energy management and funding in municipalities and companies

Prof. Dr. Klaus Sedlbauer, head of the Fraunhofer IBP, opened the third round of discussion with his keynote speech on "Energy efficiency in non-residential buildings – invest ecologically and economically". The focus was mainly placed on learning effects which could be gained from outstanding and ground-breaking projects like the model projects. Prof. Sedlbauer emphasised that the learning effect not only existed within Germany but Germany could also become a pioneer with projects like these.

A further aspect, addressed by Sedlbauer, was the reconciliation of cost-effectiveness, sustainability and usability. Taking the life cycle of a building into consideration, it becomes clear that the majority of 80 per cent of the costs was attributed to the follow-up costs, i.e. management costs, maintenance as well as demolition. In order to balance off the construction costs of 1.5 million euros, it would be sufficient to reduce the management costs by 37.5 per cent. He emphasised, however, that he was not only talking about new buildings but that he thought the renovation of old buildings was equally important. A sound planning and evaluation was always necessary for an ecologically and economically sensible implementation.

Prof. Sedlbauer's speech was followed by an interactive discussion with four keynote speeches on different topics. Participants were representatives of the BMWi, the German Industry Initiative for Energy Efficiency (DENEFF), the DStGB and the Fraunhofer IBP. The speakers were from the KfW banking group, Siemens Building Technologies, the Berlin Energy Agency (BEA) and the Institute for Resource Efficiency and Energy Strategy (IREES).

The first speech was given by the KfW banking group on "Incentives for energy-efficient construction and renovation". The topics focussed on the two new incentive programmes for non-residential buildings: financial support of commercial non-residential buildings (as of July 2015) and for social and municipal non-residential buildings (as of October 2015). It was said that continuity, a simple funding logic, easy access, modern communication and the cooperation of the Bund, distribution partners and Landesförderinstitut were the factors responsible for the success of the funding programmes.

At the beginning of the following panel discussion it was stated that these were attractive offers for municipalities, but the availability of very cheap municipal

loans impedes taking out these loans. A further obstacle was that the municipalities need staff to design concepts for the funding programmes. An external consultation would not be sufficient.

From a business point of view, it is central that the offers are specifically tailored to target groups. Furthermore, stability is needed to increase planning security. Another aspect from a business perspective is that the topic of energy consultation plays an important part when it comes to negotiating funding offers.

The next keynote speech by Siemens Building Technologies was about the topic of "Consultation and Contracting-solutions in practice". The starting point was the high energy costs per user in practice in the case of non-residential buildings. These costs may be attributed to the fact that 70 to 80 per cent of these buildings are older than 30 years. The difficulty is that the building envelope has a life cycle of 30 years, the building technology only of 15 years, however. Against this background, the optimization of building management is hardly feasible in an efficient way, a fact that leads to a backlog in investments. An approach to solve this problem is Reduction-Contracting. Measurements and analyses have to be used to create transparency; the user behaviour has to be influenced through sensitization; and sustainability has to be achieved through optimizing and ensuring the building's functionality.

In the panel discussion with the above mentioned representatives, it was stated that Germany has potential with regard to Contracting-solutions as they are still regarded with scepticism in practice. A great obstacle was also the insecurity of companies and municipalities. It was necessary to broaden skills to evaluate Contracting-offers economically and technically. It was added that not every single municipality had to have this know-how, but it was more important that the know-how existed on a regional level. One approach could be to establish a neutral body as a centre of excellence.

The third keynote speech titled "Energy consultation – Energy management – Energy audit" by the Federal Energy Agency described the energy consumption of German companies in their respective industries in order to present consultation approaches on the basis of the aforementioned data. It was said that within this framework, energy audits would be a partly compulsory measure in order to get an accurate picture of the current energy situation. In addition to the audits, further steps would have to be taken when using energy management according to DIN EN ISO 50001. The important step would be implementing a continuous management process which is coordinated by an in-house energy-team.

The following discussions regarded energy audits as an opportunity for companies to intensely deal with the energy aspect and to be able to recognize savings-potentials for the first time. Energy management would ensure that companies would have to continue dealing with this topic.

With regard to the situation in municipalities it was stated that these simply could not but establish an energy management. Due to regional climate protection concepts the topic had reached the municipalities.

A representative of the IREES then spoke about "Learning Energy Efficiency Networks" (LEEN). The stakeholders in such networks were trade associations, utilities (EVU), municipalities and energy agencies. It was the aim of such networks to develop a joint plan for energy conversation and to learn from each other through a regular exchange of experience. He said that by 2014, a total of 30 pilot networks with more than 370 companies and municipalities had been established in Germany and that the participants had already been able to reduce their energy costs by an average of 2.2 per cent per year.

According to the following discussions, such networks were very well suited to promote mutual enthusiasm for these topics with those responsible. In order to progress the work in such networks, benchmarks had to be established which make it possible companies and municipalities to compare themselves with each other.

Session 4: City – district – building: more energy efficiency and sustainability through cooperation

This group of topics was introduced with two talks on urban development plans – in Hamburg and Berlin. These two cities are practical examples of energy efficient urban districts. In Hamburg, the "HafenCity" project is to show the redevelopment of old port facilities into an economically, ecologically and socially sustainable economic region. The aim is to recycle and open up the old port facilities that were industrially used as conversion area and to increase ecological usage through short ways and a new mobility concept.

The "Berlin Adlershof 2020+" energy strategy, on the other hand, intends to reduce the primary energy consumption at the business and science location to 30 per cent by 2020. In Berlin, the optimization of primary energy is the most important issue - to be achieved by using renewable energies, building- and process optimization as well as using load shifting potential.

The following discussion was about the districts and the special challenges these pose. It was stated that in such concepts it was necessary to no longer consider each building individually as these constitute social spaces.

Summary of presentations and expert discussions

The core messages of the individual speakers were in close agreement with that of the opening speech. The business with project promotion in Germany is well organized but it would only be possible to reveal obstacles through a scientific approach and a subsequent evaluation of the projects. Not every research result could be easily transferred to the market. It has to be taken into account that people do not build houses in order to save energy but to live and work in them. This is why energy efficient building and renovation means: the functionality of the buildings has priority, quality of buildings has to be sustainable and the life cycle assessment has to be right. The biggest "problem area" for the energy transition was to implement research results fast.

This fact has not been communicated well in all directions. On the other hand, the qualifications of craftsmen but also of architects and engineers are often lacking expertise. It is simply not enough to do research, to state requirements and to fund, it is also the government's job to inform, train and qualify people.

Businesses and associations called for sustainability to be included in the political demands and measures. It was only possible to render quality in the long-run, if instruments used by all were reliable.

Uwe Beckmeyer MdB, Parliamentary Secretary of State at the Federal Ministry of Economic Affairs and Energy, said:

"Our European neighbours are looking at us. With regard to energy efficiency we have the following opportunities: We are able to develop technology, we can extend our leading position and subsequently we can sell this technology elsewhere – opportunities which we have to make use of and actively implement now in our companies and municipal areas."

Posters and stands of exhibitors

A poster exhibition and stands of the exhibitors at the back of the conference room framed the event:

Representatives of BBSR, KfW banking group, dena and the BINE Informatinsdienst at their respective stands were a point of contact to interested participants. Furthermore, a huge amount of information material on projects of the BMWi, EnEff: City – Research for the energy-efficient city and EnOB – Research for energy-optimized building was available. Brochures, copies of books as well as flyers of the German Institute for Urban Studies (Difu), the BMUB as well as the German Sustainability Award Research et al increased the offer of topic-relevant material and overviews on funding possibilities.

The accompanying poster exhibition took place in a separate room opposite the conference room. It mainly consisted of posters showing the individual model projects. Furthermore, several architects and engineer offices presented more role model projects of energy-efficient new buildings or renovation of non-residential buildings which have been or are still being implemented.

The posters of the model projects were especially designed for the conference by EuPD Research in close cooperation with WEEBER+PARTNER and contact persons at the municipalities The posters on municipal building projects were complemented by more information-roll-ups on initiatives, research and promotion measures of BINE, dena, EnEff:Stadt, EnOB and the German Energy Efficiency Alliance (geea).