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OVERVIEW

Market Trends towards Nearly Zero-Energy Buildings

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High performance buildings which use nearly zero or very low energy (and meet the requirements of the Recast EPBD for the years 2019/2021) have been developed as pilot projects for many years. Passive House, Active House, effinergie®, MINERGIE® and Effizienzhaus Plus are some of the most interesting examples of national and international market concepts currently available. An overview of commonly used terms and definitions of high performance buildings among the EU Member States was prepared by members of the Concerted Action EPBD.

The international trend: Passive House

Developed in the late eighties, nowadays the Passive House concept is fully embedded in the market for energy efficient building. The starting point is the idea that **solar gain and internal heat production (people and electrical appliances) should be sufficient to provide space heating**. Therefore the Passive House concept is based on a **very well insulated, air tight building shell**. Optimisation of passive solar energy use (solar oriented building) is a *sine qua non*. Furthermore, **mechanical ventilation with highly efficient heat recovery** is indispensable for this strategy.

PASSIVE HOUSE RENOVATION AT THE KROEVEN (ROOSENDAAL, NETHERLANDS) © FRANK HANSWIJK

Standard building products of twenty years ago, like windows, glazing and front doors, were thermally insufficient to be applied in a Passive House. As a consequence, innovative manufacturers developed well insulated windows, doors and glazing systems, adhesive slabs, adhesive tape, insulation materials and so on. These new products were initially available mainly in the German-speaking countries, and now in many other countries as well. The international Passive House conferences and the accompanying trade fairs which take place every year in many countries show the **continuing development of new products**.

The Passive House contributes to a **strong reduction of energy use for space heating** mainly through construction measures. This also makes the Passive House durable: the measures will last as long as the building itself. Further reduction of energy use can be achieved by **energy efficient heating and ventilation technology**. And as most building service system appliances have a life span of about 15 to 20 years, the Passive House can be upgraded with the latest technology several times in its life span of one hundred years or more.

According the European Commission's Energy Efficiency Plan and the Energy Performance of Buildings Directive, from 2019 onwards all new public buildings, and from 2021 onwards all new buildings, will have to reach a 'nearly zero-energy' performance level. The passive house standard of **maximum 15 kWh/m²a for space heating** contributes greatly towards the goal of nearly zero-energy buildings. Many Passive House associations have recently been established in Europe, but also in the United States and in New Zealand, for instance. The adaption of the concept to warm climates and cold climates, detailed monitoring of new passive

houses in the south of the EU and the further promotion through Intelligent Energy Europe projects ensures a great future worldwide for the Passive House concept.

Active House – Buildings that give more than they take

FUTURE ACTIVE HOUSE (NORWAY)

Active House is a vision of **developing buildings that give more than they take – of healthier and more comfortable buildings adapted to climate and environment**. The Active House vision defines highly ambitious long term goals for the future building stock. The vision aims to unite interested parties based on a **balanced and holistic approach to building design and performance**, facilitating cooperation on building projects, product development, research initiatives and performance targets to make progress towards the long term goals.

Active Houses can be newly built or renovated. They can be homes, offices or public buildings. Active House proposes a target framework – the Active House Specifications - for how to design and renovate such buildings that contribute positively to human health and well-being. The focus is on:

- **ENERGY** - Contributes positively to the energy balance of the building
- **INDOOR CLIMATE** - Creates a healthier and more comfortable life for the occupants
- **ENVIRONMENT** - Has a positive impact on the environment

An Active House interacts positively with the environment by **optimising the relationship with the local context**, focused use of resources, **and minimising overall environmental impact throughout the building's life cycle**.

Active House is a non-profit organisation supported and managed by a group of Alliance partners. Currently nearly 40 organisations have signed up for the Active House Alliance and more than 800 users are registered at www.activehouse.info. It is the ambition of Active House to become the **reference point for new buildings and renovation projects worldwide**. Mikkel Skott Olsen, Chairman of the Board of Directors of the Alliance states, *'The purpose of the Active House Alliance is to bring together different disciplines. The building sector has a responsibility for helping to develop the standards of the future, and for spreading the word that low-energy buildings are attractive to both end-users and builders, provided that the building design focuses on indoor climate and overall environmental impact as well as energy.'*

Germany: Efficiency House Plus – My house is my filling station

EFFICIENCY HOUSE PLUS (BERLIN): A PILOT PROJECT OF THE GERMAN BUILDING MINISTRY © FRAUNHOFER

After the construction of a research pilot project in Berlin, the German Ministry for Transport, Building and Urban Development (BMVBS) launched a financial support programme for energy surplus buildings called 'Effizienzhaus Plus'. Builders of houses which **generate significantly more energy than the building uses for its operation in an annual balance** will receive support for using innovative technologies, integrated planning and monitoring. The surplus energy shall be used especially for electro mobility. A detailed definition and a calculation method for Efficiency House Plus buildings are available and must be used by the applicants to the support programme. The method considers the **total energy generated by renewables on-site in order to balance the energy demand of the building including household electricity and the electric car**.

The inhabited pilot project and a growing number of other examples of Efficiency House Plus buildings are being monitored and presented on a national platform. **The different energy concepts are being evaluated** by the accompanying research organisation, the Fraunhofer Institute for Building Physics, on behalf of the ministry. First results are already available on the project website and will be continuously updated. Several manufacturers of prefabricated buildings have developed their own version of Efficiency House Plus. Examples of houses with heavy-weight constructions are also presented on the platform. Newest applications include Efficiency Houses Plus as renovation projects.

France: BBC-effinergie® and RT 2012 – Reduce the greenhouse gas emissions by a factor of 4

In France the main objective of the national climate protection strategy (as defined in the law of July 13 2005) is to **reduce greenhouse gas emissions by a factor of 4**. Following a national discussion process known as the 'Grenelle Environnement', performance requirements in the building sector were set to reduce the primary energy use in buildings to a mean value of **50 kWhpe/(m²a)**. This value includes space heating, hot water production, cooling, lighting and auxiliary energy (e.g. for fans and pumps). Depending on the climatic zone and the altitude the requirement varies between 40 kWhpe/(m²a) in the south to 65 kWhpe/(m²a) in the north of France. This value has also served as the basis for the French low energy standard 'BBC' (Bâtiment Basse Consommation) specified in the **BBC-effinergie® label**. Between 2007 and September 2012, 92,550 residential units in 20,451 construction projects as well as 97 non-residential projects have been certified with the BBC-effinergie® label. To monitor the quality of the construction the Ministry of Ecology, Sustainable Development and Energy (MEDDTL), the Environment and Energy Management Agency (ADEME) and the Effinergie association have launched a national platform dedicated to BBC buildings.

The '**Grenelle Environnement'** included provisions to **transform the ambitious performance targets to a general legal requirement for all new constructions**. Consequently the low energy requirements were adopted in the recast of the French thermal regulation (RT 2012) which is already applied for non-residential uses and will come into force for all residential new constructions on 1 January 2013. Even more ambitious targets are set by the effinergie+ label which was published early 2012 – **already 29 construction projects have applied** for it. As the Effinergie association aims at **promoting energy efficiency**, on-site electricity production may not be deducted from the calculated primary energy needs. Yet the law 'Grenelle I' requires that **new constructions after 2020 produce more energy from renewables than used in the buildings**. The necessary calculations are specified by RT 2012 which can consequently be regarded as the next step towards NZEBs with high energy performance requirements and the consideration of on-site electricity production. **In France 190 case studies of 'bâtiments à énergie positive – BEPOS' are registered** in a database set up by ADEME.

Switzerland: MINERGIE® – Higher quality of life, lower energy use

MINERGIE® is a **quality brand for low energy use at a higher level of comfort for new and refurbished buildings**. The trademark is supported by the Swiss Confederation, the Swiss Cantons along with trade and industry. **Comfort is at the heart of MINERGIE®** – the comfort of the users living or working in the building. A wholesome level of comfort is made possible by a **high-grade building shell and the continuous renewal of air**. Specific energy is used as the main indicator to quantify the required building

quality. In this way, a reliable assessment can be assured. Only the final energy use is relevant, weighted according to national factors for different energy sources.

The MINERGIE®-Standard for buildings was introduced in 1998 as an exemplary building standard, with higher user comfort compared to legislative requirements. The rapid spread of these standards led to a **50% reduction of energy use for new constructions in the legislative requirements, within a period of a few years**. In some cases the MINERGIE®-Standard for buildings is now obligatory for public buildings. For this reason MINERGIE® was extended with two more stringent energy standards, **MINERGIE-P®** and **MINERGIE-A®**. Furthermore, all MINERGIE® Standards can be combined with the eco-bau® construction standard, which adds health and ecological requirements: MINERGIE-ECO®, MINERGIE-P-ECO®, MINERGIE-A-ECO®. Apart from general requirements such as a ventilation system and that the extra costs be moderate, a detailed quantitative proof of energy performance (for heating, hot water, ventilation and air conditioning) has to be delivered. The sum of all weighted energy demand components has to be compared to the limiting value, e.g. 38 kWh/m²a for residential buildings. For all building categories, significantly less stringent limiting values exist for the MINERGIE® renovation standard (e.g. 60 kWh/m²a for residential buildings).

- MINERGIE-P®-Standard requires a **very good insulation and proven air tight building shell**, corresponding to the passive house standard.
- MINERGIE-A®-Standard is a **zero-heating-energy-building**. The total required heating energy must be provided, or compensated, by renewable energy sources. **Biomass-derived heat contributions are permitted**, providing that the heat source is hydraulically integrated in the housing technology (e.g. a wood fired heating system combined with solar panels and joint storage). **A heat pump is often installed**, with its electricity use wholly compensated for by a photovoltaic installation. Furthermore, **a large enough photovoltaic installation can compensate for the household electricity use**. Thereby, a MINERGIE-A®-Building is upgraded to a plus-energy-building.

In the meantime, the building sector has developed a wide range of products and services for MINERGIE®-Buildings. Suppliers include architects and engineers as well as manufacturers of materials, components and systems. The MINERGIE® Standard is widely accepted. Today **over 25,000 buildings with a total of more than 28 million m² gross floor area have been certified as MINERGIE®-Buildings**.

Further information on international and national approaches towards nearly zero-energy buildings (NZEBs) can be found on the BUILD UP Community 'Nearly zero-energy buildings'.

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