

IntEnD

Integrated Energy Design

By Nicole Holanek



In the past decades both the energy consumption of buildings and the energy prices have been increasing rapidly. Global warming and a larger focus on independency from oil have in many European countries resulted in establishing a more restrictive political and legal framework in order to reduce the energy consumption of buildings and thus also the CO₂ emissions.

Building users are becoming aware of these problems and requirements as well as of the fact that there are simple possibilities to save money when building and using buildings. To meet these requirements "new" strategies of construc-

ting buildings are needed – the so-called Integrated Energy Design (IED).

IED is a construction process which tries to ensure coherence between shape, function, architecture and energy consumption so that the building convinces by its architecture, ensures the desired functions and flexibility, provides a convenient indoor climate and, at the same time, relieves its user with low energy costs during the whole life cycle of the building.

Experiences show that IED-designed buildings are built with 40–70 % lower energy consumption than conventional buildings, and the financial feasibility (rate of return) for the IED-measures is often more than 10 %.

The target of integrated energy design is to define and set energy related targets and measures right at the beginning of a project, as any changes in a later stage of a building process cost lots of money and will nevertheless have only a relatively small impact on the energy performance (see Figure 1).

Design philosophy

To ensure an energy efficient building it is

important to utilise a low-energy principle:

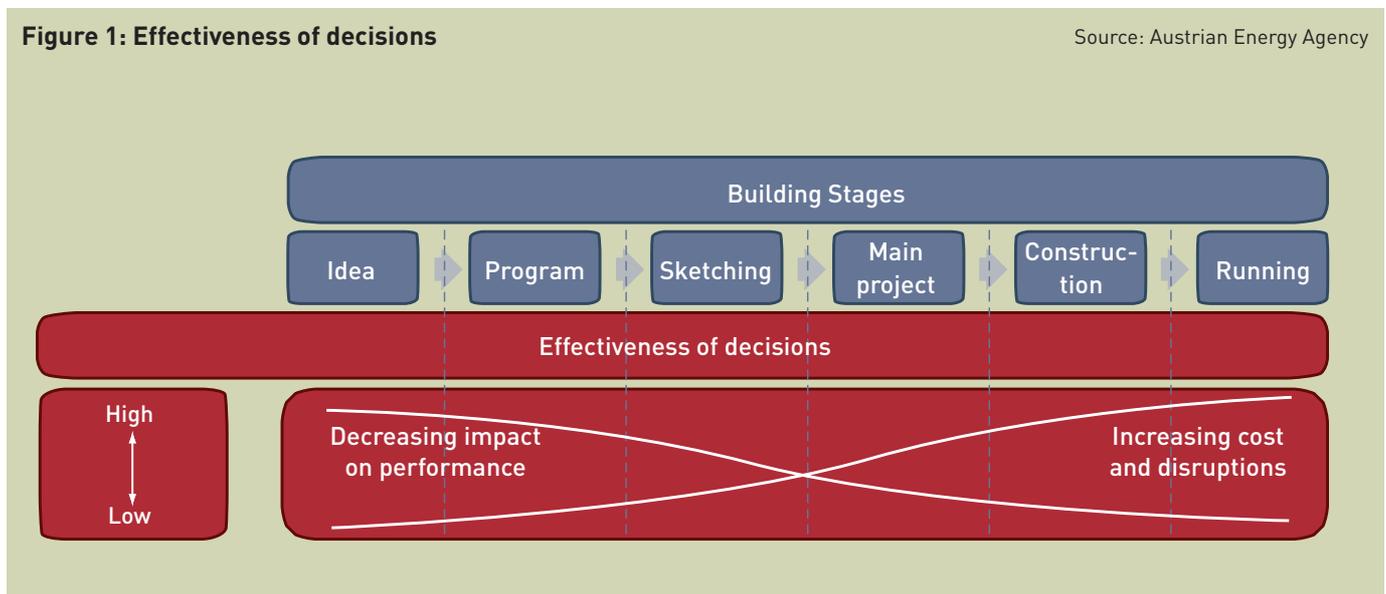
1. Reducing the demand of energy as far as possible by utilising passive strategies:
 - a) Keeping the heat energy demand as low as possible by using solar gains, applying thermal insulation etc.
 - b) Keeping the cooling demand as low as possible by being careful when designing window areas, using shading systems, considering thermal mass, applying passive cooling systems etc.
2. Utilising renewable energy sources as far as possible.
3. If using fossil fuels is necessary after these measures, the least harmful fuel has to be found and applied as efficiently as possible (see Figure 2).

The process of IED

The basis of a well functioning integrated energy design process is an open minded building owner, planners who are interested in energy savings and qualified as well as skilled craftsmen having a good knowledge of the technical possibilities. It is important that the different participating professions respect each others' work and that everyone works for the common targets.

Figure 1: Effectiveness of decisions

Source: Austrian Energy Agency



The design team is the fundament for the whole concept of IED. In IED we use the 3-ring-model (see Figure 3). Members of the core team are planners who are decisive for the innovation aspect of a building. The core team makes decisions and defines the questions, which are then worked out by the project team. The core team attends the start meeting and the concept meetings. Further meetings are held if required. All contents compiled by the project team and the experts have to be delivered to the core team.

Members of the project team are field planners. The project team attends the start meeting and concept meetings as well as special meetings. Experts bring in their expertise. They only attend the start meeting and the concept meetings if it is necessary. They are consulted during the planning processes at times. One member of the design team is the facilitator who makes sure that the cooperation slides smoothly. He supports the process and has an important role in the sketching phase. The facilitator must not be confused with the project manager who is responsible for the time schedule, economy etc.

While working together communication is a critical point. Different professions speak different languages. For example, talking about "flexible walls": The customer means that the wall is moveable (e.g. for enlarging or reducing rooms). An architect thinks about options of different materials (bricks, gypsum...). A manufacturer wants to have solutions which serve all conditions. The facilitator should pay special attention to the communication and ensure that ambiguities are discussed.

Close collaboration between all members has to take place in the initial stages. Thereby you create awareness of the impact of architectural and technical decisions on the sketching level and you avoid the necessity of changes in the later stages and thus save a lot of money.

At the beginning of the project targets/target values and common premises have to be defined. The developed solutions considering the architecture, building physics, equipment etc. have to be

Figure 2: Principle of Trias Energetica

Source: Austrian Energy Agency

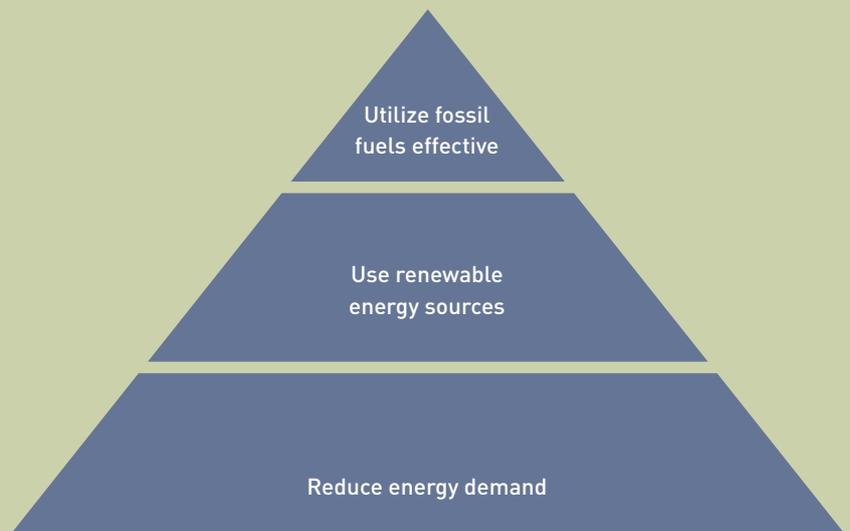
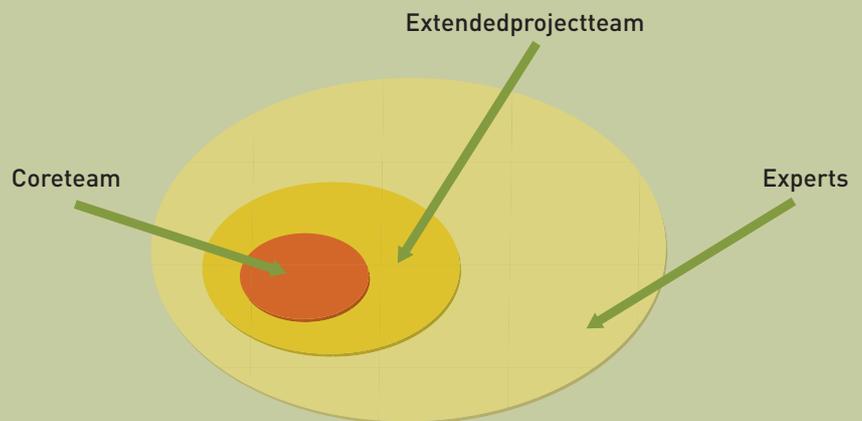


Figure 3: Three-Ring-Model



Source: Source: S. Geissler, Vernetzte Planung als Strategie zur Behebung von Lern- und Diffusionsdefiziten bei der Realisierung ökologischer Gebäude – Vernetzte Planung – Leitfaden, Wien 2002

evaluated throughout the whole process according to common targets.

Methodology

It has to be ensured that both the building design and the building services are taken into consideration right from the start. Figure 4 shows the time flow of an integrated energy design.

Experience says that it is easier to concentrate on one topic at the same time and to go through the building design focusing at that topic. But of course many of the topics are correlated and will interact with each other. So in practice the design team will jump around between the building services and building design. However the design team (the facilitator) should try to follow the suggested methodology. It is based on a typical office building where lighting has an important role in the total energy consumption. Depending on the type of the building and the analyses of the surrounding, climate

and legislations the design team can choose another order.

There are no recipes but the planning team has to work out the optimum solution for every specific case. To implement integrated planning successfully procedural knowledge as well as a functioning interdisciplinary communication process is essential.

The EU supported project IntEnD (Integrated Energy Design) was started to develop Integrated Energy Design as a standard European practice of building design and to set a new standard, which is substantially beyond the anticipated level of the Directive of Energy Performance of Buildings.

Tools and methods for IED are developed for practical use by the participants involved in a design process. The methods will ensure indoor climate according to new EN standards by focusing on passive energy strategies and measures. To demonstrate how IED can be used in practise, the integrated design

concept will be carried out in at least 12 building projects in the 6 participating countries. It will be demonstrated how IED can contribute to energy optimized design in these buildings. The IED-tools, the results and practical experiences from the demonstration projects will be disseminated through seminars and workshops for public real estate organisations and for architects and consulting engineering companies in each of the countries. ■

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Nicole Holanek is a scientific officer in the Buildings & Heating Department of the Austrian Energy Agency. Beside the contribution to the klima:aktiv programmes ecofacility and wohnmodern she works within the EU supported projects IntEnD and KeepCool II (Sustainable cooling).

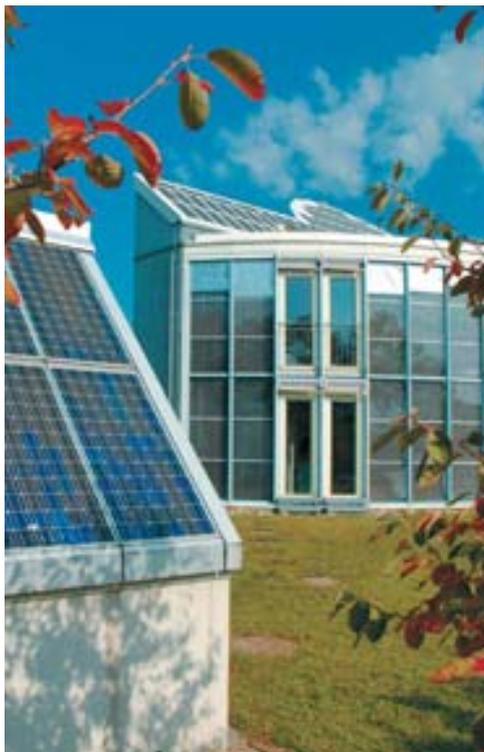
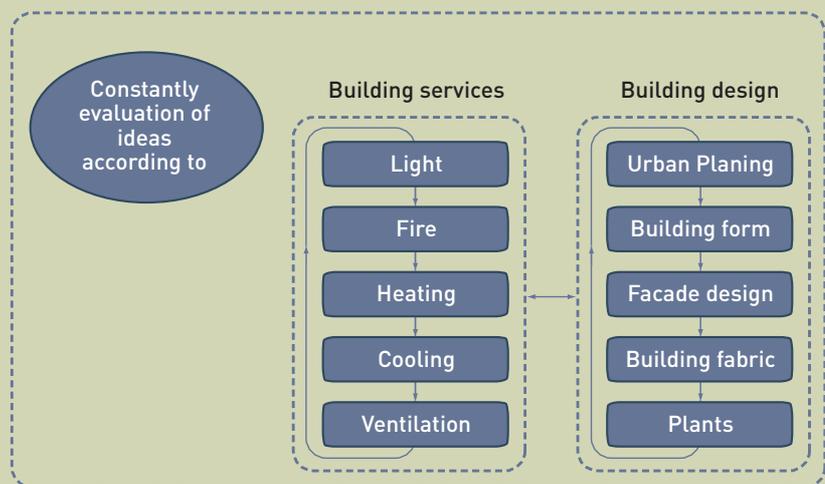


Figure 4: Methodology when designing the core design of a building. In this phases there is the need for all professions.

Source: Austrian Energy Agency



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