

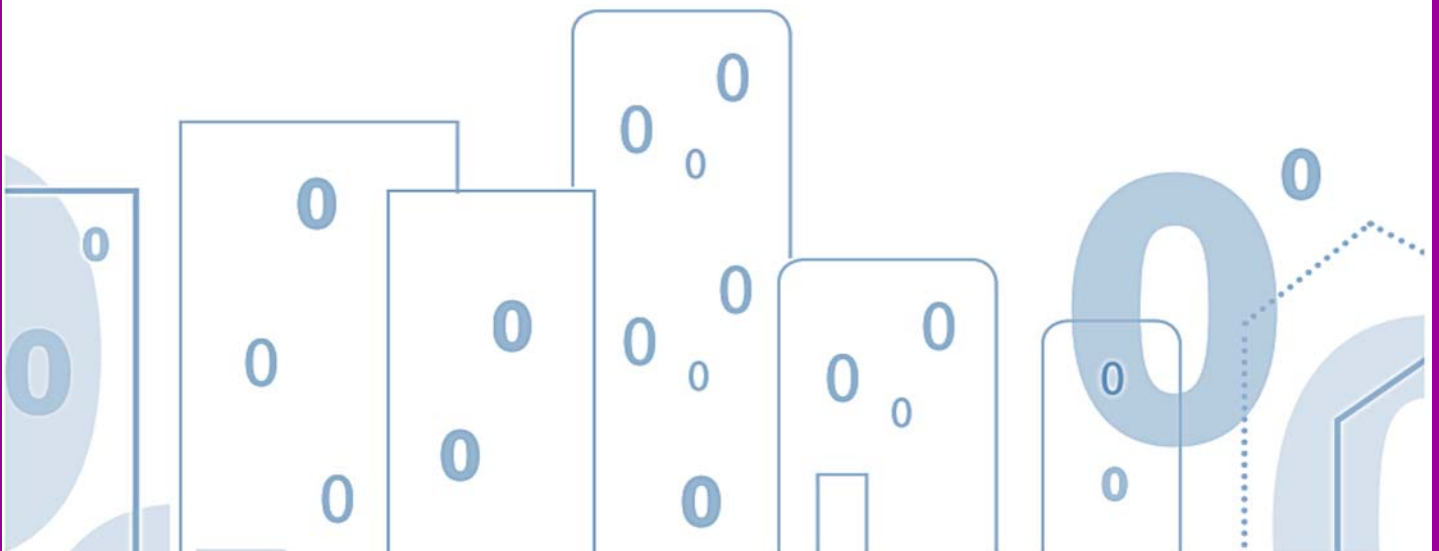
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**NEARLY
ZERO
ENERGY**
HOUSING FOR
COLD/CONTINENTAL
CLIMATE ZONES

THE NEARLY-ZERO ENERGY CHALLENGE IN COLD AND CONTINENTAL CLIMATES

Usability of nZEB in
Cold / Continental Climates



Authors:

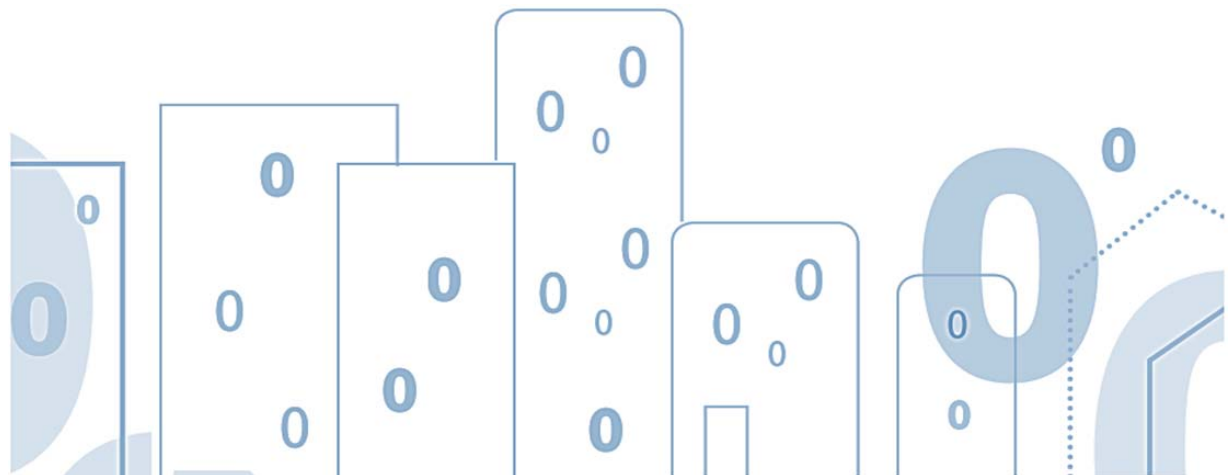
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1. Introduction

This report is dedicated to usability of residential buildings with focus on costs of property administration in low(est) energy buildings. Whether these costs have to be integrated in the costs efficiency calculation depends on different assumptions. Respective conclusions will be driven after discussion of quantification of extra costs.

This document deals with:

- Issues which cause additional cost in administration such as **information and training of residents** either during the process of (first) moving in or after (deep) renovation;
- Issues causing additional efforts during the life cycle such as **dealing with problems, requests and complaints**;
- Additional costs which are caused by the **maintenance of technical infrastructure** as such.

This report is based on interviews of housing managers, analysis of information sheets or manuals and other documentation as well as on residents' communication via internet forums. It is not limited to the projects dealt with in the cost analysis in order to broaden the spectrum of information. It does not comprise residents' satisfaction surveys and it has to be noted that it is based only on the experience of Austrian housing providers.

2. Additional costs: main causes

Low energy buildings are based on a set of technical features which need to be dealt with in a specific way in every aspect of planning, building, maintenance, service and every-day handling. Even when in this part special regard is given to costs of management it has to be noted that these costs depend not only on „poor“ use of dwellings but also depend on the planning and building process. Similar to other aspects of home building failures in the planning/building process lead to extra costs in the afterwards management – and vice versa.

To specify the special technical features of low(est) energy buildings the following are to be mentioned:

- Improved insulation of buildings without installation of automatic ventilation;
- Improved insulation of buildings with installation of automatic ventilation in lowest energy and passive buildings.

While the improved insulation together with improved air tightness without installation of automatic ventilation as such leads to adaption of mechanical ventilation and heating by inhabitants, the automatic ventilation – eventually in combination with a special heating system - is a new element of housing/living which requires special handling and care by users. Handling is also different in summer and winter.

To specify the mentioned requirements:

- **Improved insulation of buildings without installation of automatic ventilation:**

New buildings with improved insulation without automatic ventilation but automatic exhaust air unit are a comparatively “simple” solution. In new buildings the heating system is adapted to the level of insulation and does not need special care; the heating system as such is a common system. The exhaust air unit in bathrooms and kitchens prevents mould formation and does not require special care by residents. Nevertheless mechanic ventilation might be an aspect of concern, especially if there is a very high level of airtightness.

After renovation with improvement of the insulation of the facade (and roof/cellar) it might occur that inhabitants tend to overheat their dwellings, especially if heating system is not adapted. At least some basic information has to be provided in this case to prevent or reduce the technical rebound effect. This technical rebound effect occurs when an oversized heating system is not exchanged. Housing administrators also report that residents complain if flow temperature is reduced – even if same air temperature as before renovation is reached due to better insulation. This may be identified as „effect of habitude“ which has not been identified in analysis yet. It is reported that housing managers sometimes reduce flow temperature step by step quasi in order to „hide“ this fact.

- **Improved insulation of buildings with installation of automatic ventilation in lowest energy and passive buildings**

To better understand the complications occurring with automatic ventilation systems they have to be described on a basic level: These systems constitute the core element in very

low energy buildings. They have two functions: to reduce the cooling effect of mechanical ventilation by opening windows plus to guarantee the required air exchange in very airtight buildings. They may be equipped with a heat exchange system – using warm exhaust air to warm supply air - and/or an additional heating source (like e.g. district heating). Nevertheless these ventilation systems are no heating or cooling systems. There are different systems depending of whether the individual dwellings are equipped with a ventilation unit (de-central) or there is a central system supplying different dwellings. Also combinations are possible.

In any of these systems the ventilation may be regulated individually in each single dwelling but to different degrees and sensitivity. As it turned out that even in passive houses there is need for an independent, extra heating system – both to obtain a comfortable temperature and air humidity – there are two systems influencing temperature and air quality in very low/passive buildings (if not a humidifier as third element is used by residents). Since the ventilation system states the essential element of the system it is not meant to turn them completely off. There are systems which may be switched off – nevertheless this may result in a dysfunctional effect as regards temperature/energy consumption as well as to worsen air quality with even negative health effects. Thus it is reported that even in case of installing individual ventilation systems in dwellings in multi-family blocks the 0-modus has been blocked in order to guarantee a minimum degree of automatic air ventilation.

Mechanic ventilation via opening the windows in very low/passive buildings should be avoided in winter. It results in cooling the walls which store the warmth and leads to a higher energy consumption and/or uncomfortable temperature. To provide a higher level of air exchange – e.g. while/after cooking or the presence of guests – there are different levels of ventilation which can be regulated by residents. So to obtain comfortable air temperature and quality it requires some knowledge and training with the devices installed in lowest energy buildings.

In summer it is different; mechanic ventilation – during cooler hours (nights) – might be advisable. The heat-storing effect of walls also occurs during summer season and has to be taken into consideration. Especially dwellings with south-west orientation on higher storeys not equipped with outside window shades are in danger of overheating.

Last but not least monitoring, regular service and maintenance of the mentioned system is of interest. Depending on the system – central, semi-central or de-central – there are different requirements. Regular service – such as exchange of filters – has to be cared for by housing administration or residents. In addition there is need of cleaning of pipes

and check of hygienic status. Extra effort for housing administration is caused by organizing these activities or providing it – if possible – by own personnel. If some of the service activities are left to residents, respective instructions have to be provided. Nevertheless housing management has to perform some minimum control in this case as the proper functioning of the whole system might be effected as well as the performance of the system in the future.

3. Extra efforts: additional activities of administration / management

Separating the extra efforts of housing administration of “normal” activities is not self-evident in low(est) energy buildings. Providing information material and organizing information meetings for tenants for example is important – but it is common at least in any big housing estate. It is more the content of the information which is “extra”: It is that on the specific technical equipment and their handling in these buildings.

According to information by housing providers it turns out that the information provided for (future) inhabitants does not prevent any additional requests by tenants after they have moved in. These requests may occur due to:

- Need for information in handling with heating/ventilation;
- “Real” (technical) problems;
- Mishandling of devices; mishandling of mechanical ventilation, shading of windows;
- Neglection of care instructions;
- Dealing with energy bills.

Passive house technology requires very careful planning and construction. The central ventilation system is the most sensitive part – especially in big buildings with dwellings with different positions within that building. It turned out for example, that the temperature of ingoing air – after pre-warming – in some buildings was too warm in upper storeys and too cold in dwellings on the ground level. The consequence was that the cold dwellings needed to be equipped with additional heating devices, while the warm dwellings needed extra outside window shades for summer use. Finding out the causes of the discomfort reported by residents takes some time and “trial and error”. In this process the housing management is involved for some time. In other cases the ventilation system needed to be adapted in total.

Another reason for extra engagement of the housing administration are costs and billing of energy. People living in passive/lowest energy buildings expect reduced costs for energy, they have the information of the energy certificate. When their expectations are not met they put requests or complaints which have to be dealt with from side of the housing management – eventually in co-operation with the energy provider and/or facility manager.

To summarize additional activities of housing administration in lowest energy/passive buildings: There are no extra activities of a new quality; but any additional technical feature in a residential building bears some probability of malfunction, failure, mishandling and needs special care. Therefore, there are extra activities with respect to the new techniques in such buildings.

4. Extra efforts and additional costs: some reflections

To draw conclusions from the above presented facts as regards the financial consequences we can state:

- There are extra costs for the housing management but their quantification is not easy. In addition it seems that these activities are more intense in the first years after the completion of the building – so an estimation for the lifetime is hard. That has also to do with the handling of these costs.
- According to the non-profit system in Austria costs for the housing administration are not charged according to the individual costs of an estate but by a limited provision defined by law. Therefore, the housing provider has to cover its costs by this charge. That is also a reason why there are no exact calculations of these costs. Furthermore, these costs depend to some extent of the size of the building. So it is not very unlikely that these extra costs for housing management activities add up to 10 – 15 percent of common average level in the first years; but there are no figures for a longer period.
- For the cost efficiency calculations of lowest energy buildings these extra costs have to be taken into consideration to some extent – but due to the lack of exact quantification more in a qualitative way.



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