

Energy efficiency of heritage buildings

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Introduction

As a requirement of the Energy Performance of Buildings Directive (EPBD), Member States (MSs) must set energy performance requirements for existing buildings when they undergo major renovation; at the same time, as a requirement of the Energy Efficiency Directive (EED), they must formulate a national strategy for renovation of existing buildings.

Heritage buildings, in their original condition, usually have very poor energy performance. It may be unreasonably expensive, or otherwise impracticable, to comply with the energy performance regulations applicable to renovation. As architectural characteristics have to be preserved, standard solutions that are feasible for other buildings will be unacceptable for heritage buildings if they bring a change in appearance and character.

In buildings of unconventional design, especially when they are large or old, access to parts of the fabric may be particularly difficult, and the opportunity for energy performance improvements is limited to occasions when major repairs are needed. Nevertheless, there will usually be some scope for improvement of the technical building systems inside the building.

The importance of historic buildings is recognised by both the EPBD and the EED. According to the EPBD, minimum energy performance standards, for the building as a whole and for its components, need not be applied to:

"... buildings officially protected as part of a designated environment or because of their special architectural or historical merit, in so far as compliance with certain minimum energy performance requirements would unacceptably alter their character or appearance".

There is similar wording in a different context in the EED. The EED imposes obligations concerning the exemplary role of public bodies' buildings, and government purchases of services and buildings. In both circumstances, the minimum energy performance requirements are relaxed for buildings that are part of a designated environment or possess special architectural or historical merit. These provisions of the EED extend further to places of worship and religious activities, and buildings for national defence or the armed forces (except living quarters and offices). In addition, it may be argued (under both Directives) that renovation to regulatory requirements is obligatory only where it is "*technically, functionally, economically feasible*". It may not be feasible to achieve the same energy performance levels as for other buildings for such reasons.

The economic benefits of energy performance improvements of heritage buildings are likely to be reduced if renovation projects are judged on the same basis as conventional buildings, and this may harm the prospects for obtaining funding support.

Work performed by the Concerted Action EED has previously shown that MSs do not see energy performance improvements of heritage buildings as a priority. Energy consumption data for them is scarce: it is not homogenous, and not comparable. Barriers and uncertainties persist in funding arrangements, as well as poor coordination, and inflexibility.



What the Member States are doing

Enquiries by the Concerted Action EPBD in April 2016 have shown that about three-quarters of the MSs have an agreed national definition of heritage buildings.

The same number of MSs have established principles that are to be followed for renovation of heritage buildings (e.g., restricted use of modern materials), and more than half of those have published rules or guidance documents.

About two-thirds of the MSs allow some degree of exemption for heritage buildings from the regulations governing energy performance standards on major renovation.

In the MSs where significant energy performance improvements have been made to heritage buildings, it is predominantly the technical building systems (mainly heating) that have been upgraded.

Difficulties encountered

Energy efficiency is not usually the key driver for renovation of heritage buildings. Drivers are more likely to be preservation, and restoration or essential repairs to extend building lifetime.

Technical solutions may conflict with aesthetics and other considerations. Sensitivity and quality control are of heightened importance in heritage buildings. The insensitive use of exterior wall insulation in France, producing a noticeable change in building character, has been noted by the *Société pour la Protection des Paysages et de l'Esthétique de la France*¹ and examples can be seen in their article "Isolation Thermique par l'Extérieur: Deux Ans de Combat, de la Loi au Décret"².

Multiple organisations, with different aims, are likely to be involved in renovation projects, and so are government departments. Projects have to bring together technical and cultural experts and curators, who may not share the same vision.

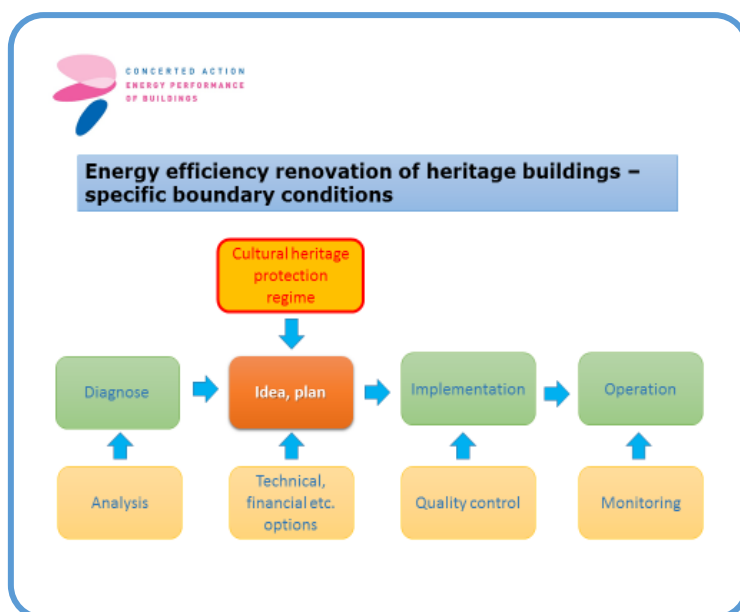


Figure 1. Renovation projects for heritage buildings are subject to additional conditions.

Higher costs of renovation for heritage buildings are very likely. Even when feasible, it may still be much more expensive to achieve the same energy performance in heritage buildings than in other buildings.

The rules of national financing schemes for energy efficient renovation may put heritage buildings at a disadvantage, if all applications are judged on an equal basis. Unless they are subsidised or supported in other ways, heritage buildings may not succeed in obtaining public funds because there is no recognition of the higher investment-to-savings ratio. Heritage projects are relatively unusual, and authorities and approval procedures may be inflexible.

¹ <http://www.sppef.fr/2016/11/15/sites-monuments-n-223/>

² http://www.sppef.fr/wp-content/uploads/2016/11/sppef_article-ite-sites-monuments-n%C2%B0223.pdf

Success factors

Renovation projects on heritage buildings are more likely to be successful when there has been a thorough assessment at the outset. This lowers the risk of subsequent discoveries that require a change of plans. For example, it may be discovered that the age of materials and fixings, and their rate of deterioration, is greater than expected.

Categorisation of heritage buildings, and their components, helps to simplify and focus on a range of feasible solutions. Shared experience of previous projects is particularly valuable – which solutions did or did not work well, and how cost-effective were they?

Relief from regulations can be granted on a quantitative basis by building category. For example, the targets for heat loss (W/m^2K) and energy consumption ($kWh/m^2\cdot year$) can be relaxed by building category. Categorisation by age, type of construction, purpose, and occupancy level, can be used as a proxy for prospective renovation costs and benefits. This approach has been adopted in Germany, with relaxation of up to 175% and 160% of the normal targets.

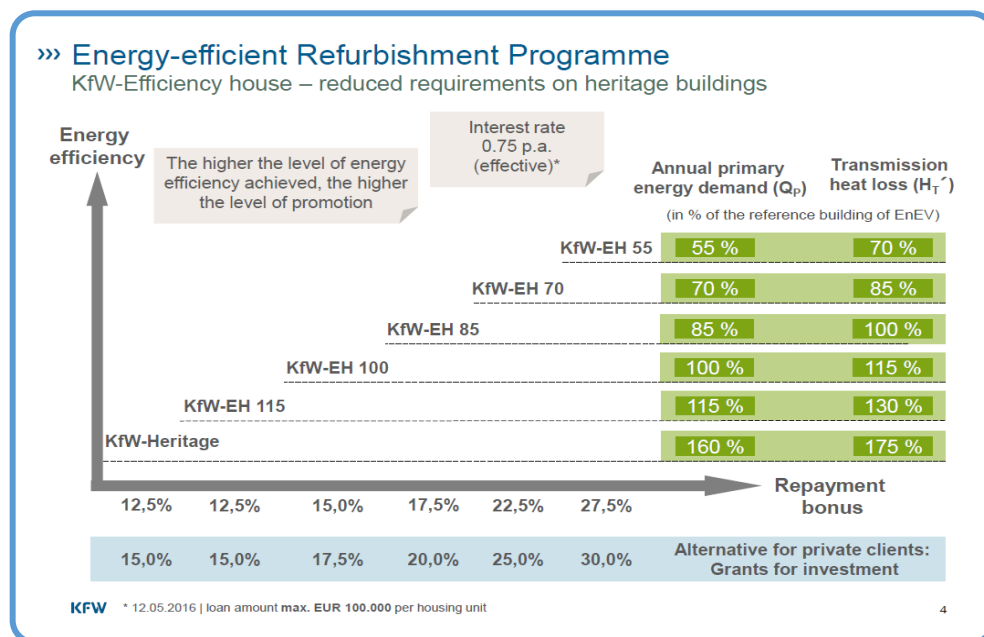


Figure 2. An example of targets that are adjusted quantitatively, according to type of building.

Advanced technology can be invoked for building services such as heating and lighting and can be used to monitor and control the building environment unobtrusively.

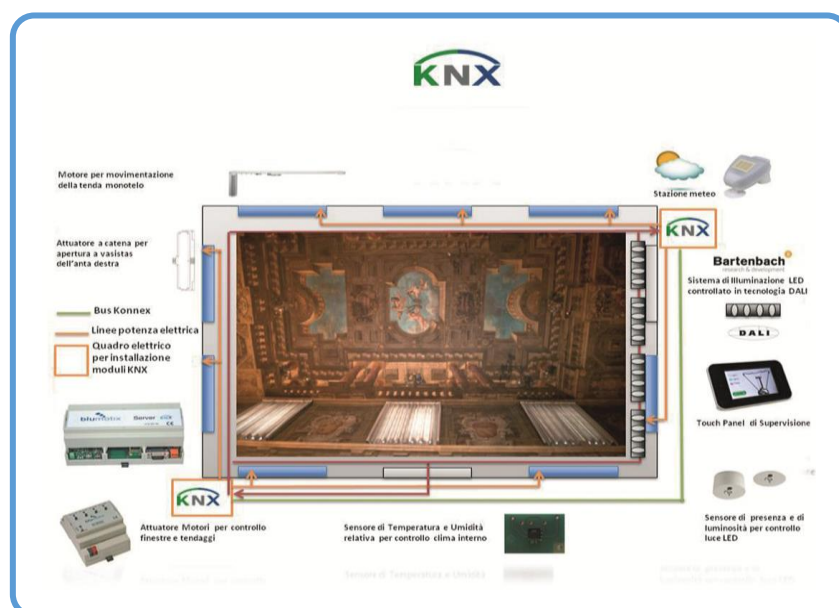


Figure 3. LED lighting, digital window and curtain actuators (an example from the Sala Urbana of the Palazzo d'Accursio Municipal Palace in Bologna).

Positive discrimination in the rules of funding schemes can be applied in the form of a “*heritage factor*” (or similar mechanism). Such a factor would compensate for the higher investment-to-savings ratio and generally inferior energy indicators after renovation of heritage buildings.

Many countries have published detailed guidance on how to approach the restoration of historic buildings and monuments with the help of various national organisations, based on previous experience. European projects, e.g., 3ENCULT³, have also studied the needs of historic buildings and the conflict presented regarding energy targets.

The importance of heritage buildings has been recognised by the Namur Declaration of April 2015, which may assist in the future promotion and funding of projects for renovation of heritage buildings. It defines objectives and priorities for a future common European Heritage Strategy and its priorities are the contribution of heritage to quality of life, the living environment, and Europe’s attractiveness and prosperity.

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³ <http://www.3encult.eu>