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DECREE OF THE MINISTRY OF THE ENVIRONMENT ON IMPROVING THE ENERGY EFFICIENCY OF A BUILDING TO A ZERO-EMISSION BUILDINGS IN CONJUNCTION WITH REPAIR AND MODIFICATION WORKS

Cost-effectiveness

Cost-effectiveness has been assessed through cost-optimality. The cost-optimal level must fall within the range of efficiency levels for which the cost-benefit analysis, calculated over the assessed economic life cycle, is positive. Four building types have been examined, each represented by two buildings of different ages. Some of the buildings have multiple heating methods and ventilation systems. The assessment period is 30 years for residential buildings and 20 years for offices and schools. The same time horizons must also be used in the comprehensive cost-optimality calculation reported to the Commission.

The Energy Performance of Buildings Directive (EPBD) requires that national requirements are at least at the cost-optimal level. The requirements may be up to 15 per cent less stringent than the cost-optimal level. Particularly in renovation, the scope for variation is almost unlimited, as the initial conditions of buildings and the solutions used in them differ across decades.

The assessment uses reference buildings created for four different building categories as follows:

- a detached house representing the 1950s–1970s and a detached house representing the 1980s–1990s
- a block of flats representing the 1970s and a block of flats representing the 1980s–1990s
- an office building representing the 1970s and an office building representing the 1980s
- an educational building representing the 1970s and an educational building representing the 1980s.

In the calculations, the energy carrier coefficients proposed in the draft Government Decree were used; these are 25 per cent lower than the coefficients currently in force. The Government Decree on the numerical values of energy carrier coefficients used in buildings is intended to enter into force at the same time as this Decree.

The range of deviation below the cost-optimal level for standard solutions averaged 1–13 per cent for buildings other than office buildings; therefore, the requirements of the Energy Performance of Buildings Directive are met with the proposed baseline solutions for buildings other than office buildings.

The ranges between variations of different baseline solutions were large, for example:

- In the detached house representing the 1950s–1970s, the range was 0–36 per cent, meaning that some values were too low, as the maximum permitted deviation is 15 per cent; however, this is achieved on average across the baseline solution variations.

- In the detached house representing the 1980s–1990s, the range was 1–25 per cent, meaning that some values were too low, as the maximum permitted deviation is 15 per cent; however, this is achieved on average across the baseline solution variations.

- In the block of flats representing the 1970s, the range was 0–16 per cent; therefore, no actual excessive deviation below the cost-optimal level is considered to occur in the baseline solutions.

- In the block of flats representing the 1980s–1990s, the range was 13–16 per cent; therefore, no actual excessive deviation below the cost-optimal level is considered to occur in the baseline solutions.

In school buildings, the baseline solutions of the reference buildings are slightly below the cost-optimal level, but the deviations are clearly smaller than the permitted 15 per cent.

For office buildings, the baseline solutions of the reference buildings, as assessed through the E-value, were 6 and 9 per cent more stringent than the cost-optimal level. For this reason, it is proposed that the E-value coefficient for office buildings be changed from 0.70 to 0.75.

The Energy Performance of Buildings Directive requires Member States to carry out a cost-optimality assessment in accordance with the methodological framework established by a delegated regulation. The results of the assessment and the report must be submitted to the Commission by 30 June 2028 at the latest. The obligation on Member States to remedy the situation where requirement levels are more than 15 per cent worse than the cost-optimal levels has been tightened. The requirements must be adjusted within 24 months of the results being obtained.

Impact on the position of households

In Finland, energy efficiency requirements have been set at a level where life-cycle costs are lowest over the economic life cycle. The additional investment costs arising from the requirements are offset by energy savings during use.

Savings are also achieved when repairs reduce the required power demand.

In renovation, the requirements can be met cost-effectively through various structural improvements, upgrades to technical systems, or combinations of these.

The aim is that energy efficiency improvements carried out in connection with renovation works are cost-effective. Measures to improve energy efficiency are most often justified when scheduled alongside repairs undertaken for other reasons, in which case they are also economically justified. The majority of Finland’s building stock is used by households. Improving a building’s energy efficiency can lead to long-term savings in energy costs and may have a positive impact on the building’s market value in areas where functioning markets exist. Costs vary from project to project. From the perspective of property owners, cost-effective energy efficiency improvement measures can often include, for example, additional insulation of the roof carried out in connection with other repairs to the structure or system concerned, new energy-efficient windows, improvements to the airtightness of walls, and changes to the heating system when the existing system has reached the end of its service life.

Improving energy efficiency, and also taking account of summertime overheating during renovations, supports preparedness for and adaptation to the adverse effects of weather phenomena caused by climate change.

In return for the investments, there are savings in energy costs, which reduce housing costs once the investment has been paid back. Design costs account for approximately four per cent of total construction costs. Planning related to energy efficiency improvements forms part of these costs, and improving energy efficiency does not significantly increase design costs when it is carried out in connection with other renovation works. The cost of building services engineering design accounts for around one and a half per cent of the construction costs of a new building, and slightly more in renovation projects depending on the nature and scope of the project. The additional input required for design and site supervision would also have a positive impact on the overall quality of project implementation in other respects.

As measures to improve a building's energy efficiency would be scheduled cost-effectively in connection with other repair works, the party undertaking the renovation would incur permit costs, since the repair requires an official permit under the Construction Act.

Effects on corporate finances

The new obligations concerning energy efficiency in renovation will apply to renovation projects owned by companies. The obligations will increase the investment costs of renovations, depending on the scope and nature of the project. The obligations relating to renovation construction will increase the value of renovation work and the amount of project-specific planning required. They will also increase demand for construction products and systems that affect energy efficiency. Renovation construction has an employment effect. For example, design firms and construction companies specialising in energy-efficient renovation will gain additional business opportunities as the volume and quality of renovation work develop. The proposed Decree will support the development of expertise in energy-efficient renovation and of related products by increasing demand for energy-efficient construction products. This may also enhance the competitiveness of companies in European markets.

Impact on public finances

No significant additional workload is expected for municipal building control authorities from taking energy efficiency into account, as the structure of the regulations will remain unchanged and only the requirement levels will be modified. The proposal may temporarily increase advisory tasks for building control authorities. The magnitude of any additional costs is difficult to estimate. The new obligations concerning energy efficiency in renovation will also apply to renovation projects owned by the state. The same obligations will apply to improving the energy efficiency of properties owned by municipalities in connection with other repair works. The obligations will increase the investment costs of renovations, depending on the scope and nature of the project.

Impacts on the costs of individual projects

The economic impacts in individual renovation projects vary considerably depending on the market situation and geographical location. The guiding principle of the requirements for renovation is that a structure or system is repaired when it has reached the end of its service life or must be replaced or renewed, for example due to a change in use. For this reason, when carried out at the same time, the cost impacts of improving energy efficiency are generally relatively small.

In Finland, energy efficiency requirements have been set at a level where life-cycle costs are lowest over the economic life cycle. The additional investment costs arising from the requirements are offset by energy savings during use.

In renovation, the requirements can be achieved cost-effectively through various structural improvements and upgrades to technical systems.

Ventilation

It is not advisable, on energy-saving grounds alone, to convert natural ventilation or mechanical extract ventilation into balanced supply and extract ventilation. If such a conversion is undertaken, for example due to indoor air quality considerations, a heat recovery system exceeding the minimum required performance level should be selected.

Roofs

Many roofs in older buildings have already been retrofitted with additional insulation, but the insulation thickness can still be increased. In buildings with pitched roofs, additional insulation can be implemented as a standalone measure. Increasing thermal insulation is not typically considered a repair measure as such, although it is important to ensure adequate air circulation in the insulated space.

Additional insulation of unventilated roof structures can, in practice, only be carried out in connection with roof covering repairs. The adequacy of ventilation in the roof void should be ensured after installing additional thermal insulation.

External walls

Additional insulation of external walls should be carried out when the external cladding is due to be renewed in any case. The costs of insulating external walls increase if other building components also have to be replaced as a result of the insulation works.

Windows

When replacing old windows that have reached the end of their service life, windows with the lowest possible U-value should be selected.

Estimates of the marginal costs of energy efficiency improvement measures carried out in connection with renovations vary. In some projects, the costs may be very low, while in other buildings achieving the required performance level may result in high costs. In such cases, it is possible to deviate from the required level on technical, functional or economic grounds. In average buildings, the costs are reasonable in relation to the benefits achieved, and they have a payback period over the lifecycle of the repair or within a shorter period. The cost associated with improving energy efficiency in renovation works refers only to the additional cost compared with the original solution, since the renovation would be carried out in any case.

Measures that typically do not result in additional costs, even when energy efficiency is improved in connection with them, include, for example, the replacement of windows and doors and the renewal of an existing ventilation unit, where such measures would be undertaken anyway.

At the other extreme is the addition of ventilation, for example in connection with pipe renovations or façade renewal. The cost impact of such measures is difficult to assess. The most significant factor in the

assessment is the extent to which the installation of new ventilation is considered to contribute to energy efficiency improvement. On the other hand, the regulations do not require an improvement in quality level, for example, there is no obligation to install ventilation, so such measures represent an upgrade in performance achieved through refurbishment. The requirements also apply, in respect of ventilation, to situations where ventilation would in any case be installed or existing ventilation improved; therefore, the additional costs arising from the requirements would not be significant and the payback period would be reasonable.

Investment in energy efficiency reduces a building's operating costs and helps to curb increases in housing costs. Throughout the 2020s, energy prices for consumers have shown a clear upward trend regardless of the heating method; for this reason, paying attention to energy efficiency in building design and construction is also economically justified. Fluctuations in electricity prices, and in particular price increases during the heating season, further improve the cost-effectiveness of renovation measures that reduce the need for purchased energy. In addition, taking good energy efficiency into account in design improves the overall quality of construction.

Renovation activity can also be encouraged through financial incentives, which are particularly effective in activating residential buildings. For example, grants for switching to a more energy- and environmentally efficient heating system are likely to encourage many to change their heating system at the latest when the technical service life comes to an end. The best outcome is achieved if financial incentives can encourage the implementation of measures that exceed the required regulatory level. At the time of writing, there are no financial support schemes specifically for energy renovation, apart from the increased household tax deduction aimed at phasing out oil heating.

Emission reductions can be achieved particularly in detached houses by replacing heating systems with systems based on renewable energy sources. These changes are likely to reduce greenhouse gas emissions from the building stock more than energy-saving measures implemented within buildings themselves. However, both approaches are necessary in order to achieve emission reduction targets.

In addition to regulatory requirements, effective guidance and information are needed for residential construction, both for housing companies and private owners of detached houses, as well as training for designers and real estate professionals. In training, it is important to emphasise not only the energy efficiency of different solution options but also the long-term functionality of the overall system.

Environmental Impact

Energy used in buildings and in construction accounts for more than 40 per cent of final energy consumption and nearly 40 per cent of greenhouse gas emissions. As the building stock is renewed slowly, it is important to improve the energy efficiency of existing buildings as well. Energy efficiency also has positive effects on the availability of natural resources. The energy efficiency of buildings improves and emissions are reduced. Building products used in renovation increase material consumption. However, calculations show that emissions during the use phase of a building are significantly higher than emissions from the production of materials, and therefore the use of additional materials is justified. Renovation activities generate waste and emissions regardless of whether energy efficiency is improved in connection with them.

Regulations increase owners' awareness of building energy use and guide decision-making. If they also trigger indoor air quality improvements, the quality of housing improves. In itself, many professionally implemented energy renovations eliminate draughts and thereby already improve living comfort. Poor design

and careless execution can result in problems such as indoor air quality issues, regardless of whether energy efficiency is improved at the same time.

The objective of the regulations is to reduce the use of fossil fuels, decrease greenhouse gas emissions, and increase the use of renewable energy. The requirements apply to major renovations as well as smaller refurbishments that can improve building energy efficiency. In addition to major renovations, a similarly significant impact can be achieved through proactive property management and operation. Renovation activities use a greater number of building products, which increases production volumes and emissions either in Finland (for domestically produced products) or in the countries where imported products are manufactured. Renovation activities also generate additional transport of construction materials and increased waste. The amount of waste also increases if, instead of renovating, poorly maintained buildings are demolished and replaced with new construction. In such cases, the production of building products and its environmental impacts also increase. The requirements apply to existing buildings. Building envelope renovations can be utilised as a tool for improving the urban landscape.

Other impacts

The draft decree is not assessed to have any other significant impacts.