

Implementation of building energy quality

Intelligent Energy (+) Implementation.

The proposed “Energy (+)” standard for sustainable and energy efficient building quality introduces an energy efficiency standard which goes beyond the new minimum demands concerning energy quality for new build and renovation which anyway needs to be improved again 5 years later (in 2011).

This means that a logic definition of the energy (+) standard concerning energy use could be to use this to be able to introduce the expected minimum energy standard for 2011 already from 2006.

To be efficient in implementing the EU-energy performance directive for buildings in an effective way, and to be able to lead to aimed at energy savings in practice it is the idea that the energy (+) standard should also include the following:

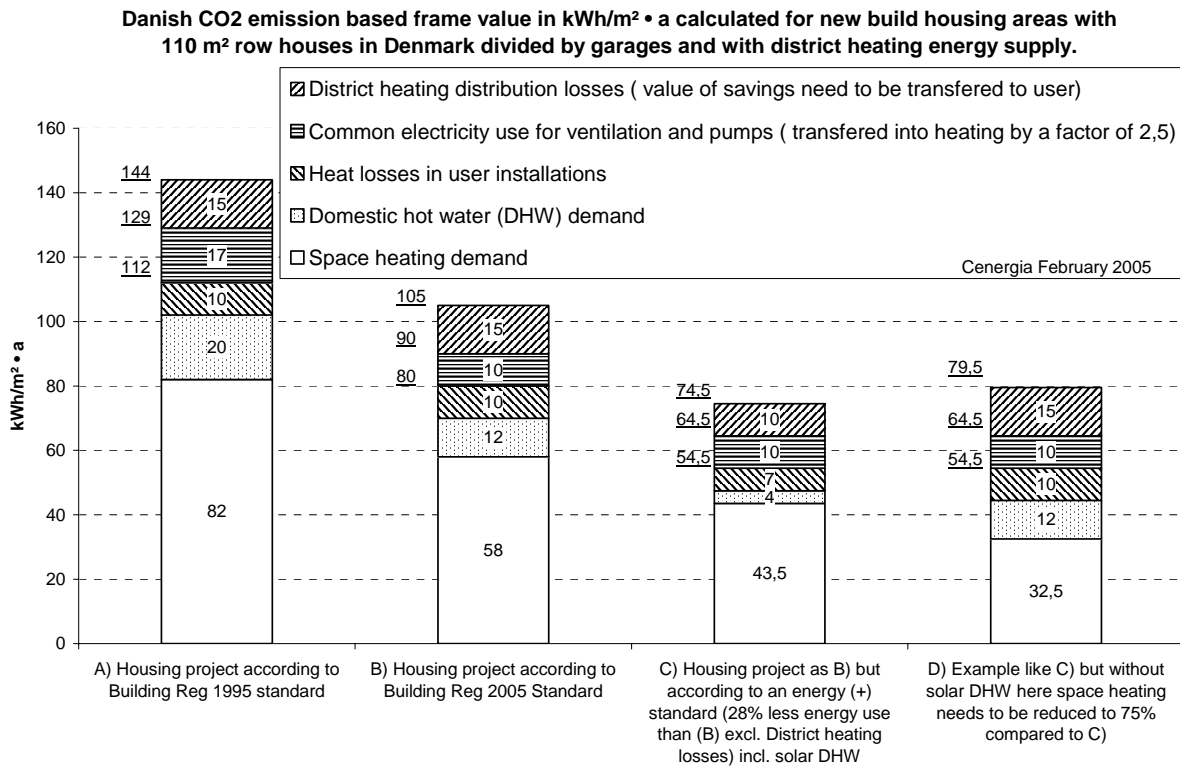
<p>As part of the total design budget for a building project an allocation of up to ½% of the total building costs should be used for support on the following work:</p>	<p>1. Establishment of a clear definition of performance requirements for used technologies as well as for the complete building project. Here information in the Green Catalogue website can be used as an inspiration (see: www.greencatalogue.com).</p> <p>2. Monitoring and control of energy qualities and energy supply solution including use of blowerdoor test, thermography and documented energy use including a monitored energy signature and green accounting after one year operation.</p> <p>In connection to item 1 + 2 a builder need to use an independent energy specialist organisation.</p>	<p>3. Use of Green Catalogue Questionnaire with energy and environmental points. And use of a certain number of sustainable building measures according to the Green Catalogue questionnaire.</p> <p>4. Total economy assessment (optimisation of investment, operation and maintenance costs).</p>	<p>5. Assessment on adapted energy supply solution with reduced losses.</p> <p>6. Assessment of possibility of utilising solar energy e.g. for domestic hot water or ventilation.</p>
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Actually the mentioned demands for performance requirements and follow-up including the use of the “Green Catalogue Questionnaire” is just as useful and necessary to ensure a good energy quality also in connection to the new minimum energy demands which will exist by January 2006.

By help of the mentioned “Energy Quality“ approach it should be possible to ensure that the difference between the calculated and monitored energy use for new building projects, which is often between 20-40%, should be much less in the future. Besides it can also help to create a good basis for the necessary energy labelling of buildings.

In the following is for privately owned houses illustrated the economy of an energy (+) standard (C and D) which is 25% better than the new minimum demands in Denmark from January 2006 (B), and here compared to the standard before January 2006.

In the example a combination of airtightness and use of heat recovery ventilation is used to meet the new minimum demands from January 2006. And for energy (+) there is shown how solar DHW systems can be used as one option and an improved insulation standard as another.



A) The energy use is often 20-40% higher due to lack of control of energy quality.

The calculations have shown that if you combine airtightness control with a new type of low cost heat recovery ventilation with low electricity use, this is the cheapest way of meeting the new minimum energy demands, while perhaps a little surprising use of very small solar DHW systems (with 2-3 m² solar collectors per housing unit) are an economic solution as part of an energy saving package to meet the demands of the new low energy standard 2 in Denmark which can be considered as the local energy (+) standard.

The used technical solutions for (B), (C) and (D) are as follows including some information on the existing standard (A):

Estimated extra costs compared to (A) to ensure energy quality: $\frac{1}{2}\%$ of building costs is 40 DKK/m² = 6 Euro/m²

This can be realised with a very good economy because monitored energy use will be very near to calculated energy use.

B: Main energy saving features:

- heat recovery ventilation and airtightness
- extra domestic hot water savings
(estimated extra costs compared to A: 110 DKK/m² = 15 Euro/m²)

C: Main energy saving features:

- as (B) including:
- solar DHW heating systems in combination with solar prepared DHW tanks
- extra avoidance of cold bridges
- improved insulation in attic
(estimated extra costs compared to ((B): 110 DKK/m² = 15 Euro/m²)

D: Main energy saving features:

- as (B) including:
- improved windows with 3 layer energy glass
- extra avoidance of cold bridges
- improved insulation in general
(estimated extra costs compared to ((B) = 200 DKK/m² = 27 Euro/m²)

Calculated yearly energy and operation cost savings:

B:

$$\begin{aligned} [(112 - 80) \text{ kWh/m}^2 \text{ a} = 32 \text{ kWh/m}^2 \text{ a} \times 0,355 \text{ DKK/kWh}] &= 11,4 + 9,5 = \underline{20,9 \text{ DKK/m}^2 \text{ a}} \\ + [(17-10) \text{ kWh/m}^2 \text{ a} \times 1,36 \text{ DKK/kWh}] &= \underline{2,82 \text{ Euro/m}^2 \text{ a}} \end{aligned}$$

C, D:

$$\begin{aligned} (112 - 54,5) \text{ kWh/m}^2 \text{ a} = 57,5 \text{ kWh/m}^2 \text{ a} \times 0,355 \text{ DKK/kWh} &= 20,4 + 9,5 = \underline{29,0 \text{ DKK/m}^2 \text{ a}} \\ + [(17-10) \text{ kWh/m}^2 \text{ a} \times 1,36 \text{ DKK/kWh}] &= \underline{4,0 \text{ Euro/m}^2 \text{ a}} \end{aligned}$$

This means the payback time to meet the new minimum energy demands (B) are:

15 Euro/2,82 Euro = 5,3 years. Which is very good and at the same time improves the indoor air climate if heat recovery ventilation is used.

At the same time the payback time to realise an energy (+) standard with a here calculated extra 28% energy saving is:

C: (15 + 15) Euro/4,0 Euro per year = 7.5 years.

D: (15 + 27) Euro/4,0 Euro per year = 10.5 years.

Which is actually reasonable good economies.

Besides it could be argued that an “energy quality” standard with extra preparation and control costs by an independent energy expert assistance to reach the new energy minimum demands (B) should be a part of the economy calculation.

These costs are estimated to be ½% of the total building costs. This is only 5% compared to the normal design fee costs. In actual costs it is around 6,0 Euro/m².

However, it can be less at larger building projects, and in fact it not only ensures the above shown savings, but also improves the general energy quality standard compared to today with extra energy savings.

If you can avoid a 30 kWh/m². a extra energy use for heating, e.g. the value of this is approximately 2,6 Euro/m². a. With an extra investment of ½% of total building costs, to obtain this the payback time will be 2-3 years for the investment.

This is so positive that you could even suggest to allocate another ½% of the building costs as a bonus to the contractor if they meet the energy saving level within e.g. a 10% difference.

Based on the here mentioned there is no doubt about the need to realise “Intelligent Energy (+) and Energy Quality Implementation” in future building projects. It is just a question of how you can organise it in practice, e.g. related to local policies in Sustainable Energy Communities.

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