

Strategy for energy renovation of buildings

The route to energy-efficient buildings in tomorrow's Denmark

May 2014

Danish Government

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Foreword

Car-free Sundays, turning down the heating and turning the lights off in small houses. These were the consequences in the 1970s when Denmark faced the worst energy crisis in recent memory. The crisis taught us to save energy, and it was also the spur for a new energy policy which made us less dependent on imported energy. Today, the big growth in consumption of oil, coal and gas has set the world on course towards climate change, which will create increasing problems for future generations if we do not change course and reduce emissions of greenhouse gases.

Here in Denmark, the government is converting energy supplies to a greener energy system, which will be 100 % based on renewable energy by 2050. We have made a good start and are on the right track. Since the oil crisis, a targeted energy policy has increased the proportion of renewable energy to 25 %, taking us a quarter of the way there. If we are to achieve our goal, however, we need to substantially improve the efficiency with which we use energy in all sectors of society. This is particularly true of energy consumption in our buildings, which account for 40 % of Denmark's total energy consumption.

The energy requirements for new buildings have been steadily tightened up, so new buildings today use far less energy than old ones, and in 2020 they will use 75 % less energy than in 2006. But as buildings generally have a very long life – often 100 years or more – the vast majority of the buildings that exist today will still be in use in 2050. That is why energy efficiency measures in existing buildings are a major priority area for energy policy.

These buildings are a major part of our everyday lives and are important to the finances of individual families. There is great potential for reducing energy consumption in existing buildings. We can exploit this potential if we choose cost-effective and energy-efficient solutions every time the buildings are renovated. That does not mean compromising on the quality and architectural values that make the buildings special. On the contrary: energy renovation should be a means of improving and developing buildings to meet the needs and challenges of the future and of making home-owners and tenants less vulnerable to rising energy costs in the future.

In Denmark we have been working on energy improvements to our buildings for many years. We have built up considerable expertise and, compared to other countries, we have come a long way. Still, we need even more investment if we are to attain our goal of reducing energy consumption in our buildings. In the Energy Agreement of 2012, the government agreed with the other parties that an overall strategy for energy renovation of the existing building stock should be drawn up. This strategy is now before you. The strategy sets out the initiatives to be taken to ensure that energy consumption in buildings is reduced as we move towards an energy system based on renewable energy.

In the course of preparing the strategy, a broad network of stakeholders was established, comprising some 40 organisations and almost 200 people. This network has shown great commitment and a wealth of ideas in helping to develop a comprehensive catalogue of initiatives with proposals for ways of improving and promoting energy renovation. The strong backing from this networking work has created a firm foundation for us to work together to implement the initiatives in the strategy. I would like to thank all those involved for their great work and constructive contributions. Only by a collective effort can we reduce energy consumption in existing buildings. It is important for the people and businesses that live and work in these buildings, and of course it is important for our climate.

Rasmus Helveg Petersen

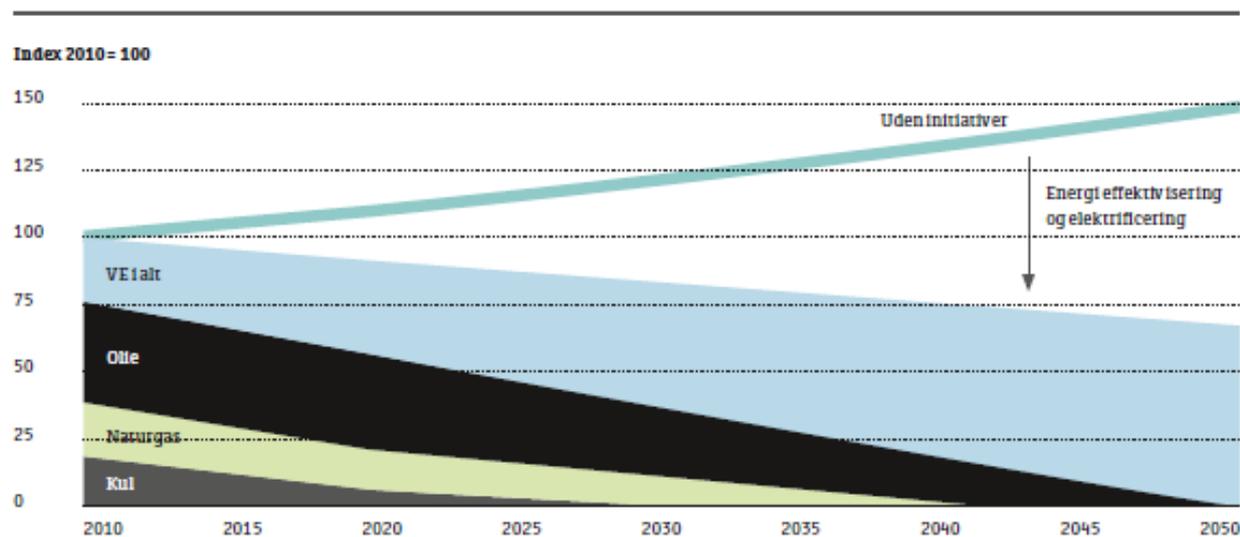
Need for extensive energy renovation of buildings

The government's energy policy is based on a number of considerations. Emissions of greenhouse gases have to be substantially reduced, in line with the EU's objective of an 80-95 % reduction in 2050. At the same time, we have to maintain security of supply by reducing our exposure to shortages and rising energy prices. Finally, our energy policy must be cost-effective and so promote growth and prosperity

With these considerations in mind, the government set as a target in its report **Vores energi** ('Our energy') that Denmark's energy supply in 2050 should be covered by renewable energy. To achieve this goal we need a combination of comprehensive energy efficiency measures and a massive expansion of renewable energy.

Around 40 % of the total energy consumption today is used in buildings for heating and operating equipment etc. Energy consumption for heating accounts for 35 % of final energy consumption. This energy consumption has to be significantly reduced over the next 30–40 years if we are to attain the goal of covering Denmark's energy supplies in 2050 from renewable energy in a cost-effective way. There also needs to be a shift in the energy supply to these buildings from fossil fuels to renewable energy.

Figur1 Udviklingen i energiforbruget frem mod 2050



Kilde "Vores energi"

The energy requirements for new buildings have been steadily tightened since the 1970s, and this has meant that new buildings now use much less energy than older ones. With the specified Building Class 2020, which is expected to be mandatory no later than 2020, Denmark is meeting the EU requirements for new buildings to have an energy consumption figure close to zero; see Figure 2. The potential for further requirements for new buildings is therefore limited.

However, new building is very limited compared to the total building stock. During the economic boom, new building amounted to around 1 % of the building stock, but the figure has been much lower in the last few years. Moreover, there has been very little demolition of existing buildings. This means that the vast majority of

buildings that exist today will still be in use in 2050.

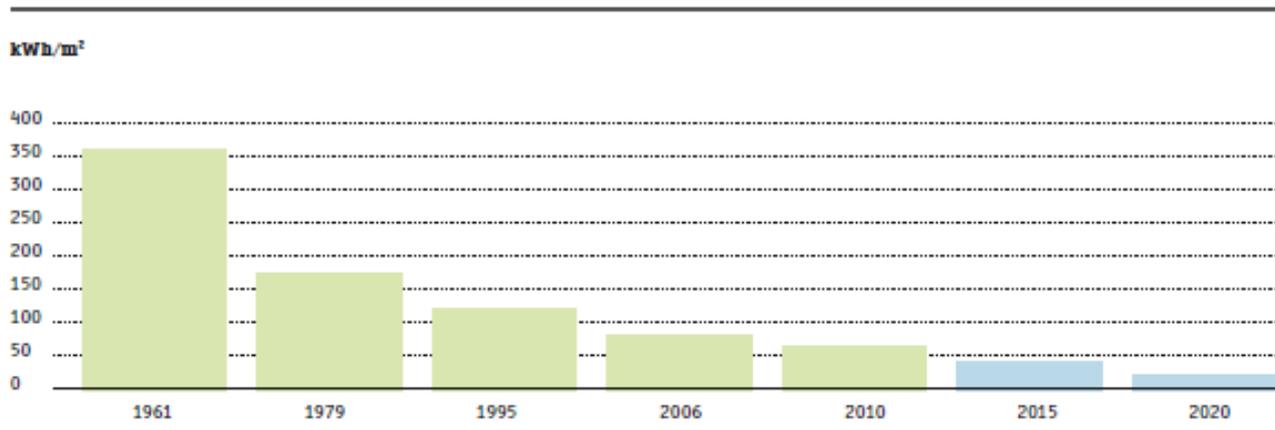
A reduction of energy consumption in buildings can therefore only be achieved by substantial energy savings in existing buildings. There is huge potential. If building owners make sensible and financially worthwhile energy improvements when they are carrying out renovations anyway, energy consumption can be substantially reduced. This strategy therefore focuses on reducing energy consumption in existing buildings by way of extensive energy renovations.

The energy savings can be achieved best and most cost-effectively when the work is done at the same time as the general building renovation. It may for example be combined with replacing the roof or windows or renovating outside walls or floors. The energy savings therefore have to be viewed in conjunction with the ongoing need for renovation work to preserve the value of the buildings.

Energy renovations also help to increase the utility value and quality of buildings, as they can improve the indoor climate and daylight conditions, making the buildings healthier and better to live and work in. Energy renovations also need to take account of the architectural value of the buildings. In many cases, energy renovations will actually mean an architectural improvement to the buildings. Finally, energy renovation plans need to take account of the environmental objectives for reuse and sustainability in the building industry.

Energy renovation of buildings also has a major part to play in safeguarding the great value tied up in the building stock. The value of the building stock is some DKK 3 700 billion, or more than twice one year's economic activity (GDP) in Denmark. Every year, DKK 80–100 billion – equivalent to 2.1–2.7 % of the value of the buildings – is spent on various forms of renovation and other investments in existing buildings. By way of comparison, it should be noted that annual spending by householders on heating the buildings totals more than DKK 40 billion. The renovations help to ensure that the buildings do not fall into disrepair and to develop them to meet future challenges, not least energy prices and other climate-related and environmental challenges.

Figur 2 Energiforbrug til bygningsdrift af nye bygninger



Kilde Energistyrelsen

Many benefits from energy renovation of buildings

Energy renovation of existing buildings has generally positive effects for the individual building owner and user, and also for society.

*Energy renovation means a **reduction in future energy bills**. There will be some initial costs associated with the renovation, but energy renovation can subsequently create a more robust financial position for the building owner and may **increase the resale value of the building**. Improving the financial position of building owners can also have positive benefits for society.*

*A properly implemented energy renovation creates a **better indoor climate and greater comfort**, which can improve the wellbeing of users and the use of the buildings. Energy renovation can also give the buildings an **architectural lift**.*

It is important for energy renovation work to be organised in such a way that all these considerations are satisfied, so that it helps to develop and improve Denmark's building stock.

***Denmark has considerable expertise** in reducing energy consumption in buildings. The major investments made over many years, and especially the very great effort that followed the oil crisis in 1979, have helped to develop skills and establish a number of large Danish companies in this area. There are a great many companies working on the production of materials, components and systems for energy-efficient buildings, and there are also solid technical resources in the field. Greater investment to promote the energy renovation of buildings in Denmark can help to develop and enhance these skills. Analyses from the International Energy Agency (IEA) show that there is great unexploited potential for cost-effective reduction of energy consumption in buildings. The EU's Energy Efficiency Directive requires all Member States to draw up coherent strategies for energy renovation. This may help to provide Danish firms with new sales opportunities.*

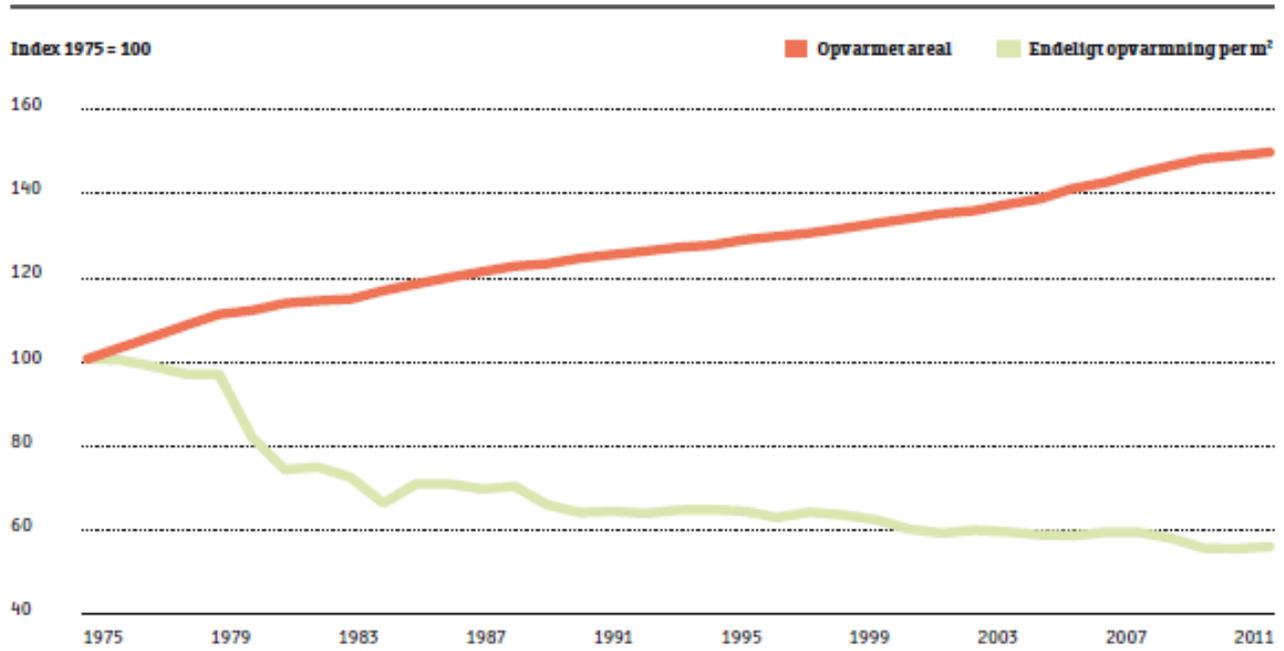
Basis for future energy renovation work

A key element of the Energy Policy Agreement of 22 March 2012 is that the government should draw up an overall strategy for energy renovation of the existing building stock. This strategy is also based on the results to date and the current initiatives, and takes account of the current energy standard of the buildings. In light of this, the strategy is designed to promote and improve energy renovations which reduce energy consumption in existing buildings.

Since the mid-1970s, the focus in Denmark has been on reducing energy consumption in buildings, and this has decreased significantly. Thus, final energy consumption for the heating of homes is now almost 45 % less per square metre than it was in 1975. See Figure 3.

The efficiency improvements in energy consumption in buildings are the result of active efforts involving a large number of initiatives. First, the energy requirements in the Building Regulations have been tightened up considerably. In recent years, the Building Regulations have also included specific energy requirements for components etc. when they are being replaced in existing buildings.

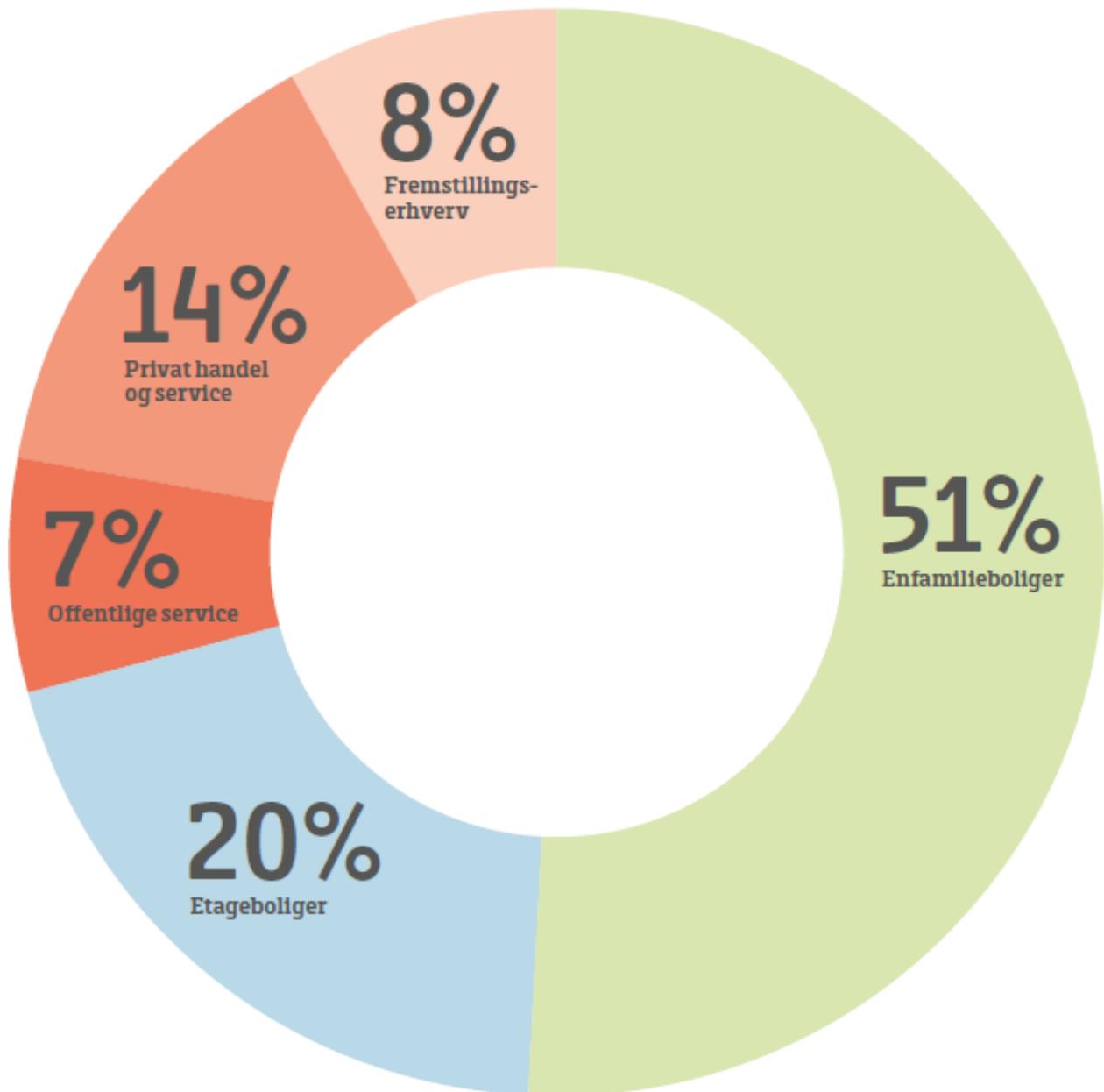
Figur 3 Udvikling i energiforbrug til opvarmning af boliger



Kilde Energistyrelsen

Secondly, the financial incentives to reduce energy consumption have steadily increased as a result of high energy costs. There have also been various subsidy schemes that have provided direct incentives to implement energy-saving measures.

Figur 4 Fordeling af energiforbruget til opvarmning på bygningstyper



Kilde: Energistyrelsen og SBI 2014:01 "Potentielle energibesparelser ved løbende bygningsrenovering frem til 2050"

Thirdly, there has been a focus since 1979 on information and various forms of advice on energy consumption and energy savings. Among other things, these have helped to establish a sensible attitude to energy in daily life.

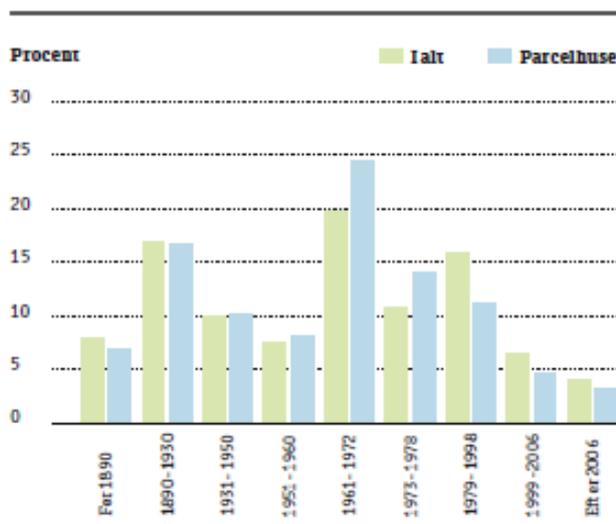
As a consequence of this, energy savings have become a frequent topic in energy policy, and successive governments have taken many practical steps to promote energy savings in Denmark. At the same time, there have been active efforts in the EU to encourage greater ambition in energy-saving work in the Member States. For example, the energy companies in Denmark are required to make large energy savings for consumers, something that is now included in EU policy on energy savings, so that all Member States are required to introduce similar schemes.

As can be seen from Figure 4, more than half of the energy consumption to heat buildings in 2011 was used in single-family houses (detached and terraced houses and villas), and together, homes accounted for more than 70 % of energy consumption for heating. Homes, and particularly detached houses, are therefore a key area for investment in energy renovation. There is also substantial energy consumption in public-sector buildings and in buildings used for private commerce and services, and hence also potential for reducing energy consumption in these building categories.

More than 70 % of the current total building stock and more than 80 % of the stock of detached houses were built before 1979, i.e. before the building regulations contained any serious energy requirements for new buildings. As can be seen in Figure 5, a large part of the total building stock was erected in the 1960s. Many of these buildings now require extensive energy renovation. Some energy improvements have been made in a number of old buildings, but there are still very significant opportunities to reduce energy consumption in these buildings.

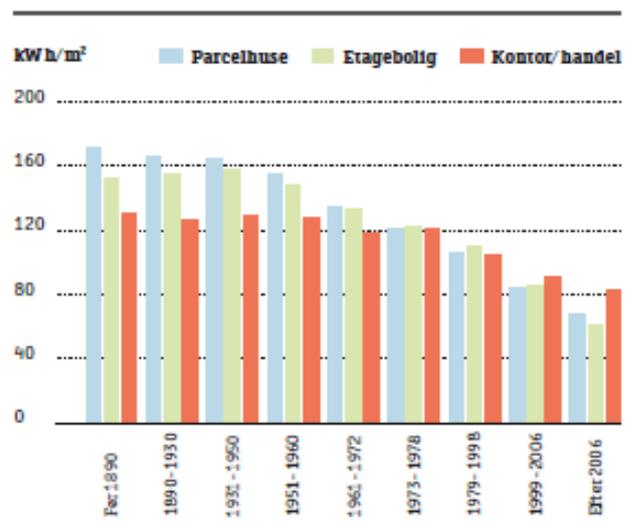
This can be shown by the fact that the average net heating demand in detached houses built between 1931 and 1960 is now around 165 kWh per square metre (see Figure 6), and that buildings erected before 1979 use more than 80 % of the total consumption of heat. For all existing buildings, the average heat demand per square metre is approx. 135 kWh. This can be compared with a new building constructed in accordance with Low Energy Class 2015, which will use approx. 37 kWh/m².

Figur 5 Aldersfordeling af opvarmet bygningsareal



Kilde Energistyrelsen og SBI 2014:01 "Potentielle energibesparelser ved løbende bygningsrenovering frem til 2050"

Figur 6 Energiforbruget per kvadratmeter i 2011



Kilde SBI 2014:01 "Potentielle energibesparelser ved løbende bygningsrenovering frem til 2050"

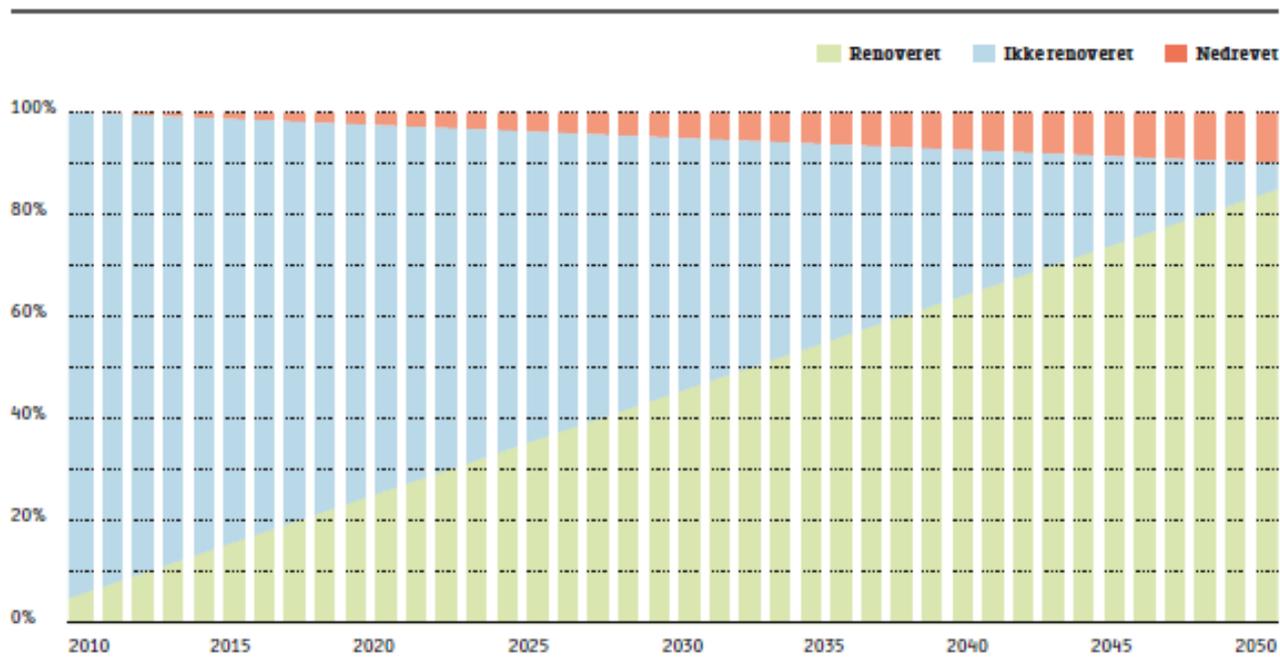
Energy savings in buildings

There are many technical ways of reducing heat consumption in existing buildings. To exploit these opportunities, any strategy for energy renovation of buildings should contribute to the following:

First, the strategy should help to create a transparent market for renovations, so existing buildings are renovated as they wear out and cost-effective energy renovations are made at the same time. As most building components in existing buildings will wear out over the next 30–50 years, most of the existing building stock will undergo renovation between now and 2050. The strategy will thus help to ensure that a large part of the building stock undergoes energy renovation by 2050, as shown in Figure 7.

Energy renovation can be best and most economically carried out in conjunction with the conversion, extension, ongoing renovation and maintenance of buildings. If the energy savings are to be achieved in a cost-effective way, it is therefore crucial for energy renovations to be carried out whenever the opportunity arises.

Figur 7 Energirenovering af bygninger



Note Der er alene tale om en illustration af, at hovedparten af bygningerne skal renoveres frem til 2050.

Kilde Energistyrelsen

Major renovations of buildings are not normally carried out just to reduce energy consumption. The reason for a building owner's deciding to renovate may, for example, be that parts of the building are worn out or that the owner wants to adapt the building to meet future needs. These may include a change in the size of the family, or the desire for a more practical home or for a better indoor climate. But every time a modification or change is made to the building, there is an opportunity for cost-effective energy renovations to be carried out. For example, it may be possible to install new energy-efficient windows which reduce energy consumption in the building and provide greater comfort, when the existing windows are worn out and need to be replaced.

Many building components have long lives, and a number of the components that have a major bearing on energy consumption will only be renovated once between now and 2050. If we do not take the opportunity for energy renovation, it will be many years before it comes around again. So it is important to start acting now.

Secondly, the strategy should ensure that 'deep' energy renovations are carried out with future-proof, energy-efficient and cost-effective solutions, so energy consumption is significantly reduced. If only 'partial solutions' are implemented, e.g. limited insulation of roofs or walls, it will be very expensive and perhaps technically impossible to realise the full energy-saving potential at a later date.

The renovations must not only focus on reducing energy consumption. They should also be sustainable in the broad sense. Among other things, this means that they must also take account of other environmental effects and other resource consumption. This may then affect the choice of building materials. It is also absolutely crucial to ensure that the renovations enhance the functionality of the buildings. The indoor climate is a key element here, but there are a number of other factors that have a major bearing on the quality of the buildings.

Thirdly, the strategy should help to ensure that when energy renovations are carried out, heating systems are converted so as to be based on renewable energy. There are currently some 250 000 buildings heated by oil and some 400 000 heated with natural gas. The conversion of heating supplies to renewable energy is often best done alongside the general energy renovation of buildings, just as it is important that any conversion is accompanied by an energy renovation. This is especially important when converting to heat pumps and other forms of renewable energy, which work best with low flow temperatures and airtight buildings.

Finally, the strategy should ensure that energy renovations are carried out cost-effectively, so the goal of independence from fossil fuels is achieved at the least possible expense. The investments should be viewed in relation to the long-term reduction in heating costs. At the same time, the other benefits in the form of better living quality and improved indoor climate should also be considered. In this connection it is absolutely crucial for the strategy to ensure that energy renovations are carried out in a way that provides for a good indoor climate.

Reducing energy consumption in buildings can also help to free up resources that can be used to promote growth and employment and hence also to increase prosperity and competitiveness. Work is also going on in other countries to reduce energy consumption in buildings, and there is an increasing international focus on this market. We therefore expect to see a growing global market for knowledge, solutions and products that can help to ensure that the building stock of the future is energy-efficient and sustainable. Efficient Danish companies will be in a position to benefit from these growing foreign markets.

Effects of the strategy on energy consumption

The Danish Building Research Institute (Statens Byggeforskningsinstitut – SBI) has produced analyses¹ showing the scale of energy savings that can be achieved if cost-effective energy renovations are carried out when buildings are to be repaired in any case because roofs, windows, walls etc. are in a bad state.

The analyses show that, with the energy efficiency requirements for components that are included in the 2010 Building Regulations, the net heating demand in 2050 can be reduced by approx. 28 % compared to 2011. The net heating demand is the energy consumption for heating, hot water, ventilation etc. excl. losses in heating systems and consumption in plug-in appliances etc.

Achieving these savings assumes the following:

- That building owners maintain the buildings and replace or renovate the individual components as they wear out. This means that the owners must be aware of the need and motivated to carry out energy renovations, and the financial conditions for energy renovation must be in place.
- That the requirements set out in the building regulations are reasonably well adhered to. This means that there must be a focus on compliance with the rules, to include ongoing training of the workers and provision of information to building owners.
- That various barriers to energy renovation are removed. Among other things, this means making it easier for building owners to carry out energy renovations, by supplying them with information, by efforts on the part of the energy companies etc.
- That the energy renovations are carried out correctly, e.g. in such a way that the buildings are airtight after renovation. This demands an improved level of expertise in the building industry.
- That energy savings do not translate into higher temperatures and other comfort improvements. This means maintaining a high level of knowledge and an awareness of energy consumption by way of targeted information activities.

The SBI's report also contains analyses of a number of scenarios involving other measures to promote energy savings through energy renovation. The report shows that net energy consumption in 2050 will be reduced by 35 % compared to 2011, if

1. initiatives are taken to improve compliance with the energy requirements set out in the Building Regulations with regard to retrofitting insulation when replacing and renovating roofs and outside walls;
2. when the Building Regulations are revised in 2015, they include an upgrade to the energy requirements relating to the maintenance and replacement of roofs and outside walls etc. and to the requirements for new windows, and the requirements for windows are further upgraded after 2020;
3. the operation of large buildings is optimised, e.g. through increased automation and control, optimisation of heating systems etc.

The strategy includes a number of initiatives to help to reduce energy consumption in buildings in the coming years. Overall, the government expects the strategy to bring about reductions in net energy consumption for heating and hot water of 35 % in the building stock by 2050 compared to 2011.

The energy savings will not come about by themselves. It will take targeted work to achieve them, including ensuring that the conditions for achieving them are in place.

Apart from the initiatives in the strategy, there are now a number of other instruments that help to promote energy savings. A prime example is the energy-saving efforts of the energy companies, which are helping to make a number of energy savings over and above those arising from the requirements in the Building Regulations. The energy-saving investments by the energy companies up to the end of 2020 are laid down in the Energy Agreement of 2012.

The SBI's analyses also show that we have the technical means to make further savings in buildings. If mechanical ventilation with heat recovery is installed in most of the homes when the buildings are renovated and made airtight, the net heat energy demand in buildings can very probably be reduced by more than 45 % by 2050.

It is thus possible to achieve a greater reduction in energy consumption in buildings than the expected 35 %. This will allow greater flexibility in meeting the government's overall goal for 2050 that energy supplies should be based on renewable energy. It may also help to improve the quality of the building stock, partly by creating a better indoor climate.

If this is to be done cost-effectively, however, a number of conditions have to be met. First, it calls for technological development to make the technologies for achieving the savings better and cheaper. This includes developing cheaper systems of mechanical ventilation with heat recovery, which are better suited to various types of existing building.

Secondly, we need to ensure that the knowledge and incentives are in place to use the technology, that the renovations are carried out correctly, and that the level of expertise in the building industry is improved.

It will also depend on the instruments to promote energy savings that are implemented after 2020. A very important factor here will be whether we decide to continue the efforts of the energy companies to promote energy savings after 2020.

However, initiatives to promote energy renovation of buildings cannot stand alone. There must be parallel efforts to promote energy savings in the equipment used in the buildings. This will mainly involve setting ambitious efficiency requirements for new equipment and products under the EU Eco-design Directive and promoting the sale of the most energy-efficient products, including energy-labelling appliances, providing information etc.

¹ SBI 2014:01 'Potential energy savings from ongoing building renovation up to 2050'

Figur 8 De energipolitiske indsats til gennemførelse af energirenovering



Summary of initiatives to promote energy renovation of buildings

In its 'Strategy for energy renovation of buildings', the government presents a number of initiatives which, taken together, are expected to bring about a 35 % reduction in energy consumption in buildings by 2050.

In the strategy, the government sets out an overall approach to realising the energy-saving potential in buildings. The strategy includes a high-level summary of the government's initiatives to promote energy savings in buildings, including the initiatives launched under the Energy Agreement of March 2012, the agreements relating to 'Vækstplan DK' ('Growth plan for Denmark'), the Growth Plan for Energy and Climate, and agreements on the Danish Innovation Fund.

As the initiatives from the strategy are implemented, they should all be coordinated to create synergies. The implementation of the strategy should also mesh with and support the government's 'Smart grid' strategy and Climate Plan. Implementing the 'Smart grid' strategy will support the integration of renewable energy in buildings and the interaction of buildings with the energy system, which can contribute to more efficient operation of the electricity system and reduced electricity consumption in buildings. The objective in the Climate Plan to reduce Denmark's total greenhouse gas emissions by 40 % in 2020 compared to 1990 levels has the same aim of reducing energy consumption.

The implementation of the initiatives in the strategy should also be viewed in conjunction with the government's new architecture policy 'Mennesket in centrum' ('Putting people first') published at the beginning of 2014, which focuses on the experience of architecture (for young people and adults), democracy (municipalities and public involvement), sustainability (environmental, social and cultural) and value creation (quality, innovation and international potential).

The initiatives in the strategy are aimed at the individual building categories. The reason for this is that the different building categories have different backgrounds, face different challenges and have varying energy-saving potential. Different targeted instruments therefore need to be used to promote energy renovation in every building category.

Some of the initiatives in the strategy have a broad aim, however, and are not aimed specifically at any one building category. The reason is that there are initiatives that have the same starting point and character with a built-in relevance to building use, design and ownership. This is the case, for example, with the tightening of the energy requirements in the Building Regulations, the information campaigns on energy renovation and the financial conditions for investing in energy renovations.

The greatest potential for savings is in single-family houses, as more than half of the heating consumption in buildings is used in these. Single-family houses are characterised by the fact that the owner and the occupier are generally the same person. Maintaining the home is important to the owner because it is also the basis for the occupier's existence. However, the owner does not start out with the knowledge and skills to handle energy renovation projects, which may seem like large and unmanageable tasks for the individual.

Apartment buildings account for half of all homes. They are characterised by the fact that the individual building is the basis for many occupiers' existence. Decisions on energy renovation of the building therefore require several parties to agree and decide collectively what should be done. The ownership arrangements may

vary, as some of the buildings will be owned by the residents either as owner-occupied or as cooperative apartments. In other buildings, homes are let to residents either as private tenancies or as social housing, which poses special challenges when it comes to carrying out energy renovations. Part of the apartment blocks may consist of commercial premises, either owned or leased by the company that uses the building.

Public buildings are a separate category where the owners have special opportunities and conditions for carrying out energy renovations, and also special obligations.

Finally, the strategy includes cross-cutting initiatives relating to skills and innovation. These initiatives are intended to overcome barriers to promoting energy renovation by increased investment in training and skills development within energy renovation and a greater emphasis on research, innovation and demonstration.

A high-level overview of the initiatives in the strategy is given below. You can read more about the specific initiatives in the next section, which describes the individual initiatives in more depth.

1.

Initiatives targeted at all building categories

The Minister for Climate, Energy and Building will upgrade the energy requirements in the Building Regulations for building components and fixed installations in existing buildings to ensure that the buildings are energy-renovated and future-proofed as they are maintained.

Existing initiatives:

- The energy requirements for existing buildings in the Building Regulations oblige building owners undertaking conversion or maintenance work to use energy-efficient solutions.
- Requirements pertaining to the energy efficiency of equipment and products.

The Minister for Climate, Energy and Building will:

1.1 (page 35)

Upgrade the energy requirements for the building envelope, excl. windows

- Upgrade the energy requirements for climate protection components so that they reflect future demands and expected energy prices.

1.2 (page 36)

Upgrade the energy requirements for windows

- Upgrade the energy requirements for replacement windows in 2015, to reflect the published future requirements for 2015.
- Upgrade the energy requirements for replacement windows in 2020, to reflect the energy requirements for windows in Building Class 2020.
- Set new targets for future energy requirements for windows after 2020.
- Produce information material on the choice of energy-efficient window solutions, also considering architectural aspects and conservation-grade windows, as well as light and noise conditions.

1.3 (page 37)

Upgrade the energy requirements for installations in buildings

- Review the energy requirements for installations in buildings with a view to upgrading them, and consider whether to introduce requirements concerning the automation and control of the installations.
- Analyse the interplay between installations in buildings and the 'smart grid', and use this to assess the possibility of introducing special requirements for the installations in the buildings to exploit the benefits of the smart grid.

- Examine the advantages and drawbacks of introducing requirements for the use of ventilation with heat recovery in new single-family houses.
- Examine the possibility of introducing new requirements for the use of commissioning in some types of large buildings with complex installations.

1.4 (page 38)

Ensure greater compliance with the Building Regulations

- Make the rules in the Building Regulations easier to understand.
- Provide more information on the Building Regulations, e.g. by developing sets of examples.
- Monitor compliance with the energy requirements for existing buildings in the Building Regulations on a regular basis, including reviews of compliance every other year.

1.5 (page 40)

Introduce voluntary energy classes for existing buildings

- Launch an analysis of the level of demand and profitability for energy conditions for existing buildings and introduce voluntary energy classes for existing buildings in the Building Regulations for 2015, which correspond to the classification of buildings on a scale from A to G in the energy-labelling scheme for buildings.
- Change the requirements for existing buildings in the Building Regulations so building owners carrying out renovations can opt for compliance with a voluntary energy class instead of the energy requirements for certain building components.

The Minister for Climate, Energy and Building will upgrade the energy requirements in the Building Regulations for new buildings to ensure that Denmark retains its lead in energy-efficient construction.

Existing initiatives:

- The Building Regulations ensure that new buildings are constructed to avoid any unnecessary energy consumption for heating, hot water, cooling, ventilation and lighting, while providing adequately healthy conditions.
- The Building Regulations define voluntary low-energy classes: Low-Energy Class 2015 and Building Class 2020.

The Minister for Climate, Energy and Building will:

1.6 (page 41)

Upgrade the energy requirements for new buildings

- Evaluate the energy requirements in the low-energy classes.
- Make the energy limits in Low-Energy Class 2015 requirements from 2015 and assess the component requirements on the basis of an evaluation.

- Assess the need to adjust the requirements for Building Class 2020.
 - Carry out initiatives to promote compliance with the airtightness requirements in new buildings, which place greater emphasis on the advantages of making new buildings airtight.
-

The Minister for Climate, Energy and Building will step up the provision of information on energy-efficiency in buildings to ensure that building owners and businesses have access to the information needed to take decisions on cost-effective energy renovations, also taking account of the indoor climate, the environment, architecture etc.

Existing initiatives:

- Information is being published on the potential and benefits of energy efficiency on the web site and in guidelines aimed at building owners, advisers and the companies doing the work.
- Energy labelling of equipment and products.

The Minister for Climate, Energy and Building will:

1.7 (page 43)

Step up information and communication activities about energy renovation and energy efficiency in the building industry

- Step up information activities about energy efficiency, to provide greater support for the energy renovation of buildings.
 - Develop new, targeted information tools emphasising an all-round view of energy renovation, also including the indoor climate, comfort, health, architectural considerations, and radon and PCB problems etc.
 - Support municipal efforts towards energy efficiency, including the establishment of partnerships to run information activities.
-

The Minister for Climate, Energy and Building will discuss with the energy companies how their energy-saving efforts can be targeted at existing buildings with a view to promoting the objective of reducing energy consumption in existing buildings.

Existing initiatives:

- Under the Energy Agreement, the energy companies are required to make a reduction in energy consumption equivalent to 10.7 PJ per year in the period 2013–2014 and 12.2 PJ per year in the period 2015–2020.

The Minister for Climate, Energy and Building will:

1.8 (page 45)

Target energy-saving efforts by the energy companies

- Discuss with the energy companies whether it is possible to introduce a target for the proportion of their energy savings to be made in existing buildings.
-

The Minister for Climate, Energy and Building will enhance the energy-labelling scheme for buildings by making it more effective and ensuring that it provides greater support for energy renovation of buildings.

Existing initiatives:

- All new buildings must be energy-labelled before they are taken into use.
- All buildings must be energy-labelled when they are sold or let.
- Buildings over 1 000 m² must have a valid energy certificate. Public buildings over 250 m² must have a valid energy certificate.

The Minister for Climate, Energy and Building will:

1.9 (page 47)

Maintain an effective and targeted energy-labelling scheme for buildings

- Increase the use of energy labelling of buildings by setting up a web site where building owners and tenants can use the energy labels to gain an overall view of the energy-saving potential in their buildings and obtain specific information and guidance on carrying out energy renovations.
- Provide background data on buildings from the energy labels via the Danish Energy Agency web site.¹
- Draw up guidelines and examples of how energy labelling can assist with building maintenance and the renovation of property portfolios.
- Strive for constant improvements in the quality of the energy labels for buildings, simplify the rules and reduce the costs of energy labelling.¹
- Pursue the dialogue with building owners, tenants, consultants, tradespeople, energy companies, financial institutions and other market operators on ways in which energy labelling can best support energy-saving efforts.

The Minister for Climate, Energy and Building will ensure that building owners and businesses are provided with data and technical tools to give them a better and more reliable basis for decisions to undertake cost-effective energy renovations.

Existing initiatives:

- The Register of Buildings and Dwellings [BBR] is used to register buildings, including their energy consumption.
- A calculation model, BE10, has been developed to calculate the energy consumption of buildings when they are renovated; see Building Regulations and energy labelling of buildings.
- A draft Order which updates the requirements for metering the consumption of gas, heat, hot water, electricity and cooling in buildings has been issued for consultation. The Order implements the metering requirements in the EU Energy Efficiency Directive.

The Minister for Climate, Energy and Building will:

1.10 (page 27)

Provide better data and tools for decisions in energy renovation

- Carry out an analysis of the various parties' need for data, technical tools etc. to support the energy renovation of buildings.
 - Develop a method to calculate and document energy savings from energy renovation.
 - Draw up a plan to develop data, technical tools, guidelines etc. to promote energy renovation of buildings in collaboration with the parties involved.
-

The Minister for Climate, Energy and Building will analyse the conditions for financing energy renovations in order to ensure that there is a good basis for financing energy renovations.

Existing initiatives:

- Taxes on energy have been introduced, to give end-users a greater incentive to make energy savings.
- The 'Bolig Job' community employment scheme grants tax relief on maintenance and repairs to homes, including energy renovation.²
- A bill has been tabled for a law on real estate transactions etc. which states that the details of the consumption-related aspects of the property, and particularly the heating information, that have to be provided to the buyer when a property is sold must be qualified where possible to give a truer picture of the consumption-related aspects of the property and hence also provide better information to consumers.

The Minister for Climate, Energy and Building will:

1.11 (page 29)

Promote good conditions for financing energy renovation

- Analyse whether the housing market is sufficiently transparent to ensure that the pricing reflects the energy status of the buildings and ensures that worthwhile energy renovations retain their value when the property is to be sold. Analyses will also be performed to determine how energy factors can be better incorporated into loan advice from banks or mortgage lenders and into the valuation of properties, and to look at ways of paying for investments through energy bills.
-

The Minister for Climate, Energy and Building will draw up an overall strategy to promote productivity and growth in the building industry.

The Minister for Climate, Energy and Building will:

1.12 (page 49)

Produce a building policy strategy

- Produce a building policy strategy to set out the government's overall strategy for the construction sector and address the challenges facing the industry to help to promote growth, productivity and employment in the building industry.

¹ Initiatives arising from the 'Growth Plan for Climate and Energy'

2.

Initiatives targeted at all single-family houses

The Minister for Climate, Energy and Building will make it easier and more manageable for owners of single-family houses to carry out energy renovation of their homes.

The Minister for Climate, Energy and Building will:

2.1 (page 51)

Promote energy renovation in single-family houses via the 'BedreBolig' scheme

- Launch and market the 'BedreBolig' scheme in 2014, to create one common place for home-owners to go for energy renovation. The scheme will be rolled out progressively based on experience from a number of selected municipalities.^{1,2}

The Minister for Climate, Energy and Building will promote the use of alternatives to oil and gas-fired boilers based on renewable energy

Existing initiatives:

- The Building Regulations were amended in 2013 to introduce a prohibition against installing oil and gas-fired boilers in new areas not supplied by natural gas from 1 January 2013.
- The Energy Agreement of 22 March 2012 states that, to support the conversion from oil and natural gas-fired boilers in existing buildings to types of heating based on renewable energy in 2012–2015, a pool totalling DKK 42 million will be set aside to promote initiatives for energy-efficient alternatives.

The Minister for Climate, Energy and Building will:

2.2 (page 52)

Promote the spread of alternatives to oil and gas-fired boilers based on renewable energy

- Run demonstration projects to test solutions that integrate renewable energy in buildings and illuminate the relationship between conversion to renewable energy and the need for energy renovation.

¹ Initiatives arising from the 'Growth Plan for Climate and Energy'

² Initiatives arising from agreements on 'Vækstplan DK'

3.

Initiatives targeted at apartment blocks, commercial and public buildings

The Minister for Climate, Energy and Building will use the experience gained with the ESCO model to develop and launch a new model for carrying out energy renovations in large buildings, to give the building owner more confidence that the expected energy savings will be achieved in practice.

Existing initiatives:

- Analyses were conducted in 2013 of experience with the use of guarantees for energy renovation in apartment buildings. On this basis, steps were taken to develop a new guarantee model to make energy savings in apartment buildings.

The Minister for Climate, Energy and Building will:

3.1 (page 55)

Promote energy renovation of large buildings by public tenders with guarantees

- Launch a model for energy renovation with guarantees for energy savings in apartment and office buildings etc. and test it in a number of actual construction projects.
 - Evaluate the experience with the model and assess the need for enhancement to establish an overview of the total energy consumption of buildings, e.g. some types of process energy.
-

The Minister for Housing, Urban and Rural Affairs will promote energy renovation of social housing, home-owners' associations and cooperatives and commercial leased property to remove barriers and provide decision-makers with a better and more reliable basis for decisions on energy renovations.

Existing initiatives:

- The kick-start and 'Vækstplan DK' increased the Rural Development Fund's renovation budget to more than DKK 23 billion for the period 2011–2013.2
- The Social Housing Act [Almenboligloven] has been amended so that the highest authority in housing organisations has increased decision-making powers to decide on energy renovations, even though the local section is opposed.

- A pool has been set aside for demolishing and refurbishing rural buildings in poor repair, running to DKK 200 million per year in 2014 and 2015.2
- In 2013 the basis for calculating housing benefit was changed so that energy renovations including exterior insulation do not cause housing benefit to be reduced.
- In February 2014 a bill was tabled containing a model for the way in which the costs of energy renovations that are worthwhile from a total cost perspective can be shared between owners and tenants to the benefit of both parties.

The Minister for Housing, Urban and Rural Affairs will:

3.2 (page 56)

Promote energy renovation of social housing

- Reduce the economic uncertainty for residents in existing social housing when major energy renovations are carried out by developing a special model whereby the housing organisations' special reserve funds can be used to provide a guarantee for energy savings in addition to a guarantee from a technical adviser or another party to the building project. 1
- Promote energy renovation work in existing social housing by developing a flexible digital energy-renovation platform with a coordinated collection of instructions and planning and calculation tools that can be used to plan, project-manage, implement and operate major energy-saving exercises. The platform will be developed together with the social housing sector and will be continuously expanded on the basis of experience from e.g. trials and demonstration projects.

3.3 (page 58)

Promote energy renovation of private rental properties and cooperatives and owners' associations

- Carry out an analysis of the use of property administrators in private rental properties, private cooperatives and housing associations, including the extent to which agreements are entered into on energy control and optimisation in administration contracts or agreements on the use of energy consultants inside or outside the owner's or administrator's business.
- Discuss with owners and tenants what measures can be taken to ensure that energy control and energy renovation receive greater emphasis in the operation of properties, and how far this can be brought about via administration contracts.

3.4 (page 60)

Promote energy renovation of commercial rental property

- Table a bill to amend the Commercial Rental Act [Erhvervslejeloven] to make it easier for landlords of properties leased for business use only to enter into agreements with tenants on energy renovation of the properties and on a rent increase tied to this.

The Minister for Climate, Energy and Building will promote energy renovation of public buildings, so they are in the forefront when it comes to energy renovation.

Existing initiatives:

- DKK 100 million have been set aside in the period 2015–2016 to bring forward maintenance of state-owned buildings where energy-optimisation measures can be taken at the same time.²
- Circular on energy efficiency in state institutions, with a target of 10 % energy savings.
- Agreements with Local Government Denmark and the Danish Regions on the energy-saving activities of the municipalities and regions.
- Access to loans totalling DKK 1 billion for hospital construction carried out in conformity with Building Class 2020.
- In 2013, specific requirements to take account of the total cost/benefit were established as part of the revision and extension of the Order on quality, OPP and total costs in public building projects.

The Minister for Climate, Energy and Building will:

3.5 (page 60)

Promote energy-efficient public buildings

- Revise the Circular on improving energy efficiency in Danish state institutions
- Carry out analyses of ways in which the energy renovation of the State's total property portfolio can be carried out in the most cost-effective way and hence throw light on the marginal costs of extra energy renovations.
- Discuss the establishment of new conditions for energy-saving efforts in municipalities and regions with Local Government Denmark and Danish Regions.
- Support cross-cutting work with State, regional and municipal building owners aimed at promoting energy-efficient operation of the public property portfolio.
- Develop a digital tool and a database to record and display energy consumption in public buildings.

¹ Initiatives arising from the 'Growth Plan for Climate and Energy'

² Initiatives arising from agreements on 'Vækstplan DK'

² Initiatives arising from agreements on 'Vækstplan DK'

4.

Initiatives aimed at developing skills and innovation to promote energy renovation

The Minister for Climate, Energy and Building will raise the level of training and skills in energy renovation in companies in the building industry, banks, financial institutions and DIY stores that provide guidance to building owners on energy renovation.

Existing initiatives:

- The 'Knowledge Centre for energy savings in buildings' was extended to 2016 under the Energy Agreement of 22 March 2012. The centre passes on know-how on concrete and practical ways of reducing energy consumption in buildings to parties involved in the building industry.
- Range of training courses on implementing an approval scheme for companies installing small renewable energy plants.¹

The Minister for Climate, Energy and Building will:

4.1 (page 63)

Improve training and skills development within energy renovation

- Assess the need for training in energy efficiency and renewable energy in the building industry.¹
 - Ensure that teaching materials and tools for the training of banking advisers which enable active marketing of financing options for energy renovation are developed
 - Ensure that information materials and tools which equip sales staff in DIY stores with the skills to guide building owners on energy-efficient energy renovation solutions are developed.
-

The Minister for Climate, Energy and Building will promote research, innovation and demonstration of energy-efficient solutions for energy renovation of buildings.

Existing initiatives:

- The agreement on the allocation of research funding between the Government, the Radicals, the Danish People's Party, the Red-Green Alliance and the Conservative People's Party of 31 October 2013 included a policy decision to support the establishment of five social partnerships for innovation.

- It is planned to send out guidance documents and a set of examples of ways in which innovation can be promoted using the functional requirements in tender specifications.³

The Minister for Climate, Energy and Building will:

4.2 (page 64)

Enhance research, innovation and demonstration of energy renovation

- Support the establishment of a social partnership for innovation called the ‘Innovation centre for world-class building renovation’. By way of broad cooperation between public and private sector operators, the partnership will develop and demonstrate solutions for sustainable building renovation using less energy and fewer resources.

¹ Initiatives following from the Growth Plan for Climate and Energy

³ Initiatives following from the Strategy for intelligent public procurement

Initiatives to promote energy renovation of buildings

1.

Initiatives targeted at all building categories

1.1 Upgrade the energy requirements for the building envelope, apart from windows

Purpose

The energy requirements for building components installed in existing buildings ensure that energy-efficiency measures are adopted in existing buildings as they are maintained. The energy requirements for building components should therefore be upgraded so that energy-efficient components are used in future in new and existing buildings, to provide for a steady improvement in the energy standard of Denmark's building stock.

Background and contents

The Building Regulations contain energy requirements for building components which have to be met when extending or converting or maintaining existing buildings. The energy requirements ensure that whenever buildings are renovated, energy-efficiency measures are also carried out on them. The energy requirements have also helped to create opportunities to market energy-efficient solutions and hence also to place Danish companies in a strong position in the field.

The energy requirements for components are based partly on an energy assessment and partly on a total cost assessment, so they do not impose an additional financial burden on building owners.

The technology is developing all the time, and new ways of enhancing energy efficiency are appearing. At the same time, the prices for the technical solutions are rising as new solutions come onto the market. Other things being equal, as energy prices rise, so investments in energy-efficient solutions become more profitable for building owners and for society as a whole.

That is why all requirements for climate protection components associated with the publication of the new Building Regulations in 2015 will be reviewed and future-proofed so that they reflect future challenges and expected energy prices.

The Minister for Climate, Energy and Building will:

- Upgrade the energy requirements for climate-protection components so that they reflect future demands and expected energy prices.
-

1.2 Upgrade the energy requirements for windows

Purpose

The energy properties of the windows have a major bearing on energy consumption in buildings. Windows should be replaced at regular intervals, providing an opportunity to make large and cost-effective savings by replacing the old windows with durable, energy-efficient windows. The energy requirements for windows therefore need to be upgraded.

Background and contents

The Building Regulations contain requirements for the energy efficiency of new windows, which have to be satisfied in new buildings and when windows in existing buildings are replaced. At the same time, future requirements for replacing windows in 2015 have been announced, and Building Class 2020 lays down more stringent requirements for windows in new buildings. These therefore state the expected levels of requirement in 2015 and 2020. These requirements also act as targets for the development of more energy-efficient windows.

In connection with this, the energy requirement for windows in 2015 will be tightened up, to reflect the published future requirements for window replacement in 2015. The requirements for replacement windows in 2020 will also be upgraded, to reflect the energy requirements for windows in Building Class 2020.

Setting long-term goals for windows has been shown to have a particularly positive effect on innovation generally in the building industry, because the goals have provided certainty for investment and for establishment of the innovation process. In the light of this positive experience, new and more ambitious targets will also be set for future windows after 2020, based on the latest developments. The intention is that the windows of the future should represent a substantial annual energy 'subsidy' towards the heating of buildings. The targets will be set after discussions with the sectors concerned.

There are particular problems associated with buildings with small windows (casement windows, windows with glazing bars etc.), because the relative energy gain from using new energy-efficient windows decreases with the pane size. Many conservation properties may therefore call for solutions other than replacing the whole window. The Danish Energy Agency will draw up an information pack on this, so building owners are better able to decide on the choice of windows to take account of both energy consumption and the architectural look of the buildings.

Windows also have an effect on the daylight conditions in buildings. When windows are replaced, the daylight conditions can be improved, slightly reducing the electricity consumed for lighting. To give building owners a better basis for including daylight conditions in their decisions on new windows, this aspect will also be covered in the information pack, together with noise aspects.

The Minister for Climate, Energy and Building will:

- Upgrade the energy requirements for replacement windows in 2015, to reflect the published future requirements for 2015.
- Upgrade the energy requirements for replacement windows in 2020, to reflect the energy requirements for

windows in Building Class 2020.

- Set new targets for future energy requirements for windows after 2020.
 - Produce information material on the choice of energy-efficient window solutions which also considers architectural aspects and conservation-grade windows, as well as light and noise conditions.
-

1.3 Upgrade the energy requirements for installations in buildings

Purpose

Installations in buildings (e.g. heating and ventilation systems, lifts etc.) have a major effect on energy consumption in the buildings. Technological development has resulted in more energy-efficient installations being developed and also opened the way to automated control of some installations. This provides for both a better indoor climate and lower energy consumption. The 'smart grid' rollout also provides an opportunity for further energy savings through control-related interaction between the electricity supply system and electrically powered installations in the buildings. The installations put into new and existing buildings must therefore be both more energy-efficient and ready to exploit the potential for greater energy efficiency provided by automation and the 'smart grid' rollout.

Background and contents

The Building Regulations contain energy requirements for installations in new buildings and when installations in existing buildings are replaced. Technological development means that the energy efficiency of these installations is improving and that the energy-efficient solutions are getting cheaper.

Analyses have also shown that there is great potential in the use of automation to regulate heat supply systems according to the outside temperature and heating needs. This includes the acquisition of new heating installations such as heat pumps, and also the replacement of district heating systems in existing buildings. Automatic control provides both a more stable indoor climate and more energy-efficient operation of the heating system.

The rollout of the smart grid offers fresh opportunities for energy savings, including the use of automation systems whereby electrically powered appliances are controlled according to the electricity price. For example, there may be advantages in turning off heat pumps and other electricity-consuming installations at peak times. Exploiting this potential requires meters and other types of equipment to be installed that can communicate with the electricity supply system and regulate consumption.

Analyses will therefore be carried out into the possibility of upgrading the efficiency requirements for the electrically powered installations to reflect technological development and of identifying the possible benefits of automation systems for building owners and electricity suppliers. On this basis, the energy requirements for installations set out in the Building Regulations will be upgraded, and consideration will be given to laying down requirements for automation so that the installations are ready to be incorporated into automated control systems or to make use of the possibilities of the smart grid.

There is great potential for long-term energy savings in the use of ventilation systems with heat recovery, where the cold air drawn into the building from outside is warmed with the inside air being extracted. Ventilation systems also have a favourable effect on the indoor climate, with lower humidity and a controlled intake of fresh air. Possible problems with radon and PCBs will also be reduced by the use of ventilation, because this will reduce the concentration of harmful substances in the indoor air.

The existing Building Regulations contain requirements for ventilation with heat recovery to be installed in new

apartment blocks, but not in single-family houses. In single-family houses one can choose between balanced ventilation with heat recovery and natural ventilation. Advantages and drawbacks of introducing requirements for the use of ventilation with heat recovery in new single-family houses will therefore be examined.

Experience has shown that there are often complications associated with getting complex technical installations in buildings to work together without impeding each other. This is especially true in large buildings and particularly in buildings with both heating and cooling systems installed. The problems can be remedied by ensuring that the systems are set correctly so that the individual parts of complex systems do not work against each other. The Danish Standards Foundation [Dansk Standard] has therefore issued a standard for verifying and documenting that the technical installations in a building are energy-efficient (commissioning). It will therefore be investigated whether it is appropriate to introduce a requirement that commissioning be performed according to the standard when large buildings with cooling systems, where control of the energy system is often complex, are reported as complete. There may be a risk of serious energy wastage in these buildings because the system has not been adjusted correctly. The standard can also be used as a guide for other buildings.

The Minister for Climate, Energy and Building will:

- Review the energy requirements for installations in buildings with a view to upgrading them, and consider whether to introduce requirements concerning the automation and control of the installations.
 - Analyse the interplay between installations in buildings and the 'smart grid', and use this to assess the possibility of introducing special requirements for the installations in the buildings to exploit the benefits of the smart grid.
 - Examine the advantages and drawbacks of introducing requirements for the use of ventilation with heat recovery in new single-family houses.
 - Examine the possibility of introducing new requirements for the use of commissioning in some types of large buildings with complex installations.
-

1.4 Assure greater compliance with the Building Regulations

Purpose

The rules in the Building Regulations on energy renovation of existing buildings ensure that buildings undergo regular energy improvement in conjunction with maintenance and renovation. The rules are one element in the drive to achieve energy savings in buildings. However, the rules will only have an effect if they are complied with. It must therefore be ensured that the rules in the Building Regulations are applied in practice.

Background and contents

The energy requirements for existing buildings in the Building Regulations cover two types of component requirement. There are component requirements that must always be satisfied when installations or building components are replaced, and others that only have to be met if the energy-saving measure is cost-effective. The cost-effectiveness requirement means that cost/benefit calculations have to be performed for the energy-saving measure before work starts, to determine whether or not the energy saving should be made.

The component requirements that must always be complied with when replacing components are easy for both owners and tradespeople to understand. Experience therefore shows that they are largely followed. On the other hand, studies have shown that cost/benefit calculations are only performed in a few cases before

converting and replacing roofs and other building components where the Building Regulations require such a calculation to be done. It has also been found that the energy-saving measures stipulated in the Building Regulations are often carried out in any case, even without any cost/benefit calculations.

The reason why no cost/benefit calculations are done is probably that the rules in the Building Regulations are complicated and hard to understand and apply in practice. A number of measures will therefore be taken to ensure that the rules in the Building Regulations are complied with.

Steps will be taken in three areas.

First, changes will be made to the Building Regulations to make them clearer and easier to understand. Secondly, information material for building owners and tradespeople will be compiled in collaboration with the relevant organisations, explaining how the rules should be applied. Among other things, this will be based on examples showing insulation should be retrofitted, so that in most situations, building owners will be able to see which requirements apply in a given situation. This will be a help in the cost/benefit calculation. This information will be provided on the Danish Energy Agency web site.

Thirdly, a survey will be carried out every other year to verify compliance with the energy requirements for existing buildings laid down in the Building Regulations, to assess on a regular basis whether the rules are being applied in practice. These surveys will be used to assess whether there is a need for further action.

The Minister for Climate, Energy and Building will:

- Make the rules in the Building Regulations easier to understand.
- Provide more information on the Building Regulations, e.g. by developing sets of examples.
- Monitor compliance with the energy requirements for existing buildings in the building regulations on a regular basis, including reviews of compliance every other year.

1.5 Introduce voluntary energy classes for existing buildings

Purpose

Good results have been achieved with voluntary low energy classes for new buildings. These should be transferred to existing buildings, so building owners have targets for energy renovation of existing buildings. Voluntary energy classes should therefore be introduced for existing buildings

Background and contents

There have been voluntary low energy classes for new buildings since 2010. This has produced significant movement in the market, as building owners wishing to construct energy-efficient buildings have had a concrete objective to aim at. Building owners have also had the chance to highlight the energy-efficiency of their buildings by indicating that they were built according to the requirements in the low-energy classes.

These positive results should be transferred to existing buildings by defining voluntary energy classes to serve as a yardstick for energy efficiency in existing buildings. A building will conform to a given energy class if its overall energy-efficiency reaches a certain level and the renovation is carried out in accordance with the rules in the Building Regulations.

The energy classes should serve as guides for building owners and highlight the energy status. The energy-

renovation classes should also flesh out the overall objectives for energy savings in existing buildings. The energy classes in the Building Regulations should be coordinated with those in the energy-labelling scheme for buildings, in which their energy efficiency is described by grading them on a scale from A to G, so there is a relationship between the energy classes in the Building Regulations and in the energy-labelling scheme. In the longer term, the energy classes could be coordinated with or included in broader sustainability classes for buildings, which also incorporate other environmental factors besides energy.

Compliance with a voluntary energy class for existing buildings may also be an alternative to the efficiency requirements for replacing or modifying a number of building components such as walls, roofs, floors etc., where an efficiency requirement applies if it is cost-effective. That means that satisfying the criteria for an energy class would make the component requirements for some components redundant.

The Minister for Climate, Energy and Building will:

- Launch an analysis of the level of demand and profitability for energy conditions for existing buildings and introduce voluntary energy classes for existing buildings in the Building Regulations for 2015 which correspond to the classification of buildings on a scale from A to G in the energy-labelling scheme for buildings.
 - Change the requirements for existing buildings in the Building Regulations so building owners carrying out renovations can opt for compliance with a voluntary energy class instead of the energy requirements for some building components.
-

1.6 Upgrade the energy requirements for new buildings

Purpose

The ambitious energy requirements for new buildings mean that Denmark is in the forefront when it comes to energy- and climate-friendly building, and they have helped to place Danish companies in a strong position in this area. Low-Energy Class 2015 and Building Class 2020 have also helped to establish targets for these companies' innovation work in the field. An upgrade to the energy requirements for new buildings and to the low-energy classes can also help to secure Denmark's position of strength in the market.

Background and contents

The energy requirements for new buildings were laid down in the Energy Agreement of 2008, to the effect that energy consumption in new buildings should be reduced by 75 % in total by 2020 compared to the levels required in 2008. The cuts are being made in three stages from 2010 to 2020 by inserting requirements into the Building Regulations in 2010, 2015 and 2020. This started in 2010, when the energy limits for new buildings in the Building Regulations (BR10) were tightened by 25 %.

BR10 also introduced voluntary low-energy classes in 2010, namely Low-Energy Class 2015 and Building Class 2020. The low-energy classes are targets for building owners and the construction industry to aim at. This gives building owners who want to construct new buildings to meet future requirements something to aim at. It also provides a target for the building industry to develop technical solutions for the buildings of the future.

We now have experience of constructing new buildings according to the requirements laid down in 2010 – both with the statutory requirements for new buildings and with the voluntary low-energy classes. An evaluation of the low-energy classes and some component requirements has therefore been initiated. The aim of the evaluation is to obtain a solid basis for setting the energy requirements for new buildings from 2015 in the Building Regulations.

It will also be used to assess whether there is a need to adjust Building Class 2020.

Great energy savings can be made by complying with the airtightness requirements in new buildings. Information material will therefore be compiled on the importance of this subject and ways of meeting the airtightness requirement.

The Minister for Climate, Energy and Building will:

- Evaluate the energy requirements in the low-energy classes.
 - Make the energy limits in Low-Energy Class 2015 requirements from 2015 and assess the component requirements on the basis of an evaluation.
 - Assess the need to adjust the requirements for Building Class 2020.
 - Carry out initiatives to promote compliance with airtightness requirements in new buildings, to sharpen the focus on making new buildings airtight.
-

1.7 Step up information and communication activities about energy renovation and energy efficiency in the building industry

Purpose

Building owners need access to knowledge about energy renovation options and their impact on finances, energy consumption, the indoor environment, comfort etc. is necessary for if they are to be able to decide proceed with energy renovation. Similarly, advisers, tradespeople, fitters, financial institutions and other parties working on energy renovation of buildings need to have easy access to knowledge about energy renovation in order to give the best possible advice to building owners. There will therefore be an increase in information and communication activities about energy renovation and energy efficiency in the building industry.

Background and contents

A feature of energy renovations in buildings is that they involve many decision-makers: the individual building owners and tenants. The biggest group of building owners is made up of the citizens who directly or indirectly own the home they live in. These are owners of single-family houses and owner-occupied apartments and members of cooperatives. These building owners do not start out with the necessary technical or financial knowledge to assess the options for energy renovation of their homes on an informed basis. In rental accommodation, the tenants should be involved in the decision-making process on energy renovation, and a common basis for decision should be established for owners and tenants.

Moreover, the process of carrying out energy renovations is often complex. This is partly because it involves complex technical and financial questions and partly because energy renovations often call for close collaboration between multiple parties, including consulting engineers, architects, financial institutions etc. In some cases, the municipal building authority also needs to be involved. The area is also subject to rules that may be very hard to understand for both laymen and professional operators.

Access to information and knowledge on energy renovation and the implications of it, and how the process can be approached in practical terms, is therefore essential to the implementation of energy renovations. Disseminating information on energy renovation and energy savings in buildings has therefore been an important element of energy policy also.

The Danish Electricity Saving Trust (Elsparefonden) was set up in 1996, and a major effort was made to save electricity in households and in the public sector. In 2010 Elsparefonden was renamed the Centre for Energy Savings (Go' Energi), and was tasked with expanding the initiative to all sectors and types of energy except for transport.

The 'Knowledge Centre for energy savings in buildings' was established in 2008 with the aim of developing, organising and communicating knowledge of energy solutions in buildings for tradespeople and advisers.

The Energy Agreement of March 2012 set up a new framework for communication campaigns about energy efficiency. The Centre for Energy Savings was closed and the Danish Energy Agency assumed responsibility for continuing the communication work on energy efficiency. At the same time, it was decided to extend the approval for the 'Knowledge Centre for energy savings in buildings'.

The Danish Energy Agency has run communication activities on three strategic axes: easily accessible and usable guidance and information to final energy consumers, use of strategic partnerships and support for local ownership and location of activities. In 2012 and 2013 a large part of the effort was concentrated on setting up a consumer-oriented web site about energy efficiency in buildings and equipment.

In 2012 and 2013 the Danish Energy Agency also developed specific information tools, including general information on energy renovation and the derived benefits in relation to the environment, the indoor climate and comfort; checklists for use in assessing the energy status of buildings and installations; a short film on energy solutions; sets of examples; process guides etc.

Also in 2013, an experience database on energy renovation was developed, containing specific cases and experience of energy renovation, which building owners (in the first phase, single-family houses) can search when they are considering energy renovations.

In 2014 there will be increased coordination of the overall communication activities with a view to achieving greater synergy, and there will be particular emphasis on activities that support the initiatives in the 'Strategy for energy renovation of buildings'.

In 2014, emphasis will also be placed on providing broader information about the effects of energy renovation. Analyses, data and practical tools will be developed to explain the connection between energy renovations, the indoor climate, comfort, health, the future-proofing of buildings etc. The issue of preserving the architectural qualities of buildings will also be included. Great emphasis will also be placed on informing people of the link between energy renovation and PCB and radon problems, with a view to ensuring that energy renovations are carried out in such a way that PCB and radon levels are addressed. Conversely, the actions taken to reduce PCB and radon levels should also provide a basis for carrying out energy renovations of buildings.

For the first time, the information will be structured in a building atlas, broken down by building types, so users can gain quick and easy access to the relevant information for the specific building type that is relevant to them.

Experience shows that the best results are achieved with municipal involvement and local activities. A particular priority in 2014 will therefore be support for municipal efforts by establishing local activities to promote energy renovation of buildings.

The Minister for Climate, Energy and Building will:

- Step up the information activities about energy-efficiency so that they provide greater support for the energy renovation of buildings.
 - Develop new, targeted information tools emphasising an all-round view of energy renovation, including the indoor climate, comfort, health, architectural considerations, and radon and PCB problems etc.
 - Support municipal efforts towards energy efficiency, including the establishment of partnerships to run information activities.
-

1.8 Target energy-saving efforts by the energy companies

Purpose

One of the key instruments for attaining the goals of reducing energy consumption in the Energy Agreement of 2012 is the energy-saving work being done by the energy companies. Under the Energy Agreement, these savings are to be stepped up to 12.2 PJ per year in the period 2015–2020. It was also decided that the companies' efforts should be directed at existing buildings and industry. It is thus important to ensure that the work of the energy companies to promote energy renovation of the existing building stock is expanded.

Background and contents

The Agreement of 13 November 2012 between the Minister for Climate and Energy and the energy companies states that some of the work of the companies should be targeted at existing buildings. However, this objective has not been defined in detail. On the other hand, it is clear from the Agreement that it may be necessary to discuss adjustments to it in response to the strategy for energy renovation.

The energy companies are already achieving a significant part of their energy savings in buildings. For example, the proportion of savings in households over the whole period 2006–2009 was equal to their share of total consumption. In 2010–2011 the proportion of savings in households was much lower because of the increased obligations, but from 2011 to 2012 it rose significantly. In particular there was growth in the savings from improving building envelopes and improving heating systems etc. The proportion of the savings made in the public sector is greater than this sector's share of consumption.

The basis for the work of the grid and distribution companies is flexibility and cost-effectiveness, expressed as the relationship between their costs and the energy savings made. In view of this, it may be expected that, other things being equal, the various initiatives in the 'Strategy for energy renovation of buildings' will increase the proportion of savings to be achieved in the future in existing buildings.

The Minister for Climate, Energy and Building will open discussions with the energy companies to set a target for the proportion of the total energy savings to be made within existing buildings. This may be done by adjusting the existing agreement with the energy companies, which runs to 2015, and through the new agreement to be entered into for the period from 2016 onwards.

Along with a general objective for the proportion of energy savings in existing buildings, it may be considered whether the energy companies should be obliged to promote extensive, across-the-board 'deep' renovations and run demonstration projects.

The Minister for Climate, Energy and Building will:

- Hold talks with the energy companies about whether a target for the proportion of their energy savings to be

made in existing buildings can be established.

1.9 Maintain an effective and targeted energy-labelling scheme for buildings

Purpose

The energy-labelling scheme for buildings helps to create transparency in the property market, as studies indicate a relationship between property prices and energy certificates. This fact should be emphasised to ensure that building owners' efforts to improve the energy efficiency of their buildings continue to be reflected in higher property prices. Energy labelling should also be used to a greater extent as a basis and inspiration for making energy savings in buildings.

Background and contents

The energy-labelling scheme for buildings means that all buildings in which energy is used to regulate the indoor climate must be energy-labelled before they are sold or let. This involves an inspection of the building by an independent expert, who rates the energy-efficiency of the building by placing it on a scale from A2020 to G, where A2020 is the best. It also covers the potential energy savings that can be made to the building.

Since July 2010 there has been a requirement for the rating of the building on the scale to be included in all advertisements for sale of properties through estate agents. This was extended from January 2013 to the effect that the energy label for buildings must now be included in all advertisements for the sale or letting of buildings, flats or commercial premises.

The visibility of the rating given to the building on the scale has created greater transparency in the property market, as studies indicate a relationship between property prices and energy labels. To support this, an initiative has been launched under the Growth Plan for Climate and Energy with the aim of making the labelling scheme more robust and hence establishing it as a reliable indicator of energy-efficiency when setting prices in the market.

In connection with energy labelling, a large volume of data is being collected on the design and energy characteristics of buildings. This information has been organised and will be made available to the public via the Danish Energy Agency web site. Tradespeople, construction companies and research and development institutions will then have access to a large knowledge base on the design and energy status of buildings, giving them a better basis for planning their efforts to develop and market energy-saving solutions. Access to data also creates a basis for developing new and innovative energy-efficiency solutions and services.

A multilateral approach is needed to increase the use of energy labelling as a basis for carrying out energy renovations. First and foremost, it must be easier for building owners to use the energy certificates. A web site has therefore been developed to issue energy certificates to building owners. This web site will be enhanced with new facilities to analyse potential energy savings for single-family houses on the basis of the data collected from energy labelling. Facilities will also be developed to enable building owners to calculate the financing costs of energy-renovation projects.

Municipalities, social housing organisations and other building owners who own whole property portfolios have a particular need to incorporate the energy-labelling scheme into the ongoing maintenance of their buildings, so that it becomes a tool to be used as a basis for such maintenance. There will also be an effort to make energy labelling more user-friendly for these parties.

A parallel effort will also be made to improve the technical quality of the labelling and simplify the rules, e.g. exempting new summer homes from energy labelling.

At the same time, the dialogue with financial institutions, tradespeople, advisers and other players on ways in which energy labelling can support their efforts to promote energy renovations will continue.

The Minister for Climate, Energy and Building will:

- Increase the use of energy labelling of buildings by setting up a web site where building owners and tenants can use the energy labels to gain an overall view of the energy-saving potential in their buildings and obtain specific information and guidance on carrying out energy renovations.
 - Provide background data on buildings from the energy labels via the Danish Energy Agency web site.
 - Draw up guidelines and examples of how energy labelling can assist with building maintenance and the renovation of property portfolios.
 - Strive for constant improvements in the quality of the energy labels for buildings, simplify the rules and reduce the costs of energy labelling.
 - Pursue the dialogue with building owners, tenants, consultants, tradespeople, energy companies, financial institutions and other market operators on ways in which energy labelling can best support energy saving efforts.
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1.10 Provide better data and tools for decisions in energy renovation

Purpose

Increased, cost-effective investment in energy renovation requires up-to-date data, technical tools and methods of establishing a good and reliable basis for decisions. Building owners, advisers and tradespeople should have access to the data and tools they need to plan cost-effective energy renovation work.

Background and contents

Access to data on buildings and installations and their energy characteristics is a prerequisite for building owners, advisers and other players to be able to analyse the potential for energy renovation in buildings. Similarly, access to tools and guidelines enabling them to analyse renovation options or the potential for energy-efficient operation of energy facilities in buildings and calculate costs, energy savings, the impact on the indoor environment etc. is essential to establishing a basis for decisions by building owners. In this context, energy renovation should be viewed on total cost principles, including operating and maintenance costs in buildings.

An analysis will therefore be carried out to determine what data and technical tools the various parties need to support their work on energy renovation. The analysis will include a view of energy renovation in a wider context, so it will also cover the indirect effects on the indoor climate and comfort and the relationship to the government's resource strategy and consider the architecture of the buildings.

On this basis, and in collaboration with the parties involved, a long-term plan will be drawn up to develop the data, technical tools, guidelines etc. needed to promote energy renovation of buildings. The provision of data will address the needs of building owners who want to gather and maintain data on their buildings (building logbooks), to enable easy access to data that can be made available via existing registrations.

Work will also be initiated to develop standardised methods of calculating and documenting energy savings

from energy renovation. The intention is to give building owners a more reliable and transparent basis for decisions.

The Minister for Climate, Energy and Building will:

- Carry out an analysis of the various parties' need for data, technical tools etc. to support the energy renovation of buildings.
 - Develop a method to calculate and document energy savings from energy renovation.
 - Draw up a plan to develop data, technical tools, guidelines etc. to promote energy renovation of buildings in collaboration with the parties involved.
-

1.11 Promote favourable conditions for financing energy renovation

Purpose

Energy renovation projects often rely on favourable, stable financing conditions. Ways of promoting financing via mortgages and bank loans will therefore be analysed.

Background and contents

Denmark already has a framework that offers many building owners various options for the financing of energy renovations. In many cases, it may be advantageous to use mortgage lenders, where the interest rate is relatively low by virtue of the security inherent in the arrangement. If the financing need is not so great, it may be better to take out a bank loan instead of a mortgage, as the setup costs are lower. Finally, many building owners self-finance energy improvements to their buildings.

In a properly functioning and transparent property market, buildings that have a good energy standard will sell for higher prices than those with a poor energy standard, so building owners have a financial incentive to carry out energy renovations. There are already studies to indicate that energy efficiency has an influence on property prices for single-family houses, but these need to be followed up to assess whether there is a need for fresh measures to ensure that energy efficiency remains a factor in market pricing. Further analyses will therefore be conducted on this.

These analyses are part of the initiative behind the 'BedreBolig' scheme (green property contracts), which was included in the agreements on the 'Vækstplan DK' growth plan. As part of this, analyses will also be performed to determine how energy factors can be better incorporated into loan advice from banks or mortgage lenders and into the valuation of properties, and to look at ways of paying for investments in energy renovation through energy bills.

The Minister for Climate, Energy and Building will:

- Analyse whether the housing market is sufficiently transparent, so the pricing reflects the energy status of the buildings and ensures that worthwhile energy renovations retain their value when the property is to be sold. Analyses will also be performed to determine how energy factors can be better incorporated into loan advice from banks or mortgage lenders and into the valuation of properties, and to look at ways of paying for investments through energy bills.

1.12 Produce a building policy strategy

Purpose

The construction industry in Denmark faces a number of structural challenges which are not restricted to energy renovation. These include a low level of innovation and a need to attract qualified workers. As the building industry also accounts for 20 to 35 % of the most important negative environmental effects, such as the greenhouse effect, acidification, resource and water consumption and waste generation, there is also great potential to safeguard the environment and climate by promoting sustainability in the industry over and above reducing the energy consumption of buildings.

These challenges and opportunities can be better handled in a broader context than the strategy for energy renovation. The government will therefore set out a building policy strategy in 2014 to address the general challenges facing the whole of the building industry.

Background and contents

The building industry is a major element of the national economy, accounting for 6 % of GDP and employing some 5 % of the total workforce. As well as being a large sector in itself, the building industry also plays a major role in ensuring that the other parts of society can operate.

Building in Denmark is much more expensive than in neighbouring countries. Among other things, building prices affect whether Danish and foreign companies are prepared to invest in new production or expanding existing production and hence jobs in Denmark, just as the price of energy renovations has a bearing on how fast the ambitious climate targets can be attained.

The building industry has the potential to make a major contribution to generating increased growth and employment, but faces a number of structural challenges that need to be tackled if productivity in the sector is to be increased. These include the structure of the industry which is marked by a fragmented supply chain with many links, causing high transaction costs, and the fact that there are many small enterprises which do not appear to be getting any bigger. Moreover, the building industry as a whole is less innovative than other industries and faces challenges in attracting the necessary skills in the form of qualified staff and employees with tertiary qualifications.

The strategy will also promote sustainable building. The Building Regulations already lay down a number of requirements for sustainability elements. As part of the building policy strategy, we need to examine how these requirements can be supplemented to produce a holistic approach to sustainability. A parallel objective is to enhance our knowledge of sustainable building. As part of this, there is a need for greater knowledge and use of tools to assess lifecycle costs (LCC analyses) and perform lifecycle assessments (LCA analyses), to promote a total cost approach and efficient use of resources in building.

These fundamental challenges will be addressed in the building policy strategy to be presented by the government in 2014.

The Minister for Climate, Energy and Building will:

- Produce a building policy strategy to set out the government's overall strategy for the construction sector and address the challenges facing the industry to help to promote growth, productivity and employment in the building industry.

2.

Initiatives targeted at single-family houses

2.1 Promote energy renovation in single-family houses via the 'BedreBolig' scheme

Purpose

The Ministry of Climate, Energy and Building is introducing the 'BedreBolig' scheme in 2014. The aim of the scheme is to promote energy renovation of private homes. The scheme should make it clear to Danes how much potential for increased comfort and energy savings there is in energy renovation of their homes, and make it easy and manageable to start energy renovations.

Background and contents

There is great potential for saving energy in private homes, but in spite of this, home-owners are not taking every opportunity to cash in by way of energy renovation. They are thus missing the chance to invest in a home to meet future requirements for energy-efficient solutions, and also to take advantage of the increased comfort and energy savings to be gained from energy renovation.

'BedreBolig' is an approval scheme whereby specialists within the building industry are authorised to advise home-owners on ways of carrying out energy renovations and to help them to manage the renovation. The idea behind the scheme is for home-owners to be able to go to one place to obtain an overall pack on energy-saving renovation work. The advisers accredited under the scheme are equipped by a course of training to provide home-owners with qualified advice, including an assessment of the condition of the building and the potential for energy renovation, advice on the choice of solutions and suppliers, documentation for decisions by financial institutions, obtaining quotes from building firms and project-managing renovation projects.

'BedreBolig' advisers offer their services on market terms, and the home-owner is free to decide how many parts of the service to purchase. Through the approval scheme, the adviser undertakes to engage in detailed discussions with the home-owner in order to be able to handle all stages of the process, from the initial screening of the home and planning the energy renovation to project management and quality assurance.

The scheme was developed in 2013. In 2014 there will be a campaign to launch and market the 'BedreBolig' scheme, aimed at home-owners, approved 'BedreBolig' advisers and other parties involved, including energy companies, financial institutions, municipalities, DIY stores etc.

There will be a phased rollout of the scheme, which means that it will be launched in a number of selected municipalities in the first half of 2014. These selected municipalities will thus play a key role in the initial marketing to home-owners. The phased rollout will enable a firm sense of ownership and a high level of involvement among the players, whereby the experience gained can be used to make adjustments to the scheme before it is marketed throughout the country.

The Minister for Climate, Energy and Building will:

- Launch and market the 'BedreBolig' scheme in 2014, to create one common place for home-owners to go for energy renovation. The scheme will be rolled out progressively on the basis of experience from a number of selected municipalities.

2.2 Promote the spread of alternatives to oil and gas-fired boilers based on renewable energy

Purpose

If we are to achieve the objective that heat and energy supplies in Denmark should all be based on renewable energy from 2035 onwards, oil and gas-fired boilers need to be replaced with forms of heat generation based on renewable energy. In conjunction with energy renovation projects, work therefore needs to be done to convert heat supplies in areas without district heating to renewable energy.

Background and contents

The government's aim that electricity and heat supplies should be based on renewable energy from 2035 onwards demands that, when energy renovation work is done in buildings, heat supplies in areas without district heating should also be converted to types of provision based on renewable energy.

The first step was taken in the Energy Agreement of 2012, when it was decided that no oil and natural gas-fired boilers could be installed in new buildings from 2013 onwards and that, from 2016 onwards, it should not be possible to install oil-fired systems in existing buildings in areas served by natural gas or district heating supplies.

The Agreement also set aside DKK 42 million in the period 2012–15 to promote energy-efficient alternatives to oil and natural gas-fired boilers in existing buildings. As part of this, an impartial telephone advice service has been set up, where building owners can go for advice on replacing oil and natural gas-fired boilers. The Danish Energy Agency web site has also been extended to provide information and calculation tools to enable building owners to gain an overview of the costs of replacing oil and natural gas-fired boilers. For example, product lists have been produced to give an overview of efficient heat pumps.

A number of demonstration projects have also been initiated, including a trial of a new business model where an energy company owns and operates heat pumps for building owners and the building owners draw off heat at a fixed price, as they do with e.g. district heating. Trials are also being run on new renewable energy-based technologies with automation and control facilities that enable interaction with the smart grid, and various tools are being developed that can help to overcome barriers to consumer investment in renewable energy by clarifying the financial and insurance aspects.

The Minister for Climate, Energy and Building will pursue these efforts out to 2016, with an increased focus on the interplay between energy renovations and conversion of heat supplies to models based on renewable energy.

The Minister for Climate, Energy and Building will:

- Run demonstration projects to test solutions that integrate renewable energy in buildings and illuminate the relationship between conversion to renewable energy and the need for energy renovation.

3.

Initiatives targeted at apartment blocks, commercial and public buildings

3.1 Promote energy renovation of large buildings by public tenders with guarantees

Purpose

There is often great uncertainty associated with energy renovations, and this constitutes a barrier to carrying out these renovations. In many situations, the uncertainties are connected with the scale of the energy savings to be made through energy renovation. New concepts therefore need to be developed for energy renovations, to give building owners a better overview and greater certainty about the energy factors associated with energy renovation projects.

Background and contents

Energy renovation projects often involve heavy investment which pays back over a prolonged period. In many cases, there are uncertainties associated with realising the expected energy savings, and this may constitute a barrier to carrying out the projects. In many countries, the ESCO concept is used as a way of overcoming these barriers. The original ESCO concept involves building owners entering into an agreement with a private company to implement a project where the private company also provides the financing and a guarantee that a given saving will be achieved after payment of interest and charges.

In Denmark, the ESCO concept is used by a number of municipalities to carry out energy renovations of municipal buildings. As Denmark already has advantageous financing schemes for the municipalities, all the municipalities that have used the ESCO concept have chosen to provide the financing themselves. The role of the ESCO company has been to run the energy renovation project and assume all or part of the risk of failing to achieve a given result. Experience with the ESCO model in the municipalities has been positive, particularly in major projects involving a large number of buildings. So far, the ESCO agreements have mainly been aimed at energy savings through optimisation of installations.

In buildings owned by private and social housing associations, the ESCO concept has been less widely used in Denmark. There are several reasons for this; one is that the mortgage system etc. gives building owners access to financing that the ESCO companies cannot compete with. Another is that the projects are often too small to be the subject of ESCO agreements.

The general experience is that the most important element of the ESCO structure in the Danish context is the guarantee, and that wider use of guarantee schemes could reduce the uncertainties and hence the barriers to energy renovation. The government therefore allocated DKK 5 million in 2013 to develop and test a concept for carrying out energy renovations and new building, where the adviser or contractor provides a guarantee that the energy saving will be achieved.

The concept will be launched and tested on actual building projects in 2014. The findings will also be monitored. This will include an assessment of whether there is any need to enhance the concept with a view to

establishing an overview of the total energy consumption of buildings, e.g. some types of process energy.

The Minister for Climate, Energy and Building will:

- Launch a model for energy renovation with guarantees for energy savings in apartment and office buildings etc. and test it in a number of actual construction projects.
 - Evaluate the experience with the model and assess the need for enhancement to establish an overview of the total energy consumption of buildings, e.g. some types of process energy.
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3.2 Promote energy renovation of social housing

Purpose

There are around 600 000 social housing units in Denmark. Around 60 % of them were built before the energy requirements in the Building Regulations were seriously tightened up in 1979. There is therefore great potential for energy savings through energy renovation of the social housing stock, and energy renovation in this sector should be encouraged.

Background and contents

The renovation of social housing is a major exercise. In the 'kick-start' in the autumn of 2011 and the agreements on 'Vækstplan DK' in the spring of 2013, it decided to bring forward and increase the renovation budget from the Rural Development Fund for the period 2011–2013 to over DKK 23 billion in total. However, the overall investment in the buildings concerned is even bigger, as by no means all the investments draw on the renovation budget. Unfunded improvements and planned maintenance are also being carried out in other buildings. In light of this, the total investment in renovation in the social housing sector is estimated at a minimum of DKK 40 billion in the years 2011–2013. Renovation projects are considered to bring a significant reduction in energy consumption, particularly via improvements in climate protection, as they make energy improvements that at least meet the current requirements of the Building Regulations. It is estimated that around a third of the supported renovation projects have a bearing on the energy consumption of the buildings concerned. Substantial energy renovations are thus being carried out in the social housing sector.

However, there are barriers to doing renovations. These are due to the uncertainties associated with energy-renovation projects, particularly with regard to the scale of the energy savings to be realised and hence also the future energy costs. As it is ultimately the residents who have to approve the renovations by a democratic vote, these uncertainties can be a stumbling block to the projects. Following the Energy Agreement of 2008, an amendment was therefore made to the Social Housing Act, giving the governing body in housing associations increased decision-making powers to enable them to take decisions in exceptional cases to carry out major energy renovation work even where the relevant section is opposed. However, the Social Housing Act stipulates that decisions on energy renovations must generally be taken by a democratic vote among the residents. It is therefore important to maintain credibility in energy-renovation projects and limit the risk, to minimise uncertainty as to the future level of rents and energy charges as far as possible.

This is supported by the amendment to the regulations of the Rural Development Fund on drawing rights, approved by the Minister for Housing, Urban and Rural Affairs at the beginning of December 2013. For improvements subsidised from drawing rights, e.g. energy-saving measures, it is now permissible for the original grant to be increased within a period of 5 years from completion if the expected operational saving from the improvement work is not achieved.

The rules for calculating housing benefit have also been amended so that energy-renovation projects that include insulating outside walls and so also increase the gross floor area of the building do not cause a reduction in the housing benefit received by many residents in social housing sections. This could affect the residents' backing for retrofitting insulation. The new rules, which include a change to the area registration rules in the BBR, also apply to private rental property.

Inspired by the ESCO model, which has gained wide acceptance in the municipalities, the Ministry of Housing, Urban and Rural Affairs has started work on developing a model aimed at reducing the financial uncertainty for residents in existing social housing that results from major energy renovations. This includes allowing the housing organisations' special reserve funds to be used to provide a guarantee for energy savings in addition to a guarantee from a technical adviser or another party to the building project.

The work on energy renovations and other energy-efficiency measures in social housing organisations is also supported by research and development projects which may be concerned with more efficient energy-renovation processes, total cost calculation tools, methods of energy renovation that take account of the architecture of the buildings, ways of making energy consumption visible and 'educating' residents and operating staff.

The findings from this will be gathered together and used to draw up specific instructions to be distributed to the sector via a digital energy-renovation platform.

The Minister for Housing, Urban and Rural Affairs will:

- Reduce the economic uncertainty for residents in existing social housing when major energy renovations are carried out by developing a special model whereby the housing organisations' special reserve funds can be used to provide a guarantee for energy savings in addition to a guarantee from a technical adviser or another party to the building project.
- Promote energy-renovation work in existing social housing by developing a flexible digital energy-renovation platform with a coordinated collection of instructions and planning and calculation tools that can be used to plan, project-manage, implement and operate major energy-saving exercises. The platform will be developed together with the social housing sector and will be continuously expanded on the basis of experience from e.g. trials and demonstration projects.

3.3 Promote energy renovation of private rental properties and cooperatives and owners' associations

Purpose

Property administrators should help to professionalise the operation of private rental properties, private cooperatives and owner-occupiers' associations by seeking to place greater emphasis on ways in which energy control and renovation can be included as a natural part of running the properties and planning maintenance.

Background and contents

The Energy Agreement of 2012 states that an energy-saving package should be produced to promote energy savings in private rental properties. The reason for this is the 'paradox problem' in private rental properties which means that even directly profitable investments in energy savings are often not made because of uncertainty as to who will reap the financial benefit of the investments. On 29 April 2014, a new law (the

Energy Savings Package Act) was therefore adopted, containing a model of the way in which the costs of energy renovations that are profitable in a total cost perspective can be shared between owners and tenants to the benefit of both parties. The law also contains a model of how owners and tenants can sign an agreement on green urban renewal to share the costs of energy renovation. Finally, the law includes a number of measures to support energy renovations in private rental properties. The principal elements of the law form a whole that maintains the financial and legal balance between landlords and tenants. The law removes the barrier to carrying out profitable energy renovations which has put a brake on investment in this area for many years.

There is increasing professionalisation of letting and operation in the private rental housing sector. For example, many large landlords use property administrators to manage their properties. This also applies to cooperatives and private owners' associations. It is generally the traditional administration role that is handed over to the property administrators, but the agreements may not state the extent to which the owner intends to develop his property, e.g. by way of energy control and renovation. This means that the landlords or the cooperative or owners' association receive no guidance on the energy-efficient operation of the property or on energy renovation, which may often involve complex technical questions.

As an extension to the Energy Savings Package Act, a study will therefore be conducted to determine whether energy control and management and energy renovation could, to a greater extent than is currently the case, be covered by administration agreements, to ensure that decision-makers receive better guidance and a more solid basis for decisions on these matters.

The Minister for Housing, Urban and Rural Affairs will:

- Carry out an analysis of the use of property administrators in private rental properties, private cooperatives and housing associations, including the extent to which agreements are entered into on energy control and optimisation in administration contracts or agreements on the use of energy consultants inside or outside the owner's or administrator's business.
- Discuss with owners and tenants what measures can be taken to ensure that energy control and energy renovation receive greater emphasis in the operation of properties, and how far this can be brought about via administration contracts.

3.4 Promote energy renovation of commercial rental property

Purpose

It should be more attractive for landlords and tenants to carry out energy renovations in properties let for commercial purposes only.

Background and contents

The Commercial Rental Act is based on the idea that tenants and landlords should have more freedom to agree the terms of the tenancy, including the amount of rent and the landlord's ability to make improvements to the property.

The Commercial Rental Act allows tenants and landlords to agree on rent increases to cover both improvements and maintenance costs, e.g. in connection with energy-renovation projects that result in lower energy charges to the tenant. If a tenant does not wish to enter into such an agreement, any improvements will be covered by Chapter 6 of the Commercial Rental Act, to the effect that the landlord may demand an increase in rent to cover the improvement costs associated with e.g. energy renovations. An individual commercial tenant may

refuse to enter into such an agreement, which means that the landlord may receive a lower return on his investment in the energy-renovation project. This may mean that the energy renovation is not carried out.

To promote energy renovations in private rental properties let for commercial purposes only and to several tenants, it may be appropriate to allow the landlord to enter into agreements with the majority of the tenants on energy renovation of the property with effect for all tenants, to prevent a minority of the tenants from blocking the implementation of profitable energy renovations.

The Minister for Housing, Urban and Rural Affairs will therefore present a bill to amend the Commercial Rental Act, to ensure that a minority of tenants cannot block the implementation of profitable energy renovation projects. The bill will allow landlords to increase rents for all tenants if the energy improvement is profitable to them from a total cost perspective, and agreements on rent increases for this have been entered into with a number of tenants whose tenancies together account for at least 2/3 of the gross floor area of the property.

It will thus be possible to agree that a rent increase should be imposed to cover both improvement and maintenance costs, but the amount of the increase may not exceed the saving in consumption costs to the tenants from carrying out the energy work. A small minority of tenants (based on gross floor area) will not then be able to block such an agreement and the associated rent increase.

The Minister for Housing, Urban and Rural Affairs will:

- Present a bill to amend the Commercial Rental Act [Erhvervslejeloven] to make it easier for landlords of properties leased for business use only to enter into agreements with tenants on energy renovation of the properties and on a rent increase tied to this.
-

3.5 Promote energy-efficient public buildings

Purpose

The public sector has the chance to take a lead in the green transformation and implementation of energy savings in buildings. An effort should therefore be made to promote energy renovation of the public building stock.

Background and contents

The public sector faces different challenges – and opportunities – from the other construction categories. First and foremost, this is a sector that performs a politically defined role in society. It provides a framework for planning, organising and implementing an energy renovation exercise different from that found in the other construction categories.

The Circular on energy efficiency measures in state institutions of 1 October 2009 states that all ministers and associated institutions within the state administration should be set an energy-saving target. This Circular is to be revised to meet the requirements for energy renovation of state-owned buildings in accordance with the EU Directive on energy efficiency. To support this work, analyses will be conducted to determine how further energy renovation of the overall State property portfolio can be done in the most financially efficient way.

As part of the agreements on 'Vækstplan DK', the government has also set aside DKK 100 million in the period 2015–2016 to bring forward maintenance of state-owned buildings. Priority funding will be given to buildings where energy-optimisation work can be done at the same time.

For buildings owned or used by municipalities and regions, voluntary agreements were entered into with Local Government Denmark (KL) and Danish Regions in 2007 and 2009 respectively. Under these agreements, the municipalities and regions undertook to carry out energy-saving activities matching the investment by state institutions before 1 October 2009. Discussions will be held with municipalities and regions on entering into new agreements on energy efficiency.

As part of optimising the public property portfolio, cross-cutting cooperation will be initiated with state, regional and municipal building owners with a view to increasing the parties' knowledge and overview of energy renovation needs and opportunities in the public building stock. This cooperation is also intended to strengthen dialogue and knowledge-sharing between public building owners on efficient energy use in the public property portfolio, including the use of commissioning, green accounts etc.

As part of this cooperation, a digital tool will be developed in conjunction with a common database, in order to determine energy consumption in public buildings (municipalities, regions and state). The new tool will build on the existing computer systems 'View electricity consumption' and 'Energy savings at state level'. Development of the tool will be coordinated with the guidelines for strategic energy planning and the CO₂ calculator.

The Minister for Climate, Energy and Building will:

- Revise the Circular on improving energy efficiency in Danish state institutions
- Carry out analyses of ways in which the energy renovation of the state's total property portfolio can be carried out in the most cost-effective way and hence indicate the marginal costs of extra energy renovations.
- Discuss the establishment of new conditions for energy-saving efforts in municipalities and regions with Local Government Denmark and Danish Regions.
- Support cross-cutting work with state, regional and municipal building owners aimed at promoting energy-efficient operation of the public property portfolio.
- Develop a digital tool and a database to record and display energy consumption in public buildings.

4.

Initiatives aimed at developing skills and innovation to promote energy renovation

4.1 Improve training and skills development within energy renovation

Purpose

The cost-effective implementation of an energy-renovation project demands a high level of expertise from advisers, companies and other parties involved in the project. It will often entail complex building work in existing buildings which have to be modified individually. It is therefore important to ensure that the advisers and implementers have the right knowledge and skills in the area of energy renovation, so they can provide well-qualified interdisciplinary advice to building owners and ensure that the renovations are carried out correctly, cost-effectively and using the most energy-efficient solutions.

Background and contents

Realising energy savings in buildings places demands on the skills of the advisers, implementers and other parties from whom building owners seek guidance and assistance. This should also be viewed against the fact that construction, especially new energy-saving solutions, is getting ever more complex.

The building industry has said that there is a need to raise the level of expertise, most recently in an analysis of training needs within the construction sector in Denmark conducted under the EU 'Build Up Skills' programme. The 'Think tank for building renovation' has reached the same conclusion.

There will therefore be an assessment of the need for training in energy efficiency and renewable energy in the building industry.

Measures will also be targeted at a number of players who have an advisory function towards building owners. These include financial institutions, property administrators and sales staff in DIY stores.

The Minister for Climate, Energy and Building will:

- Assess the need for training in energy efficiency and renewable energy in the building industry.
- Ensure that teaching materials and tools are developed to train banking advisers to enable active marketing of financing options for energy renovation.
- Ensure that information materials and tools are developed to provide sales staff in DIY stores with the expertise to guide building owners on energy-efficient energy renovation solutions.

4.2 Enhance research, innovation and demonstration of energy renovation

Purpose

Developing energy-renovation solutions for the existing building stock is a challenge, as the existing buildings are very diverse and the energy solutions are getting more complex all the time. If the number of energy renovations is to be seriously boosted, products need to be developed and energy-efficient solutions and technologies made cheaper with industrialised and system-oriented renovation technologies. Optimisation of and innovation in building processes are also crucial drivers in bringing down the cost of energy renovation. There should therefore be an increase in product and process innovation within energy-efficient renovation solutions.

Background and contents

The building industry has great potential for innovation and business development. But there is also a tendency to lag behind the rest of industry when it comes to productivity gains, innovation and business development. Historically, the Danish building industry has invested relatively little in research and development, which may be a contributory reason why there has been less growth in the sector than in other parts of the economy. As part of the agreement on allocating research funding in 2014 to cross-cutting research initiatives, it has been decided to launch a social partnership to create an 'Innovation centre for world-class building renovation' for projects from 2014 onwards. The social partnership will be implemented by the Danish Innovation Fund. One aim of the partnership is to demonstrate sustainable and cost-effective renovation solutions that can help to reduce energy consumption in existing buildings.

Under the heading 'Use of functional requirements', steps were taken as part of the government's strategy for intelligent public procurement from October 2013 to support fresh thinking, innovation and efficiency improvements by applying functional requirements in the public contract award process, also including energy renovation. This will be followed up by sending out guidelines and examples of the use of functional requirements in calls for tender.

Greater efforts to promote energy renovation will have an impact on several levels. The solutions that are developed are expected to help reduce energy consumption in existing buildings. The solutions may also contribute to increased activity and a greater degree of innovation in the building industry, which will lead to increased growth and productivity. Finally, increased investment in innovation, research, development and demonstration within energy renovation will enable Danish companies to go out into the international markets with the solutions that are developed, as the industry will be better able to position itself in know-how and specific niches.

The Minister for Climate, Energy and Building will:

- Support the establishment of a social partnership for innovation called the 'Innovation centre for world-class building renovation'. By way of broad cooperation between public- and private-sector operators, the partnership will develop and demonstrate solutions for sustainable building renovation using less energy and fewer resources.

Key to figures

Figure 1: Change in energy consumption to 2050

(From top):

With no initiatives

Energy efficiency and conversion to electricity

Renewables total

Oil

Natural gas

Coal

Source: 'Vores energi' ['Our energy']

Figure 2: Energy consumption for the operation of new buildings

Source: Danish Energy Agency

Figure 3: Change in energy consumption for heating buildings

Heated area

Final heat energy per m²

Source: Danish Energy Agency

Figure 4: Breakdown of energy consumption for heating buildings

(Clockwise from right):

51 % single-family homes

20 % apartments

7 % public services

14 % private business and services

8 % manufacturing industry

Source: Danish Energy Agency and SBI 2014:01 'Potential energy savings from ongoing building renovation to 2050'

Figure 5: Age structure of heated building area

Percent

Total

Detached houses

Pre-1890

....

Post-2006

Source: Danish Energy Agency and SBI 2014:01 'Potential energy savings from ongoing building renovation to 2050'

Figure 6: Energy consumption per square metre in 2011kWh/m²

Detached houses

Apartments

Offices/business

Source: Danish Energy Agency and SBI 2014:01 'Potential energy savings from ongoing building renovation to 2050'

Figure 7: Energy renovation of buildings

Renovated

Not renovated

Demolished

Note: This is just an illustration to show that the majority of buildings should be renovated by 2050

Source: Danish Energy Agency

Figure 8: Energy policy initiatives for energy renovation

(Clockwise from top right):

Buildings should be maintained as they wear out

The energy requirements in the Building Regulations should be tightened up, and they must be complied with

Barriers to energy renovation should be removed, to make it easier to carry out energy renovation

Energy renovation projects should be carried out properly

Information should be provided to maintain a high level of knowledge and awareness of energy among building owners and users

Future energy-efficient solutions and processes should be developed and made cheaper

(Centre):
35 % reduction in energy consumption in buildings in 2050

Strategy for energy renovation of buildings

The route to energy-efficient buildings in tomorrow's Denmark

2013/2014: 23

Any correspondence about this publication should be addressed to

The Ministry of Climate, Energy and Building

Stormgade 10-12

DK-1402 Copenhagen K, Denmark

Tel.: +45 33 92 28 00

E-mail: kebmin@kebmin.dk

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