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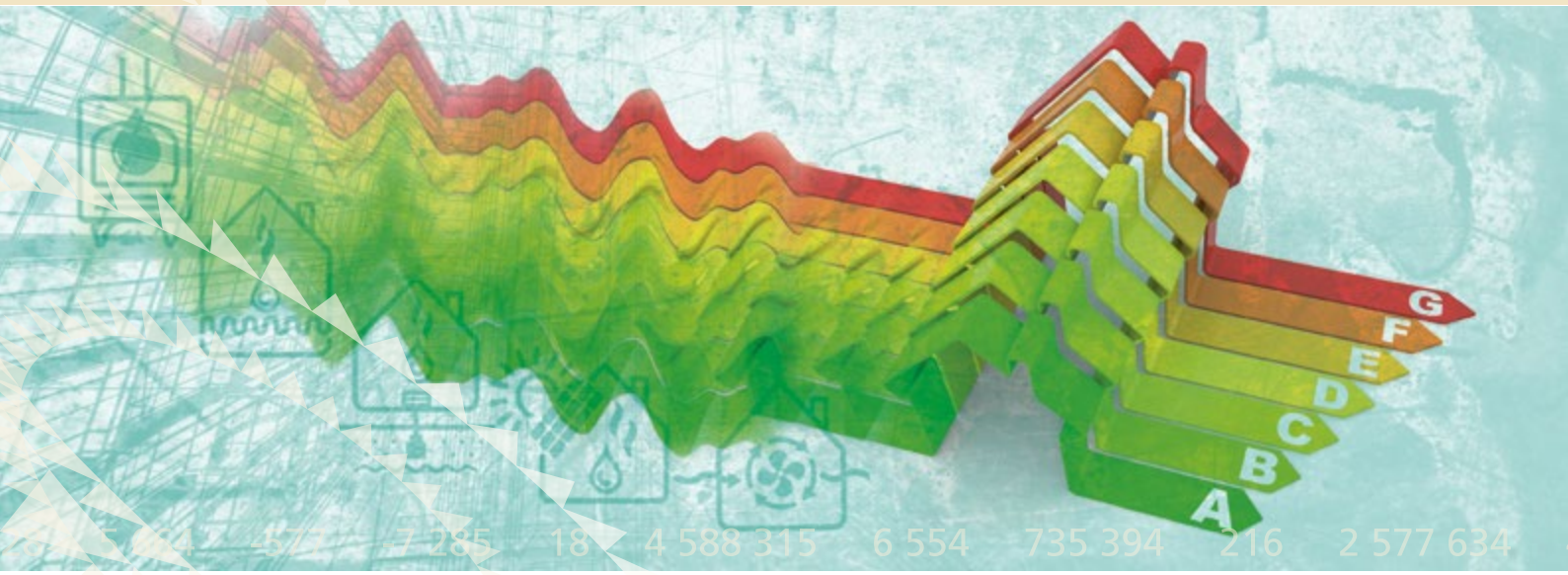
Office of the Auditor General
of Norway

The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

Document 3:4 (2015–2016)



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The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

Document 3:4 (2015–2016)

To the Storting

The Office of the Auditor General hereby submits Document 3:4 (2015–2016) *The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings*.

The Office of the Auditor General of Norway, 24 November 2015

For the Board of Auditors General

Per-Kristian Foss
Auditor General

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The Ministry of Petroleum and Energy
The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

The aim of the audit was to illuminate the extent to which central government instruments for energy efficiency are helping to reduce energy consumption in buildings, and possible reasons for why the measures may have limited impact. The audit covers the period 2009–2015.

One of the main goals of the building policy is to achieve well-designed, safe, energy-efficient and healthy buildings. By 2020, energy consumption in buildings will be significantly reduced using statutory and economic instruments and with the help of information. There are close to four million buildings in Norway. The buildings' total energy consumption increased by 33 per cent from 1990 to 2010.

Energy efficiency in buildings involves measures on the building structure that make it possible to achieve the same comfort or production as before, but with lower energy consumption. According to Meld. St. 28 (2011–2012 *Gode bygg for eit betre samfunn* (the White Paper on Building Policy), energy efficiency will contribute to reducing overall energy consumption in buildings and the high use of electricity in Norway during the winter season.

Central government instruments for energy efficiency in buildings are the building regulations, Enova's support schemes, the Norwegian State Housing Bank's basic loan, as well as information. Whereas the Ministry of Local Government and Modernisation has primary responsibility for building policy, the Ministry of Petroleum and Energy's main priority is to facilitate a coordinated and comprehensive energy policy.

The audit is based on the following decisions and intentions of the Storting:

- *The Act relating to planning and processing of building applications* (the Planning and Building Act)
- Recommendation to the Storting 129 S (2012–2013) *concerning good buildings for a better society – A forward-looking building policy*, cf. Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*, white paper concerning good buildings for a better society
- Recommendation to the Storting 390 S (2011–2012) concerning Norwegian climate policy, cf. Meld. St. 21 (2011–2012) *Norsk klimapolitikk*, white paper on Norwegian climate policy
- Recommendation No. 145 (2007–2008) to the Storting *concerning Norwegian climate policy*, cf. Report No. 34 to the Storting (2006–2007) *Norwegian Climate Policy*
- Recommendation No. 321 (2008–2009) to the Storting *concerning a public administration for democracy and community*, cf. Report No. 19 to the Storting (2008–2009) *A Public Administration for Democracy and Community*
- Recommendation to the Storting 163 S (2012–2013) *concerning changes to the Fiscal Budget for 2012 under the Ministry of Petroleum and Energy*, cf. Proposition to the Storting 33 S (2012–2013) *Changes to the Fiscal Budget for 2012 under the Ministry of Petroleum and Energy*
- Budget Recommendation No. 1 to the Storting (2008–2009), cf. Report No. 1 to the Storting (2008–2009) for the Ministry of Petroleum and Energy for budget year 2009

- Recommendation to the Storting 9 S (2013–2014), cf. Proposition to the Storting 1 S for the Ministry of Petroleum and Energy for budget years 2013 and 2014
- Recommendation to the Storting 16 S (2013–2014), cf. Proposition to the Storting 1 S for the Ministry of Local Government and Modernisation for budget years 2012 and 2013

The report was presented to the Ministry of Local Government and Modernisation and the Ministry of Petroleum and Energy via a letter dated 10 July 2015. The ministries commented on the report in a letter dated 25 August 2015. The comments have largely been incorporated in the report and this document.

The report, the Board of Auditors General's cover letter to the Ministry of Petroleum and Energy dated 25 September 2015 and the Minister's reply dated 20 October 2015 are enclosed as appendices.

1 Key Findings

- The statutory instruments for energy efficiency do not work for existing buildings.

- Economic instruments for energy efficiency have little impact on reducing energy consumption in buildings.
  – Enova's grants for commercial buildings have limited effect.
  – Enova's focus on housing has little effect.
  – The Norwegian State Housing Bank's basic loan has limited effect in the short term.

- There is still a great need for information about energy efficiency, as well as more coordination.

2 The Office of the Auditor General's comments

2.1 The statutory instruments for energy efficiency do not work for existing buildings

According to the white paper on good buildings for a better society (Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*), the energy requirements in the Building Code Regulations (TEK10) are the most important instrument for energy efficiency in new buildings and in connection with major reconstruction (general renovation/total rehabilitation) of existing buildings. TEK10 provides supplementary provisions about what the energy requirements entail. Insulation requirements (heat efficiency) are key, with minimum requirements for air leakage and minimum requirements for the heat insulation properties of walls, ceilings, floors, windows and doors. The regulations aim to contribute toward ensuring construction of buildings with low energy requirements.

Buildings erected before the applicable energy requirements were introduced in 2010, account for the majority of current buildings. The rate of new construction only amounts to 1–2 per cent per year. This means that energy efficiency in existing buildings will be entirely essential in order to reach the goal of significantly reduced energy consumption in 2020. The energy requirements for new construction will only have an impact over the long term, leading up to 2040.

The regulatory energy requirements have limited effect as an instrument for energy efficiency in existing buildings. Ambiguities concerning which measures are covered

by the term general renovations, contribute to the regulations' marginal application in existing buildings.

The authorities have no knowledge about the extent to which energy requirements are complied with, and the majority of municipalities do not supervise compliance.

Most oversight of energy requirements is document oversight, and physical measuring of heat efficiency in buildings is rare. As of 2013, buildings will also be subject to compulsory independent inspection. This inspection covers the energy requirements, including heat efficiency requirements. An independent inspector is not required to physically measure the building's heat efficiency. Documentation of a completed heat efficiency inspection is sufficient. The design of the municipalities' oversight and the compulsory independent inspection scheme is thus not suitable to determine whether or not the energy requirements in the Building Code Regulations have been met.

2.2 Economic instruments for energy efficiency have little impact on reducing energy consumption in buildings

Enova's and the Norwegian State Housing Bank's financial support schemes are crucial policy instruments for energy efficiency in buildings, and aim to contribute toward a significant reduction in energy consumption by 2020.

2.2.1 Enova's grants for commercial buildings have limited effect

During the period 2005–2014, Enova has disbursed about NOK 2.2 billion to projects through its grant scheme for energy efficiency in commercial buildings. Enova estimates that the scheme's effect on efficiency is 3.3 TWh per year, which corresponds to 9.3 per cent of overall energy consumption in commercial buildings. This is an estimate of energy efficiency that follows from measures implemented in the buildings, and is based on theoretical standard values, not actual measurements.

The OAG's analysis in the audit calculates the effect that Enova's grant scheme for commercial buildings has had on energy consumption in the buildings, based on actual measured energy consumption. The analysis shows that the scheme has limited effect on overall energy consumption in commercial buildings. On average, the measures lead to a reduction in energy consumption per square meter of 16 kWh/m², which corresponds to two per cent of the energy consumption during the year before the application was submitted to Enova.

Enova's grant scheme for commercial buildings has existed since 2005, and therefore falls partially outside the period of the audit. Nevertheless, the audit shows that if the result from the investigation is applied to the entire period from 2005 to 2014, the grant scheme has had a total effect that amounts to an overall reduction in energy consumption of 0.67 TWh per year. This corresponds to 1.8 per cent of the energy consumed by commercial buildings.

Enova's execution of the requirement that the measures must be commercially unprofitable in order to trigger a grant, may explain why the scheme has a limited effect on overall energy consumption in buildings. Even if buildings have a significant potential for energy reduction, Enova will not disburse a grant if it considers the measures to be profitable for the owner.

Grant recipients are required to report on energy consumption to Enova's building statistics (ByggNett) for five years after the measures have been implemented. Enova only marginally exploits the opportunity afforded by the building statistics (ByggNett) to follow up whether contractual results are realised, and to monitor the effects of the

grant scheme. As a consequence of this, there is little information concerning the effect of the grant scheme. If these data are not used, the reporting may be considered to be an unnecessary burden for the grant recipient.

2.2.2 Enova's focus on housing has little effect

Enova must support the development of more energy-efficient buildings, including existing buildings. The White Paper on Building Policy states that Enova's efforts toward energy efficiency must be reinforced in the years ahead.

As a response to a request from the Storting, the Ministry of Petroleum and Energy in 2013 presented instruments it believes will provide a substantial contribution toward energy efficiency in private households. At the same time, the Ministry stated that there will be a significant focus on energy efficiency in both housing and commercial buildings in the years ahead.

Enova's focus on housing has very little effect as an instrument for influencing energy consumption in homes. Established in 2013, the scheme *Support for Comprehensive Upgrading of Housing* is hardly used. This is Enova's grant scheme for homeowners who want to carry out substantial measures in order to significantly reduce energy consumption in their home. Since the scheme was established, only 113 people have received grants for upgrading their home. Given the fact that there are approx. 2.3 million residences in Norway, this grant scheme has reached about 0.005 per cent of the country's residences. The Ministry of Petroleum and Energy points out that the programme is relatively new, and is of the opinion that it is too early to rule out that it may have a substantial effect. The OAG is nevertheless of the opinion that it is improbable that this scheme will have a substantial effect on overall residential energy consumption within 2020.

Enova lacks grant schemes for homeowners who want to implement individual measures in order to reduce energy consumption in their home without having to go the route of a comprehensive upgrade. Over the last three years, hardly any building associations (housing cooperatives and co-ownerships) have been granted support for upgrades that reduce energy consumption.

The White Paper on Building Policy points out that residences account for the majority of all energy consumption in Norwegian buildings, and that the majority of consumption cuts must therefore take place in residential buildings if the goal of a significant reduction in energy consumption is to be reached.

2.2.3 The Norwegian State Housing Bank's basic loan has limited effect in the short term

Basic loans are given for the erection of new housing and upgrades of existing homes. In order to qualify for a basic loan, the building must satisfy energy requirements which are more stringent than the requirements in the Building Code Regulations. The audit shows that, over the short term, the Housing Bank's basic loan for new construction only marginally contributes to reduced energy consumption in homes.

Existing homes account for the bulk of energy consumption in the residential segment. 90 per cent of basic loan funds are awarded for new construction. New construction is of little significance for overall energy consumption in the housing segment over the short term. The importance of the Housing Bank's energy requirements for new construction will be increasingly significant over the longer term, up to 2040 and beyond.

Only 10 per cent of the total basic loan funds are used to rehabilitate existing buildings. As long as the Housing Bank uses a small share of its basic loan funds on rehabilitation of existing buildings, the scheme will, over the short term, have little effect as an instrument for energy efficiency.

2.3 There is still a great need for information about energy efficiency, as well as more coordination

Energy efficiency is largely a question of attitudes and knowledge, and information efforts vis-à-vis users and building owners are therefore important in order to trigger interest and investment decisions. Enova, the Norwegian State Housing Bank, Norwegian Water Resources and Energy Directorate (NVE) and Norwegian Building Authority are important state purveyors of information.

Enova is the entity that primarily issues broad information concerning energy efficiency in buildings. The Norwegian Building Authority restricts itself to regulatory guidance, without particular emphasis on the energy rules. There is also a need for the NVE to bolster its information concerning the Energy Labelling Scheme in order to secure better compliance therewith.

The Housing Bank's basic loan is not broadly known, and information about the scheme is unclear, scant and only marginally covers the aspect of energy efficiency.

While Enova's information activities on energy efficiency are extensive, homeowners still have a great need for such information.

Coordination of the agencies' instruments can contribute to increased and faster goal attainment in the work on energy efficiency. A range of instruments that includes more stakeholders and more types of schemes yields a need for coordination. The individual stakeholders preferably provide information about their own energy-related schemes, and there is a particular need for coordination of the information and advisory measures.

In 2011, the Housing Bank, Norwegian Building Authority and NVE assessed and put in concrete terms the need for coordinating energy efficiency instruments. This work resulted in 16 proposed measures to improve coordination. Many of these measures have hardly been followed up, and work is still under way on several of the measures. This e.g. applies to the proposal concerning coordination of information campaigns directed at shared target groups.

There is a need for more coordination of information concerning the instruments. It is difficult for the individual to see how the instruments interact, and no public stakeholder compiles the information in a good manner. From a user perspective, it is important that it is not too complicated to obtain a good overview, and that it is possible to see the connections between relevant instruments.

A cooperation agreement was entered into in 2013 between the Housing Bank and Enova. The agreement shows that there is still a need for better coordination on multiple important points. In this agreement, the parties have decided that they will *develop a shared understanding* of how the Housing Bank and Enova together can contribute to a rapid spread of ambitious projects for energy efficiency in new and existing buildings, *maintain a dialogue on* how Enova's and the Housing Bank's instruments can complement each other, *improve interaction* between Enova's and the Housing Bank's instruments aimed at (for example) long-term systematic energy upgrades in existing buildings, and *collaborate on* marketing the Housing Bank's and Enova's instruments

for housing cooperatives/co-ownerships and private residences, where this may yield synergies.

The Ministry of Petroleum and Energy and Ministry of Local Government and Modernisation generally agree that they have a good dialogue on coordination issues, and that coordination between the ministries has improved in recent years. The ministries emphasise as positive and significant the formal cooperation agreement entered into in 2013 between Enova and the Norwegian State Housing Bank.

The OAG ascertains that the Storting's intentions concerning significant reductions in energy consumption in buildings leading up to 2020 will not be realised, and that grant schemes and other instruments have so far had very little impact.

3 The Office of the Auditor General's recommendations

The OAG recommends that the Ministry of Petroleum and Energy
- consider whether Enova's grant schemes yield actual reductions in energy consumption in buildings, and improve the reporting on this

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy
- consider the design of Enova's residential programmes and the Norwegian State Housing Bank's basic loan scheme
- intensify its information campaign on energy efficiency, particularly for households, cooperatives and co-ownerships
- continue efforts to strengthen coordination between government agencies
- intensify its efforts to obtain knowledge concerning whether the energy requirements in the Building Code Regulations work and are complied with. This is particularly important as work is under way today on changing the applicable regulations

4 The Ministry's follow-up

The Minister points out that energy consumption is affected by many external factors, and that economic growth, population growth and significant construction activity all lead to increased energy consumption. The general trend has nevertheless been that buildings are increasingly energy-efficient. The authorities' instruments are aimed at restricting energy consumption, and at phasing out fossil energy consumption in buildings. The regulations, grant schemes and information must contribute to make buildings more energy-efficient.

The Minister is concerned with assessing the results and effect of Enova's activities, but is of the opinion that methodical weaknesses mean that the OAG's finding that Enova's grant scheme for commercial buildings has limited effect, is presented in a manner for which there is no basis.

The Minister emphasises that Enova's activities cover different sectors, and it is up to Enova to prioritise between areas within the set framework. Since its inception, Enova has emphasised cost effectiveness, as well as seeking to trigger measures that were not profitable for the developers.

The Minister emphasises that Enova must work in a manner that reduces barriers to energy efficiency. Enova's information activities are extensive and are an important part of its activities. The Government is concerned with focusing Enova in a good manner, and the Ministry's announced white paper on energy policy will review Enova's role.

The Ministry of Local Government and Modernisation agrees with the OAG that the significance of the Norwegian State Housing Bank's basic loan will be greater over time, because basic loans are primarily used for new housing. The Ministry has asked the Housing Bank to study how the basic loan can act as an instrument for improving existing housing. The Ministry is furthermore reviewing the basic loan regulation with a view toward increasing the scheme's housing policy goal attainment.

The Ministry is concerned with further developing its information work concerning energy efficiency so that the information is disseminated more effectively, and will follow up the OAG's recommendation to intensify this work, particularly vis-à-vis households, housing cooperatives and co-ownerships. An effort has e.g. been initiated to increase familiarity with basic loans for improvements.

The Minister of Local Government and Modernisation states that the two ministries cooperate closely and well as regards energy efficiency in buildings, and that the ministries' underlying agencies cooperate both informally and formally. He agrees with the OAG that coordination of the government agencies is important, and will follow up the OAG's recommendation to continue efforts to bolster coordination.

The Minister of Local Government and Modernisation agrees with the OAG that it is important to know whether or not the energy requirements in the Building Code Regulations are working, and is therefore in the process of implementing initiatives. The Ministry has engaged a consultancy to gain an overview of the understanding and application of the regulations for work on existing buildings. The Norwegian Building Authority has been tasked with preparing a plan for a follow-up evaluation of upcoming changes to the energy requirements.

5 The Office of the Auditor General's closing comments

In the opinion of the OAG, the audit shows that the economic instruments only marginally contribute to reducing energy consumption in buildings, and that Enova's grant scheme for measures aimed at commercial buildings has limited effect in relation to the assumptions for the grant scheme. The OAG's effect analysis is based on actual measured energy consumption. The OAG has noted that the Ministry of Petroleum and Energy and Enova still do not verify whether or not the calculated energy results are actually realised, cf. Document 3:6 (2009–2010) *The Office of the Auditor General's investigation into the operation and administration of Enova SF*.

The OAG followed up the Ministry's remarks on the method through an expanded discussion in the report of circumstances that must be considered when interpreting the analysis result. The discussion shows that it is most likely that the OAG's analysis overestimates the effect of measures supported by Enova, which means that the OAG's estimates of Enova's contribution to reduced energy consumption in commercial buildings is probably somewhat excessive. There is thus a solid basis for the OAG's conclusion that Enova's grant scheme for measures aimed at commercial buildings has limited effect.

The OAG has noted that the Ministry of Petroleum and Energy will review Enova's role in the announced white paper on energy policy. In the opinion of the OAG, there is a need for specific measures that have a greater impact on energy consumption in buildings, in order to reach the goal of a significant reduction in energy consumption in buildings within 2020.

The case will be submitted to the Storting.

Adopted at the meeting of the Office of the Auditor General, 4 November 2015

Per-Kristian Foss **Karl Eirik Schjøtt-Pedersen**

Beate Heieren Hundhammer **Gunn Karin Gjul** **Arve Lønnum**

Bjørg Selås

Appendix 1

The Office of the Auditor General's letter to the Minister

Riksrevisjonen
Office of the Auditor General of Norway

Our executive officer
Kjell Ivar Sandvik +47 22241279
Our date Our reference
25 September 2015 2014/00381-50
Your date Your reference

Deferred public access, cf. Section 18(2)
of the Auditor General Act

Minister Tord Lien
MINISTRY OF PETROLEUM AND ENERGY
P.O. Box 8148 Dep
0033 OSLO

The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

Enclosed please find the draft Document 3:X (2015−2016) *The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings.*

Reference is made to our letter of 22 September 2015 signed by the Auditor General, and we kindly request that this letter be substituted for the previously sent letter. The deadline is extended to 16 October 2015.

The document is based on a draft report submitted to the Ministry of Petroleum and Energy with our letter of 10 July 2015, and the Ministry's response dated 25 August 2015.

The Minister is requested to give an account of how the Ministry will follow up the Office of the Auditor General's comments and recommendations, and whether the Ministry disagrees with the Office of the Auditor General, if relevant.

The draft report has also been submitted to the Ministry of Local Government and Modernisation. The recommendations in the document to the Storting apply to both Ministries, and the Ministry of Petroleum and Energy is requested to obtain and incorporate any comments from the Ministry of Local Government and Modernisation in its response.

The Ministry's follow-up will be summarised in the final document submitted to the Storting. The Minister's full response will be enclosed with the document.

Response deadline: 16 October 2015.

For the Board of Auditors General

(Signed) Per-Kristian Foss
Per-Kristian Foss
Auditor General

Enclosure:
Draft Document 3:X (2015−2016) *The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings*

Copy:
The Ministry of Local Government and Modernisation

Appendix 2

The Minister's reply

NORWEGIAN MINISTRY
OF PETROLEUM AND ENERGY

The Minister

Your ref.	Our ref.	Date
2015/00381-50	13/1734-	20 October 2015

The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

I refer to the letter dated 25 September 2015 concerning the Office of the Auditor General's (OAG's) investigation of the authorities' work on energy efficiency in buildings. The letter asks that my comments regarding the investigation be submitted along with comments received from the Minister of Local Government and Modernisation.

Below follows my response, followed by the Minister of Local Government and Modernisation's response.

The OAG recommends that the Ministry of Petroleum and Energy consider whether Enova's subsidy schemes actually reduce energy consumption in buildings, and improve reporting about this.

The Government is facilitating energy efficiency measures in all sectors of society. Many external factors affect energy consumption, so it will be challenging to manage total energy consumption. A country experiencing economic growth sees increasing activity in many areas, and this tends to lead in the direction of increased energy consumption. Such growth is often accompanied by population growth and substantial construction activity. Some of the income growth may be spent on larger residences, heating additional rooms, perhaps a higher indoor temperature and more use of energy-intensive appliances. The general trend has nevertheless been for buildings to become increasingly energy-efficient as measured in energy consumption per m^2.

The authorities' instruments are aimed at curbing energy consumption so that it is lower than it would otherwise have been, and at phasing out fossil energy consumption in buildings. The regulations, support schemes and information shall contribute to make buildings more energy-efficient, cf. Meld. St. 28 (2011−2012).

It is difficult to estimate what energy consumption would be without instruments. I am therefore concerned with assessing the results and effect of Enova's activities. This also applies within the work on energy efficiency in buildings.

The original letter in Norwegian has been translated into English.

However, I would like to emphasise the Ministry's previous comments on the OAG's analysis, which e.g. point out methodical weaknesses. I am therefore of the opinion that the OAG's main findings, cf. Item 1 of the report, are presented in a manner for which there is no basis.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy

- ***consider the design of Enova's residential programmes and the Norwegian State Housing Bank's basic loan scheme***
- ***intensify its information campaign on energy efficiency, particularly for households, cooperatives and co-ownerships***
- ***continue efforts to strengthen coordination between government agencies***

When Enova was established, emphasis was placed on the objective being to obtain as many environmentally friendly and saved energy units as possible in the most cost-effective manner possible, cf. Recommendation No. 59 (2000−2001) to the Odelsting. Enova's activities cover a number of sectors, and it is up to Enova to prioritise between areas within its set framework. Enova shall work in close proximity to the market, and the development of programmes shall be based on the market insight it accumulates, as well as expert energy assessments.

During the period 2009−2014, Enova has allocated more than NOK 3.2 billion to projects in the commercial building and housing area within energy efficiency measures and conversion of fossil fuels. Since Enova's inception, the aim has been to seek to trigger measures that were not profitable for the developers. They shall work in a manner that reduces barriers for energy efficiency measures. This can be anything from information and competence development to helping energy-efficient technologies and construction techniques to gain a foothold in the market. Enova's information work is comprehensive and constitutes an important part of its activities. Knowledge is crucial in order to achieve market changes. The information work must be adapted to the overall instrument package. Over the longer term, it would be desirable for Enova to withdraw from the markets, and for energy-efficient solutions to be the preferred solutions. The state aid rules do not allow for supporting measures that are commercially profitable.

I'm concerned with my Ministry maintaining a close dialogue with the Ministry of Local Government and Modernisation concerning instruments for energy efficiency measures in buildings. Energy efficiency measures in buildings primarily involve competence, construction techniques and good routines. The market must be prepared to handle increasingly stringent requirements. The grant schemes help prepare the markets for potentially more stringent requirements for buildings in the future.

Enova is an important tool in the work on energy efficiency, conversion to energy consumption with less emissions and the development of energy and climate technology. The Government is concerned with focusing Enova in a sound manner. The Ministry will review Enova's role in the announced white paper on energy policy. Here it will be natural to also discuss Enova in the context of other government agencies.

The Minister of Local Government and Modernisation's response:

"I refer to the OAG's investigation of the authorities' work on energy efficiency in buildings. Below follow my comments on the OAG's recommendations that are relevant for my ministry.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy consider the design of Enova's residential programmes and the Norwegian State Housing Bank's basic loan scheme

The OAG points out that the Norwegian State Housing Bank's basic loans are primarily used for new housing, and that the short-term effect is therefore marginal. I agree with the OAG that the importance will be greater over time. However, the basic loan also plays an important role today in contributing to make new housing more energy efficient. Since the basic loan was established, about 40 000 residences have been built with higher energy requirements than presumed by the Building Code Regulations at the time of construction. This yields greater competence and incentives for product development, thus allowing the construction industry to be better prepared for the introduction of new energy requirements in the Building Code Regulations. At the same time, I'm concerned with fully utilising the basic loan. This is why I have initiated measures in this area. In 2014, I asked the Housing Bank to propose changes to the basic loan scheme in order to increase goal attainment. The Housing Bank has studied how the basic loan works as an instrument to upgrade existing housing, and the Ministry will follow up the matter with the Housing Bank in the time ahead. The Ministry of Local Government and Modernisation is also in the process of reviewing the entire basic loan regulations with a view toward increasing housing policy goal attainment in the loan scheme.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy intensify its information campaign on energy efficiency, especially for households, cooperatives and co-ownerships

I am concerned with continuing and further developing the information work concerning energy efficiency so that the information reaches its audience more effectively and will follow up the OAG's recommendation. This effort is already under way, and the Housing Bank has, for example, in 2015 awarded competence grants to two projects involving nationwide seminar rounds aimed at cooperatives and undetached and semi-detached homes. An effort has also been initiated to increase familiarity with basic loans for renovation.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy continue efforts to strengthen coordination between government agencies

I agree that coordination between government agencies is important and will follow the OAG's recommendation. My impression is that the cooperation between the Ministry of Petroleum and Energy and Ministry of Local Government and Modernisation is close and sound as regards the work on energy efficiency in buildings. Both in the form of close dialogue in the discipline, and close cooperation on individual topics. Our underlying agencies have also established cooperation processes. This cooperation is both informal and formalised; for example, the Housing Bank and Enova have entered into a cooperation agreement.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy intensify its efforts to obtain knowledge concerning whether the energy requirements in the Building Code Regulations work and are complied with; this is particularly important as work is under way today on changing the applicable regulations

I agree with the OAG that it is important to know whether the energy requirements in the Building Code Regulations are working and have therefore started initiating measures. In its allocation letter for 2015, the Norwegian Building Authority was tasked with preparing a plan for follow-up evaluations of changes to the energy rules in the Building Code Regulations (TEK). This will provide knowledge concerning how the tightening of energy requirements we are currently working on, will function. The Ministry has also recently placed a consultancy assignment to obtain a better overview of the understanding of the regulations for work on existing buildings, and how they are practised. This will provide better knowledge concerning how the rules, including energy requirements, actually work in connection with rehabilitation. This will e.g. provide information about how the term "general renovation" is understood."

Kind regards,

(Signed) Tord Lien
Tord Lien

Appendix 3

Report: The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings

The audit has been conducted in accordance with the Act and Instructions relating to the Office of the Auditor General, and with the guidelines for performance audits that are consistent with and based on ISSAI 300, INTOSAI's international standards for performance audits.

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1 Introduction

1.1 Background

One of the main goals of the building policy is well-designed, safe, energy-efficient and healthy buildings. Energy consumption must be reduced significantly within 2020. The key instruments that will contribute to this are the building regulations, Enova's grant schemes, the Norwegian State Housing Bank's basic loan, as well as information measures.[1]

Figures from Statistics Norway (SSB) show that there are close to 4 million buildings in Norway, about half of which are residences. It emerges from Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn* (White Paper on Building Policy) that most existing buildings do not satisfy the current energy requirements.[2] This is explained with the fact that the buildings were either built before the energy requirements were designed, or while less stringent energy requirements were in effect. According to the white paper, this entails that the energy needs of older buildings are significantly greater than for those built according to the current standard. Annual new construction and rehabilitation amount to 1–2 per cent of all buildings.[3]

In 2009, energy consumption for operation of residences and commercial buildings amounted to 37 per cent (83 terrawatt-hours (TWh)) of overall domestic energy consumption, 46 TWh of which for residences and 37 TWh for commercial buildings.[4] Total energy consumption in buildings has grown by 33 per cent from 1990 to 2010.[5] During the same period, the Norwegian population has increased each year, which leads to a need for more housing and commercial buildings, as well as more energy consumption.

Energy efficiency is a measurement of the performance of an energy input in comfort or production. [6] Energy efficiency measures are measures implemented to ensure that a unit of energy (1 kWh) provides a greater benefit than before. This benefit can be improved comfort in the building, or better lighting, but with the same or less use of energy. An energy-efficient building has a lower need for energy for heating than a less energy-efficient comparable building.[7]

The Ministry of Petroleum and Energy's primary task is to facilitate a coordinated and comprehensive energy policy. The Ministry of Local Government and Modernisation has primary responsibility for building policy. Energy consumption must be reduced in all buildings, both new and existing.[8] According to the White Paper on Building Policy, energy efficiency in buildings will contribute to reducing overall energy consumption and the high use of electricity in Norway during the winter months. This will contribute toward securing the national power supply and reduce the need for landscape intervention.

1) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 73.
2) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 80.
3) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 24.
4) Proposition to the Storting 33 S (2012–2013), Ministry of Petroleum and Energy, page 80. Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 74.
5) Statistics Norway (2013) *Fakta om energi. Utviklingen i energibruk i Norge* [Facts about energy. Development of energy consumption in Norway] (in Norwegian), page 42.
6) Proposition to the Storting 33 S (2012–2013), Ministry of Petroleum and Energy, page 7.
7) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 80.
8) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 73.

In the white paper on Norwegian climate policy, Meld. St. 21 (2011–2012) *Norsk klimapolitikk* (the Climate Report), the Government presents an action plan for energy efficiency that aims to reduce total energy consumption significantly in the building sector by 2020.[9] In 2010, emissions from energy consumption in the construction sector amounted to about five per cent of Norway's overall greenhouse gas emissions.[10] In order to reach the paramount goal of the climate policy concerning emission reductions, much of the fossil energy must be replaced by renewable energy (energy restructuring), combined with energy efficiency.[11]

Energy efficiency measures in buildings are measures on the building shell and technical systems that yield reduced energy consumption per square meter in the building,[12] whereas energy restructuring measures entail conversion (transition) from fossil heating to renewable energy.[13]

1.2 Objective and audit questions

The aim of the audit is to illuminate the extent to which central government instruments for energy efficiency are helping to reach the goal of reduced energy consumption in buildings, and possible reasons for why the measures may have limited impact.

The audit covers the following audit questions:

1 How do the authorities ensure compliance with the building regulations' energy efficiency requirements?
2 Do economic instruments for energy efficiency lead to reduced energy consumption in buildings?
3 What is the significance of central government information and advisory measures for energy efficiency in buildings?
4 To what extent do the Ministry of Petroleum and Energy and Ministry of Local Government and Modernisation fulfil their responsibility for coordinating instruments for energy efficiency in buildings?

The selection of central government instruments for energy efficiency in buildings has taken a point of departure in the White Paper on Building Policy's account of the instruments for energy efficiency measures in new construction and existing buildings. Here it emerges that Enova's grant schemes and the Norwegian State Housing Bank's loan schemes are particularly important among the economic instruments.[14] The fact that these financial instruments are particularly important is also stated in Proposition to the Storting 33 S (2012–2013) and Proposition to the Storting 1 S (2013–2014), respectively, from the Ministry of Petroleum and Energy.[15]

The audit concerns energy efficiency measures in buildings as represented by measures in the actual building shell.

9) Meld. St. 21 (2011–2012), *Norsk klimapolitikk,* white paper on Norwegian climate policy, page 7 et seq.
10) Meld. St. 21 (2011–2012), *Norsk klimapolitikk,* white paper on Norwegian climate policy, page 140.
11) Meld. St. 21 (2011–2012), *Norsk klimapolitikk,* white paper on Norwegian climate policy, page 168.
12) Reply letter from Enova of 8 May 2015.
13) *Energieffektivisering.* [Energy efficiency] (in Norwegian) Report from the Low Energy Commission, 2009, page 9.
14) Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, pages 77–82.
15) Proposition to the Storting 33 S (2012–2013), Ministry of Petroleum and Energy, page 10.

2 Methodical approach and implementation

The audit questions are illuminated using document analysis, quantitative analyses of data for commercial buildings, questionnaire surveys for municipalities and grant recipients and information gathering in letters and interviews.

2.1 Statistics and registry data

Publicly accessible housing statistics from Statistics Norway (SSB) have been used to provide an overview of the number of residences, both existing and new construction. Data from KOSTRA[16] for the period 2009–2014 have been used in order to provide information about the municipalities' supervision of energy requirements in buildings.

Registry data from the Norwegian State Housing Bank's system for following up basic loans for the period 2009–2014 have been obtained and analysed in order to estimate the effects of this instrument.

Registry data from Enova's application system and analyses for the period 2009–2014 have been obtained in order to illuminate the results of grants to existing commercial buildings. The application system e.g. contains information about grant amounts, expected energy results for all projects that have received grants, final reported energy results and realised energy results at the project level, in addition to an overview of all buildings included in projects that have received grants.

Registry data from Enova's building statistics (ByggNett) have been obtained in order to analyse energy consumption in the different buildings that fall under Enova's grant scheme. According to the criteria for the grant scheme, grant recipients are required to report on energy consumption to Enova's building statistics (ByggNett) for five years after the measures have been implemented. The basis for reporting on energy consumption must be found in the buildings' energy follow-up system (EOS).

2.1.1 Econometric method, differences in differences[17]

In order to measure the effect of Enova's grants for measures in existing commercial buildings, we use the "differences in differences" method. This is a common method for measuring effects when it is not possible to conduct a controlled randomised experiment. The method used involves comparing the difference in result between a control group and a measure group that is as similar as possible, with the exception of the described variable (measure variable).

The method presumes that the units would have had the same development if none of the groups had implemented measures, which means that it is founded on a presumption of parallel trends.[18]

Differences in differences requires data to be measured during at least two time periods – before and after measures are implemented. In order to measure the effect of Enova's grants for commercial buildings, we have obtained actual energy consumption, both from the year preceding the application (reference year) and from 2014, cf. Table 1.

16) KOmmune-STat-Rapportering [Municipal-State Reporting].
17) differences in differences (Forskjell i forskjell in Norwegian).
18) Angrist and Pischke (2013) *Master of metrix. The Path from Cause to Effect,* page 160.

Table 1 Illustration of measurement points when using differences in differences

Group	Measurement point 1	Measure	Measurement point 2
Measure group	Energy consumption kWh/m² the year before application (reference year)	Measure	Energy consumption kWh/m² in 2014
Control group	Energy consumption kWh/m² the year before application (reference year)	No measure	Energy consumption kWh/m² in 2014

Information about energy consumption in the years before the grant is not easily available and is not found in Enova's registries. The number of measurement points for each building limits the robustness and sensitivity analyses that can be performed.

Separate sensitivity analyses have been conducted for buildings with the same reference year in order to test the effect of measures for buildings with the same measurement points. The test shows that Enova's grants do not have a significant effect when the units are divided into groups by reference year, with an exception for the buildings that applied in 2012 (reference year 2011).

Separate sensitivity analyses have also been conducted for buildings with the same building type. These analyses show that Enova's grants only have a separate significant effect on industrial buildings and warehouses and office and administration buildings when the buildings are divided into groups by building type, cf. Table 2.

Table 2 Separate analyses for each individual building type

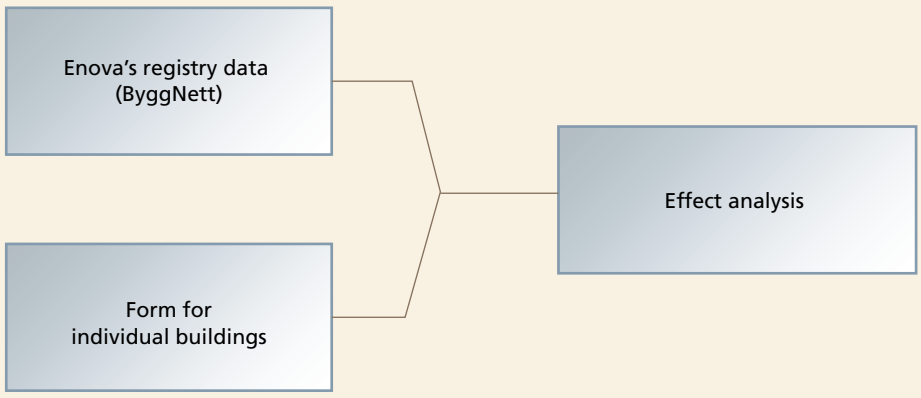
	Measure group			Control group				
	Number of buildings	Percentage	Energy consumption in the reference year	Number of buildings	Percentage	Energy consumption in the reference year	Diff-Diff result	Sig (p-level)
Commercial buildings	265	77%	825	762	52%	558	–10	27%
Cultural and research buildings	44	13%	222	355	24%	199	–47	20%
Industrial buildings and warehouses	12	3%	483	50	3%	327	–136	0%
Medical buildings	11	3%	255	80	5%	309	8	81%
Office and administration buildings	10	3%	262	170	12%	245	–73	2%
Hotel and restaurant buildings	3	1%	283	7	0%	252	49	32%
Housing	0	0%	0	47	3%	167	–	–
Total	345		697	1 471		403	–16	2.8

The effect of Enova's grants for commercial buildings has been illuminated by comparing the change in energy consumption in individual buildings for which grants were offered and energy-saving measures were implemented during the period from 2010 to 2013 (measure group), with buildings for which grants were offered, but where measures were not implemented during the period from 2010 to 2013 (the control group).

The change in energy consumption is measured through the difference between actual measured energy consumption in the year before the projects contacted Enova (reference year) and energy consumption in 2014. The difference in the change in energy consumption between the measure group and control group is used as a measurement of the grant's effect. The purpose is to illuminate to what extent Enova's grants for existing buildings contribute to reducing energy consumption in buildings.

Figure 1 shows that the effect survey is based on data from Enova's registries (ByggNett) and from forms for individual buildings. The forms were linked to data from ByggNett.

Figure 1 Illustration of data sources in the effect survey



A total of 4,032 forms were sent out to owners of individual buildings that have been granted support during the period 2010–2014. 2,523 completed forms were received, which yields a gross response rate of 63 per cent. 707 of 2,523 buildings could not be used in the effect evaluation, for example due to a lack of information needed to calculate energy consumption per square metre (kWh/m^2), or because measures were implemented in 2014. The net response rate was 45 per cent, which corresponds to 1,816 individual buildings. This amounts to 20 per cent of all buildings that have been offered grants from Enova, cf. Table 3.

Table 3 Response rate for data collection on energy consumption in individual buildings

Number of buildings that have been granted support	8 872
Number of forms sent out	4 032
Number of responses	2 523
Gross response rate	63%
Number of buildings that can be used in the effect evaluation	1816
Net response rate	45%
Percentage of all buildings	20%

Of the 1,816 buildings included in the effect evaluation, 19 per cent (345 buildings) belong to the measure group, while 81 per cent (1,471 buildings) belong to the control group. The status of the measure/measures in the buildings was mapped in order to place the buildings in the control and grant groups. Buildings where the developer responded that the measure/measures were completed during the period 2010–2013, were placed in the measure group,[19] while buildings where the measures had not been initiated during the period, were placed in the control group.

2.1.2 Factors that may affect the analysis

As a point of departure, commercial buildings that are offered grants from Enova are equal in the sense that they fulfil Enova's grant conditions. A building is placed in the measure group or control group based on whether or not the enterprises have implemented measures during the audit period from 2010 to 2013.

Enova has stipulated that all measures must be implemented within three years from the project start-up date in the grant letter.[20] The buildings are not sorted in the control and measure group entirely at random. Observable and not-observable circumstances may lead some to implement measures and others not to. This means that the analysis results will be somewhat uncertain and that they must be interpreted with caution. Below follows an account of circumstances that may affect the validity of the results.

There could be a number of reasons why some have implemented measures and others have not. Many of the buildings are part of major projects including more than one hundred different buildings, which entails substantial engineering. In these projects it is not natural for all measures to be implemented at the same time, for example due to lack of resources and skilled professionals. The major projects will also logically have longer lead times than small projects. Data has not been collected concerning why some have implemented measures and others have not.

In principle, Enova only provides grants for unprofitable measures.[21] One may nevertheless presume that the most profitable measures are implemented first. When this is the case, there will be a majority of more profitable measures in the measure group than in the control group. The effect of this means that the analysis may overestimate the impact of Enova's measures, as the best measures may be over-represented in the measure group.

Table 4 shows that a significant share (83 per cent) of the buildings in the measure group applied for measures in 2011. Energy consumption in 2010 is thus the reference year for these buildings. The control group has a uniform distribution between those that applied in 2011 to 2014. 2010 was one of the coldest years of the past century, which led to a high consumption of energy to heat housing and commercial buildings.[22] This means that a percentage of the reduced energy consumption we have registered in the measure group, is due to the substantial temperature difference between 2010 and 2014. An equivalent effect will not occur in the control group. This means that the model used may overestimate the impact of Enova's grants.

19) The following question was asked: "What is the status of the measure/measures in the building?". Reply alternatives: 1) The measure/measures have not yet been initiated 2) The measure/measures are under way 3) The measure/measures have been cancelled 4) The measure/measures are complete 5) Other, please specify.
20) Enova's criteria and guidelines for grants for commercial buildings.
21) Enova's criteria and guidelines for grants for commercial buildings.
22) NVE (2012) *Energy consumption 2012*.

Table 4 Group divided by application year (N = 1816)

Application year	Measure group (N = 345)	Control group (N = 1471)
2010	1.1%	0.3%
2011	83.4%	22.3%
2012	9.4%	33.1%
2013	6.0%	15.8%
2014	0.0%	28.5%
Total	100%	100%

Another possible difference between the measure group and the control group could be that measures are implemented simultaneously within geographically limited areas, for example that a supermarket chain implements measures in its stores on a county-by-county basis. The effect of such a distribution between the measure group and control group is presumed to be accidental, and will therefore not affect the result of the analysis.

As regards some of the buildings, some of the measures may have been implemented, but not all. These buildings will then be placed in the control group, since not all measures have been implemented. They will nevertheless presumably have a lower energy consumption than equivalent buildings where no measures have been implemented. The effect of this means that the analysis may underestimate the impact of Enova's grants.

As a point of departure, the buildings in the measure group have around 300 kWh/m² higher energy consumption than buildings in the control group. This is because the measure group largely consists of shops (supermarkets) that are characterised by high energy consumption per square metre. High consumption in the reference year makes it easier to reduce the energy consumption. This means that the model used may overestimate the effect of the measure.

There may be a risk of owners of buildings that have implemented measures reporting too good energy results. Enova has stipulated as a requirement that at least 65 per cent of the contractual energy savings must be realised; if not, the grant will be voided in its entirety.[23] This risk may contribute to overestimation of the effect of the measures.

2.1.3 The effect for all buildings that have been granted support

In order to estimate the effect for all buildings that have been granted support (the population), a weighted estimate is multiplied by the total number of square metres in the buildings that have received grants.

The composition of building types in the sample (the measure and control group) is not identical with the composition in the population. In particular, the sample contains a higher share of commercial buildings. In order to counteract the effects of this, the different building types in the analysis have been weighted. The applied weighting was calculated based on the percentage in the sample (measure group and control group), relative to the percentage in the population (all buildings in Enova's application system that have been granted support) for the different building types. Table 5 provides an overview of weighting that was used:

23) Enova's criteria and guidelines for grants for commercial buildings.

Table 5 Comparison of building types in the population and in the sample (control and measure group)

Building type	Buildings that have been granted support (N = 8872)	Buildings in the sample (N = 1816)	Difference	Weighting (percentage in the population / percentage in the sample)
Commercial buildings	33%	57%	23	0.59
Cultural and research buildings	20%	22%	2	0.90
Office and administration buildings	11%	10%	–1	1.12
Medical buildings	6%	5%	–1	1.13
Industrial buildings and warehouses (incl. transport and emergency preparedness buildings)	5%	3%	–1	1.34
Housing	5%	3%	–2	1.85
Hotel and restaurant buildings	2%	1%	–1	3.70
Lack a residence type	19%	0%	–19	–
Total	100%	100		

* The figures in the table have been rounded.

The factors discussed above entail some uncertainty, but the model provides a good measurement of the effect of Enova's grants for commercial buildings. Statistics Norway's research department has assisted in the design and quality-assurance of the analyses for the effect evaluation.

2.2 Surveys

2.2.1 Questionnaire survey for municipalities concerning supervision of energy requirements in buildings

Questionnaires were sent electronically to all 428 municipalities. The intent was to investigate to what extent the municipalities during the period 2013 to 2014 have verified the energy requirements in applicable regulations, and whether this verification is appropriate for detecting deviations from the regulations, and thus obtaining knowledge about compliance with the rules. The response rate was 69 per cent and was approximately the same regardless of municipality size, and is therefore deemed to be representative.

2.2.2 Questionnaire survey for grant applicants and grant recipients concerning Enova's grants for commercial buildings

In order to compare energy consumption in individual buildings that have been granted support from Enova, it was necessary to obtain information on two occasions.

Questionnaire survey for grant applicants concerning projects in Enova's application system

Questionnaires were first sent to 1,510 grant applicants who have registered one or more projects in Enova's application system during the period 2010 to 2014. The purpose of this questionnaire survey was to investigate whether the projects would

have been implemented without the grants, and whether the applicants have available information about energy consumption for individual buildings.

The response rate in this questionnaire survey was 57 per cent. The non-response analysis shows that there are no biases in the group that has responded, compared with the 1,510 who received the questionnaire survey, and the questionnaire survey can be regarded as representative.

Questionnaire survey for grant recipients concerning individual buildings in Enova's application system
Enova's building statistics (ByggNett) do not contain adequate information to measure and compare changes in energy consumption before and after completed measures. In order to complete the effect evaluation it has therefore been necessary to collect data concerning individual buildings that have received grants from Enova. Information has e.g. been obtained for each individual building concerning energy consumption in the year before the application and energy consumption in 2014, and information about heated area (m^2) and the status of measures in the building.

In the data collection, the forms were linked to Enova's building statistics (ByggNett), so that grant recipients were only asked to report information that was lacking in ByggNett.

A total of 4,032 forms were sent out to owners of individual buildings that have been granted support during the period 2010–2014. 2,523 completed forms were received, which yields a gross response rate of 63 per cent. Of the 2,523 received forms, 707 could not be used in the effect evaluation due to a lack of information needed to calculate energy consumption per square metre (kWh/m^2), because the projects had implemented measures in the reference year or in 2014, or because the units had extreme values that greatly affected the analyses. The net response rate was therefore 45 per cent, which corresponds to 1,816 individual buildings. This amounts to 20 per cent of all buildings that have been offered grants from Enova.

Of the 1,816 buildings included in the effect evaluation, 19 per cent (345 buildings) belong to the measure group, while 83 per cent (1,471 buildings) belong to the control group. The reason why the control group is larger than the measure group, is that most had yet to implement their measures in individual buildings during the period from 2010 to 2013.

2.3 Interviews and written responses to inquiries

The interviews with the Ministry of Petroleum and Energy and Ministry of Local Government and Modernisation have provided information about all audit questions in the investigation.

Enova has responded in writing to submitted questions. Information has been obtained concerning how the grant scheme for commercial buildings is administered, the importance of Enova's housing programme, the need for coordination with the status of any measures initiated and challenges linked to the regulations, including compliance and the authorities' familiarity with this.

The Norwegian State Housing Bank has been interviewed in order to illuminate the importance of its basic loan as an instrument for energy efficiency, the need for coor-

dination and the status of any measures initiated and challenges linked to the regulations, including compliance and the authorities' familiarity with this.

The Norwegian Building Authority has been interviewed in order to illuminate challenges linked to the regulations, including compliance and the authorities' familiarity with this, as well as the need for coordination.

In order to illuminate the importance of instruments concerning the regulations, information and the need for coordination, the Norwegian Water Resources and Energy Directorate and the Bellona Foundation have also responded in writing to submitted questions, and the following private stakeholders have been interviewed concerning similar issues:

- SINTEF Building and Infrastructure: Norway's leading supplier of research-based knowledge to the construction industry[24]
- The Federation of Norwegian Construction Industries (BNL): Leading professional body for the Norwegian construction industry[25]
- Norwegian Technology: National association in the Confederation of Norwegian Enterprise (NHO) with 1,700 member companies and 33,000 employees[26]
- The Norwegian Federation of Cooperative Housing Associations (NBBL): Professional body for 47 cooperative building societies with a total of 925,000 members[27]

All minutes from the interviews have been verified.

2.4 Document analyses

The following documents, among others, have been reviewed in connection with the preparation of audit criteria and the collection of data:

- statutes, budget propositions and other Storting documents
- *Regulations relating to technical requirements for buildings* (Building Code Regulations, TEK)
- The Ministry of Petroleum and Energy's allocation letter to Enova and the Ministry of Local Government and Modernisation's allocation letter to the Norwegian State Housing Bank
- annual reports from Enova and the Norwegian State Housing Bank
- agreement between the Ministry of Petroleum and Energy and Enova
- cooperation agreement between the Norwegian State Housing Bank and Enova SF
- research reports and technical literature

The following reports, surveys and evaluations, among others, have been reviewed in order to illuminate familiarity with the regulations – and questions linked to compliance with the regulations:

- *Kjennskap og kunnskap om lavenergi og passivhus. Undersøkelse blant håndverkere* [Familiarity with and knowledge about low-energy and passive buildings. Survey among tradesmen], Respons Analyse, 2012
- *Kjennskap og kunnskap om lavenergi og passivhus. – Undersøkelse blant arkitekter og rådgivende ingeniører* [Familiarity with and knowledge about low-energy and passive buildings. Survey among architects and consulting engineers], Respons Analyse, 2012
- *Fra TEK10 til TEK15 [From TEK10 to TEK15]*, Rambøll and LINK Arkitektur, January 2013

24) http://www.sintef.no/Byggforsk/Dette-er-SINTEF-Byggforsk/
25) http://www.bnl.no/
26) http://norskteknologi.no/Om-Norsk-Teknologi/Hva-er-Norsk-Teknologi/
27) http://www.nbbl.no/Om-NBBL/NBBL

- *Energiregler 2015 – forslag til endringer i TEK for nybygg [Energy rules 2015 – proposed changes to TEK for new construction]*, Rambøll, 2013
- *Undersøkelse om effekten av uavhengig kontroll i byggesaker [Investigation of the effect of independent control in building projects]*, Analyse & Strategi, 2015

The importance of Enova's housing programme has been illuminated through Enova's result reporting, and to clarify objectives and factors that potentially restrict Enova's work vis-à-vis the housing segment, the four-year agreement between Enova and the Ministry of Petroleum and Energy has been important both in the document analysis and as a basis for the questions to Enova and the interview with the Ministry of Petroleum and Energy.

The following documents have been reviewed to assess the effects of the Norwegian State Housing Bank's basic loan:
- *Veileder for Husbankens grunnlån* [Guidelines for the Norwegian State Housing Bank's basic loan], Norwegian State Housing Bank 2014
- *Utbedring av eksisterende boligmasse – Husbankens grunnlån som virkemiddel [Improving existing housing stock – the Norwegian State Housing Bank's basic loan as an instrument],* Proba Research*, 2014*

The following studies, reports and questionnaire surveys from the 2008–2015 period have been reviewed in order to illuminate the need for information and advisory services, as well as the significance of any information barriers:
- *Energieffektivisering [Energy efficiency measures]*, the Low Energy Commission, 2009
- *Energieffektivisering i bygg. En ambisiøs og realistisk plan mot 2040 [Energy efficiency measures in buildings. An ambitious and realistic plan toward 2040]* (Arnstad Group report) August 2010
- *Energieffektivisering i eksisterende bygg [Energy efficiency measures in existing buildings]*, Vista Analyse AS/Thema Consulting group, 7 December 2011
- *Potensial- og barrierestudie. Energieffektivisering i norske bygg [Potential and Barrier Study: Energy efficiency in Norwegian buildings], Enova 2012*
- *Eierundersøkelsen* 2013 [The owner survey 2013], Norwegian Building Authority, 2013
- *Evaluering av boligprogrammer [Evaluation of housing programmes],* TNS Gallup*,* 2014
- *Utbedring av eksisterende boligmasse [Improving existing housing stock],* Proba Research, 2014
- *Energieffektivisering og samfunnsøkonomi* [Energy efficiency measures and socio-economics], Thema Consulting Group, 16 September 2014
- *Boligeieres beslutningsprosesser ved oppgradering* [Homeowners' decision-making processes in connection with upgrades], SINTEF Building and Infrastructure, 2014
- *Norske energismartinger* [Norwegian energy geniuses], TNS Gallup, 25 February 2015, for Enova

The investigation also examined the importance of knowledge and competence in the execution, engineering and planning phases, i.e. among tradesmen, architects and consulting engineers. The following reports were reviewed in order to illuminate the need for competence and the importance of competence in the construction industry, including potential barriers:
- *Build Up Skills, del 1 – status analyse* [Build Up Skills, part 1 – status analysis], the Low Energy Programme, 2012

- *Kjennskap og kunnskap om lavenergi- og passivhus, undersøkelse i byggenæringen* [Familiarity with and knowledge about low-energy and passive buildings, survey in the construction industry], Respons Analyse, April 2012
- *Boligeieres beslutningsprosesser ved oppgradering* [Homeowners' decision-making processes in connection with upgrades], SINTEF Building and Infrastructure, 2014
- *Energieffektivisering og samfunnsøkonomi* [Energy efficiency measures and socio-economics], Thema Consulting Group, 16 September 2014

Key governing documents have been reviewed in order to illuminate the need for coordination and guidelines linked to coordination. This primarily includes the Ministry of Petroleum and Energy's agreement with Enova for the 2011–2015 period, and the Ministry of Local Government and Modernisation's allocation letter to the Norwegian State Housing Bank for the same period. Annual reports from the agencies have also been reviewed.

The need for coordination between all government agencies has been illuminated based on the Arnstad Group report (2010), the White Paper on Building Policy (2012), and the letter from the Norwegian State Housing Bank to the Ministry of Local Government and Modernisation (2011) concerning coordination of instruments in the energy area. The cooperation agreement between Enova and the Norwegian State Housing Bank from 2013 is among other documents that are important in order to elucidate challenges with and the status of coordination. The minutes from meetings between Enova and the Ministry of Petroleum and Energy for the period from 2009–2015 have also been reviewed with a view toward illuminating to what extent coordination has been included in the dialogue between the Ministry and agency.

3 Audit criteria

3.1 Goals for energy efficiency

The Ministry of Petroleum and Energy emphasises that energy efficiency and limiting energy consumption are key elements in the Government's energy policy.[28] According to the white paper on good buildings for a better society (Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*), cf. Recommendation No. 129 to the Storting (2012–2013), it is a goal to reduce energy consumption in buildings significantly by 2020.[29] The regulations must contribute to ensure that we have buildings with low energy needs, and grant schemes and information must contribute to make buildings more energy-efficient.[30] In Proposition to the Storting 1 S (2013–2014), the Ministry of Local Government and Modernisation underlines that it is a major goal for more homes and buildings to meet future needs, and that this implies, in part, that they must become more energy efficient.

3.2 Requirements for instruments for energy efficiency in buildings

3.2.1 The building regulations as an instrument for energy efficiency

According to the white paper on good buildings for a better society (Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*), the energy requirements in the Building Code Regulations (TEK) are the most important instrument for energy efficiency in new buildings and in connection with major reconstruction of existing buildings. According to the Planning and Building Act, the municipalities are obliged in building projects to verify that the measures are implemented in line with issued permits and provisions of the Act and regulations. The municipalities must conduct verifications in a scope that allows them to prove breaches of the rules.

The municipalities decide in which cases and in which areas verification is conducted. The municipalities can implement this verification in the manner, in the scope and with the intensity they find to be appropriate.[31] The legislative history of the Act specifies that the provision stipulates a duty of verification, but without providing clear criteria or goals for the scope of verification, which will depend on municipal practice, competence and resources.

In Recommendation No. 145 (2007–2008) to the Storting, the majority in the Standing Committee on Energy and the Environment emphasises that new energy requirements will be an important area for more stringent verification of construction measures and increased audit activity by the municipalities.[32] New energy requirements were introduced in 2010. Municipalities must have a strategy for conducting the verification.[33] Requirements linked to energy consumption must be included in the municipalities' prioritised audit areas for the two-year period from 1 January 2013 to 1 January 2015.[34]

28) Proposition to the Storting 1 S (2009–2010), Ministry of Petroleum and Energy, page 15, and Proposition to the Storting 1 S (2010–2011), page 14.
29) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, pages 4, 10, 23 and 73.
30) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 73.
31) Section 25-2 of the Planning and Building Act.
32) Recommendation No. 145 (2007–2008) to the Storting, page 25, cf. Report No. 25 (2006–2007) to the Storting *Norwegian Climate Policy.*
33) Section 15-1 of the Planning and Building Act.
34) Sections 15-1 and 15-3 of the *Regulations relating to building applications*.

In addition to supervision, independent control must also help ensure that requirements in the Building Code Regulations are complied with. An independent control requirement was introduced in the Building Application Regulations in 2013.[35] The independent control must e.g. ensure that the engineering of the construction measure and construction work satisfy the requirements in the Building Code Regulations (TEK 10).

3.2.2 The effect of economic instruments for energy efficiency

The Climate Compromise of 2008 included agreement on substantially increased activity within the development of energy-efficient buildings and that the Norwegian State Housing Bank and Enova must have good support schemes for energy-efficiency measures.[36] According to Proposition to the Storting 33 S (2012–2013), cf. Recommendation to the Storting 163 S (2012–2013), the Norwegian State Housing Bank and Enova are to stimulate measures beyond the requirements of the Building Code Regulations when issuing basic loans and grants.

According to the white paper on Norwegian climate policy (Meld. St. 21 (2011–2012) *Norsk klimapolitikk*), provisions have been made for the Norwegian State Housing Bank to be a source of competence and economic instruments that support the work on energy efficiency in the housing sector. The Norwegian State Housing Bank's basic loan will contribute to promoting important housing qualities such as energy in new and existing housing.[37] Several different requirements, for example specific energy requirements, must be met in order to receive a basic loan.[38]

The Ministry of Petroleum and Energy's management of Enova's administration of the Energy Fund's means follow the principles for goal and performance management. These goals are formulated through the purpose of the Energy Fund, as well as primary goal and performance goals stipulated in the agreement between the Ministry of Petroleum and Energy and Enova.[39] The present agreement applies for the period 2011–2015. Enova's responsibility for allocating grants and following up projects that receive grants, is governed by the agreement.

It follows from the agreement that Enova must support the development of more energy-efficient buildings, including existing buildings. One key premise for Enova's use of economic instruments is that it must contribute to triggering projects that would otherwise not have been implemented. Another prerequisite is that Enova must achieve the highest possible energy results per krone in grants within the set framework. It emerges from the white paper on Norwegian climate policy (Meld. St. 21 (2011–2012) *Norsk klimapolitikk*) that Enova's tasks will be strengthened in the years ahead, for example as regards its focus on energy efficiency.

3.2.3 Central government information and advisory measures for energy efficiency

Enova must have a nationwide range of information and advisory services that will help ensure better information about energy-efficient solutions.[40] Enova shall continue its information activities aimed at households, and the parts of the construction industry that are in contact with homeowners must receive special attention, so that households can obtain the best possible advice concerning good energy-efficiency measures.[41]

35) Building Application Regulations (SAK 10), Chapter 14.
36) Recommendation No. 145 (2007–2008) to the Storting, cf. Report No. 34 (2006–2007) to the Storting *Norwegian Climate Policy.*
37) Recommendation to the Storting 129 S (2012–2013), page 12.
38) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, side 79.
39) Proposition to the Storting 1 S (2014–2015), Ministry of Petroleum and Energy, page 69.
40) Proposition No. 1 (2008–2009) to the Storting, p. 54 and Proposition to the Storting 1 S (2013–2014), page 78.
41) Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 9.

The Energy Labelling Scheme, which entered into force on 1 July 2010, is an information measure that aims to spread awareness concerning the energy status of buildings. [42] *The Regulations relating to energy labelling of buildings and self-evaluation of technical facilities* (the Energy Labelling Regulations) will help ensure that information reaches the market as regards the energy status of housing, buildings and technical facilities, as well as the opportunities for improvement, and create greater interest for specific energy-efficiency measures. The energy labelling requirement entails that energy performance certificates are mandatory.[43] The requirement applies to buildings that are sold, leased or erected, and commercial buildings exceeding 1,000 square meters. The requirement aims to put energy on the agenda in the housing and building market and in the planning of new construction.

According to the white paper on good buildings for a better society (Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*), the Norwegian Building Authority is tasked with increasing knowledge about building rules in the industry and the municipalities, and must give advice and provide information about regulatory requirements for energy efficiency. The Authority must have an overview of how the regulations work in the building area and act as a professional link between central government activities, the industry and municipalities, and between relevant authorities.[44] The Authority shall also provide advice to the Ministry of Local Government and Modernisation and assist professionally in e.g. energy issues.[45]

The Low Energy Programme (2008–2017) is a collaboration between the central government and the construction industry with the purpose of achieving energy efficiency and energy restructuring in buildings through information activities and skills development. [46]

The Norwegian State Housing Bank's competence grants can be awarded for knowledge development, support for trial projects and disseminating information about energy consumption in housing and buildings.[47]

3.3 The ministries' responsibility for coordinating the use of instruments

The principal responsibility of the Ministry of Petroleum and Energy is to achieve a coordinated and integrated energy policy.[48] The Ministry of Local Government and Modernisation is responsible for building policy, including energy requirements for new buildings and buildings that are rehabilitated.

In Recommendation No. 321 (2008–2009) to the Storting, the Standing Committee on Local Government and Public Administration emphasises that the governing principles for the public sector must be based on coordination and a comprehensive approach.

According to Report No. 19 (2008–2009) to the Storting *Ei forvaltning for demokrati og fellesskap* [A Public Administration for Democracy and Community], organisation, the division of labour, management systems and forms of work must facilitate coordi-

42) Letter from the Ministry of Petroleum and Energy to the OAG of 8 April 2014.
43) Proposition to the Storting 1 S (2013–2014) pages 64 and 147.
44) Proposition to the Storting 1 S (2012–2013), Ministry of Local Government and Modernisation, pages 92 and 93; Proposition to the Storting 1 S (2014–2015), page 160.
45) Proposition to the Storting 1 S (2012–2013), Ministry of Local Government and Modernisation, page 92.
46) Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 37.
47) Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn,* white paper on good buildings for a better society, page 79.
48) http://www.regjeringen.no/nb/dep/oed/dep/ansvarsomraader.html?id=775.

nation of the policy areas and instruments that must be viewed in context, even if they are located in different ministries or different underlying agencies.

According to the white paper, important instruments for coordination in public administration are coordination bodies and meeting points, regulations, routines, information, competence development, guidelines and studies.[49] The white paper simultaneously emphasises that the Government is the most important coordination instance, and that all matters where there is e.g. disagreement between different ministers, must be addressed by the Government.

The Regulations on Financial Management in Central Government (Item 1.4) stipulate that all ministries are responsible for ensuring that underlying agencies conduct activities in accordance with the Storting's resolutions and intentions, as well as the Ministry's stipulated goals and priorities. Central government agencies, including ministries, must establish goals and performance requirements, ensure that set goals and performance requirements are achieved, and ensure adequate governing information and a prudent basis for decision-making, cf. Item 1.2a.

Enova SF is a state enterprise owned by the Ministry of Petroleum and Energy. Through an agreement, Enova is responsible for managing funding from the Energy Fund. The Ministry's management of Enova's administration of the Energy Fund's funds follows principles for goal and performance management, but at a general level, through the stipulation of goals and criteria for result reporting in the four-year agreement with Enova. Within the framework of the agreement, it is up to Enova to prioritise between different sectors and design its programmes.[50]

The Norwegian State Housing Bank is a central government administrative body under the Ministry of Local Government and Modernisation. The Ministry's management of the Norwegian State Housing Bank follows the principles for goal and performance management.

49) Report No. 19 (2008–2009) to the Storting, *Ei forvaltning for demokrati og fellesskap* [A Public Administration for Democracy and Community], page 87.
50) Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 76.

4 To what extent do the instruments contribute toward energy-efficient buildings?

Norwegian authorities use a variety of instruments to influence energy consumption and encourage greater energy efficiency. They include legal and economic instruments, as well as information and advisory services. See Table 6 for a summary.

Table 6 Instruments for energy efficiency in buildings

Instrument category	Instrument	Instrument actor	Target group	Impact
Legal	The Planning and Building Act and Building Code Regulations	Ministry of Local Government and Modernisation and the Norwegian Building Authority	All buildings	Reduced energy needs in buildings
Economic	Support for reduced energy consumption in commercial buildings	Enova	Existing commercial buildings	Reduced energy need
	Enova's support for comprehensive upgrading of housing	Enova	Existing housing	Reduced energy need
	Basic loan for new construction	Norwegian State Housing Bank	New housing	Reduced energy need
	Basic loan for upgrading	Norwegian State Housing Bank	Existing housing	Reduced energy need
Information	Enova Answers	Enova (NVE)	All buildings	Knowledge about Enova's support schemes, energy efficiency in general and the Energy Labelling Scheme
	Enova's web pages	Enova	All buildings	Knowledge about Enova's support schemes and energy efficiency in general
	Energy adviser for ambitious measures	Enova	Homeowners, existing housing	Knowledge about Enova's support schemes and home energy consumption
	The Energy Labelling Scheme	NVE	All buildings	Knowledge about the energy status of the building
	Information about regulations	Norwegian Building Authority	All buildings	Knowledge about regulations and interpretation of the regulations
	Low Energy Programme	Collaboration between state and private actors	The building industry	Knowledge about energy-efficient building
	The Norwegian State Housing Bank's competence grants	Norwegian State Housing Bank	The building industry	Knowledge about energy-efficient building

4.1 How do the authorities ensure compliance with building regulations' energy efficiency requirements?

For new buildings and with major renovations of existing buildings, the requirements of the Building Regulations and Building Code Regulations (TEK10) according to the White Paper on Building Policy are the most important energy efficiency instrument.[51]

TEK10 provides supplementary provisions about what the energy requirements entail. Insulation requirements (heat efficiency) are key, with minimum requirements for air leakage and minimum requirements for the heat insulation properties of walls, ceilings, floors, windows and doors.[52]

Scope of the Building Code Regulations (TEK10)

The Ministry of Local Government and Modernisation underlines that while the energy requirements of TEK10 are primarily aimed at new buildings and general renovations, other work subject to application on existing buildings is covered by TEK 10 where the requirements are relevant, i.e. fill a function and have an effect.

The potential for energy efficiency

The White Paper on Building Policy emphasises that the potential for energy efficiency is greatest in existing buildings, and notes that about 80 per cent of the current building stock will still be standing in 2050. The white paper points out that most of the savings must be made in existing buildings, and an estimated 60 per cent of this must occur in homes. At the same time, the White Paper on Building Policy states that while the new construction rate for housing over two decades has averaged 1.3 per cent per year, commercial and public buildings have had an average new construction rate of 1.9 per cent per year.

TEK10 is primarily applied to new buildings

The White Paper on Building Policy states that the Building Regulations are not always relevant for promoting energy efficiency in existing buildings. This is because those who refurbish undetached, semi-detached and detached homes usually do this in stages over a longer period without considering energy efficiency – and rarely carry out a total rehabilitation (general renovation) subject to application. According to the White Paper on Building Policy, this means in practice that information, competence and economic measures are particularly relevant for existing buildings for achieving more energy efficiency.

Existing buildings and the term general renovation

In an interview, the Norwegian Building Authority stated that the energy requirements for measures for existing buildings are perceived by many as too strict. According to the Authority, the consequence is that some do not undertake repairs in existing buildings for fear that it will become too costly and extensive. In an interview, the Norwegian State Housing Bank stated that the regulations are highly open to interpretation in terms of the question of whether measures in existing buildings are considered to be a general renovation or not. The Norwegian State Housing Bank's assessment is that TEK10 is currently not a driver of energy efficient upgrading of existing buildings.

SINTEF Building and Infrastructure believes that it is unclear whether and when TEK10 applies to existing buildings.[53] The Federation of Norwegian Construction

51) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 10.
52) The U value of the building component indicates how good the heat insulation properties are. A low U value provides good heat insulation. Source: Enova.
53) Interview with SINTEF Building and Infrastructure.

The general renovation rules apply to work that is so extensive that all or part of the structure is essentially refurbished. Photo: Hans Drexler

Industries' (BNL) view is that the impact of the regulations is very limited for existing buildings. According to BNL, this is because the term general renovation is not clearly defined, which means that the regulations do not work for the rehabilitation market.[54] The Norwegian Federation of Cooperative Housing Associations (NBBL) views the regulatory ambiguities about general renovation as one reason why very few of NBBL's members carry out total rehabilitations. According to NBBL, what takes place is done in small operations, even though the most effective approach would be to take big steps.[55]

The Norwegian Building Authority notes that the conditions for enabling local governments to make exceptions to the rules for existing buildings for a general renovation are so cumbersome and difficult that the municipalities have problems practising them.[56] According the Norwegian State Housing Bank, the municipalities have practised a spacious threshold for when the energy requirements for general renovation of existing buildings shall be applicable. As a result, most rehabilitation projects fall in practice outside the TEK10 rules.[57]

The questionnaire to the municipalities on supervision shows that over half of the municipalities' building technology experts believe that the energy requirements in the Building Code Regulations (TEK 10) for rehabilitation (major modifications) are difficult to understand, and two-thirds think that the rules are difficult to practice.

In an interview, the Ministry of Local Government and Modernisation emphasised that TEK 10 applies fully for general renovation of existing buildings, i.e. work that is so extensive that the entire or parts of the structure are substantially renewed. In its

54) Interview with Federation of Norwegian Construction Industries, 11 December 2014.
55) Interview with NBBL.
56) Interview with the Norwegian Building Authority, 4 November 2014.
57) Interview with the Norwegian State Housing Bank – follow-up questions, 31 March 2015.

comments on the report, the Ministry assesses that the requirements of TEK10 do not have widespread application to existing buildings. While they apply to general renovation, application beyond that to existing buildings is limited. The Ministry's explanation is that the energy requirements are primarily designed for new buildings. The Ministry has no knowledge of the extent of general renovations of existing buildings.

The Federation of Norwegian Construction Industries states that the regulations are in effect for new construction.[58] The Norwegian Building Authority states that the rules are perceived as more difficult for existing buildings than for new buildings.[59]

4.1.1 The authorities' knowledge of compliance with regulations

The Ministry of Local Government and Modernisation states that it does not have statistics on regulatory compliance, nor does it go into individual cases to assess whether the requirements are complied with. The Ministry points out that it is the developer's responsibility to meet the energy requirements of the Building Code Regulations, and that the municipalities have regulatory authority.

The Norwegian Building Authority, which administers the regulations, states that it does not have the impression that there is any major problem with compliance with the regulations, but according to the Authority, there are no evaluations of the extent to which the energy requirements of TEK10 are complied with. SINTEF Building and Infrastructure reports that they have no exact information on compliance with the rules, and are not aware of the existence of reports on the degree of compliance.

A number of reports and external surveys exist which, among many other issues they address, also discuss issues related to whether the regulations are known, and if they work, see the methodology chapter's item on document analysis. The review of the documents shows that knowledge about the degree of compliance is lacking.

The Ministry of Local Government and Modernisation refers to the evaluation *Fra TEK10 til TEK15* [From TEK10 to TEK15] from 2013 conducted for the Norwegian Building Authority in connection with the preparation of the forthcoming regulatory changes. The evaluation is a 29-page memo intended for internal distribution that discusses seven different issues. The memo states that no previous official evaluations of either TEK07 or TEK10 have been made. Moreover, it is pointed out that there is very little literature on experiences with buildings that are built in accordance with regulations. One of the seven issues deals with compliance. Ten respondents answered questions about the extent to which the regulations are complied with. The respondents agree that there probably are big differences in how and whether the regulations are complied with, and that this has to do with the skills and knowledge regarding use of the regulations.

4.1.2 Control of compliance with the regulations

The scope of the municipalities' supervision

The survey of municipalities shows that 58 per cent did not monitor compliance with the energy requirements of TEK 10 in 2013–2014. Thirty-six per cent of the municipalities checked whether the energy requirements were met in new buildings, and 16 per cent conducted similar oversight for renovation of existing buildings. Just under seven per cent did not answer this question. In some municipalities, there will be so little construction activity that supervision is irrelevant, and among small municipalities (under 5,000 inhabitants) 75 per cent say they have not conducted oversight. In

58) Interview with Federation of Norwegian Construction Industries, 11 December 2014.
59) Interview with the Norwegian Building Authority, 4 November 2014.

medium-sized municipalities (5,000–20,000 inhabitants) this applies to 55 per cent, and in large municipalities (more than 20,000 inhabitants) 34 per cent.

KOSTRA data shows that municipalities' overall scope of supervision pursuant to the Planning and Building Act increased in the period 2009 to 2014. The municipalities conducted a total of 11,262 inspections in 2014 compared with 6,753 in 2009. The inspections that involved energy consumption accounted for about two per cent of the total number of inspections until 2013. The percentage then increased to five per cent, and to six per cent in 2014. The Ministry of Local Government and Modernisation states that the scope of supervision varies from municipality to municipality based on resources and priorities.

The quality of the municipalities' supervision

Of the municipalities that conducted supervision, 78 per cent responded that they conducted document supervision, and 47 per cent responded that they conducted inspections of the construction site. Approximately six per cent responded that they conducted other types of oversight.

The Norwegian Building Authority believes that controls of whether energy requirements are met involve measuring the heat efficiency of the building, which is essential for determining whether the energy requirements of TEK10 are met.[60] The questionnaire to the municipalities on supervision shows that of the 104 municipalities that have conducted checks of compliance with energy requirements in TEK 10, a little over half (57) checked the heat efficiency of the building, but only three of these conducted their own heat efficiency measurements of the building.[61] The remaining 54 checked heat efficiency by reviewing the client's documentation of the building.

The Norwegian Building Authority has published *Veiledning: Energikrav i TEK10* [Guidelines: Energy requirements in TEK10].[62] The introduction states: "In a two-year period from 1 January 2013, the municipalities shall prioritise supervision of requirements related to energy consumption and universal design. […]. The new focus areas shall be incorporated in the municipality's supervision strategy."

In the survey of municipalities, 38 per cent replied that they have developed a strategy for supervision pursuant to Section 25–1 of the Planning and Building Act. Of the municipalities that have such a strategy, 62 per cent have a supervision strategy that includes energy requirements. In other words, only 24 per cent of municipalities have a strategy that satisfies Section 15–1 of the Building Application Regulations.

Independent controls of building projects

The Building Application Regulations (SAK 10), which were issued pursuant to the Planning and Building Act, require independent checks of building projects. The developer (the developer, builder or contractor) shall order independent checks. The independent control is performed by a different entity than the developer and the inspector must be independent of the developer. Independent controls shall include checking airtightness and energy efficiency. It will be sufficient to ensure that there is documentation of heat efficiency testing (as part of quality assurance) of virtually completed buildings, and that the target is within the regulatory requirement.[63] SINTEF Building and Infrastructure is one of many actors who perform independent

60) Interview with the Norwegian Building Authority.

61) An artificial fan that creates under or overpressure is used during pressure testing. The building's leakage figures are measured by so-called "blower door" equipment, according to NS-EN 13829. The standard describes the differential pressure method and can be used to document that heat efficiency requirements pursuant to NS 3700 are met.

62) *Veiledning: Energikrav i TEK10. HO-2/2013 – 2013 – 2015*, [Guidelines: Energy requirements in TEK10. HO-2/2013 – 2013 – 2015] (In Norwegian) Norwegian Building Authority, 2013.

63) *Veiledning: Uavhengig kontroll.* [Guidelines: Independent control.] (in Norwegian). Norwegian Building Authority (undated).

checks. In an interview, SINTEF Building and Infrastructure pointed out that this is a purely theoretical check of documents to show whether the design corresponds with drawings and other specifications of the project.

If the independent inspector finds deviations from the regulations, the deviation must be reported to the developer. The developer can follow up the pointed out deviation either by correcting the deviation or by documenting that there is no deviation. The matter will be reported to the municipality only if the developer has not followed up the deviation.[64] A new study on the effect of independent controls performed for the Norwegian Building Authority states that more than 60 per cent of municipalities have never received reports of deviations, and that just over 20 per cent have been notified of this between one and five times.[65]

4.2 To what extent do economic instruments for energy efficiency lead to reduced energy consumption in buildings?

4.2.1 Enova's grants for existing commercial buildings

Introduction

According to the Ministry of Petroleum and Energy's agreement with Enova on the management of the Energy Fund, energy and climate results equivalent to 6.25 TWh shall be achieved in the period 2012–2015 with Enova's collective instruments.[66] Enova states that by the end of 2014 the company had achieved 4.3 TWh of 6.25 TWh. Support for commercial buildings contributed 1.3 TWh (30 per cent).

Box 1 Measurement units for energy consumption

Measurement units for energy are:

- kilowatt hours (kWh)
- megawatt hours (MWh): thousand kWh
- gigawatt hours (GWh): million kWh
- terrawatt hours (TWh): billion kWh

Output is measured in watts (W), while energy is measured in watt hours. At 1,000 watts per hour consumption is one kilowatt hour (kWh). The consumption of a household is often measured in kWh. Total energy consumption in Norway was 211 TWh in 2014, and an average household consumes about 21,000 kWh of energy per year. Of this, about 16 000 kWh is electricity.

Source: Statistics Norway and NVE (2014), *Energibruksrapporten 2013: fremtidens energibruk i bygninger [Energy consumption 2013: future energy consumption in buildings] (in Norwegian)*

Under the agreement, the Energy Fund is managed as cost-effectively as possible. Enova shall endeavour to develop programmes that trigger good projects, while keeping support costs low.

Box 2 About the Energy Fund

The Energy Fund was established in 2001 in connection with Enova's establishment. The Fund is state-owned and earns revenue from the surcharge on the grid tariff, returns from the Fund for Climate Change, Renewable Energy and Energy Conversion, allocations from the state budget and accrued interest. The Energy Fund's revenues in 2014 totalled about NOK 1.97 billion, of which revenues from the surcharge on the tariff amounted to about NOK 660 million (33 per cent).

Source: Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy

64) *Veiledning: Uavhengig kontroll. [Guidelines: Independent control.] (in Norwegian).* Norwegian Building Authority (undated).
65) *Undersøkelse om effekten av uavhengig kontroll* [Investigation of the effect of independent control] (in Norwegian), Analyse & Strategi (2015).
66) Clause 6 of the agreement.

Forty-seven per cent of the municipalities state that they have carried out inspections of construction sites.

Photo: Ingvar Andersson

The target group for Enova's grant scheme for commercial buildings is owners and tenants of commercial buildings, housing cooperatives and co-ownerships that are registered enterprises.[67]

The scheme has existed since 2005. This audit looks at the period from 2010 to 2015. The total portfolio from when the scheme was established is shown in Table 7.

Table 7 Number of projects and buildings in the grant scheme for commercial buildings (2005–2014)

Application year:	2005	2006	2007	2008	2009*	2010	2011	2012	2013	2014	Tot	Per
Completed applications	111	69	51	52	481	83	138	136	231	230	1 583	100%
of which rejected	21	7	6	8	262	16	20	13	35	7	396	25%
of which cancelled	19	10	4	10	24	10	13	10	9	3	112	7%
of which under execution in 2015	4	0	4	4	12	21	59	69	156	213	542	34%
of which finished	67	52	37	30	183	36	46	44	31	7	533	34%
Number of buildings in finished applications	351	186	797	106	813	222	2 062	2 551	890	1 204	9 182	100%
of which rejected	0	0	0	0	0	12	30	15	47	7	111	1%
of which cancelled	1	0	0	4	60	13	19	66	32	4	199	2%
of which under execution in 2015	12	0	455	0	0	179	1 919	2 391	777	1 183	6 916	75%
of which finished	338	186	342	102	753	18	94	79	34	10	1956	21%
Area in buildings under execution or finished (in 1,000 m²)	3 403	1 089	3 769	611	1 528	1 529	7 806	6 095	5 282	4 066	35 177	

* 175 of 219 (79%) of the projects from 2009 stem from the package of measures for dealing with the financial crisis. Funding for the projects is sorted under the support for commercial buildings, but stand out by being counter-cyclical measures. The support rate for these projects could be up to 100% of project costs.

Source: Registry data from Enova

67) Enova (2014): *Dagens støtteordninger for bygg* [Current support schemes for buildings] (in Norwegian). Presentation.

The table shows that Enova handled a total of 1,583 project applications in the period 2004 to 2014. Seventy-five per cent of the applications resulted in a commitment of support, seven per cent were cancelled, 34 per cent are finished and 34 per cent are under implementation at the beginning of 2015. The projects that have been granted support comprise a total of 1,075 projects totalling 35 million square metres of buildings, divided into 8,872 individual buildings.[68] This is the population of buildings in the grant scheme for existing buildings, which is meant to contribute energy results for Enova.

Enova's contractual energy results

The contractual results are the calculated energy efficiency results in each project, and are also the basis for the agreement between the grant recipient and Enova.

Box 3 Three categories of energy results

Enova distinguishes between three categories of energy results, which highlight the projects' goal achievement at different times:

Contractual energy results are an estimate of the energy result on the basis of normalised values for each measure that Enova supports. This energy result constitutes the contractual basis that the grant recipient is committed to vis-à-vis Enova, and that Enova will follow up. According to Enova, the values are conservatively set so that the actual energy result is probably better than what is contracted.

Final reported energy results are, according to Enova, an updated analysis of the contractual energy results after the project is completed. If all measures are completed as agreed, the final reported and contractual result will be the same. Projects that have implemented fewer measures than agreed, are given a final reported energy result that is lower than the contractual, and vice versa for projects that have carried out several steps.

Realised energy results are defined by Enova as measured results after the measures are implemented. The realised results will thus differ from the contractual and the final reported results by being based on actual observations, not on expectations and must therefore show whether the project and the measures actually save energy. Enova shall follow up whether the contractual results are reached by contacting grant recipients three years after the end date, and request that the realised results are reported.

Source: Enova

The Ministry of Petroleum and Energy points out that the final reported energy result may also differ from the contractual when all agreed measures have been implemented since the data basis for estimated energy results may be updated. Furthermore, the Ministry points out that the realised energy results are always estimated. The realised energy results in energy efficiency measures are the difference between measured energy consumption by measure, and an estimate of what the energy consumption would have been if the change had not been carried out.[69]

68) According to Enova, the registry data for individual buildings is not complete for older applications.
69) Letter from the Ministry of Petroleum and Energy, 28 August 2015.

Table 8 Contractual results, grant amounts and number of projects divided by application year (N = 1061)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Number of projects	69	51	37	32	193	54	105	113	187	220	1 061
Contractual energy result in GWh	330	352	375	229	235	240	447	448	336	271	3 263
Adopted grant amount in million NOK	72	94	120	56	465	131	341	344	302	263	2 188
Support per project (million NOK)	1.0	1.8	3.2	1.8	2.4	2.4	3.2	3.0	1.6	1.2	2.1
Cost-effectiveness (NOK/kWh) for contractual results	0.22	0.27	0.32	0.24	1.98	0.55	0.76	0.77	0.90	0.97	0.67

Source: Registry data from Enova

Table 8 shows that the contractual results total 3.3 TWh per year at the beginning of 2015.[70] This is the expected total effect of Enova's support for existing commercial buildings in a normal year, after all actions that have received support are implemented.

The projects have been granted support totalling NOK 2.2 billion, which represents a result of NOK 0.67/kWh per invested krone. Enova considers NOK/kWh to be an expression of the scheme's cost-effectiveness. In its reply letter, Enova pointed out that the agreement with the Ministry of Petroleum and Energy requires the administration of the Energy Fund to be cost-effective. According to Enova, there are limitations in the amount of support that can be provided per kWh, due to the requirement of cost-effectiveness.[71]

Table 8 shows that the number of projects increased in 2013 and 2014, while grant amounts and expected energy results declined. In 2011 and 2012, the projects averaged pledges below NOK 3 million in support, compared with NOK 1.2 million in 2014. Enova states in its performance report for 2013 that the change in the project composition is due to lack of major projects. Enova cites that the company's overall energy result is affected by the fact that there are a few major projects.

Enova's final reported energy results

Table 9 Contractual and final reported energy results for completed projects divided by application year (N = 518 projects)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Tot
Contractual energy result (GWh)	249	344	247	170	142	70	40	38	16	1	1 318
Final reported energy result (GWh)	266	350	243	96	163	65	30	36	16	1	1 268
Final reported as a percentage of contractual	107%	102%	98%	57%	115%	93%	74%	95%	101%	100%	96%
Number of projects with final reported energy result	40	45	33	29	183	37	51	53	40	7	518
Cost-effectiveness (NOK/kWh) for contractual results	0.22	0.27	0.32	0.24	1.98	0.55	0.76	0.77	0.90	0.97	0.67

Source: Registry data from Enova

70) 14 projects with 0 in contractual result are omitted.
71) Enova's reply letter to the Office of the Auditor General on 20 April 2015.

Table 9 shows that 518 projects of a total of 1,061 that have been granted support, cf. Table 8, were finished at the beginning of 2015. Table 9 contains only the contractual results of the finished projects, showing that the final reported energy results are equivalent on average to 96 per cent of contractual results.

Realised results

The OAG's Document 3:6 (2009–2010) *The Office of the Auditor General's investigation into the operation and administration of Enova SF* (2010) showed that the Ministry of Petroleum and Energy and Enova do little to ensure the actual realisation of the contractual energy results (stipulated energy savings targets), and that the realised results were significantly lower than those contracted. The audit showed that there were weaknesses in the quality and validity of the reported energy results, and that reporting was based on contractual energy results.

Enova's annual report for 2011 was the first time realised energy results were reported together with contractual and final reported results. The first time the Ministry of Petroleum and Energy reported the results to the Storting was in Proposition to the Storting 1 S (2012–2013). In Proposition to the Storting 1 S (2013–2014), the Ministry of Petroleum and Energy states that Enova has compared the realised result of completed projects from 2001–2009, and that this comparison shows that the construction projects mainly deliver energy results equivalent to what is contracted, or better.

According to Enova's routines, realised results are obtained three years after completion. The audit shows that for projects that applied before 2011, Enova obtained realised results for about one in three (107 of 330) completed projects. Enova has not obtained realised results for finished projects that applied in 2011.

Enova states that projects in commercial buildings generally have better realised energy results than those contracted.[72] Overall, the audit shows that the realised results are slightly above (107 per cent) the contractual. For each project, the realised results are consistently almost identical to the final reported energy results. Further examination of data from Enova shows that about half, i.e. 52 of the 112 projects with realised results, provide results in the form of round numbers (for example, 77,700,000 KWh). The use of round figures suggests that the results are estimates and not actual energy measurements in buildings.

The Ministry of Petroleum and Energy notes in the comments to the report that realised energy results are always estimated. The realised energy results are the difference between the measured energy consumption by measure and an estimate of what the energy consumption would have been if the change had not been carried out.[73]

The Ministry points out in comments to the report that Enova's energy results are calculated according to standard NS 3031 Calculation of energy performance of buildings – Method and data. The Ministry relates that several projects have been carried out to investigate how energy calculations according to NS 3031 correspond with the measured energy consumption, and that Enova has, among other things, given assignments to SINTEF Building and Infrastructure on this subject.

In a 2011 report from SINTEF Building and Infrastructure commissioned by the Low Energy Commission, it emerges that there is no tradition in Norway to test and evaluate energy consumption in building projects, and that there is little data about the cor-

72) Enova's reply letter of 8 May 2015.
73) Letter from the Ministry of Petroleum and Energy of 25 August 2015.

There is no tradition in Norway for checking and evaluating energy use in building projects. Photo: Moyan Brenn

relation between calculated and measured energy consumption. The reason for the Low Energy Commission's assignment was a need to make calculation standards NS 3031, NS 3700 and NS 3701 more accurate.[74]

SINTEF Building and Infrastructure states that there is still very little systematic evaluation of energy consumption in buildings in Norway. Two measuring projects have been initiated to analyse whether energy objectives are being met: one organised by Enova and one under the auspices of the Research Council of Norway. These projects are in progress in 2015.[75]

Enova's follow-up of contractual energy results through building statistics (ByggNett)

Grant recipients are required to report on energy consumption in two different ways:

1 reporting of realised result three years after project completion (at project level)
2 annual reports for five years of energy consumption to Enova's building statistics (ByggNett) (at building level)

Enova states that the company, in addition to reporting realised results after three years, has the ability to estimate actual energy results through reporting in Enova's building statistics (ByggNett).[76] ByggNett is Enova's reporting module for annual energy data from individual buildings. Grant recipients will generally report actual annual energy consumption in ByggNett for five years after the project is completed.[77]

The OAG pointed out in Document 3:6 (2009–2010) *The Office of the Auditor General's investigation into the operation and administration of Enova SF* that Enova did not use figures reported by grant recipients in its external reporting, and that Enova did not follow up grant recipients to ensure that they carried out the reporting.[78] Enova

74) SINTEF Building and Infrastructure (2011) *Energibruk i bygninger [Energy consumption in buildings] (in Norwegian).*
75) Interview with SINTEF Building and Infrastructure, 7 November 2014.
76) Enova's reply letter of 8 May 2015.
77) Building associations without common energy meters may receive an exemption for reporting in ByggNett.
78) Document 3:6 (2009–2010) *The Office of the Auditor General's investigation into the operation and administration of Enova SF*, page 62.

Grant recipients shall report actual energy consumption in the building for five years.

Photo: © John Petter Reinertsen

still does not use reported figures from ByggNett in its external reporting, nor does it use data reported to ByggNett to follow up whether contractual energy results are actually realised. Enova issues an annual description of energy consumption in commercial buildings on the basis of construction statistics. In addition, grant recipients can use the statistics to compare energy consumption in one's own building with the energy consumption of similar buildings.

Enova points out that it is a challenge to get grant recipients to report to ByggNett. Reporting reminders and notices are sent out. Enova has also attached great importance to establishing a system that promotes reporting, by emphasising that building owners can compare their own energy consumption with similar buildings.[79]

Half of the completed projects in the period 2005–2014 have not reported energy consumption in ByggNett.

The effect of Enova's grants to reduced energy consumption in commercial buildings

The effect analysis is based on actual measured energy consumption, as opposed to Enova's energy results that are based on theoretically calculated values.

Enova states in its reply letter that the actual energy savings are heavily dependent on the use of the building. Energy consumption changes from year to year with changing conditions of use. The use of the building can thus explain why the actual reduction in 2014, compared with the year before the application, is lower than the contractual result.[80] The Ministry of Petroleum and Energy also points out that many factors affect developments in energy consumption, such as economic growth, cold winters and technological development.[81]

To prevent such extraneous variables from affecting the result, the buildings in this audit are divided into a control group and a measure group. Assuming that the control

79) Enova's reply letter of 8 May 2015.
80) Enova's reply letter of 20 April 2015.
81) Letter from the Ministry of Petroleum and Energy, 27 August 2015.

and measure group are as identical as possible except for the described variable (the measure variable), the difference in average results between the two groups can be interpreted as the effect of the measure.

Table 10 Difference in average energy reduction in control and measure group [kWh/m²]

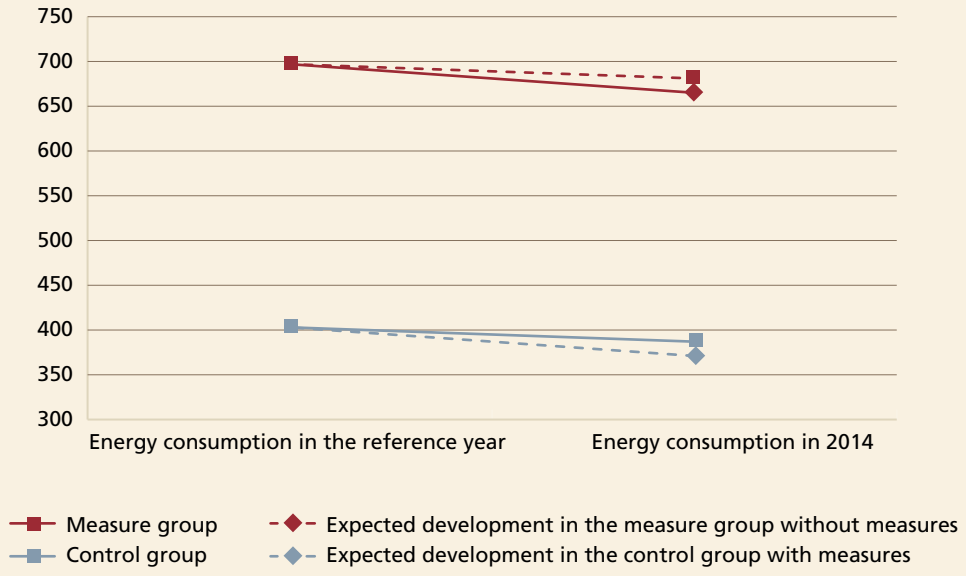
Measure group				Control group				Effect	
Number of build-ings	Energy consump-tion in the reference year	Energy con-sump-tion in 2014	Differ-ence	Number of build-ings	Energy consump-tion in the reference year	Energy con-sump-tion in 2014	Differ-ence	Diff -Diff	Sig (p value)
345	697	665	–32	1471	403	387	–16	–16	2,8%

Source: Registry data from Enova (ByggNett), and collection of data on energy consumption from individual buildings

Table 10 shows that the buildings in the measure group on average have reduced energy consumption by 32 kWh/m², compared with 16 kWh/m² in the control group, when energy consumption in 2014 is deducted from energy consumption the year before the application to Enova was sent (reference year). The difference between the reduction in energy consumption between the two groups, 16 kWh/m², is a measure of the grant's effect in 2014.

Figure 2 illustrates the parallel trend of the measure group without measure, assuming the same development as the control group.

Figure 2 Comparison of energy consumption in the control and grant group in the reference year and in 2014



The figure shows that, without measures, the buildings had an expected energy consumption in 2014 of 681 kWh/m², assuming the same development as the control group. Using the Enova-supported measures the buildings have thus reduced energy consumption per square meter by about two per cent compared with the energy consumption one year before the application.

Many commercial buildings receive support from Enova. Photo: OAG

Estimated effect for total building stock that has been granted support from Enova

The effect of the grant scheme increases slightly, from a reduction in energy consumption of 16.1 kWh/m² to 19.3 kWh/m² when the buildings are assigned weight[82] based on the distribution of building type in the population (all buildings that have been granted support). This is because the types of buildings that reduce the effect, especially commercial buildings, are over-represented in the sample.[83]

The overall effect of Enova's support is estimated in Table 11, given that the measures on average have the same effect on all buildings. The weighted result of about 19 kWh/m² is used as a basis for the calculation.

Enova pledged support of about NOK 2.2 billion to 1,061 projects divided among 8,434 buildings with around 35 million square metres of buildings[84] in the period 2004 to 2015.

Table 11 Estimated effect on total building stock that has been granted support from Enova (2004–2015) (N = 8434 buildings with offer of support in the period 2004–2014)

Total number of square metres [mill. m²]	Total grant amount [mill. NOK]	Weighted effect per square metre in 2014 [kWh/m²]	Weighted total effect in 2014 [TWh]	Grant cost for reduced energy consumption [NOK/kWh]
35.18	2 188	19	0,68	3.22

The overall effect of Enova's grants to existing buildings is estimated at 0.68 TWh per year. The calculation assumes that Enova's grants have the same average effect on all buildings that are granted support, as for the weighted average of the buildings analysed here (19 kWh/m²).

By comparison, Enova reports an annual effect of 3.6 TWh for the grant scheme. Enova's reporting of results is based on calculated (contractual) results, and not on actual measured results. There will therefore naturally be differences between the audit's measurement and Enova's reporting.

The total annual energy consumption in commercial buildings is 37 TWh. This means that the estimated reduction in energy consumption resulting from Enova grants is equivalent to approximately 1.8 per cent of the total annual energy consumption for commercial buildings.

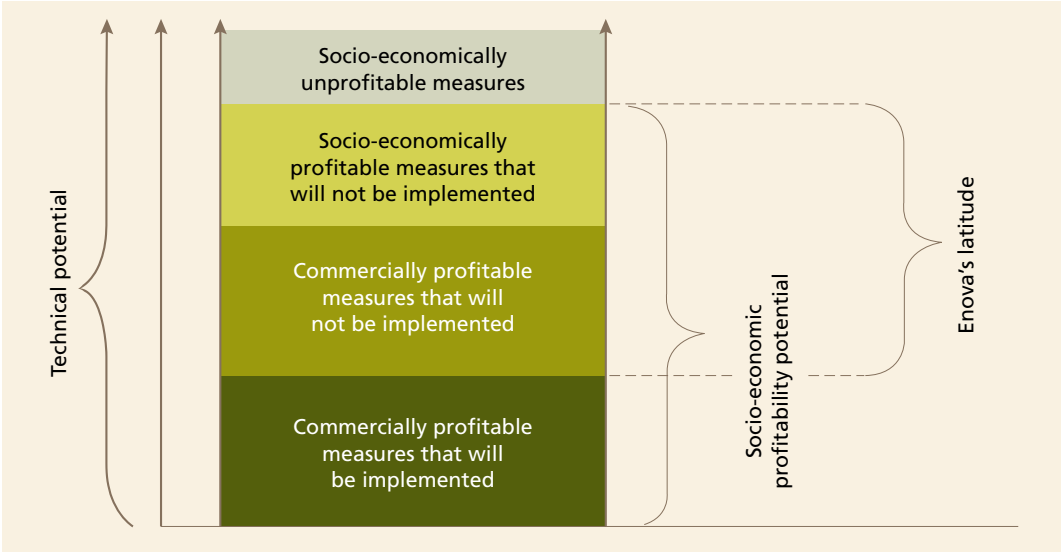
82) The buildings' weight = the building type's share in the population / the building type's share in the sample.
83) Commercial buildings are assigned a weight of 0.59, which means that each commercial building counts as 0.59.
84) Only buildings with data on the number of square metres are included.

Enova has invested NOK 2.2 billion in the measures. This provides an estimated energy efficiency cost of about NOK 3.22/kWh. The result is almost five times higher per kWh than the contractual result would indicate (NOK 0.67 per kWh saved).

Profitability – triggering effect

Enova's mandate is to trigger projects and measures that would not otherwise be carried out, i.e. the support should have a triggering effect.[85] This implies that Enova shall not provide funding for projects that would have been realised without support.

Figure 3 Enova's latitude



Source: Enova's Annual Report 2012

Figure 3 shows that Enova has latitude to support measures that are socio-economically and commercially profitable, and that would not be undertaken without support.

In its reply letter, Enova points out that both national and international studies document that even profitable measures to reduce energy consumption are often not implemented. Enova's barrier study points out that lack of profitability prevents the implementation of energy efficient measures. According to the study, what matters is that the owners themselves consider the measures to be economically profitable.[86] Reasons why measures that are found to be profitable, are not implemented, may include a lack of information or that the potential for energy savings is overrated in the profitability calculation or does not take all real costs into account.[87]

In its reply letter, Enova points out that the company ensures that the support to commercial buildings is triggering by not providing support for measures that Enova considers commercially profitable. Enova states that commercially profitable measures are automatically identified using present value analyses for each measure, based on building type and age. If expected energy efficiency gains measured in kroner exceed the cost, the measure will have a positive net present value, and thus be profitable. Measures which, according to present value analysis, generate a return of more than five per cent, are deemed too profitable to trigger support.[88]

85) Reply letter from Enova of 20 April 2015.
86) Enova (2012:2) *Potensial- og barrierestudie – Energieffektivisering i norske bygg.* [Potential and Barrier Study – Energy efficiency in Norwegian buildings.] (in Norwegian)
87) Official Norwegian Reports NOU 2012: 9 *Energiutredningen.* [Energy Report] (in Norwegian)
88) Reply letter from Enova of 20 April 2015.

If the project is eligible for support, it participates in the competition for support funding. In this selection, Enova gives priority to projects according to cost-effectiveness measured in support per kWh energy savings (NOK/kWh). Projects with large contractual (expected) energy results and low grant amounts are prioritised ahead of projects with low expected energy results and high grant amounts.[89]

According to Enova, the buildings with the worst energy status, do not have the greatest need for grants based on the assessment of triggering effect: It will often be profitable to implement measures without support in buildings with a very poor energy status. If the building owner still does not initiate the profitable measures, information from Enova to the building owner, not financial support, is primarily needed.[90]

The design of Enova's application system means that projects involving older buildings with major energy saving potential receive less or no support because the measures are considered economically profitable by Enova. However, projects involving newer buildings with lower potential energy savings receive more support, because the measures are unprofitable. Table 12 shows figures from Enova's energy calculator based on an example building with different year of construction.

Table 12 Example: Enova's grants for building-related measures in office buildings totalling 12,000m², by construction year

Construction year	Grant amount (kroner)	Contractual energy result (energy target) (kWh)	NOK/KWh for specified grant amount	NOK/KWh with support of NOK 1.5 million.
Older than 1950	429 846	4 577 040	0.09	0.3
1950–1969	0	3 963 000	0.00	0.4
1970–1987	26 331	2 579 160	0.01	0.6
1988–1997	1 439 550	1 151 640	1.25	1.3
1998 or newer	794 700	635 760	1.25	2.3

Source: Enova's energy calculator. http://soknad.enova.no/kalkulator/kalkulator.aspx

The table shows that a project with energy-saving measures[91] in an office building of 12,000 m² erected between 1950 and 1969 will not be eligible for support from Enova, although the contracted (expected) energy result is 3.9 GWh. Similar measures in a building built between 1988 and 1997, will be able to receive NOK 1.4 million in support with a contractual energy result of one third of the contractual energy result for the older building (1.1 GWh).

The table also shows that, given a grant of NOK 1.5 million, support for the older buildings with the greatest energy saving potential have the greatest cost-effectiveness measured in NOK/kWh. A grant of NOK 1.5 million will provide an expected energy efficiency cost of NOK 0.3 kWh in an office building that is from before 1950, compared with NOK 2.3/kWh in a similar building from 1998 or later.

The survey of grant applicants maps the energy rating the buildings had when the projects contacted Enova:

89) Enova's annual report for 2012.
90) Reply letter from Enova of 8 May 2015.
91) The measures: weatherising of roofs and ceilings underneath cold attics, weatherising of floors/floor dividers, weatherising of exterior walls with associated sealing and replacement of windows with associated sealing.

Table 13 Energy status for the buildings at time of application (N = 905 projects that have registered an application in Enova's application system in the period 2010–2015)

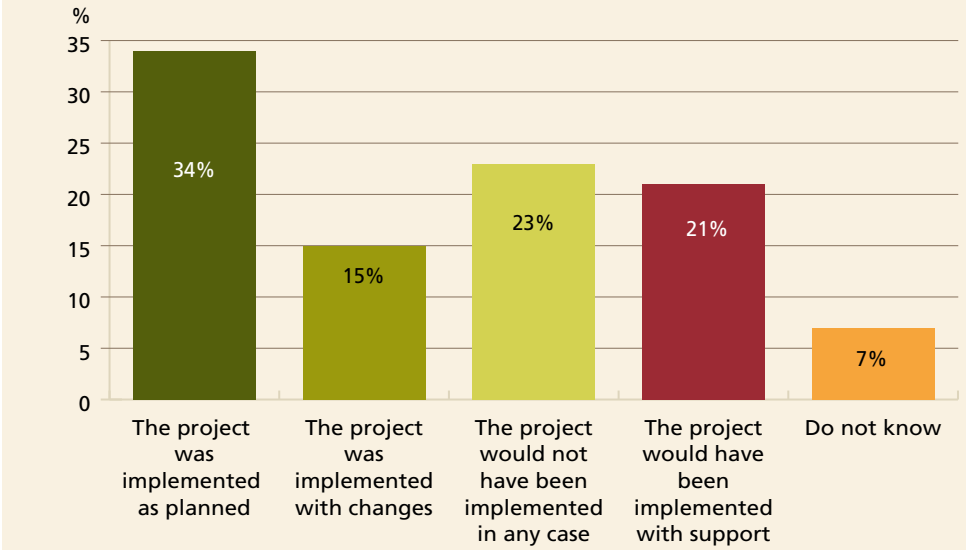
Energy rating?	Grant recipients (N = 477)	Non-grant recipients (N = 428)	Difference
A – best rating	0.2	0.9	–0.7
B – above the energy requirements in the Building Code Regulations (TEK 10)	1.9	1.9	0.0
C – on par with the energy requirements in the Building Code Regulations (TEK 10)	3.6	3.3	0.3
D – about par with the energy requirements in the Building Code Regulations (TEK 10)	8.8	4.4	4.4
E – below the energy requirements in the Building Code Regulations (TEK 10)	12.2	12.6	–0.5
F – well under the energy requirements in the Building Code Regulations (TEK 10)	15.3	18.7	–3.4
G– poorest rating	6.1	11.9	–5.8
Widely varying energy rating for different buildings	19.3	8.2	11.1
Do not know which energy rating the building had	32.7	38.1	–5.4
Total	100%	100%	

Source: Survey of grant applicants.

Table 13 shows that the buildings that do not receive support from Enova, have on average a poorer energy standard than the buildings that receive support. The percentage of buildings that do not receive support is 10 percentage points higher, and at the time of application have an energy status corresponding to the three poorest energy ratings (E, F and G) compared with the buildings that receive support.

The survey of grant recipients maps what would have happened with the projects if Enova had not granted support. Eighteen per cent of the projects would have been carried out as planned, even without support from Enova. Forty-three per cent of the projects would have been carried out with modifications, if the support had not materialised. Twenty-four per cent of the projects would not have been carried out without support from Enova, while 15 per cent responded they do not know whether the project would have been carried out without support.

Figure 4 Mapping of status of projects that did not receive grants from Enova (N = 415 projects with commenced application or that have had their application rejected)



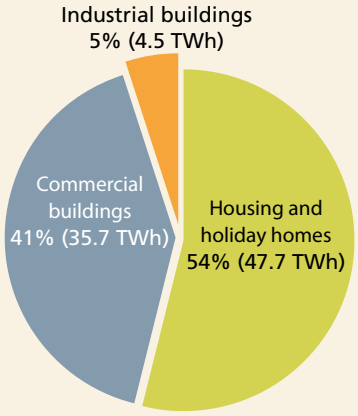
Source: Questionnaire survey to grant recipients

Figure 4 shows that most of the projects were not dependent on support from Enova, but that every fifth project that has not received support would have been realised if they had received support.[92] Enova's own evaluation of the programme in 2014 underscores that there may be potential to trigger more projects. The evaluation points out that there are several commenced, uncompleted applications that potentially can trigger support. A lack of competence among applicants and the structure of the application system are highlighted as reasons why potential applicants do not complete the application process.[93]

4.2.2 Enova's contribution to reduced energy consumption in housing

Figure 5 shows that of the total energy consumption in buildings of 87.9 TWh in 2013, housing accounted for 47.7 TWh, i.e. 54 per cent.[94]

Figure 5 Energy consumption in buildings in 2013, divided by building type



Source: E-mail from Statistics Norway, 2 June 2015.

92) Eighty of 87 have not applied. The remainder (7) have been rejected.
93) Enova (2014) *Tidligevaluering program – Støtte til eksisterende bygg [Early evaluation programme – Support for existing buildings] (in Norwegian)*.
94) However, energy consumption per square metre was greater in commercial buildings.

The Arnstad Group's report points out that the new construction rate in Norway only amounts to 1–2 per cent per year, and that the scope of total rehabilitation is at a similarly modest level. In the short term it will therefore be crucial to implement measures in existing buildings. Here, private dwellings constitute the major segment – and challenge. The report estimates that, with implementation of the measures proposed by the working group, it would be realistic to achieve a saving of 10 TWh per year, of which 8 TWh/year will have to be obtained in the existing buildings.[95]

Box 4 The Arnstad group's report

In September 2009, the Ministry of Local Government and Regional Development appointed a working group (the Arnstad Group) to provide input to an action plan for energy efficiency in the housing and construction sector. The Group was asked to submit proposals for targets and necessary measures for achieving the targets, both for new and existing buildings. The report was submitted to the Ministry on 23 August 2010.

Source: Arnstad Group report

The White Paper on Building Policy refers to the conclusion of the Arnstad report – that there is great potential for saving energy in existing buildings, and that about 60 per cent of this must be saved in homes. Enova's barrier study calculates the potential for energy efficiency by upgrading all homes to today's energy requirements (TEK 10) to 13.4 TWh, of which 2.4 TWh applies to profitable measures where the energy costs will cover the investment costs.[96]

Follow-up of the Storting's request decision

In its recommendation to the report on Norwegian climate policy in 2012, the majority of the Standing Committee on Energy and the Environment pointed out that buildings are being replaced very slowly, which means that the potential for energy efficiency in buildings cannot be realised through requirements for new buildings and major renovations alone.[97]

The majority point out that as at 2012, Enova has a model-based grant scheme for selective energy measures aimed at households, and that beyond this the minimum threshold for triggering support from Enova is an energy result of 100,000 kWh per year. According to the majority, this means that Enova's measure funding is intended for use in commercial buildings and housing cooperatives/co-ownerships.[98] The majority presented the following proposal:

"The Storting requests the Government to put forward a proposal to the Storting with instruments that help trigger significant energy efficiency and energy conversion from fossil fuels to environmentally friendly sources in private households."[99]

In Proposition to the Storting 1 S (2013–2014), the Ministry of Petroleum and Energy states, as a follow-up to the request decision, that the Government present instruments that contribute to "triggering substantial energy conversion, including energy efficiency measures in households."

95) *Energieffektivisering av bygg – en ambisiøs og realistisk plan mot 2040* [Improving energy efficiency of buildings – an ambitious and realistic plan forward to 2040] (in Norwegian), Arnstad Group report, August 2010, page 23.
96) *Potensial- og barrierestudie: energieffektivisering i norske bygg* [Potential and Barrier Study: Energy efficiency in Norwegian buildings] (in Norwegian), Enova report 2012:01.
97) Recommendation to the Storting 390 S (2011–2012), page 20, cf. Meld. St. 21 (2011–2012) *Norsk klimapolitikk*, white paper on Norwegian climate policy.
98) Recommendation to the Storting 390 S (2011–2012), page 20.
99) Recommendation to the Storting 390 S (2011–2012), Ministry of Petroleum and Energy, page 20 and page 29, decision VI.

The Storting has asked the Government for instruments to help trigger considerable energy efficiency measures in private households. Photo: OAG

In the follow-up, Enova's housing programme was restructured in 2013 and 2014 pursuant to Enova's agreement with the Ministry of Petroleum and Energy. The Ministry of Petroleum and Energy informed the Storting that the new agreement with Enova means that the focus on energy efficiency in existing commercial buildings and homes will be great in the years ahead.[100] In an interview, the Ministry stated that Enova *does not* provide significant support for improving the energy efficiency of existing homes, but still believes that the market for residential buildings is both large and important to the overall energy efficiency. The Ministry points out other measures that are better adapted to this market, such as Enova's information activities.

New instruments vis-à-vis existing homes from 2013 are Enova's energy advisory service and Enova's Support for Ambitious Upgrading scheme, respectively. Furthermore, in 2014, Enova established a new grant scheme for energy efficient new buildings, and launched a new grant – the Enova grant – from January 2015.

Enova grants for energy advice

The target group for grants for energy advice is private homeowners, who live in detached, semi-detached or undetached houses.[101] Enova provides up to NOK 5,000 in support for homeowners who want to engage a qualified energy adviser. Qualified energy advisers are listed in Enova's register of advisers. The background for the support for energy advisers is that profitable projects are often not implemented because homeowners lack information about their own energy consumption, and how much energy can be saved through such measures and their cost. In addition to increasing the level of knowledge among homeowners, the purpose of the scheme is to point out solutions that can contribute to a comprehensive upgrading of the residence.[102] The energy adviser energy labels the home and prepares a detailed action plan for the homeowner.

100) Proposition to the Storting 33 S (2012–2013), Ministry of Petroleum and Energy, page 10.
101) The term housing covers all types of dwellings. The White Paper on Building Policy uses the term residential building. The Norwegian State Housing Bank explains that the term housing is a collective term for all types of dwellings and includes single-family homes, semi-detached homes, row houses, blocks etc.
102) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, page 143.

The target group for grants for upgrading homes is private homeowners who live in detached, semi-detached and undetached homes. Photo: © Lene Elizabeth Hodge

Enova's support for comprehensive (ambitious) upgrading of housing
The grant for comprehensive upgrading of housing is up to NOK 120,000 and is offered to homeowners who want to carry out an ambitious and comprehensive energy upgrading of their home with a significant reduction (at least 30 per cent) of heat loss and energy need in line with the detailed action plan from the energy advisory service.[103]

The Ministry emphasises that this programme is not intended for the mass market, but is primarily aimed at homeowners who want to go the extra mile and implement measures that could be a role model.[104] The programme is meant to challenge the construction industry to try out ambitious solutions. The target group for grants for upgrading homes is private homeowners who live in detached, semi-detached or undetached houses.

In a reply letter, Enova says that Support for Upgrading of Housing is the only scheme Enova has for households (individuals) which provides support for measures in the building shell.

The Federation of Norwegian Construction Industries (BNL) points out that Enova's Support for Comprehensive Upgrading of Housing scheme is a highly ambitious scheme that requires high investment costs. BNL believes the programme is most applicable for homes that are in such poor condition that they must be completely renovated, with upgrades of windows, ceilings, floors and facades, which according to BNL applies to very few homes in Norway.[105] The Bellona Foundation points out that the costs of implementing an upgrading of housing is high, and that few homeowners

103) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, page 143.
104) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, page 144.
105) Reply from BNL, 27 March 2015.

are qualified to undertake this.[106] The BNL's viewpoint is that in order to do something about the large volume, it is necessary to have instruments that are directly targeted at the residential segment, i.e. the incremental measures that homeowners prefer.[107]

Norwegian Technology pointed out in an interview that Enova must trigger large volumes with grants in order to show good results, and therefore believes that support for housing is given lower priority. In an interview, SINTEF Building and Infrastructure stated that support for housing is not prioritised, and points out that energy measures provide small gains on a house-by-house basis.

The Ministry has asked Enova to report separately on the results for the household sector. Enova's annual reports for 2013 and 2014 show that since the grant schemes for energy advice and upgrading of housing were created in 2013, a total of 875 homeowners have received support for energy advice in homes, of which 13 per cent (113) continued to the next stage and received support to upgrade their home. Considering that there are approximately 2.3 million residential buildings in Norway, the Support for Comprehensive Upgrading of Housing scheme has reached about 0.005 per cent of the country's residential buildings.

Enova points out that relatively considerable support is required to trigger projects for homeowners, and refers to the agreement with the Ministry of Petroleum and Energy stating that the management of the Energy Fund must be cost-effective.[108] Consideration of cost-effectiveness, compared with the Energy Fund, limits the amount that may be granted in support per kWh.[109] In an interview, the Ministry of Petroleum and Energy pointed out that it is more cost-effective to extract energy efficiency gains in the commercial buildings market. Energy efficiency measures in individual homes provide significantly lower results per krone.

In the Ministry of Petroleum and Energy's comments on the report, the Ministry states that:

> "Even programmes with limited scope may then have a great impact. The programme for comprehensive upgrades is, relative to Enova's overall activity, small in scope. It is a relatively new programme, and it is too early to rule out that it could have a considerable effect on the market."

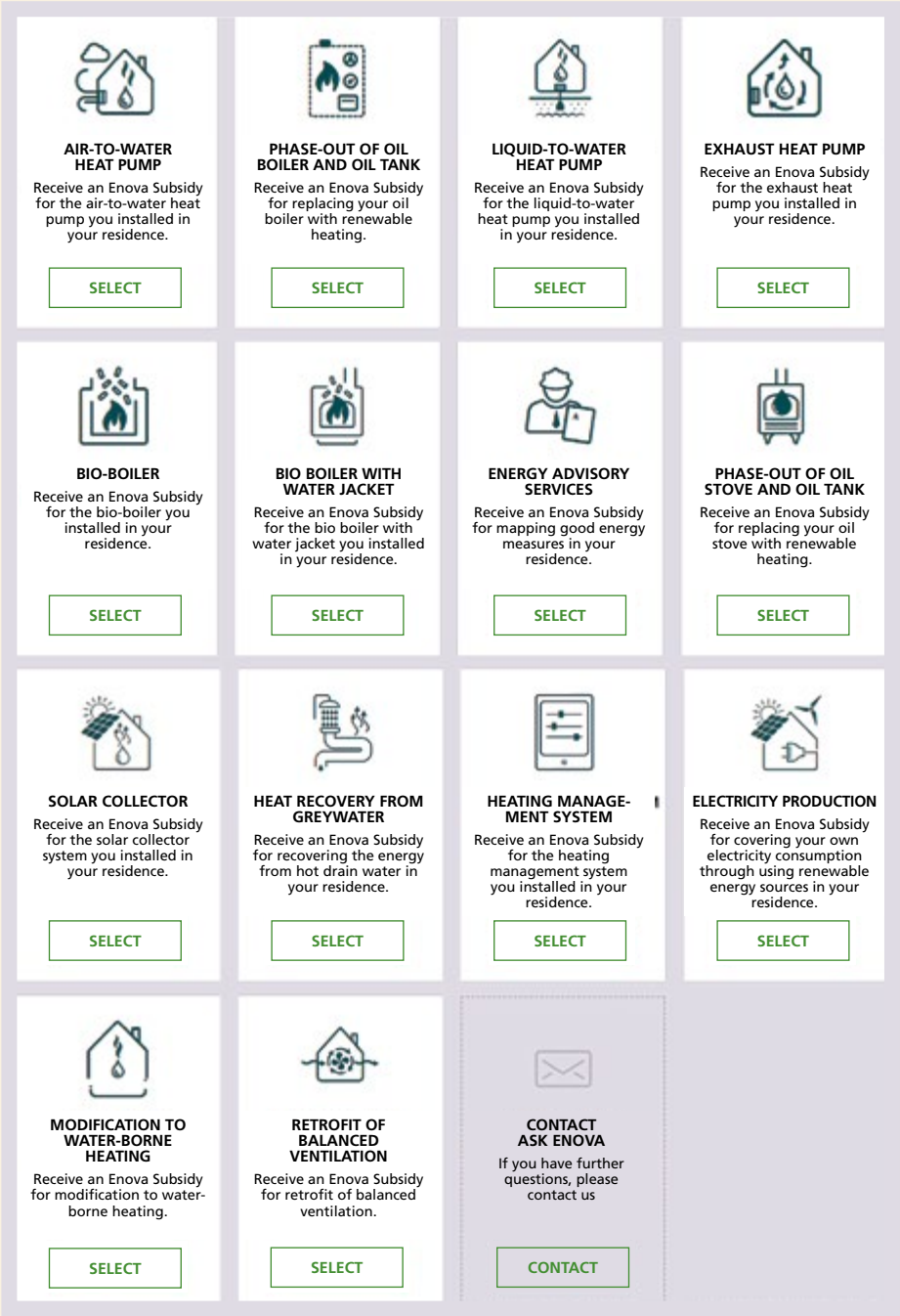
Focus of Enova grants

In its comments on the report, the Ministry of Petroleum and Energy points out that for many years Enova has had a support scheme for individual measures in private households. The Ministry also states that this scheme from 2015 was amended and extended to a limit of NOK 250 million annually.

The Ministry's data concerns the so-called Enova grant, launched in January 2015 as a rights-based support scheme where homeowners can get support for certain energy measures in the home without having to apply for support. Enova describes the scheme as a right for all homeowners to get back money for a number of energy measures in the home. The Enova grant currently covers 14 different energy measures, after two further measures were included in June 2015. The measures are illustrated in Figure 6 on the next page.

106) Reply from the Bellona Foundation, 27 March 2015.
107) Interview with BNL, 11 December 2014.
108) Item 8 of the agreement between the Ministry of Petroleum and Energy and Enova SF: "The funds from the Energy Fund shall be managed in a manner that ensures that assigned tasks are performed as cost-effectively as possible."
109) Reply letter from Enova of 8 May 2015.

Figure 6 Measures under the Enova grant



Source: Enova

Enova states that among the measures under the Enova grant only "Grants for Energy Advice" is aimed at measures in the building shell.[110] This measure is related to "Support for Upgrading of Housing" in the sense that the homeowners who want to invest in a comprehensive upgrade of their residence with ambitious energy targets can apply for support for energy advice about this.

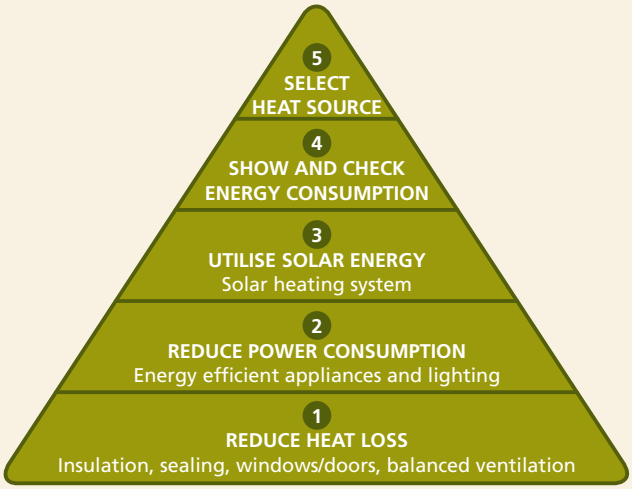
In an interview, the Ministry of Petroleum and Energy pointed out that in line with the management model, it is up to Enova to consider which measures should be included

110) Reply letter from Enova of 8 May 2015.

in the new scheme. The Ministry also points out that measures aimed at the housing market are basically not competitive compared with measures aimed at the commercial buildings market.

Enova points out in its reply letter that it is often very profitable to carry out traditional measures in the building shell, such as replacement of windows, weatherising walls and ceilings, and that these measures therefore do not qualify for support from Enova. Figure 7 shows the order in which measures to save energy should be conducted for them to be as effective as possible.

Figure 7 The Kyoto pyramid



Source: Enova and the Low Energy Programme

Enova recommends that homeowners first reduce heat loss in the building, cf. the Kyoto pyramid's first (lowest) step,[111] but does not support such measures unless they are part of a rehabilitation of the dwelling.

In the survey, the Bellona Foundation and the Federation of Norwegian Construction Industries were asked to clarify the extent to which the measures under the Enova grant are energy efficiency measures capable of reducing energy consumption. The views are nearly the same. Both responses[112] were given while the Enova grant consisted of 12 measures (January 2015). In June 2015 it was expanded by two more.

In the opinion of the Bellona Foundation, the Enova grant includes marginal measures for energy efficiency/energy reduction in buildings. Bellona points out that energy conversion measures are mainly supported, rather than measures to reduce energy consumption in existing buildings. BNL relates that the measures covered by the Enova grant concern technical measures such as energy conversion and new production, with the exception of heat recovery of greywater and management systems. BNL points out that energy conversion/production does not primarily provide energy efficiency, but is important for switching from fossil fuels to renewable energy sources. BNL provides this overview of what the various measures entail besides the Energy Adviser measure:

111) The Kyoto pyramid specifies a general procedure for reducing energy consumption in buildings.
112) Response from the Bellona Foundation, 27 March 2015 and BNL, 21 May 2015.

Enova grant:
1 Air-water heat pumps: energy supply
2 Liquid-water heat pumps: energy supply
3 Exhaust heat pumps: energy supply
4 Removal of oil boiler and tank: energy supply
5 Removal of oil stove and tank, energy supply
6 Biostove with water jacket: energy supply
7 Bioboiler: energy supply
8 Solar collector: energy supply
9 Heat management system: energy efficiency
10 Heat recovery of greywater: energy efficiency
11 Electricity production: energy production

Five of the measures under the current Enova grants were previously supported through the "Energy Measures in Housing" scheme.

In its 2014 annual report, Enova states that it supported about 4,600 housing energy measures in 2014. When it comes to what kind of measure this is, the report states on page 33: "The vast majority of applications and decisions are linked to energy measures in housing with more than 4,600 applications and almost 4,500 decisions. Phasing out oil boilers accounted for more than 40 per cent of the decisions, followed by support for central management systems with more than 20 per cent." In 2013 it was reported on p. 59: "In 2013, most applications and the decisions were linked to energy measures in housing with more than 7,000 applications and 6,900 decisions. Phasing out oil boilers accounted for about 1/3 of these decisions."

Enova states in its reply letter that all of these measures involve energy conversion, and notes that building shell measures are covered by the Support for Upgrading Housing grant. The Bellona Foundation points out that the phasing out of oil boilers is important for preparing households and commercial buildings for the Climate Agreement's ban on heating with fossil fuel from 2020, but stresses that the transition from fossil fuels to renewable heating solutions primarily involves energy conversion rather than energy efficiency that provides a reduction in energy consumption in buildings.[113]

Switching to triple glazed low-energy windows is one of the most effective single steps to reduce energy consumption.

Photo: Natural Building Technologies

Enova points out that measures relating to energy conversion represent a significantly simpler investment decision than measures that affect energy efficiency. To reduce the total energy need and improve the dwelling's ability to retain heat, Enova recommends the following five simple steps as the most effective:[114]

1) Weatherise.
2) Switch to triple glazed low-energy windows.
3) Install heat management system.
4) Replace source of heat.
5) Switch to the power-saving equipment.

113) Reply from the Bellona Foundation, 27 March 2015.
114) http://www.enova.no/radgivning/privat/energismarte-rad-for-din-bolig/gammel-boligfor-1987/148/0/

In an interview, the Ministry of Petroleum and Energy pointed out that Enova is not supposed to provide grants for measures in buildings which by themselves are profitable, as weatherisation often is. Energy savings from changing windows and weatherising walls can, according to the Ministry, not justify the costs alone, but when windows or wall-cladding have to be replaced anyway, it will often pay to do this in an energy-efficient manner. While support is not given to such measures, information here about opportunities and energy-efficient solutions is essential according to the Ministry. The Ministry states that it is concerned with energy efficiency due to energy supply considerations.

Building associations (housing cooperatives and co-ownerships)

Building associations, housing cooperatives and co-ownerships cannot apply for support for energy reduction measures through the Enova grant or support for comprehensive upgrading. Building associations must apply to the programme "Support for Existing Buildings", where the possibilities are:

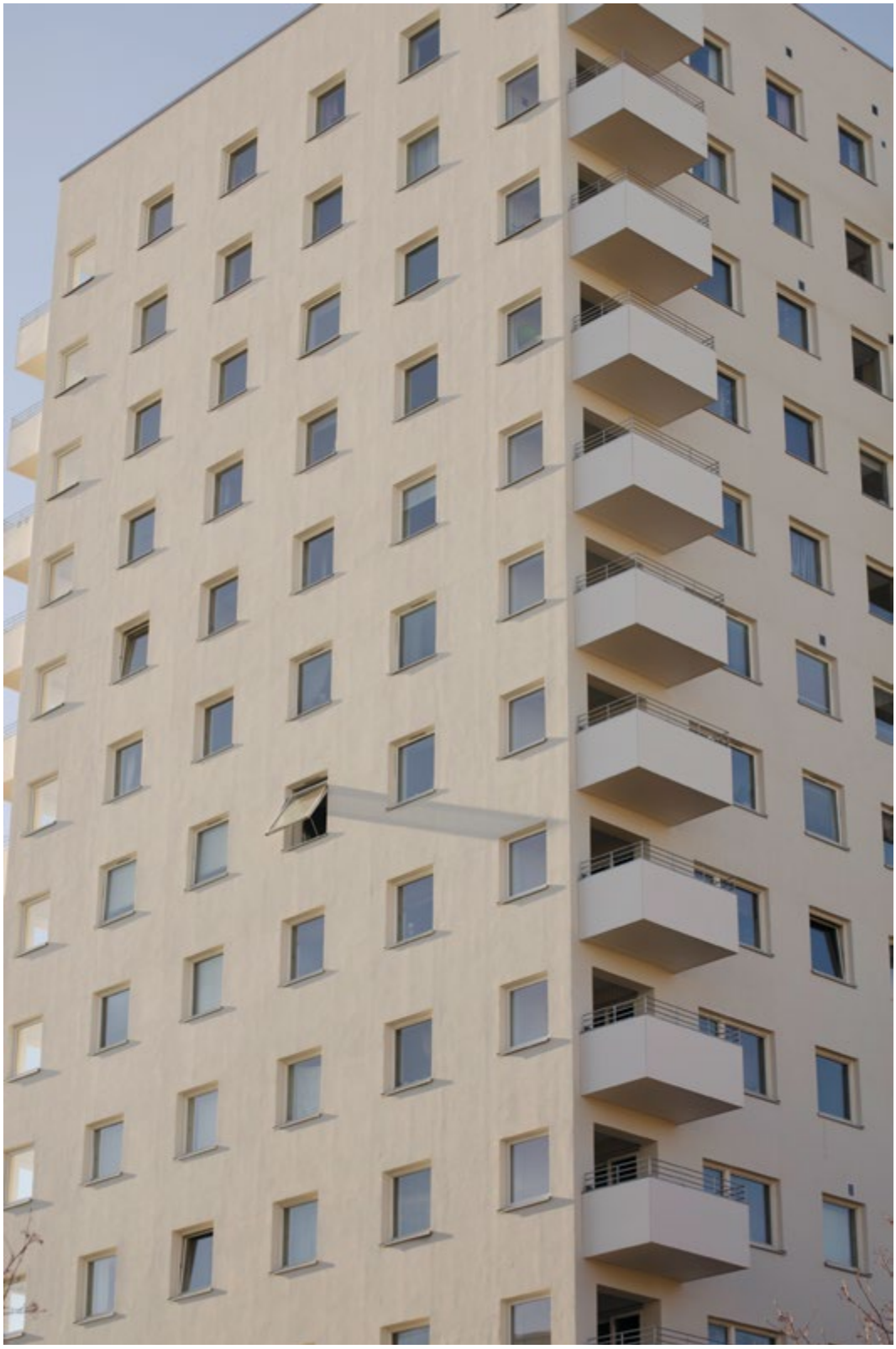
- Mapping support for existing buildings: Housing cooperatives and co-ownerships can get support from Enova to identify investments in energy measures. For housing cooperatives, the offer is aimed at cooperatives and co-ownerships with a minimum of 10 housing units. The results of the survey can in turn be used to apply for support for investments through the programme *Support for existing buildings*.
- Support for existing buildings: This is Enova's grant scheme for enterprises/commercial buildings and housing cooperatives, where housing cooperatives can also obtain support for upgrading that reduces energy consumption.
- Support for heating plants: Housing cooperatives can get investment support for heating plants that produce renewable energy.

There are few applications for support from housing cooperatives. According to Enova, this is due to demanding decision-making processes in building associations in connection with upgrading projects.[115] Registry data from Enova shows that in the period 2004–2014, 72 building associations have been granted support from Enova and the support amounts to a total of NOK 60 million.[116] For the last three years the number of building associations that have been granted support have been 10, 9 and 22, respectively.

In an interview, the Norwegian Federation of Cooperative Housing Associations (NBBL) pointed out that the building associations are obliged to apply for mapping support for existing buildings, and compete for support for existing buildings against other registered enterprises (professional commercial building actors). According to NBBL this means that housing cooperatives and collective residential buildings fall in practice outside Enova's grant schemes. NBBL describes the extent of support for building associations from Enova as miniscule, and deems this to be the reason why housing cooperatives do not prioritise energy efficiency activities, and instead prioritise other investments that provide higher quality of living.

Among building associations that completed the application in the period 2010–2014, 20 per cent received a rejection compared with 10 per cent of commercial building applicants. Enova notes that building associations generally have fewer resources and less competence available than the professional actors within commercial buildings when they prepare applications for Enova, which affects how thorough and quality assured the applications are.

115) Reply letter from Enova of 8 May 2015.
116) Four of these have been cancelled.



Enova receives few applications for support from housing cooperatives. Photo © Lene Elizabeth Hodge

4.2.3 The Norwegian State Housing Bank's basic loan as an instrument for energy efficiency in buildings

The Norwegian State Housing Bank's basic loan can fully or partially finance construction of new homes, upgrading of existing homes, or, in a few cases, purchases of housing.

To obtain basic loans, projects must meet housing quality requirements in the areas of universal design, environment and energy.[117]

The quality requirements for the basic loan are more stringent than the requirements of the planning and building regulations. These include increased demands for wall, window and heat recovery, and for energy consumption in blowers and the like, and the requirements primarily apply to measures in the building shell itself.[118]

By meeting the quality requirements, Norwegian State Housing Bank borrowers receive an interest rate advantage compared with borrowers in the private market. The Housing Bank's lending rates are directly linked to the state's own borrowing terms, which are lower than what private banks provide.[119]

The Norwegian State Housing Bank can provide basic loans for financing both new construction and renovation of existing buildings. Photo: seier+seier

117) The Ministry of Local Government and Modernisation, letter to the OAG of 25 August 2015.
118) The Norwegian State Housing Bank (2014): *Veileder for Husbankens grunnlån* [Guidelines for the Norwegian State Housing Bank's basic loan] (in Norwegian), page 13.
119) Proposition to the Storting 1 S (2014–2015), Ministry of Local Government and Modernisation, page 164.

In an interview, NBBL stated that the Housing Bank's basic loan is a favourable loan, and therefore an important element for part of the activity on the rehabilitation side. According to NBBL, the offer is nevertheless used far less today than previously by their members. NBBL believes that this is partly due to the perception that the regulations are too complicated to deal with.

Effects of the Norwegian State Housing Bank's basic loan for energy consumption measures

The Norwegian State Housing Bank can provide basic loans to finance both new construction and renovation of existing buildings. Basic loans for renovation amounted to about 10 per cent of the total loan amount from 2009 to 2014, and approximately 90 per cent of all basic loans issued have gone to building (new construction). During the same period, the share of homes that received basic loans for renovation, constituted on average 34 per cent, and the percentage of homes that received basic loans for construction, has been 66 per cent.

New construction

According to Statistics Norway, 102,909 homes have been built in the period 2011 to 2014. Loans from the Norwegian State Housing Bank have partly financed 20,286 new homes.[120] According to the Housing Bank, new construction partly financed with basic loans, has an energy performance that is above the current regulatory levels (TEK10).[121] Housing Bank-financed homes constitute about 20 per cent of the total completed housing stock.

In an interview, the Housing Bank stated that the increased energy requirements as a criterion for the basic loan provide an estimated reduced energy need as shown in Table 14. These are potential savings. The actual savings depend both on the building actually being built as agreed with the Housing Bank, and on how the dwellings are used.

Table 14 Reduced energy needs as a result of energy requirements in order to receive basic loan

	Regulatory requirements		Basic loan requirements		Reduced energy consumption
	kWh/m² / year	kWh/year	kWh/m² / year	kWh/year	kWh/year
Detached home 150 m²	130	19 500	106	15 900	3 600
Block flat 80 m²	115	9 200	90	7 200	2 000

Source: Response from the Norwegian State Housing Bank to additional questions, 31 March 2015

Based on the Housing Bank's information on reduced energy consumption, an estimate can be made of maximum annual energy savings for the basic loan scheme as a whole. In order to use the reduced energy need data from Table 14 for all of the 20,286 residences that have received basic loans for construction during the period, all of these dwellings are divided into two groups: above and below 100 m^2. Dwellings under 100 m^2 will on average have an annual reduced energy need equal to the block flat of 80 m^2, i.e. 2,000 kWh. Dwellings larger than 100 m^2 will have an annual reduced energy need equal to that of the detached home, i.e. 3,600 kWh. Basic loans were issued to 15,164 homes under 100 m^2, and 5,122 homes larger than 100 m^2.

120) Statistics on basic loans for new construction 2009–2014.
121) Statistics Norway (2015) http://www.ssb.no/218789/bygg-sette-i-gang-og-fullforte-bygg.bustader-og-bruksareal-til-bustad.bruksareal-til-anna-enn-bustad-sa-390

This means that the direct contribution to reduced energy need from the basic loan for new construction from 2011 to 2014 is calculated to be 0.05 TWh/year. This corresponds to the annual energy consumption of more than 2,400 households.[122]

Renovation
In the period from 2011 to 2014, the Housing Bank provided basic loans to renovate 10,759 residential units.[123] To provide basic loans for renovation the Housing Bank requires as a general rule that the improvements feature significant elements of both universal design and environment/energy measures. General maintenance, rehabilitation and renovation work will not be enough to obtain basic loans.[124] Major renovation/upgrading must be carried out to obtain basic loans to improve housing.

The Housing Bank's annual report for 2014 stated that of the 3,345 housing units that were issued basic loans for renovation, 411 (12 per cent) met energy requirements in line with the Housing Bank's basic loan. Although these properties do not meet the energy requirement, the Housing Bank sets for new construction, the energy efficient effect can be significant, particularly because existing buildings may have a low energy standard to begin with.

The Federation of Norwegian Construction Industries (BNL) believes that while the basic loan works very well for new construction, it is not working for existing individual homes. The Housing Bank does not provide support for incremental measures. However, the Housing Bank may be a very good tool for those who want to carry out a major rehabilitation, but they are few in number according to BNL.[125]

In its comments on this report, the Ministry of Local Government and Modernisation writes that the Housing Bank can accept support for incremental upgrades, but has not actively stimulated it.[126] This may explain why it is little known among the actors in the sector that the Housing Bank can contribute to incremental upgrading.

Oversight of the actual energy status of buildings partly financed with basic loans
The checking the Housing Bank does to see whether the energy efficiency requirements are actually met is marginal. Spot checks which are supposed to include a sample of about five per cent in each region are carried out. The spot checks are carried out by inspection, but it is difficult to detect non-conformance in some areas, such as deviations from the air leakage number requirement. The Housing Bank does not check air leaks/heat efficiency with own measurements.

The Housing Bank notes that the requirements for energy-efficient solutions to obtain basic loans are stricter than the requirements of TEK10. According to the Housing Bank, the basic loan has therefore played a major role in making it possible to tighten the energy requirements in TEK10.

122) Given a consumption of 20 230 kWh per household (Statistics Norway 2014).
123) Statistics on basic loans for upgrading 2009–2014.
124) Norwegian State Housing Bank (2014) *Veileder for Husbankens grunnlån* [Guidelines for the Norwegian State Housing Bank's basic loan] (in Norwegian), Item 3.2.
125) Interview with BNL.
126) Ministry of Local Government and Modernisation, letter of 25 August 2015.

4.3 What is the significance of central government information and advisory measures for energy efficiency in buildings?

The Low Energy Commission's report emphasises that energy efficiency is largely a question of attitudes and knowledge, and that comprehensive information work aimed at users and building owners is therefore important.[127] According to the Arnstad Group's report, there is a need for massive motivation and information measures to trigger action. The report emphasises that information about energy efficiency is especially important for private homeowners who manage the bulk of the existing building stock.[128]

4.3.1 Central government information and advisory measures

Enova, the Norwegian State Housing Bank, Norwegian Water Resources and Energy Directorate (NVE) and Norwegian Building Authority are referred to in the White Paper on Building Policy as important state expertise and advisory bodies. All of these actors have information duties and activities aimed at the end user side, i.e. building owners and users. The information activities are closely aligned with the other instruments and energy efficiency grant programmes administered by the agencies. Information and expertise on the supply side are also important. Here, the Low Energy Programme is the key instrument, as a collaboration between the authorities and the construction industry.[129] Another information and competence-related instrument aimed at the construction sector is the Housing Bank's competence grants.

4.3.2 Enova's information and advisory measures

Enova's website and information helpline Enova Answers are Enova's main information and advisory instruments. Enova also prepares guides, brochures and reports that provide considerable information both about investments and support options.

Enova Answers

Enova Answers is a nationwide information helpline for energy questions from households. The helpline handles questions about energy efficiency in general, questions about Enova's support programme, and also questions about NVE's Energy Labelling Scheme. Enova considers Enova Answers to be its main instrument for information and advice.[130] Enova notes that the service annually answers approximately 40,000 questions from private and business customers and from suppliers. Enova believes on this basis that the effect of the service is good.[131]

"Enova Answers" fields around 40,000 questions per year. Photo: plenty.r.

TNS Gallup's 2011 survey concludes that user satisfaction with Enova Answers was high. Among private customers, 77 per cent reported that they were quite satisfied or very satisfied with Enova's ability to provide good information. About as many business customers responded the same. The survey was conducted as telephone interviews with 300 individuals and 300 businesses who were among those who had been in contact with Enova Answers via telephone.

127) *Energieffektivisering: Del I Hovedrapport* [Energy efficiency: Part 1 Main Report] (in Norwegian), Low Energy Commission, June 2009.
128) Arnstad Group report, pages 38 and 53.
129) Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 47.
130) Reply letter from Enova of 8 May 2015.
131) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, pages 143–144.

TNS Gallup's 2014 survey, which is part of Enova's housing programmes, also confirms high user satisfaction. The main impression of Enova's energy advice is very positive or quite positive among 65 per cent of respondents. Seventy per cent stated that Enova's information via Enova Answers was quite or very useful. The survey was conducted among homeowners who have sought support through Enova's housing programmes and among energy advisers who have been engaged by homeowners in connection with energy plans. The survey's respondents were obtained from Enova's application centre. A total of 2,864 invitations were sent and 31 per cent submitted answers.

Enova's website

In TNS Gallup's *Evaluering av boligprogrammer* [Evaluation of housing programmes] (2014), 82 per cent of homeowners cited Enova's website as the main information source about what Enova offers, and 83 per cent reported that the website was either very or quite useful. The information on the website is linked to Enova Answers with a green number, e-mail and the option for advice through "Chat with Enova." The information places additional emphasis on old detached homes, and makes a distinction between those who are planning an ambitious upgrading, and those who are not willing to undertake major measures, but still want to reduce the homes' energy needs.

Energy adviser for ambitious measures

The purpose of this measure is to increase the level of knowledge among homeowners about their own energy consumption and point out solutions that can contribute to a comprehensive upgrade of the dwellings.[132] The energy adviser's duties are to conduct inspections, energy label the dwelling, give advice and prepare a plan for upgrading. In its reply letter, Enova points out that upgrading (rehabilitation) of a dwelling requires major investments and is a complex project. Enova therefore believes that the homeowner should get an advance assessment of the project and a commitment of support before these projects are commissioned.

Information barrier

On assignment from the Norwegian Building Authority, TNS Gallup conducted a survey in 2013 on knowledge of regulations and grant schemes in the construction area.[133] The survey covered 530 homeowners, 100 commercial building owners, 200 chairmen of co-ownerships and 170 property managers across the country. The report that was prepared in connection with the survey summarises that knowledge about the regulations, including regulations about energy consumption, is lowest among individuals. It also shows that knowledge of grant schemes is relatively low among all owner groups, apart from the knowledge of Enova's grants for energy efficiency (measured against knowledge of the Norwegian State Housing Bank's basic loan, Directorate for Cultural Heritage grants to listed buildings, etc.). Enova's system is known by a high percentage of owner groups and is the best known grant scheme in all groups, but awareness of this scheme is also lowest among homeowners (64 per cent). The sample of respondents was drawn from the Gallup Panel.[134]

In TNS Gallup's Evaluation of Enova's housing programmes (2014), users were asked about their overall impression of Enova's information and assistance related to the support programme for energy advice. As regards the overall impression of the energy

132) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, pages 143–144.

133) *Eierundersøkelsen 2013, Hovedrapport* [Owner survey 2013, Main report] (in Norwegian), Norwegian Building Authority, 17 December 2013.

134) The Gallup Panel is a database of members who are willing to participate in surveys. The panel is assembled in a manner to ensure that its members are the most representative of Norway's population.

counselling service, just over half responded that their overall impression was positive, while 19 per cent had a negative opinion.

Enova states that lack of knowledge and awareness of energy efficiency measures in a number of studies have been found to be a major barrier to energy efficiency, and that information and advice are appropriate instruments to lower this barrier.[135] Enova believes that the information barrier is still high, and points out that this is one of the reasons for Enova's grants for energy advice for homes. Enova points out that the goal of this grant is to develop both the demand and supply side in the residential segment, and that it is aimed at lowering the information barrier.

4.3.3 NVE's Energy Labelling Scheme

The intention of the Energy Labelling Scheme

The purpose of the Energy Labelling Scheme is to help secure information on the energy status of buildings and provide information about whether it is possible to improve the energy status. The intention of the scheme is to generate increased interest in and encourage the implementation of specific energy efficiency measures.

NVE has developed an online energy labelling system that automatically generates energy performance certificates based on information about the building. The energy performance certificate is composed of an energy rating, a heating rating and a list of possible energy efficiency measures. The energy performance certificate consists of an energy label, showing the building's energy standard.[136] At July 2013, in excess of 300,000 energy performance certificates had been issued and by the end of March 2015 about 488,000 energy performance certificates were registered. In a letter, NVE emphasised that in its five years of existence the scheme has made it possible to obtain a large number of energy performance certificates for homes in a short time, and believes that the scheme has led to increased focus on improving energy efficiency in buildings.

NVE believes that the Energy Labelling Scheme is an important part of the authorities' instruments, including regulatory framework, Enova's and the Norwegian State Housing Bank's schemes and information activities, but underlines that the Energy Labelling Scheme is only one of several instruments, and an indirect one as such. NVE has no knowledge of the scheme's impact on the development of energy consumption in buildings, and states that this has not been examined.[137]

Information about the Energy Labelling Scheme

The drafts for the energy labelling regulations call for compliance with the energy labelling to be ensured through good information both about the obligation that will be introduced, and about the benefits of implementing energy labelling and energy assessment. The information would create a demand for energy performance certificates in purchase and leasing situations. The Ministry of Petroleum and Energy allocated resources for the scheme and has also funded information measures about the scheme.

While NVE has carried out an information campaign about the scheme, it believes that more information efforts are required to ensure greater compliance. In addition to a guide to the regulations[138] that was prepared in 2012, NVE prepared two expert tuto-

135) Reply letter from Enova of 8 May 2015.
136) Proposition to the Storting 1 S (2013–2014), Ministry of Petroleum and Energy, pages 64 and 147.
137) Letter from the Norwegian Water Resources and Energy Directorate of 8 May 2015.
138) Veileder [Guide] 5/2012 (in Norwegian), Norwegian Water Resources and Energy Directorate.

rials in 2013 which are intended for experts who carry out energy labelling[139] and energy assessments.[140]

Besides guides, the target groups for energy labelling are offered assistance through the information helpline Enova Answers, which NVE purchases from Enova and Enova receives expert support from NVE when difficult questions are received.

TNS Gallup's survey from 2015 showed that the energy labelling regulations are relatively well known, but that knowledge of them varies to some extent among different groups. For example, only 34 per cent of individuals state that they know of the regulations, while 93 per cent of professional building owners report that they are aware of them.[141]

The obligation related to energy labelling

NVE points out that the labelling requirement for housing is triggered by sales, leasing or new construction. NVE has no overview of how many homes have been subject to mandatory labelling during this period, but believes the number is obviously far short of the potential. Similar rules apply to commercial buildings, but these have a number of exemptions.

NVE states that while there is considerable uncertainty about the number of commercial buildings subject to mandatory labelling, the share that is labelled is in any case less than for housing. According to NVE, the cause of the uncertainty about the number of commercial buildings subject to mandatory labelling is that the statistics for commercial buildings are harder to prepare than the statistics for housing, which in turn is due to the exemption provisions for professional buildings. NVE has not given priority to preparing statistics for this.[142]

NVE points out that while the labelling obligation for housing can be met quickly and cheaply, energy labelling for commercial buildings represents a substantial cost in that the building owner must usually hire a consultant.[143]

The labelling obligation for homes is triggered by sales, leasing or new construction

Illustration: NVE

In an interview, the Ministry of Petroleum and Energy stated that the most important information measure vis-à-vis the housing market is good measurement of energy consumption, along with information about the price of energy. According to the Ministry, the main impact of the information is that the homeowner learns how much he or she can profit from energy efficiency.

4.3.4 The Norwegian State Housing Bank's information and competence measures

The Norwegian State Housing Bank's basic loan – information and marketing

TNS Gallup's survey, which was commissioned by the Norwegian Building Authority in December 2013, showed that about 14 per cent of private homeowners are familiar

139) Veileder [Guide] 5/2013 (in Norwegian), Norwegian Water Resources and Energy Directorate.
140) Veileder [Guide] 7/2013 (in Norwegian), Norwegian Water Resources and Energy Directorate.
141) *Eierundersøkelsen 2013, Hovedrapport* [Owner survey 2013, Main report] (in Norwegian), Norwegian Building Authority, 17 December 2013.
142) Letter from the Norwegian Water Resources and Energy Directorate of 22 May 2015.
143) Veileder [Guide] 7/2013 (in Norwegian), Norwegian Water Resources and Energy Directorate.

with the basic loan, while about 50 per cent within the housing cooperative/co-ownership, business community and municipalities groups know about the basic loan.[144]

In an interview, the Norwegian State Housing Bank stated that the scheme is little known, and states that if there had been active, ongoing marketing of the product, the basic loan could have had a much larger market share than it has today. The framework established by the Storting limits this, according to the Housing Bank.

The Housing Bank refers to the evaluation by Proba Research, which was commissioned by the Housing Bank in the period from July to December 2014.[145] The evaluation concluded that the opportunities to use basic loans for renovation are under-communicated, that information about the basic loan is insufficient, and that the guidelines, guides and information on the Housing Bank's website are not very specific and sometimes difficult to understand. A more active strategy for information and promotion would probably increase the amount of applications.

The evaluation of Proba Research distinguishes between information and marketing. The Ministry of Local Government and Modernisation refers to the report's recommendations, which point out that there is currently:

> "(...) Very little marketing of the scheme compared with commercial lending schemes. There are no advertising campaigns, and the Housing Bank's website contains relatively little explicit information about the benefits." The explanation in the report is that "among other things, the Housing Bank does not want to compete (too actively) with the private market to finance construction and renovation."

In an interview, the Housing Bank stated that its information activities are limited to the website, and that the Housing Bank does not conduct special marketing beyond this. The Ministry of Local Government and Modernisation stated in an interview that the Housing Bank's role in information and advisory services is primarily associated with the financial instruments, where the Housing Bank in part assists applicants by providing information and input to the projects.

The Ministry points out that demand for loans from the Housing Bank in recent years has been greater than the borrowing limit. The Ministry therefore believes that there has not been a need to strengthen marketing of the loan schemes in general. However, the Ministry has wanted to better exploit the potential for the Housing Bank's basic loan for improving existing housing stock, and notes that the report from Proba Research gives recommendations on how this can be done. According to the Ministry, the renovation loan is among the priority objectives within the borrowing framework and supplements Enova's programmes aimed at existing buildings.

The Norwegian State Housing Bank's competence grants

The Housing Bank also has a competence grant for sustainable housing and building quality that will contribute to increased information and competence on the supply side (building industry). In an interview, the Housing Bank pointed out the competence grant, which in part has been applied to knowledge development, sharing best practices and pilot and prototype projects. The Housing Bank notes that it has provided competence grants to several projects with energy efficient upgrading as a goal. In recent years it has focused more on existing buildings. The Housing Bank considers that the competence grant has helped network building and contact between the actors who work at the forefront of changes and improvements. The Housing Bank

144) TNS Gallup's survey concerned the basic loan in general, including basic loans for renovation.
145) *Utbedring av eksisterende boligmasse* [Improving existing housing stock] (in Norwegian), Report 2014 – 16, Proba Research.

The Norwegian State Housing Bank has provided competence grants for several projects with energy-efficiency upgrading as a goal.

Photo: Tõnu Mauring

also points to the importance of dissemination of the knowledge acquired in the model projects that receive competence grants. Information about the projects will be entered in a separate database that will be compiled. This highlights the best that has been achieved within energy rehabilitation and should stimulate others to undertake new construction that goes beyond current requirements.

In an interview, the Ministry of Local Government and Modernisation stated that the purpose is primarily to build and disseminate expertise that can enable the actors to trigger greater efficiency gains. The Ministry believes that it is not appropriate to measure the effect of this grant in kWh, and points out that the funds for the measure are relatively modest. The Housing Bank's annual report for 2013 states that the scope of the grant is NOK 16.6 million and that NOK 6.6 million of this is allocated to environment/energy-related projects.[146] The annual report for 2014 states that the overall allocation of competence grants for sustainable housing and building quality in 2014 totalled NOK 39.7 million.[147] The annual report for 2014 does not have figures for how much of these funds were spent on energy efficiency measures.

4.3.5 Norwegian Building Authority

The Norwegian Building Authority administers regulations and a key task is to provide regulatory guidance, particularly to the construction industry, municipalities, and building materials market. The Authority has a helpline, and can be contacted about current interpretations of the Planning and Building Act and its related regulations (TEK10). The Authority reports that many of the requests it receives are from municipalities. In an interview, the Authority emphasised that guidance vis-à-vis the municipalities is not closely tied to the energy rules. According to the Authority, it does not field many questions about energy over the phone, but receives some email enquiries about energy issues. The enquiries come largely from professional actors who contact the Authority during the design phase.

146) Norwegian State Housing Bank (2014) – Annual Report 2013, page 56.
147) Norwegian State Housing Bank (2015) – Annual Report 2014, page 57.

The Authority's website is the main channel for the Authority's guidance and dissemination of how the regulations should be understood. On its website, the Authority states that its mission is to be a resource centre for municipalities, and that it annually hosts a dedicated conference for municipalities.

The Authority emphasises that its information duties are limited to guidance on regulations and its understanding of them.

The Authority states that it has not initiated joint information campaigns, but it has an ambition to provide information beyond that relating to the regulations, and to collaborate on information with the other actors to circulate information more efficiently. According to the Authority, it is a challenge to link information between different entities, such as NVE, the Energy Labelling Scheme, the Norwegian State Housing Bank, Enova and the Norwegian Building Authority.

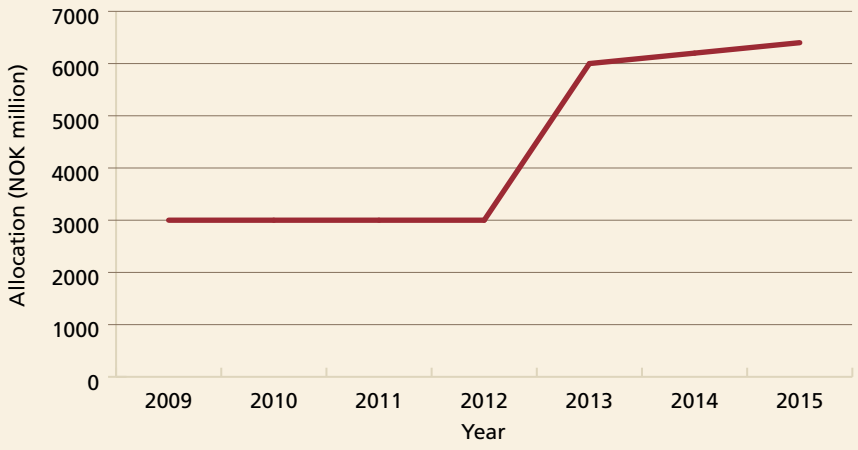
4.3.6 The Low Energy Programme

Under the Low Energy Programme (2008–2017) the state collaborates with the construction industry with a view to increasing competence in the construction industry about energy-efficient construction.

The Low Energy Programme is headed by a steering committee consisting of representatives from the Federation of Norwegian Construction Industries (BNL), Arkitektbedriftene in Norge (Architect firms in Norway), Enova, the Norwegian Building Authority, the Norwegian State Housing Bank, Statsbygg (the Directorate of Public Construction and Property) and NVE (the Norwegian Water Resources and Energy Administration).

The state budget for 2015 proposes allocating NOK 6.4 million to the programme. Figure 8 shows the allocations from 2009 to 2015.

Figure 8 Appropriations to the Low Energy Programme 2009–2015



Source: Proposition to the Storting 1 S (2009–2010), (2010–2011) and (2011–2012), Ministry of Petroleum and Energy, as well as Proposition to the Storting 1 S (2012–2013), (2013–2014) and (2014–2015), Ministry of Local Government and Modernisation.

As the figure shows, the appropriations for the programme have totalled about NOK 3 million each year in the period from 2009 to 2012, and have since been about

NOK 6 million.[148] The Low Energy Programme was transferred to the Ministry of Local Government and Modernisation from the Ministry of Petroleum and Energy in 2013. The Ministry of Local Government and Modernisation is responsible for coordinating the programme, and the Norwegian Building Authority reports to the Ministry on the use of funds under the programme.

Challenges and competence needs

The Low Energy Commission's report on energy efficiency emphasises that good competence among suppliers of goods and services is as important as good competence among users and building owners.[149]

In its reply letter, Enova points out that the main challenges relating to competence in the construction industry are tied to the actual implementation and the industry's role as an adviser to households and others. Enova emphasises that those parts of the construction industry in direct contact with households/building owners, often wield considerable influence on the solutions that are selected, such as the upgrading of housing. Enova therefore believes that it is important that this part of the industry is skilled at communicating and implementing good energy efficiency measures.

According to the Norwegian Building Authority, the main challenge is to get know-how about energy efficiency across to executors on all levels, and to get customers to demand expertise. The White Paper on Building Policy states that the challenge related to competence is great, partly because the construction industry is fragmented and extensive, see Box 5:

Box 5 The construction, building and property industry (the BAE industry)

Employment in the construction, building and property industry is spread among approximately 75,000 businesses. In 2010, the industry employed almost 340,000 people, i.e. approximately 13 per cent of total employment in Norway. A consistent feature is the many small firms. Seventy-five per cent of companies have an annual turnover of less than NOK 4 million, and 97 per cent of all firms in the industry have fewer than 20 employees. The industry includes building and homeowners and builders who place orders for new or rehabilitated buildings, architectural firms and consulting engineers who develop, plan and design building projects, and executing building trades firms and contractors.

Source: Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, pages 13 and 25-26.

Box 6 Competence challenges in the construction industry

Quality must be raised at all levels in the construction industry. This applies to those who place orders for buildings, the designers, those who work at the construction site, and those who manage the building when it is completed. Greater competence at all levels is one of the main challenges facing the construction industry in coming years.

Source: Meld. St. 28 (2011–2012), *Gode bygg for eit betre samfunn*, white paper on good buildings for a better society, page 35.

Impact of Low Energy Programme

Surveys

Commissioned by the Low Energy Programme, Respons Analyse conducted a survey in spring 2012 of the construction industry to measure the level of knowledge among

148) Proposition to the Storting 1 S (2009–2010), (2010–2011) and (2011–2012), Ministry of Petroleum and Energy, as well as Proposition to the Storting 1 S (2012–2013), (2013–2014) and (2014–2015), Ministry of Local Government and Modernisation.

149) *Energieffektivisering: Del I Hovedrapport* [Energy efficiency: Part 1 Main Report] (in Norwegian), Low Energy Commission, June 2009, page 71.

The Low Energy Commission's main priority for the period is to work to raise competence in energy rehabilitation of buildings, with a main emphasis on dwellings. Photo: © Torbjørn Tandberg / Low Energy Programme

tradesmen.[150] Those interviewed were ventilation installers (60), carpenters (177), plumbers (135), electricians (125) and other relevant building tradesmen (104). The survey showed that skills among many of the respondents varied and were inadequate in some areas, and that more than 70 per cent of the tradesmen wanted more expertise in energy efficiency in existing buildings. A similar survey published in 2014 showed that the challenges were still large, while expertise had increased somewhat. A survey among *architects and consulting engineers* revealed similar findings.[151]

The importance of the programme

According to BNL, which sits on the steering committee that heads the programme, the Low Energy Programme has provided a professional boost. The main outcome of the target of more energy efficient buildings has been information, courses and course materials that the programme has developed. BNL believes that, with greater allocations, the programme could accomplish more in terms of dissemination and implementation. BNL states that demand has been less than expected and shows that the industry's size and fragmented structure make it a challenge to get the message out.[152]

Enova, which also sits on the steering committee, believes that the construction industry has been able to utilise the opportunities afforded by the Low Energy Programme to a limited extent, and that the competence challenges in the construction industry therefore remain great. Enova emphasises that competence challenges represent a major barrier that must be lowered if the target of reducing energy consumption in buildings is to be reached. [153]

150) *Kjennskap og kunnskap om lavenergi og passivhus. Undersøkelse i byggenæringen* [Familiarity with and knowledge about low-energy and passive buildings. Survey in the construction industry] (in Norwegian), April 2012.
151) *Kjennskap og kunnskap om lavenergi og passivhus – undersøkelse blant arkitekter og rådgivende ingeniører* [Familiarity with and knowledge about low-energy and passive buildings. Survey among architects and consulting engineers] (in Norwegian), Low Energy Programme, 2012.
152) Interview with and reply letter from BNL, 27 March 2015.
153) Reply letter from Enova of 8 May 2015.

The Norwegian Building Authority states that it is difficult to measure whether the Low Energy Programme has boosted competence in the construction industry[154] and the Ministry of Local Government and Modernisation stated in an interview that no quantified performance measurements had been made of the programme. The Ministry emphasises that a number of reports and evaluations show that competence challenges in the construction industry are considerable and believes that the fundamental challenges are the same today as they were five years ago.

The SINTEF Building and Infrastructure report *Boligeieres beslutningsprosesser ved oppgradering* (2014) [Homeowners' decision-making processes in connection with upgrades] concludes that the continuing low level of knowledge in the construction industry is one of the biggest barriers to energy upgrading of housing. The study is based on eight case studies of upgraded detached homes, a quantitative survey among Mesterhus companies and information from three in-depth interviews.[155]

The Low Energy Commission's strategy for the period 2013–2015 verifies that the level of knowledge about effective energy rehabilitation measures is generally low in the construction industry. A main priority for the Low Energy Commission for the period is to work to raise expertise about energy rehabilitation of buildings, with an emphasis on housing. The desire is to enable the tradesmen to provide advice about, promote and choose building technology solutions which also have an impact on energy consumption. The strategy states that the construction industry of the future must have good expertise about the energy efficiency of buildings if society is to transition to a low-energy society.

154) Response from the Norwegian Building Authority, 30 March 2015.
155) SINTEF 2014 *Boligeieres beslutningsprosesser ved oppgradering*, [Homeowners' decision-making processes in connection with upgrades] (in Norwegian), page 29.

5 To what extent do the Ministry of Petroleum and Energy and Ministry of Local Government and Modernisation fulfil their responsibility for coordinating instruments for energy efficiency in buildings?

5.1 The need for coordination and coordination measures

In the letters of allocation for 2011, the Norwegian State Housing Bank and the Norwegian Building Authority[156] were commissioned by the Ministry of Local Government and Modernisation[157] to review the instruments for increasing energy efficiency in buildings together with Enova and NVE to assess the need for better coordination of these instruments. The result is in the form of a memo enclosed in a letter from the Housing Bank to the Ministry of Local Government and Regional Development.[158] Also enclosed with the letter from the Housing Bank is a letter from Enova stating that it does not wish to participate in the process. The reason is that they have not received a similar mandate in their allocation letter from the Ministry of Petroleum and Energy.[159]

The memo points out that coordination of the agencies' instruments can contribute to greater and faster goal achievement in the work on energy efficiency, and it presents 16 possible measures for coordination, including collaborative meetings and pooling of information campaigns aimed at joint target groups.

Box 7 Example of coordination proposal

JOINT INFORMATION: The private and professional actors within the construction industry are the target group for a number of information activities within many different construction-related subjects. Due to the many different messages, information flows are complex and confusing at times. With regard to energy efficiency, it will therefore be expedient to coordinate information from the agencies.

Potential action 14: Each year, the agencies prepare an electronic brochure that shows the agencies' instruments and the relationship between them in a transparent manner.

Potential action 15: The agencies coordinate information campaigns aimed at joint target groups.

Source: *Samordning av virkemidler på energiområdet* [Coordination of instruments in the energy area] (in Norwegian), appendix (issue memo) to the Norwegian State Housing Bank's letter of 10 May 2011.

5.1.1 The Norwegian State Housing Bank

In an interview, the Norwegian State Housing Bank related that it has not participated in any formal process for following up the proposals in the collaboration memorandum from 2011. According to the Housing Bank, work continues on the following proposals from 2011:

- annual collaboration meetings (the Norwegian State Housing Bank, Enova and Norwegian Building Authority)
- work on unified communication
- coordination of campaigns aimed at joint target groups

156) Formerly the National Office of Building Technology and Administration
157) Formerly the Ministry of Local Government and Regional Development (KRD).
158) *Samordning av virkemidler på energiområdet* [Coordination of instruments in the energy area] (in Norwegian), Norwegian State Housing Bank's letter of 10 May 2011.
159) *Arbeid vedr samordning av virkemiddelapparatet* [Work concerning coordination of the funding agencies] (in Norwegian), letter of 6 April 2011 from Enova SF to the Norwegian State Housing Bank.

The Housing Bank believes that while the current need for coordination is still as described in the memo from 2011, there has been a good climate of cooperation between the Housing Bank and Enova. The need for coordination is still there, but the basis for being able to achieve something together is better. The Housing Bank has initiated a coordination agreement with Enova.[160] The agreement was signed in 2013 and means that the Housing Bank and Enova have agreed to the following:

- *develop a shared understanding* of how the Housing Bank and Enova together can contribute to a rapid spread of ambitious projects for energy efficiency in new and existing buildings
- *maintain a dialogue on* how Enova's and the Housing Bank's instruments can complement each other
- *improve interaction* between Enova's and the Housing Bank's instruments aimed at (for example) long-term systematic energy upgrades in existing buildings
- *collaborate on* marketing the Housing Bank's and Enova's instruments for housing cooperatives/co-ownerships and private residences, where this may yield synergies.

According to the Housing Bank, the status of the work on better coordination is that little has happened, and that this is a slow process. In an interview, the Housing Bank stated that the management dialogue between the Ministry of Local Government and Modernisation and the Housing Bank presents and discusses possible measures with regard to coordination challenges between other agencies and ministries.

5.1.2 Enova

Enova also points out the cooperation agreement with the Norwegian State Housing Bank, and believes that there has been good dialogue with the Housing Bank, particularly related to the use of instruments vis-à-vis housing cooperatives. Joint marketing material has been prepared, and the agencies have attended meetings for cooperative building associations and housing cooperatives with a joint presentation of the Housing Bank's and Enova's instruments.

Enova otherwise emphasises the following measures it believes strengthens coordination between Enova and NVE:

- Enova's Support for Energy Advisers and Support for Upgrading Housing are linked with the Energy Labelling Scheme
- Enova Answers handles issues related to NVE's Energy Labelling Scheme, which means that the market has a channel to pursue[161]

Enova also notes that the four-year agreement with the Ministry of Petroleum and Energy is also the most important management document for coordination. The agreement states the following on coordination:

"Enova shall have regular contact with and coordinate its activities with other authorities with significance for the restructuring." In the management of the funds Enova shall ensure good teamwork and clear boundaries with other relevant funding agencies" (Item 10 of the agreement).

The "restructuring" refers to the purpose provision of the agreement that Enova's and the Energy Fund's objective is to promote environmentally friendly restructuring of energy consumption and production and development of energy and climate technology. Energy efficiency is not mentioned in the purpose.

160) *Cooperation agreement between Enova SF and the Norwegian State Housing Bank for the period 2013–2015,* 25 September 2013.

161) Reply letter from Enova of 8 May 2015.

5.1.3 Norwegian Building Authority

The Norwegian Building Authority states that it has continuous cooperation with the Ministry of Local Government and Modernisation in the energy area, where coordination is one of many subjects. In an interview, the Authority furthermore stated that meetings are held with the Housing Bank when the two agencies have received an allocation letter to coordinate the Authority's and the Housing Bank's mission in the energy area. The Authority does not have regular meetings with Enova and NVE.

The Norwegian Building Authority states that it has not initiated joint information campaigns, but relates that this is something it could consider. Being able to link information between various agencies, such as NVE, the Energy labelling Scheme, the Housing Bank, Enova and the Norwegian Building Authority, to communicate information that all can benefit from is a challenge according to the Authority.

5.1.4 The Norwegian Water Resources and Energy Directorate (NVE)

NVE considers its collaboration with Enova and the Norwegian Building Authority to be good. NVE points out that Enova's information helpline can also be used as an information helpline for the Energy Labelling Scheme. According to NVE, this has saved resources and has provided better information to users than if NVE did this separately.

NVE also points out that Enova, in one of its grant schemes for homeowners (Support for Comprehensive Upgrading of Housing, OAG's comment.) utilises NVE's energy labelling system as a basis for processing applications. NVE sees this as good reuse of public investment, and as something that strengthens both actors' schemes and coordination between them.

NVE states that there is an open exchange of information with the Norwegian State Housing Bank. NVE wants the Housing Bank and Enova to make energy labelling and energy assessment a condition for public support.[162]

5.2 The ministries and coordination

In an interview, the Ministry of Local Government and Modernisation stated that some of the challenges from 2011 are handled today through formal agreements, while others are no longer relevant. The Ministry believes that the cooperation agreement signed in 2013 between Enova and the Norwegian State Housing Bank has led to a more uniform understanding between the two agencies. The Ministry therefore believes that coordination has improved since 2011.

The Ministry of Local Government and Modernisation emphasised at the same time that the Housing Bank and Enova have instruments that border each other. The Ministry points out that while the Housing Bank's instruments have a housing perspective, Enova's instruments are aimed at energy supply considerations and the reduction of greenhouse gas emissions.

According to the Ministry, there is a need for coordination with Enova on information; the agencies need to provide consistent and joint information to potential applicants and that administrative procedure is coordinated, for example by sending required documentation for grant schemes to one place only.

162) Reply letter from NVE of 8 May 2015.

A review of the Ministry of Local Government and Modernisation's allocation letter to the Housing Bank in the period 2010 to 2014 shows that the Ministry is focused on coordination issues related to improving energy efficiency in buildings.

The Ministry of Local Government and Modernisation states that it has a good and ongoing dialogue with the Ministry of Petroleum and Energy on issues relating to energy efficiency in buildings.

A review of the minutes from the Ministry of Petroleum and Energy's contact meetings with Enova in the period from 31 March 2009 to 15 March 2015 shows that coordination has not been a topic at these meetings. There are no minutes from meetings in recent years between the Ministry of Local Government and Modernisation and the Ministry of Petroleum and Energy, where coordination has been a topic.

The Ministry of Petroleum and Energy emphasises in comments to the report that there is close and regular contact between the Ministry of Petroleum and Energy and the Ministry of Local Government and Modernisation, and that the objective of the meetings has been to coordinate policy areas and view the instruments in context. The Ministry also notes that there have been several meetings between the ministries, together with the Housing Bank, the Norwegian Building Authority, Enova and NVE, where coordination of instruments has been a topic. In addition, the ministries meet frequently in connection with notification work, regulation work, development of statistics, etc.

The Ministry of Petroleum and Energy also emphasises that coordination was specifically mentioned in the agreement between the Ministry and Enova and that the assignment letter to Enova also contains guidance on coordination with other government agencies. The assignment letter states that Enova shall regularly liaise with and coordinate its activities with agencies including the Housing Bank and the Norwegian Building Authority.

In an interview, the Ministry of Local Government and Modernisation stated that the need for coordination is particularly large in the event of changes in instruments. The Ministry of Local Government and Modernisation related that it has had close and regular contact with the Ministry of Petroleum and Energy, in connection with the forthcoming changes in the Building Code Regulations. In an interview, the Ministry of Petroleum and Energy also noted that there has been dialogue between the ministries about the changes in the Building Code Regulations.[163]

163) Interview with the Ministry of Petroleum and Energy, 19 May 2015.

6 Assessments

A goal of Meld. St. 28 (2011–2012) *Gode bygg for eit betre samfunn* (the White Paper on Building Policy) is to substantially reduce energy consumption in buildings by 2020. This will be accomplished using legal and economic instruments, as well as information.

6.1 The statutory instruments for energy efficiency do not work for existing buildings

Buildings that were constructed before the current energy requirements were introduced in 2010 make up most of the current building stock. The new construction rate represents only 1–2 per cent per year. This means that energy efficiency in existing buildings will therefore be entirely essential in order to reach the goal of significantly reduced energy consumption in 2020. The energy requirements for new construction will only have an impact over the long term, leading up to 2040.

The audit shows that the regulatory energy requirements act to a limited extent as an instrument for improving energy efficiency in existing buildings. The audit shows that ambiguities concerning which measures are covered by the term general renovations, contribute to the regulations' marginal application in existing buildings.

The audit also shows that the authorities do not know the extent to which energy requirements are complied with, and that a majority of municipalities do not supervise compliance. The audit also shows that most inspections of energy requirements consist of document supervision, and that physical measurement of the heat efficiency of buildings is rarely carried out. Mandatory independent controls shall also be carried out on buildings, where, among other things, energy requirements, including heat efficiency, shall also be checked. An independent inspector is not required to measure the building's heat efficiency. Documentation of a completed heat efficiency inspection is sufficient. Measuring heat efficiency is crucial for ascertaining whether energy requirements are met. The design of the municipalities' oversight and compulsory independent inspection is not suitable for determining whether the energy requirements in the Building Code Regulations have been met.

6.2 Economic instruments for energy efficiency have little impact on reducing energy consumption in buildings

6.2.1 Enova's grants for commercial buildings have limited effect

Enova's financial support schemes are crucial policy instruments for energy efficiency in buildings, and aim to contribute toward a significant reduction in energy consumption by 2020. The purpose of the schemes is to help trigger projects that would otherwise not have been implemented, and provide the highest possible energy results per krone in grants, within specified limits. During the period 2005–2014 the projects under the grant scheme received roughly NOK 2.2 billion.

Enova estimates that the energy efficiency effect of the grant scheme for commercial buildings is 3.3 TWh per year, which corresponds to 9.3 per cent of overall energy consumption in commercial buildings. This is an estimate of energy efficiency that

follows from measures implemented in the buildings, and is based on theoretical standard values, not actual measurements.

The effect analysis in the audit calculates the effect that Enova's grant scheme for commercial buildings has had on energy consumption in the buildings, based on actual measured energy consumption. The analysis shows that the scheme has limited effect on overall energy consumption in commercial buildings. On average, the measures lead to a reduction in energy consumption per square meter of 16 kWh/m², which corresponds to two per cent of the energy consumption during the year before the application was submitted to Enova.

Enova's grant scheme for commercial buildings has existed since 2005, and therefore falls partially outside the period of the audit. Nevertheless, the audit shows that if the result from the investigation is used for the entire period from 2005 to 2014, the grant scheme has had a total effect that amounts to an overall reduction in energy consumption of 0.68 TWh per year – 1.8 per cent of the energy consumption in commercial buildings.

Enova's execution of the requirement that the measures must be commercially unprofitable in order to trigger a grant, may explain why the scheme has a limited effect on overall energy consumption in buildings. Even if buildings have a significant potential for energy reduction, Enova will not disburse a grant if it considers the measures to be profitable for the owner.

The audit also shows that Enova only marginally exploits the opportunity afforded by the building statistics (ByggNett) to follow up whether contractual results are realised, and to monitor the effects of the grant scheme. As a consequence of this, there is little information concerning the effect of the grant scheme. If these data are not used, the reporting may be considered to be an unnecessary burden for the grant recipient.

6.2.2 Enova's focus on housing has little effect

Enova must support the development of more energy-efficient buildings, including existing buildings. The White Paper on Building Policy states that Enova's efforts toward energy efficiency must be reinforced in the years ahead.

The audit points out that in 2013, in response to a request from the Storting, the Ministry of Petroleum and Energy presented the instruments it believes will contribute to a significant improvement in energy efficiency in private households. In this connection, the Ministry informed the Storting that there would be a major investment in energy efficiency in both residential and commercial buildings in the coming years.

The audit shows that Enova's focus on housing has very little effect as an instrument for influencing energy consumption in homes. Established in 2013, the scheme *Support for Comprehensive Upgrading of Housing* is hardly used. This is Enova's grant scheme for homeowners who want to carry out substantial measures in order to significantly reduce energy consumption in their home. Enova's annual reports for 2013 and 2014 show that since the scheme was established, only 113 people have received support to upgrade their home. Considering that there are approximately 2.3 million residential buildings in Norway, the Support for Comprehensive Upgrading of Housing scheme has reached about 0.005 per cent of the country's residential buildings. The Ministry of Petroleum and Energy points out that the programme is limited in scope and relatively new. The Ministry therefore believes that it is premature to rule out that it may have a significant effect on the market.

The audit furthermore shows that Enova lacks grant schemes for homeowners who want to implement individual measures in order to reduce energy consumption in their home without having to go the route of a comprehensive upgrade. The audit also shows that over the last three years, hardly any building associations (housing cooperatives and co-ownerships) have been granted support for upgrades that reduce energy consumption.

The White Paper on Building Policy points out that residences account for the majority of all energy consumption in Norwegian buildings, and that the majority of consumption cuts must therefore take place in residential buildings if the goal of a significant reduction in energy consumption is to be reached.

6.2.3 The Norwegian State Housing Bank's basic loan has limited effect

Basic loans are given for the erection of new housing and upgrades of existing homes. In order to qualify for a basic loan, the building must satisfy energy requirements which are more stringent than the requirements laid down in the Building Code Regulations.

The Housing Bank's basic loan has limited effect as a means of improving energy efficiency in housing. The audit shows an estimated contribution of about 0.05 TWh per year to reduced energy demand resulting from the Housing Bank's basic loan for new buildings.

Existing homes account for the bulk of energy consumption in the residential segment. Ninety per cent of basic loan funds are given to new construction, which has little impact on total energy consumption in the residential segment in the short term. The importance of the Norwegian State Housing Bank's energy requirements for new construction will be increasingly significant over the longer term, up to 2040 and beyond.

The audit shows that only 10 per cent of the total basic loan funds are used to rehabilitate existing buildings. As long as the Norwegian State Housing Bank uses a small share of its basic loan funds on upgrading, the scheme will, over the short term, have little effect as an instrument for energy efficiency.

6.3 Still a substantial need for information and more coordination on the information side

Enova, the Norwegian State Housing Bank, Norwegian Water Resources and Energy Directorate (NVE) and Norwegian Building Authority are important state purveyors of information. The audit shows that Enova is the primary source of information to the public about energy efficiency and other energy-related measures in buildings and that the Norwegian Building Authority restricts itself to regulatory guidance, without particular emphasis on the energy rules. Furthermore, the audit shows that there is a need for the NVE to bolster its information concerning the Energy Labelling Scheme in order to secure better compliance therewith.

As for Housing Bank's basic loan, the audit shows that it is not broadly known, and information about the scheme is unclear, scant and only marginally covers the aspect of energy efficiency.

Despite the fact that Enova's information activities on energy efficiency are extensive, homeowners still have a great need for information and advice in order to trigger investments.

Coordination of the agencies' instruments can contribute to increased and faster goal attainment in the work on energy efficiency. A range of instruments that includes more stakeholders and more types of schemes yields a need for coordination. The audit shows that the individual stakeholders preferably provide information about their own energy-related schemes, and there is a particular need for coordination of the information and advisory measures.

In 2011, the Housing Bank, Norwegian Building Authority and NVE undertook efforts to concretise and assess the need for coordination of energy efficiency instruments. This resulted in 16 proposed measures to improve coordination. The audit shows that while many of the measures were followed up to a marginal extent, work continues on several of them. This e.g. applies to the proposal concerning coordination of information campaigns directed at shared target groups.

The audit shows that there is a need for more coordination of information concerning the instruments. It is difficult for the individual to see how the instruments interact, and no public stakeholder compiles the information in a good manner. From a user perspective, it is crucial that it is not too complicated to obtain a good overview, and be able to see the connections between relevant instruments.

A cooperation agreement was entered into in 2013 between the Housing Bank and Enova. The agreement indicates that there is still a need for increased coordination on several points. In this agreement, the parties have decided that they will *develop a shared understanding* of how the Housing Bank and Enova together can contribute to a rapid spread of ambitious projects for energy efficiency in new and existing buildings, *maintain a dialogue on* how Enova's and the Housing Bank's instruments can complement each other, *improve interaction* between Enova's and the Housing Bank's instruments aimed at (for example) long-term systematic energy upgrades in existing buildings, and *collaborate on* marketing the Housing Bank's and Enova's instruments for housing cooperatives/co-ownerships and private residences, where this may yield synergies.

The audit shows that the two ministries generally agree that they have a good dialogue in coordination issues, and that coordination has improved in recent years. Both ministries emphasise as positive and significant the formal cooperation agreement entered into in 2013 between Enova and the Housing Bank.

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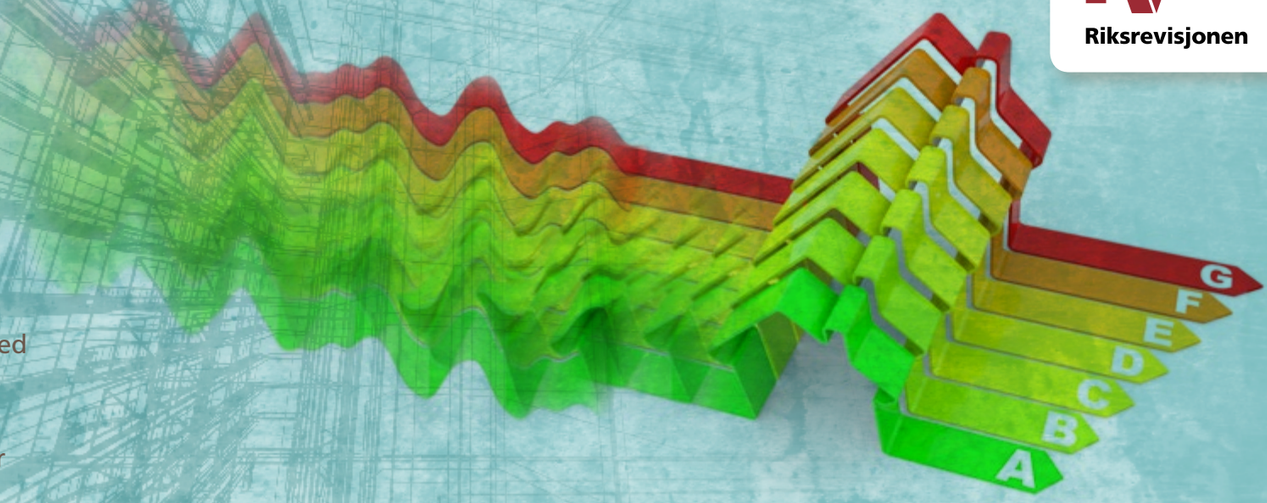
Document 3:4 (2015–2016)

The Office of the Auditor General's investigation of the authorities' work on energy efficiency in buildings



BACKGROUND AND OBJECTIVE OF THE AUDIT

According to the white paper on good buildings for a better society (Meld. St. 28 (2011-2012)), energy efficiency will contribute to reducing overall energy consump-tion in buildings and the high use of electricity in Norway during the winter season.

From 1990 to 2010, total energy consumption in Norway's nearly four million build-ings increased by 33 per cent. By 2020, energy consumption in buildings will be sig-nificantly reduced using statutory and economic instruments and with the help of information.

The aim of the audit was to illuminate the extent to which central government in-struments for energy efficiency are helping to reduce energy consumption in build-ings, and possible reasons for why the measures may have limited impact. The audit covers the period 2009–2015.

Findings and recommendations

The statutory instruments for energy efficiency do not work for existing buildings

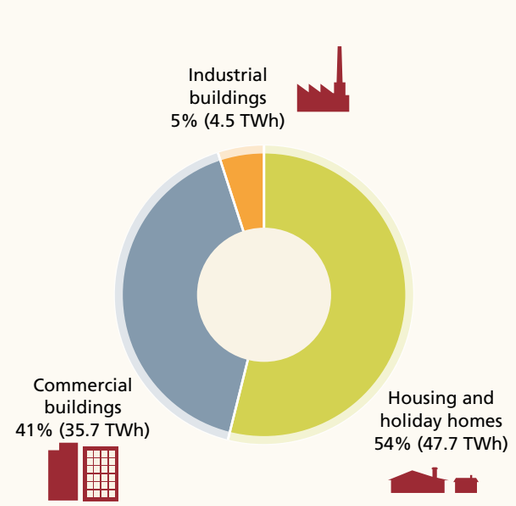
- The authorities have no knowledge about the extent to which energy requirements are complied with, and the majority of municipalities do not supervise compliance.
- Most oversight of energy requirements is document oversight, and physical measuring of heat efficiency in buildings is rare.

The Office of the Auditor General (OAG) recommends that the Ministry of Petroleum and Energy, in consultation with the Ministry of Local Government and Modernisation, intensify efforts to acquire knowledge of whether the energy requirements in the Building Code Regulations work and are complied with.

There is still a great need for information about energy efficiency, as well as more coordination

- The Housing Bank's basic loan is little known, and information about the scheme is unclear, scant and covers energy efficiency to a marginal degree.
- Enova's information activities on energy efficiency are extensive, but homeowners still have a great need for such information.
- There is a need for the Norwegian Water Resources and Energy Directorate to strengthen its information on energy labelling.

The OAG recommends that, in consultation with the Ministry of Local Government and Modernisation, the Ministry of Petroleum and Energy
- intensify its information campaign on energy efficiency, particularly for households, cooperatives and co-ownerships
- continue efforts to strengthen coordination between government agencies



Energy consumption in buildings in 2013, broken down by type of building

Housing accounts for the bulk of energy consumption in Norwegian buildings. Enova's and the Norwegian State Housing Bank's measures have little effect as instruments for reducing energy consumption in dwellings.

Economic instruments for energy efficiency have little impact on reducing energy consumption in buildings

- Enova's grants for commercial buildings have limited effect.
- Enova's focus on housing has very little effect as an instrument for influencing energy consumption in homes. Only 113 people have received support to upgrade their residence since the scheme was established in 2013. By comparison, there are approximately 2.3 million residential buildings in Norway.
- The Norwegian State Housing Bank's basic loan has limited short-term effect because only 10 per cent of the total basic loan funds are used for upgrading existing buildings. Existing homes account for the bulk of energy consumption in the residential segment.

The OAG recommends that the Ministry of Petroleum and Energy consider whether Enova's subsidy schemes actually reduce energy consumption in buildings, and improve reporting about this.

The OAG recommends that the Ministry of Petroleum and Energy, in consultation with the Ministry of Local Government and Modernisation, consider the focus of Enova's housing programmes and the Housing Bank's basic loan scheme.

Background and objectives for the audit.
Findings and recommendations.

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