enova

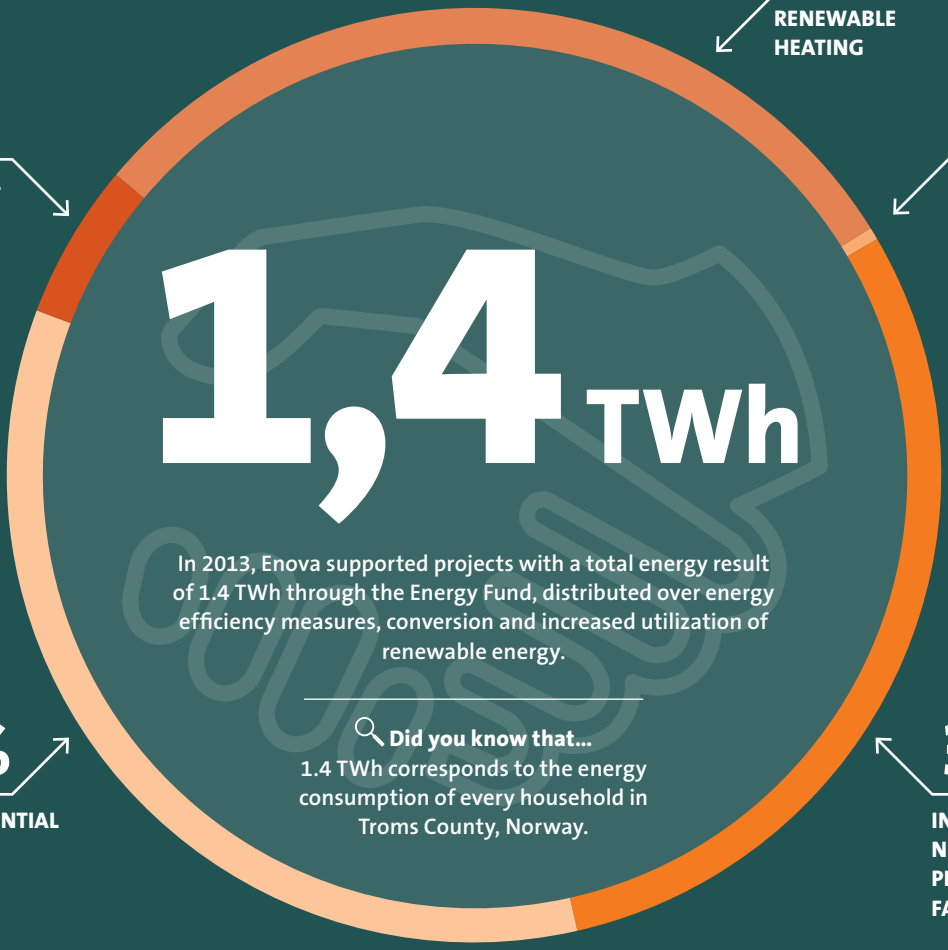
Annual report 2013

Content

Symbol key

- Investigated
- Advicing
- Graphs/tables
- Renewable
- New energy and climate technology
- Renewable heating
- Industry
- Financing
- Projects
- Interaction
- Non-residential buildings
- Resedential buildings

Key figures 2013



30%
RENEWABLE HEATING

5%
RESIDENTIAL BUILDINGS

1%
RENEWABLE POWER PRODUCTION

1,4 TWh

In 2013, Enova supported projects with a total energy result of 1.4 TWh through the Energy Fund, distributed over energy efficiency measures, conversion and increased utilization of renewable energy.

Did you know that...
1.4 TWh corresponds to the energy consumption of every household in Troms County, Norway.

34%
NON-RESIDENTIAL BUILDINGS

30%
INDUSTRY AND NON-INDUSTRIAL PLANTS AND FACILITIES

RENEWABLE HEATING
Enova will ensure renewable heating becomes the preferred heating method in Norway. Restructuring to renewable heating is an important measure for more climate-friendly use of energy in our country.

In 2013, 60 projects were supported by Enova.

INDUSTRY
Enova will contribute to a more climate-friendly and energy-efficient industry supplied with renewable energy. Enova works continuously to increase the pace of restructuring of energy end-use and energy production in the industry.

In 2013, 174 projects were supported by Enova.

NON-RESIDENTIAL BUILDINGS
Enova works to realize maximum energy efficiency potential in buildings. Enova supports market players that want to construct, renovate or operate the energy-efficient buildings of tomorrow.

In 2013, 583 projects were supported by Enova

RESIDENTIAL BUILDINGS
Enova provides advice and support for energy improvements in residential buildings. Support is provided both for constructing new buildings, as well as for upgrading existing residences.

In 2013, 484 projects and more than 6800 energy initiatives received funding commitments from Enova.

NEW TECHNOLOGY
New technology will solve the future's energy challenges. Enova supports market introduction of new technology and contributes investment support for market innovators.

In 2013, 19 projects received funding commitments from Enova.

Enova invests in energy and climate solutions

NILS KRISTIAN NAKSTAD
Chief Executive Officer

Never before has interest in implementing projects in collaboration with Enova been greater. For many, innovation and use of new energy and climate technology is the only natural choice. It is also the necessary choice to face the challenges posed by greenhouse gas emissions.

In development
In 2013, Enova launched new programmes and strengthened its own organization. We provide investment support through more than 20 programmes, about half of which are new or were renewed in 2013. The organization has been reinforced through stronger market orientation and specialization.

Results in 2013
We invested in 1350 new projects in 2013, with an overall energy result of 1.4 TWh. We are eager to see a higher energy result, but are very satisfied with the general activity level and the beginning of the new energy and climate technology focus.

The markets for Norwegian industries have been somewhat challenging and turbulent. Investments in mainland industries are relatively low, which is reflected in our results. One positive feature is a record number of projects from small industrial companies.

The results within renewable heating in 2013 were better than anticipated. Investments are particularly high within increasing expansion of existing district heating plants.

The largest result contribution came from non-residential buildings. Rehabilitation of existing buildings yielded the greatest energy results, while new building efforts have lower results and are more expensive.

We are very happy with the development in our programmes for passive houses and low energy buildings; from very few new passive houses being constructed in 2009 to 10 per cent of all non-residential buildings in 2013. The development was so robust that we discontinued support for new passive houses near the end of 2013. We believe the market will continue this development without our support.

Enova has expanded its programmes for households with support for energy advising and phasing out oil boilers, and launched a new subsidy programme for those utilizing the best solutions in the household market as well.

More projects were cancelled in 2013 than in previous years. The most affected markets were renewable heating and industry. A drop in power prices and turbulent industrial markets may have contributed to this. The largest cancelled project in 2013 came after Sødra Cell Tofte AS' plant on Tofte was wound up.

The Energy Fund received NOK 1.7 billion and pledged NOK 2.0 billion in 2013. The new allocations in the Primary Capital Fund (Climate Technology Fund) will not yield income to the Energy Fund until 2014. We advanced the new efforts by investing NOK 93 million in seven energy and climate technology projects in the industry.

Innovation and new technology
A red thread in Enova's development in 2013 is increased investments in introduction of new technology and innovation. Innovation in the markets consists of new technology, changed behaviour, new knowledge and new business models.

Enova stimulates such innovation, for example through efforts in energy management, energy advising and pre-project support. In technology projects we require the customer to have a business model for the new solutions before we become involved.

We strengthened our efforts vis-à-vis the oil and gas industry in 2013. We believe technology and knowledge from oil and gas can be transferred to projects in land-based industries and other areas in society. Enova has experience from such projects and believes this can be applied on a greater scope.

We strengthened follow-up and reporting in the technology projects. We believe there could be many valuable lessons to learn here on technology development and innovation processes, and believe it will provide us with ideas for further development.

Restructuring of energy end-use and energy production, scarcity of resources and greenhouse gas emissions
Our energy system is changing. New production is coming, new distribution is being developed and consumption is changing. A robust supply and efficient energy use are important for continued development of industry and value creation, and to reduce greenhouse gas emissions.

The global challenges associated with scarcity of resources and increasing greenhouse gas emissions are inching steadily closer. Increased renewable energy production and more efficient energy use are an important part of the solution.

In a Norwegian context, we cannot allow a good power balance and an expansive, oil-driven economy to keep us from action. The international markets want more renewable power and products that utilize resources efficiently, and leave a small climate footprint.

Enova contributes to green competitiveness.

Part 1

FINANCING
Enova's most important tool is the financing we provide to projects, whether they are major industrial projects, or smaller household measures.

ADVISING
Enova's second most important tool is the advice we provide to projects. It is given in a structured manner through our targeted programmes.

INTERACTION
Enova is a market team player. We contribute knowledge and capital for projects and enable more market players to realize their projects.

Enova's outlook

Green competitiveness

The message from the UN Climate Panel (Intergovernmental Panel on Climate Change – IPCC) and the International Energy Agency is crystal clear. If the world does not take action quickly, climate change will be dramatic, with a global temperature increase of six degrees Celsius – which we definitely want to avoid. And we can, but it's urgent.

Without new initiatives, in 20 – 25 years, the world will no longer be able to limit global warming to two degrees. Luckily, there are ways to reduce greenhouse gas emissions, and the recipe is quite straightforward. The world needs to use its energy resources more efficiently, and reduce greenhouse gas emissions from energy production and production of goods and services. In the absence of new technology to address this issue, consumption must go down.

Development of new and improved technology for renewable energy production, carbon capture and storage, as well as for efficient energy use, are essential for solving the global challenges, and could also have the added benefit of giving Norway more legs to stand on as revenues from the oil and gas sector start to decline. Norway has the knowledge and means to take a prominent role in the development of the future's energy solutions. Are we courageous enough to take the challenge? Can we afford not to?

In the 2012 Climate Agreement, Enova was assigned clear responsibility by the Norwegian Parliamentfor helping develop the future's energy and climate technology. This responsibility came on top of an already considerable responsibility for efficient energy use and a robust energy supply. Enova plays a key role in delivering the solutions which Norway and the world are requesting on the way towards a low emission society.

The world doesn't wait for the UN

The recipe for how the global climate challenges should be solved is simple, but no country can solve the challenge alone. This is the reason for the intense work to get binding international agreements into place in the past two to three years. The most recent UN climate conference was held in Poland in the autumn of 2013 but once again, proved less successful than many desired.

The ambition for a new agreement in Paris in 2015 is set, however, while we are waiting for a new agreement, the time left for the world to solve the challenge is diminishing. Luckily, not everyone is paralyzed while waiting for a new agreement.

FIGURE 1.1 GLOBAL NEW INVESTMENTS IN RENEWABLE ENERGY, 2012 (USD BILLION)

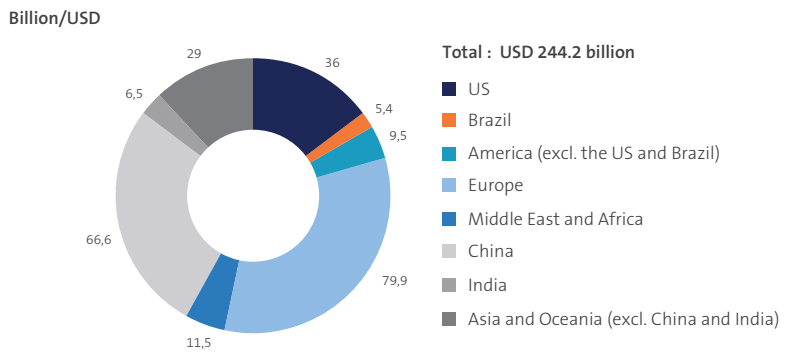


Figure 1.1: The figure shows new investments (in USD billion) in 2012 distributed by region.
Source: Bloomberg New Energy Finance; UNEP.

Norway has its Climate Agreement, and the EU has its 2020 goals. Considerable work is also underway in the world's two largest emission generators, China and the US.

None of these countries could be called initiators for getting a global climate agreement into place, the changes are being driven by regional initiatives at state levels. For China, the need for more energy combined with major local pollution challenges are the most important drivers. The fact that major emission generators such as China and the US are making major investments in emission reductions also means that they are investing heavily in technology.

The future's energy solutions

China increased its investments in renewable energy from USD 2.6 billion in 2004 to USD 66.6 billion in 2012. For comparison, the US and Europe invested USD 36 and 80 billion in 2012, respectively. Though the investments in renewable energy are considerable, a total of USD 244 billion in 2012, the volume needs to be raised significantly in order to reach the Two-Degree Target.

In its New Policy Scenario (WEO 2013), the IEA estimates that, globally, USD 260 billion must be invested annually in renewable energy and another USD 280 billion in transmission capacity – and this is a scenario that comes nowhere close to achieving the Two-Degree Target[1]. In addition, about USD 350 billion must be invested annually in energy efficiency measures, of which USD 100 billion are directed at buildings.

Though all forms of renewable energy and carbon capture must contribute in order for the world to achieve the Two-Degree Target, which technological solutions become the winners and which countries become important technology suppliers could be determined as early as now.

Norway already has a high level of expertise within renewable energy, with long experience from hydropower and power refining industry. More recently, we have harvested experience from both wind and solar power. Norway also has a highly competent supplier industry for the oil and gas sector, which delivers innovative solutions that satisfy high quality requirements and operate under tough climate conditions.

The overall knowledge and experience which these industries possess could give Norway a leading role within efficient energy use, the future's renewable production, carbon capture and storage. However, this entails that we use these opportunities when they arise. If we wait, we risk being left on the sideline.

The future's energy system

An energy system with a significantly higher renewables percentage than today will result in greater challenges related to security of supply. This would not be due to insufficient energy

FIGURE 1.2 NEW INVESTMENTS IN RENEWABLE ENERGY, 2004-2012

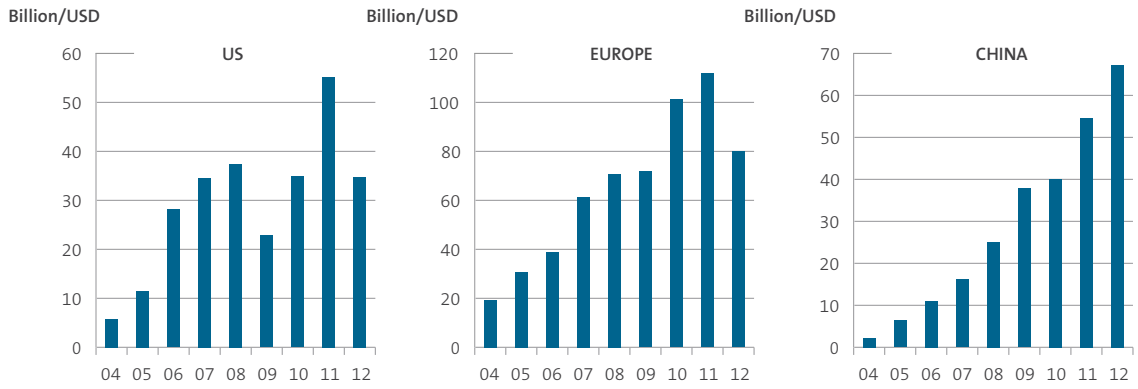


Figure 1.2: The figure shows the development in new investments (in USD billion) in the US, Europe and China during the period 2004-2012.
Source: Bloomberg New Energy Finance; UNEP.

1 50 per cent higher emissions than the 450 scenario, 37.2 compared with 21.6 gigatonnes CO^2 in 2035.

production, but because much of this production cannot be controlled to the same extent as energy production from non-renewable energy sources. Increased use of wind and solar power will result in an increased need for balance power in combination with storage.

With more than one hundred years of experience with major-scale production of renewable energy, Norway is already an important contributor in the work on making Europe more renewable. Norway still has major unused opportunities for increased renewable energy production, and we also have the possibility of offering renewable energy when it is needed.

The current challenge is that, while Europe has high ambitions for increased use of renewable energy, and has come far in succeeding with this ambition, use of the most polluting power production – coal-based power - is also increasing. Despite Germany's significant renewable energy supply ambitions through its "Energiewende", coal-based power has increased at the expense of gas power. The reason for this is low coal prices in combination with low prices for greenhouse gas emissions.

One of the most important preconditions for achieving a reduction in greenhouse gas emissions from the energy sector is not in place, considering that emitting greenhouse gases is basically free. This is in stark contrast to what the IEA, among others, stipulates as a precondition for achieving the UN's Two-Degree Target; a high, global price for greenhouse gas emissions. In its 450 scenario, the IEA assumes a global CO_2 price of USD 125; far above the current quota price in the EU, a scant USD 5.

In order for the world to succeed in limiting the global temperature increase to two degrees, the cost of emitting greenhouse gases must increase. This could take place through global agreements, perhaps as early as in Paris, France in 2015, but more likely through national and regional initiatives such as EU-ETS. When the price of emissions increases, it will not only affect technology choices in the energy supply, but also which products and services become preferred.

The future's products

As steadily more countries and regions take steps to reduce their own greenhouse gas emissions, the climate footprint will become an increasingly important argument. Energy-efficient and climate-friendly will be a competitive advantage, green products will become the winners of the future.

Norway has some basic preconditions in place for being competitive through ample access to cheap, renewable energy, sound expertise and stable political conditions. However, we know that Norwegian competitiveness could be substantially improved if we did an even better job of utilising our opportunities.

Back in 2010, Enova (McKinsey) highlighted the considerable potential for improved competitiveness through increasing energy efficiency in Norwegian industries. Though the figures are a few years old and some companies have done a lot in the interim, there is still room for reducing production costs by several billion kroner through further energy efficiency measures.

Competitive industries are far more important for a small country like Norway, which exports for 40 per cent of its GDP, than for major players such as the US, China and the EU. However, despite the EU exports representing just 14 per cent of the overall GDP, competiveness and employment are at the top of the agenda in the EU. A leading position within energy and climate technology will improve competitiveness and yield higher employment.

Energy-efficient production is only half the story, the products and production processes also need to be energy-efficient. In order to achieve our goals, everything from mobile telephones to the houses we live in need to be energy-efficient. At the same time, it is important to see products and production in context. We do not achieve much by just moving energy use and greenhouse gas emissions from products to production. In the same way, we need to be aware of how changes in one step of the energy system from energy resource to energy demand impact the big picture.

The possibilities are out there, but they require action

The UN's goal to limit global warming to two degrees is ambitious, but the prescription is relatively simple: more renewable energy, more carbon capture, more energy-efficient production and more energy-efficient products and services.

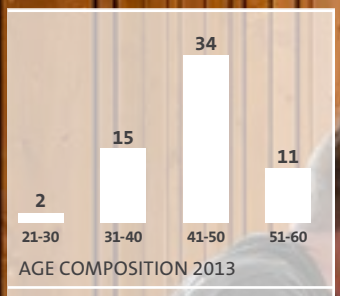
The biggest challenge is that decisions are required – tough decisions. If we are brave enough to take a stand, the road is open not just for a sustainable future, but also a competitive future. There are powerful growth impulses at play here, but also considerable risk.

Enova's mission is to make the necessary choices easier.

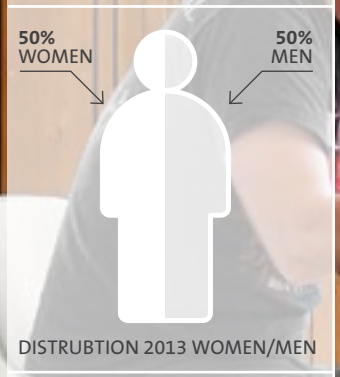
Enova invests in the energy and climate solutions.

Together we create green competitiveness

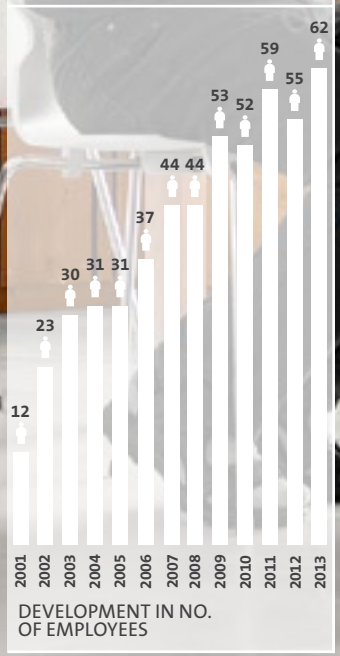
Part 2



AGE COMPOSITION 2013



DISTRUBTION 2013 WOMEN/MEN



DEVELOPMENT IN NO.
OF EMPLOYEES

Enova's activities

Social responsibility

Enova is Norwegian authorities' foremost tool for cultivating environmentally friendly energy restructuring and renewable energy production, as well as for contributing to development of energy and climate technology. Enova will strengthen security of supply and reduce greenhouse gas emissions. Enova helps private and public market players to address their social responsibility related to environmental and climate measures.

Part of Enova's corporate social responsibility is exercised through shaping good attitudes among children and young people. *The Rainmakers*, our campaign for children aged 9-12, will increase children's knowledge of energy use and climate impact. *The Energy Challenge* is part of this, and has engaged thousands of children and young people across the nation. Together with Ungt Entreprenørskap, Enova organizes *Nasjonal gründercamp* which inspires upper secondary students to develop new energy and climate technology.

Enova shall be a role model within the environment and climate and attempt to minimize the company's impact on the external environment. Our offices have low energy consumption and use renewable energy sources. We prepare annual environmental action plans including measures within energy consumption, water consumption and recycling. A limited number of parking spaces encourages employees to walk/bike, or use public transportation to/from work. We purchase climate quotas for air travel and our company car is electric.

Enova shall be perceived as an honest and predictable employer and partner. A basic precondition is that our work is carried out in accordance with applicable statutes and regulations, and in line with good practice within areas such as health, safety, the environment, human rights, business ethics and anti-corruption.

Our governance has a value-based approach with clear expectations for all employees to comply with our values: *clear, responsible, inspiring and market oriented*. Enova has extensive ethical guidelines that stipulate requirements for employees and others acting on our behalf, as well as our partners. The entire ethical guidelines are available on our website. We shall be open, honest and sensitive in our communication and contact with the outside world.

We exercise corporate governance principles emphasising openness, transparency, responsibility, equality and long-term perspectives. For example, we use external partners for quality assurance of our processes when necessary.

Organization

Enova manages considerable State resources on behalf of our society. We depend on trust and credibility in order to succeed. As a knowledge organization, each of our employees plays an important part. We need to be able to convert our employees' knowledge and expertise into desired actions, actions that help Enova achieve its goals. We must be skilled and professional in our tasks, and this shall be reflected in our encounters with the outside world.

A flexible organization that is able to adapt to solve new tasks is vital. Our experience is that the correct use of expertise in teams provides greater power and performance than each individual's achievement alone. We therefore focus on learning and how to share and build joint expertise. Clear roles and delegation of responsibility and authority help stimulate each individual to use their experience and their expertise in tasks to achieve the desired result.

We work with the aim of being an attractive workplace, and the 2013 employee survey showed strong results with improvement from 2012. Our employees have individual development plans, and we stimulate social wellbeing through cultural and physical activities. We are an IA (inclusive working life) company, and focus on facilitating work situations for people on sick leave. We aim for an open and close cooperation with the trade unions.

Enova sees the value of equality and diversity in the workplace. We have 62 full-time employees, of which 31 are women and 31 men. The main group of employees is currently in the age group 41 – 50 years. At the same time, it is important for us to maintain a broad range of ages to benefit from the knowledge and experience represented by both younger and older employees.

We have few employees in relation to our responsibilities. Special expertise and capacity needs are solved through cooperation with others.

Enova's social mission

Enova's **social mission** is to create lasting change in the supply of and demand for efficient and renewable energy and climate solutions. These activities will strengthen the security of supply and reduce greenhouse gas emissions.

Our vision

An energy-efficient and renewable Norway

The Norwegian State
The Storting (Norwegian Parliament) is Norway's legislative and budgetary power. The Storting passes Norway's statutes, determines the state budget and controls the government. The government is Norway's executive authority. The government is responsible for implementing the decisions adopted by the Storting.

The Ministry of Petroleum and Energy (MPE)
The MPE's primary task on behalf of the Norwegian State is facilitating comprehensive and value-creating energy policy based on efficient and environmentally friendly utilization of natural resources. The MPE is Enova's owner and principal; it issues letters of award and receives reporting.

The Energy Fund
The purpose of the Energy Fund is to promote environmentally friendly restructuring of energy end-use and energy production, as well as contribute to development of energy and climate technology. The Energy Fund shall be a predictable and long-term financing source for the restructuring work.

The 4-year agreement
Agreement between the Norwegian State through the MPE and Enova which defines and sets the framework for the social mission Enova has been tasked with. The Agreement will ensure the resources from the Energy Fund are managed in compliance with the goals and preconditions that form the basis for establishment of the Energy Fund.

Enova
Enova's primary task is to cultivate environmentally friendly restructuring of energy end-use and energy production, as well as contribute to development of energy and climate technology. This shall take place through management of the Energy Fund.

Office of the Auditor General of Norway
Through guidance, control and auditing, the Office of the Auditor General of Norway will help ensure Norway's resources and values are managed in accordance with what the Storting has decided.

Internal control
Enova conducts systematic follow-up, management and control over its own activities. Systems and routines are adapted to risk and significance.

Enova's social responsibility

Enova's **social responsibility** deals with operating our enterprise so it provides a positive contribution to value creation in society, both in relation to achieving our mission, as well as how our deliveries are carried out.

Social contribution
In 2013, Enova supported projects with an overall energy result of 1.4 TWh through the Energy Fund, distributed over energy efficiency measures, conversion and increased utilization of renewable energy.

Our values

Clear, Responsible, Inspiring and Market Oriented

Values and ethical guidelines
Our ethical guidelines and fundamental values are our rules of conduct for behaving ethically and in a socially responsible manner in all our activities:

- We have goals, values and ethical guidelines that describe the fundamental attitudes and the philosophy that shall characterize our organization
- We exercise corporate governance principles where we emphasize openness, transparency, responsibility, equality and long-term perspectives
- We set high integrity requirements, which e.g. entail that we do not tolerate any form of corruption and that we promote free market competition
- We are open, honest and sensitive in our communication and contact with the outside world
- We do not discriminate based on gender, religion, nationality, ethnicity, social groups or political viewpoints
- We are attentive to changes in what society in general considers good business practices. We evaluate and change our own practices when necessary

Management

Nils Kristian Nakstad — Chief Executive Officer

Born: 1962

Position: Chief Executive Officer from 2008.

Education: Chartered engineer from the Norwegian Institute of Technology, Mechanical Engineering.

Experience: Nakstad has worked as a researcher and research manager in SINTEF and project manager in Hydro. He has headed enterprises such as Trondhjem Preservering AS and ReVolt Technology AS.

External board positions: Board member in Pro Venture Seed AS, Trondhjem Preserving AS (and group companies) and Labek AS, the Norwegian University of Science and Technology (NTNU) and Langrennskomiteen (Norwegian Ski Federation).

Audhild Kvam — Marketing Director

Born: 1968

Position: Marketing Director from 2013.

Education: Chartered engineer from Pacific Lutheran University, USA.

Experience: Kvam was hired by Enova as the Director of the Energy Efficiency Department in August 2010. She has experience as the VP Strategy and Marketing in Powel ASA, has worked as an information consultant and head of information in Trondheim Energi and has been CEO of Trondheim Energiverk Kraftsalg AS.

External board positions: Board member in Energi 21.

Previous board positions: Chair of NHO Trøndelag, board member of Istad AS, the Low Energy Programme and Clean-tech Mid Norway.

Geir Nysetvold — Director of Strategy and Communication

Born: 1961

Position: Director of Strategy and Communication from 2013.

Education: Chartered engineer from the Norwegian Institute of Technology, with a major in technical cybernetics. He also has several courses in technology, management and finance from the Norwegian Institute of Technology and the Norwegian School of Economics.

Experience: Nysetvold was hired as the Chief Financial Officer in December 2007. In the period from 2009-2012 he also headed the Strategy and Analysis department. He has experience from several top positions, primarily within insurance, e.g. as a division director and head of the corporate market area in Vital Forsikring.

External board positions: Member of the control committee in Nordea Liv Norge AS.
Full member - board member - European Energy Network (EnR).

Gunn Jorun Widding — Director of Enterprise Management

Born: 1970

Position: Director of Enterprise Management from mid-2013.

Education: Master of Business and Science from the University of Nordland (HHB). She also has a number of courses from the university colleges in Sør-Trøndelag, Bodø and Lillehammer.

Experience: Widding has previous experience from a management position within the travel industry and project management and several top positions in EVRY (previously ErgoGroup).

Øyvind Leistad — Programme Director

Born: 1972

Position: Programme Director from 2013.

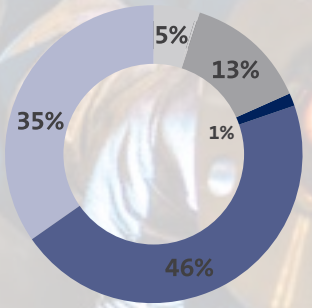
Education: Norwegian University of Life Sciences, investment and financing.

Experience: Leistad was hired by Enova as senior adviser in 2005. During the period 2007-2012 he was the Director of the Energy Production Department in Enova. Leistad previously worked in the Ministry of Petroleum and Energy, where he worked with administration of various policy instruments related to stationary energy supply and renewable energy and energy efficiency in particular.

External board positions: Member of the programme board for ENERGIX, Research Council of Norway.

Part 3

APPLICATIONS 2013 DISTRIBUTED BY MARKET AREA



APPLICATIONS 2012-2013

** Energy measures in residences are not included in the above figures. In 2013, Enova received more than 7,400 applications for individual measures in residences*

Market descriptions

Enova – market team player

Inspiring and market oriented
Two of Enova's values are inspiring and market oriented. As the driving force for new energy and climate solutions, these values are important to us. Being market oriented means always interacting with the market. We meet the market players and listen to their challenges.

Enova follows developments closely and ensures that our services consistently contribute to real market change. We inspire energy smart choices through campaigns and our annual Enova Conference, and increase expertise in the market through courses and gatherings.

Financing
Enova's most important tool is the financing we provide for projects, whether they are major industrial projects or smaller household measures. Enova shall manage the Norwegian State's resources so they can provide the greatest possible benefit for our society. When we support projects, we cover a percentage of the additional costs the market players incur by choosing more energy and climate-friendly solutions. The size of the support constitutes a smaller percentage than the project owner's own contribution, the level must be sufficient, but cannot overcompensate. Financing increases project profitability and reduces risk. Support promotes good energy and climate projects in the private and public sectors that would not have been initiated without State support. We must continuously assess whether we risk paying for something that would have been done regardless.

Advising/Guidance
The second most important tool in our portfolio is the guidance we provide to projects. Enova's contribution in the form of state support and guidance is provided in a structured manner through targeted programmes. Advice for smaller projects is provided through our Ask Enova helpline in addition to information and advice on our website. In large projects, Enova and the project team will work closely over time to improve the project with regard to technical solutions and implementation, and make it more financially robust. Enova's guidance is based on the experience from a total project portfolio of several thousand projects.

Cooperation
The goal of public tools is for more ideas to reach the market. The path from good ideas to solutions that are ready to use can be long. The need for public support will change along the way. A prudent work distribution and sound cooperation with other public policy instrument agencies is important from our perspective.

Indicators

Enova must be close to the market to carry out its mission. To help with our market monitoring we have chosen to follow a set of indicators that give us an overview of key preconditions for the development within our markets. Figures 3.1 – 3.4 are examples of conditions and indicators we follow.

FIGURE 3.1 ENERGY END-USE IN NORWAY 2012

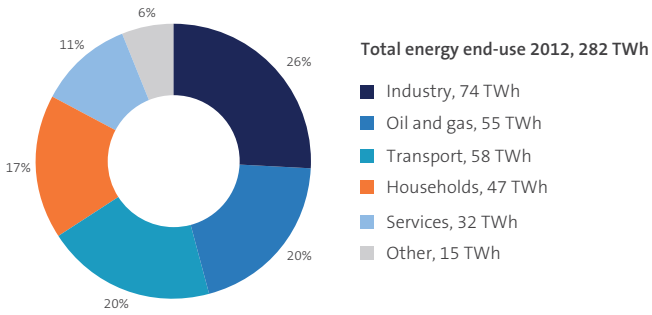


Figure 3.1: The figure shows relative distribution of energy end-use in Norway, including offshore activities, distributed by sector in 2012.
Source: Statistics Norway. Energy accounts and energy balance 2011-2012.

FIGURE 3.2 GREENHOUSE GAS EMISSIONS IN NORWAY 2011

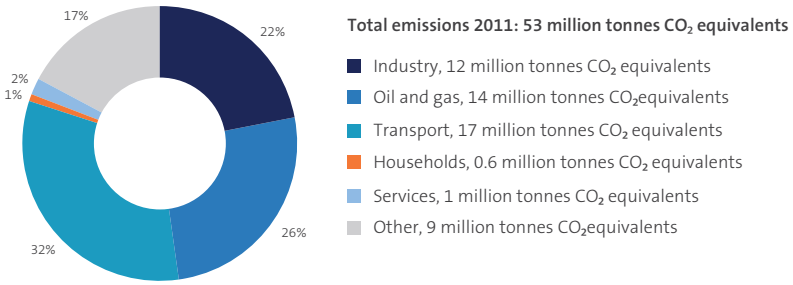


Figure 3.2: The figure shows the relative distribution of greenhouse gas emissions in Norway in 2011 distributed by sector. The figure covers emission of the six greenhouse gases included in the national emission accounts (Kyoto gases). Carbon dioxide (CO_2), nitrous oxide (N_2O), Methane (CH_4), Hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF_6). Source: Statistics Norway. Emissions of greenhouse gases.

FIGURE 3.3 SPLINE METHOD PRICE DEVELOPMENT FOR ELECTRICITY (WITHOUT FEES) AND FUEL OIL (WITH FEES)

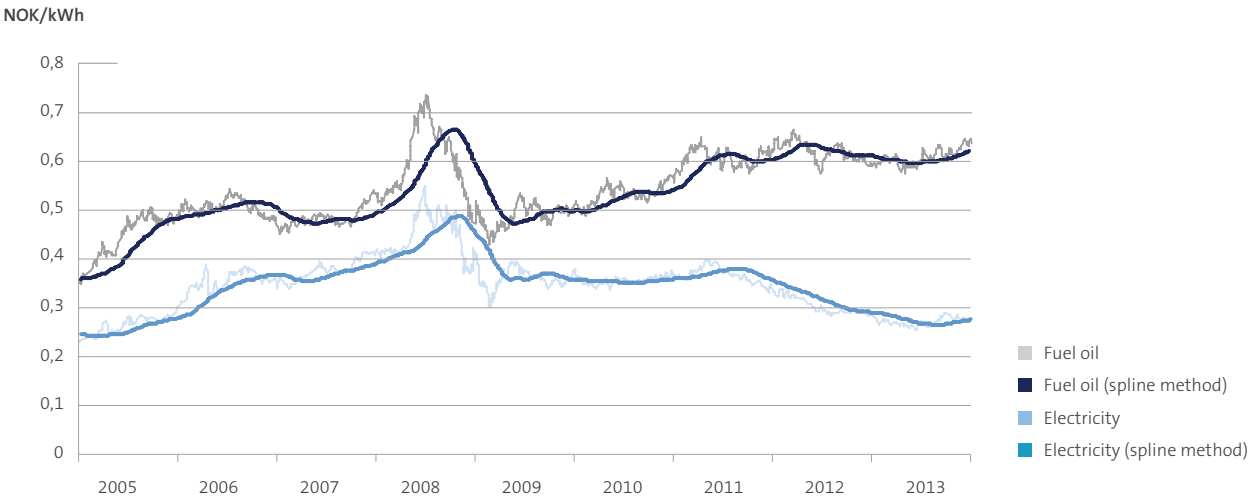


Figure 3.3: The figure shows the development in electricity (without fees) and fuel oil (with fees) in the period 2005-2013. Electricity (NordPool 3 years forward, Fuel oil (ICE GasOil forward). The spline method curves are based on a six-month sliding average. Source: Thomson Reuters Datastream and Enova SF.

The price of electricity at the end of 2013 is 52 per cent lower than the peak in July 2008 and 20 per cent lower than in January 2012.

FIGURE 3.4 RELATIVE PRICE DEVELOPMENT FOR DIFFERENT ENERGY CARRIERS AND CARBON QUOTAS

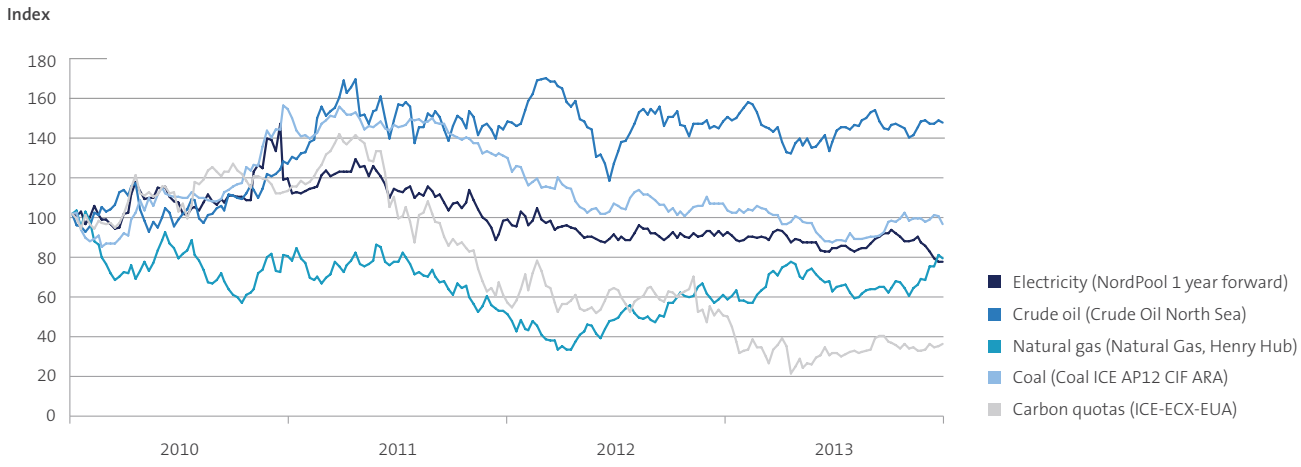


Figure 3.4: The figure shows the relative price development for different energy carriers and carbon quotas during the period 2010-2012. The index takes a basis in the prices in January 2010. Source: Thomson Reuters Datastream and Enova SF.

Renewable heating: From new establishment to growth

Market, potential and goals

The market for renewable heating covers all heating deliveries based on renewable energy sources. Restructuring to renewable heating is an important measure to achieve more climate-friendly use of energy in Norway. It results in improved utilization of resources such as biofuel, waste heat from industries and waste combustion.

The annual demand for heating buildings in Norway constitutes about 45 TWh, and approximately 27 TWh is used in process heating for industry[1]. The potential for developing renewable heating is mainly related to buildings, industries and non-industrial plants and facilities. In 2012, investments in district heating plants constituted around NOK 2.2 billion, NOK 1.4 billion in production facilities and NOK 0.8 billion in distribution facilities[2].

The goal of Enova's work is to increase flexibility in the energy system, and thus the security of supply. We do this through building production capacity and infrastructure for distribution of renewable heating and stimulating increased use of new technology in the heating industry.

Market situation 2013

Power prices, and thus district heating prices, are factors that have a major impact on development in the renewable heating market. District heating constitutes the largest market within renewable heating in Enova. Annual investments in district heating have increased from NOK 200 million in 1999 to more than NOK 3 billion in 2011. In 2012, investments in district heating declined by NOK 0.8 billion. 4.2 TWh of district heating were delivered in 2012, and the figures show steady growth in line with new developments being completed. The average price of district heating fell by 14 per cent from 2011 to 2012. Sales revenues were also reduced somewhat, and amounted to NOK 2.3 billion in 2012.

The price of power has declined continuously for about three years. This development contributes to an increased support need among heating players and many projects are being restructured or cancelled. Interest in renewable heating solutions in individual buildings and groups of buildings (small heating plants) has remained relatively stable. Based on the projects, Enova has observed that some players have started converting peak load from fossil to renewable. The renewables percentage for district heating is increasing.

Following a phase with major developments, the focus has shifted to efficient operation. Though the heating technology is mature, the potential for innovation and use of new technology in the heating industry is significant. One example is increased use of innovative heating and cooling solutions in buildings. Some players are underway and we need more to achieve market change.

Introduction of new technology and innovation in district heating is considered significant for improving district heating's competitiveness vis-à-vis future heating customers[4].

As a result of the work in recent years, most major towns and cities in Norway have either established district heating, or are in the process of establishing it. A consolidation of the heating industry has taken place and Enova has adapted its programmes to these changes. The "*Support for district heating*" programme was re-launched in January 2013. The new programme has turned out to be very fitting in a market that has been down in recent years. New applications for support for district heating are coming from smaller cities or as expansions of existing facilities.

A sustainable industry with professional suppliers of small heating plants is necessary in order for customers outside the major and established district heating areas to gain access to renewable heating. Our subsidy programmes are meant to support such a development and we see that there is still a potential for and interest in growth.

Enova supports restructuring to renewable heating through several programmes. The programmes are tailored to fit different types of players, such as district heating companies, building owners and industrial companies. Following a few years of low activity, Enova is experiencing an increase in applications for its heating programmes in 2013. Generally, the applications are smaller than before. Subsidiaries of major power companies are responsible for most of the major district heating applications.

Prospects

The decline in project size is expected to continue within district heating. We expect a stabilisation of energy results at the 2013 level in the years ahead. Several established players are expanding within already developed areas and smaller players are starting projects in areas without district heating currently.

Enova will continue its work within new establishment and expansion of existing district heating, as well as conversion of peak load to renewable energy sources. At the same time, we are directing our focus towards innovation, both as regards heating plants inside the buildings and distribution to the buildings. It is also very relevant to introduce energy management in the heating industry.

The potential for conversion to renewable heating is considerable, and special efforts will be directed at buildings in need of smaller heating plants in upcoming years. Through development of a market for small heating plants, areas without a basis for district heating could also gain access to renewable heating.

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1 Enova (2011). Potensial for fornybar varme og kjøling i 2020 og 2030 (Potential for renewable heating and cooling in 2020 and 2030). Report prepared by Xrgia.

2 Statistics Norway (2013). District heating statistics.

3 Devoteam daVinci (2012). Innovasjon i Fjernvarme (Innovation in district heating). Process study.

FIRING WITH WOOD PELLETS: Managing Director in Hafslund Finn Bjørn Ruyter is proud of the new plant which helps make Oslo a more environmentally friendly capital. (PHOTO: Hafslund ASA).

Hafslund

New boiler provides more renewable heating in Oslo

Hafslund's new wood pellets boiler at Haraldrud heating plant in Oslo was officially opened in November 2013. The facility will nearly double wood pellets consumption in Norway, producing heat corresponding to the consumption of 15,000 – 20,000 apartments.

"The percentage of renewables in district heating in Oslo was more than 93 per cent in 2012. The new boiler which can use both wood pellets and bio-oil will replace a smaller boiler that used fossil oil. This will increase the percentage of renewables even further," says Managing Director in Hafslund, Finn Bjørn Ruyter.

The increased district heating capacity will help phase out oil boilers in Oslo, and is estimated to result in a total reduction in CO_2 emissions of between 40,000 and 54,000 tonnes per year. Other local emissions are also reduced.

Facts

Programme: District heating new establishment

Support amount: NOK 40 million

Energy result: 200 GWh

Climate result: 60,600 tonnes CO_2 equivalents (reduction in oil consumption)

Year funded: 2010

Scheduled completion: 2014

Industry and non-industrial plants and facilities: More are cooperating with Enova

Market, potential and goals

The market for industry and non-industrial plants and facilities covers various industries, as well as outdoor and indoor plants and facilities. The market area works with a wide range of companies; from smaller companies to processing plants with several hundred employees. Non-industrial plants and facilities are roads, onshore power and VAR plants, etc.

The industrial sector represents a significant part of stationary energy end-use in Norway[5]. About 20 per cent of Norway's total greenhouse gas emissions come from industry[6]. Total investments in mainland industries are approx. NOK 19 billion in 2013[7]. Studies show a potential for improving energy efficiency in industries by between 10 and 15 TWh up to 2020[8]. There is also a potential for conversion to renewable energy.

Enova's goal is contributing to more climate-friendly and energy-efficient industries supplied with renewable energy.

Market situation 2013

Norwegian mainland industries are mainly based on renewable power and are considered climate-friendly. At the same time, they are characterized by many power-intensive activities. The industrial sector has reduced its greenhouse gas emissions by just over 30 per cent since 1990[9]. The total production in the same period has increased considerably. Though Norwegian industries are becoming increasingly climate-friendly and energy-efficient, they still have significant room for improvement within energy efficiency and restructuring.

The growth in the Norwegian economy in 2013 is lower than in 2012. The growth pace fell to around 2.0 per cent in 2013 compared with 3.5 per cent in the previous year. Production growth in the Norwegian economy has remained moderate in the past year and development in traditional export, as well as investments in mainland industries have been weak. The uncertainty has led to a decline in investments in industries (apart from the offshore sector), which have been reduced by about half since the previous economic downturn in 2008[10].

The companies' willingness to make investments is impacted by low energy prices and unstable market conditions. Such uncertainty contributes to an increased risk focus in the industry. The consequence is that investments in new technology and energy efficiency projects are delayed. However, Enova's experience is that many players are using this market situation to develop new production technology with the goal of becoming better equipped for economic downturns and increased competition. Simply making improvements in old technology is no longer sufficient to ensure future competitiveness. Major, ground-breaking steps are necessary.

While some players are well underway, others need more help. When innovative solutions go from pilots to full-scale facilities, they encounter several challenges, the most important perhaps being access to venture capital. Through advising and financing, Enova works continuously to reduce risk and increase the pace of energy restructuring.

Enova has a total of six programmes aimed at industries and non-industrial plants and facilities. The new programme *Support for new energy and climate technology in industr*y was launched in 2013. This attempts to increase access to venture capital for innovative solutions. The *Support for energy measures in industry* programme provides sufficient profitability in projects based on mature technology. *Introduction of energy managemen*t and *Support for energy measures in non-industrial plants and facilities* generate awareness and lay the foundation for investments in the future. Overall, this could contribute to making the market dynamic and setting new standards within energy.

Prospects

Weak improvement in international growth together with a weaker NOK can stimulate Norwegian export and contribute to increased investments in mainland industries from 2014. Weaker growth in the Norwegian economy and low energy prices could halt this development.

We want to motivate more industry players to participate in the development of new energy and climate technology solutions. In 2014, we will strengthen our efforts to make Norway an attractive location for introduction of climate-friendly and efficient new technologies for production solutions.

We will continue our work aimed at small and medium-sized market players through the energy management programme, and expect the considerable interest in the programme to result in several industrial projects.

4 Statistics Norway (2013). Energy consumption in industry 2012.

5 Storting White Paper No. 21 (2011–2012). Norwegian climate policy.

6 Statistics Norway (2013). Investments in industry, mines and power supply, estimates for the 4th quarter 2013 (measured in current value).

7 Enova (2009). Potential for energy efficiency in Norwegian land-based industries.

8 Storting White Paper No. 21 (2011-212) Norwegian climate policy.

9 Confederation of Norwegian Business and Industry (2013). Financial overview 4. Prospects for 2014.

SATISFIED EMPLOYEES: Vigdis Græsdal, Elin Værnes and Kari Hole at Orkla Foods Norge's factory at Stranda. They have carried out several measures in the pizza bakery, such as utilising the waste heat in the refrigerator and freezer compressors and introducing better energy management of seawater pumps, indoor lights and ventilation, to mention a few.

Orkla Foods Norge

Enthusiastic and energetic food producers

Orkla Foods Norge is concerned with having a good working environment which allows their employees to perform their very best. In the same way, they are concerned with the best possible utilization of the energy they use. In the period 2005-2013, they have introduced energy management in six of their plants with support from Enova, and have implemented a number of measures as a result. They currently produce as much as they did eight years ago, but using about 20 per cent less energy.

The energy efficiency measures have reduced our costs. It has also shown that we take the environmental challenges seriously, which is important both for our partners and customers. This increases our competitiveness. We also see that employees have become more aware of the important role they play as energy end-users," says Orkla Foods Norge Director Bente Brevik.

Facts

Programme: Reduced energy end-use in industry and Energy end-use industry

Support amount: NOK 0.35 million and NOK 1.6 million

Energy result: 2.5 GWh and 6.4 GWh

Climate result: 757.5 tonnes of CO_2 equivalents (increasing efficiency of oil consumption)

Year funded: 2005 and 2008

Completed: 2009 and 2013

Non-residential buildings: Energy smart buildings for the future

Market, potential, goals

The market for non-residential buildings consists of the private real estate market and buildings owned by the Norwegian State, counties and municipalities. About 85 million m² of the buildings are privately owned, while about 44 million m² of all non-residential buildings have public owners[10].

The total annual energy use in non-residential buildings is approx. 35 TWh. Turnover in the building and construction industry has been increasing since 2009 and is about NOK 58 billion within new non-residential buildings and about NOK 69 billion for rehabilitation ("ROT" – reconstruction, renovation and maintenance) in 2012[11]. Studies show that the potential for energy efficiency in existing buildings is at about 7.5 TWh leading up to 2020[12].

The goal of Enova's focus here is to realize as much as possible of the energy efficiency potential in buildings, thus improving security of supply. We do this by providing guidance and financing for projects, and by supplying the market with knowledge on energy smart buildings.

Market situation 2013

Opportunities for investments in new technical solutions and energy efficiency measures are closely related to the activity level in the real estate and construction business. The number of commissioning permits for new non-residential building area in 2013 is at a relatively high level and has remained about the same as in 2012. The prognoses indicate that the activity level will remain relatively stable for both new buildings and the rehabilitation market going ahead[13].

When the supply and demand sides develop at an even pace, this results in market change. When the technology is tested and competitive, it goes from being a niche product to off-the-shelf. Such development requires expertise and technology knowledge in the market. Establishment of the passive house standard is a good example of a market change that took place in the new building market.

There were just a few innovators building passive houses in 2005. In 2013, passive houses are being built across the nation. Together with supplemental tools, research and market players, Enova's efforts in passive houses have contributed to moving the front line and changing construction practices in Norway.

More than 1 million passive houses and more than 400,000 m² of low energy buildings received support in 2013. Together, Enova has supported about 3 million m² and allocated almost NOK 1 billion from when the prototype programme was introduced until 2013.

The market has changed and Enova's original goal of 10 per cent of the new building market being constructed as passive houses is achieved. As a result of the positive market development, the programme for passive houses and low energy buildings was phased out in 2013.

Eight out of ten properties that will be used in 40 years have already been constructed, which is why the focus on existing buildings is important. Annual investments in rehabilitation of non-residential buildings have increased steadily since 2006, and prognoses indicate that this growth will continue. The most important actions related to energy efficiency take place in connection with rehabilitation, and we work to make a larger percentage of the rehabilitations energy-related.

We do this through the *Support for existing buildings* programme, which was further developed and re-launched in 2013. The development is positive, particularly in the commercial buildings segment. Lessors, commercial brokers and developers report increasing interest in investments in energy smart buildings. Many have become aware that their reputation is impacted by a number of factors, including the energy and environmental profile of the building they are located in. Lower operating costs are another reason for the positive trend. Energy smart buildings are increasingly being perceived as good investments.

The potential related to existing buildings is still significant. We are pleased that more market players are focusing on energy use in buildings, utilizing Enova's tools. BREEAM NOR[14] and green leases help pull the market in the right direction. The positive trend in the non-residential buildings market allows more to invest in energy smart buildings for the future.

Prospects

We expect a relatively high investment pace in the construction and real estate industry in 2014 despite some negative signals at the end of 2013. Enova will strengthen its efforts vis-à-vis existing buildings by providing advice and financial support for new projects both at a building level and for individual components.

There are always market players that pave the way by utilizing new solutions. For the majority of players, it is important that the technology is competitive in relation to price and performance, and that it ensures high-quality solutions. Enova wants to stimulate players that are taking the lead and will place a greater focus on innovation and technology development in its programmes directed at the new buildings market.

10 Enova report (2012:1.2). Energy efficiency in Norwegian non-residential buildings, performed by Muliticonsult for Enova (2011).

11 Prognosesenteret (2013). Building statistics and construction trends. Apartment buildings are not included under non-residential buildings and are discussed under residential buildings.

12 Enova report (2012:01). Study of the potential and barriers: energy efficiency in Norwegian buildings.

13 Statistics Norway, Prognosesenteret (2013). Construction trends and economic shifts.

14 Norwegian Green Building Council.

INCREASING DEMAND: Norwegian Property believes the demand for green buildings will grow in upcoming years. "Energy smart buildings will have a strong position when increasingly socially aware renters choose offices in the future," says project coordinator Christine Sommerfeldt (left). Project manager Knut Yngve Larsen is on the right.

Norwegian Property

Energy smart buildings at Aker Brygge

With support from Enova, Norwegian Property started a comprehensive project in 2013, upgrading more than 40 buildings. The goal is for all office buildings to have the energy rating B.

"By reducing energy use we also reduce operating costs for our renters and ourselves as the owner. This will be very significant for value development of the properties," says project manager in Norwegian Property, Knut Yngve Larsen.

Stranden 1 on Aker Brygge is the jewel in the crown for the Norwegian Property company in the ongoing energy upgrade of large parts of their portfolio.

"The building at Aker Brygge is a flagship. It means that the changes we make in this building are very visible in the city," says Larsen.

Facts

Programme: Support for existing buildings and non-industrial plants and facilities

Support amount: NOK 33 million

Energy result: 41.4 GWh

Climate result: 772 tonnes CO_2 equivalents (reduction in use of oil and gas)

Year funded: 2012

Scheduled completion: 2015

Residential buildings: From advice to action

Market, potential, goals

The residential buildings sector consists of 260 million m^2 of buildings distributed over more than two million households. Energy use in residential buildings is 45 TWh, which constitutes just under 30 per cent of total stationary energy end-use in Norway. Seventy-eight per cent of the energy used in residential buildings is used to heat rooms or heat water.

In 2012, annual investments in new residences constituted about NOK 62 billion. The value of investments in residential rehabilitations (ROT) remained stable at around NOK 60 billion per year in recent years[15]. The potential for upgrading the existing buildings is between 5 and 10 TWh up to 2020[16].

The potential is considerable and our strategy is stimulating more homeowners to carry out energy-related measures during extensive upgrades. This creates a greater demand for energy smart buildings, making them attractive investment objects in the residential buildings market.

Market situation 2013

Together with petroleum investments, investments in residential buildings have been important business drivers for growth periods in the Norwegian economy. Investments in residential buildings have increased in the last three-year period, but started to decline in 2013, and levelled off over the course of the year. However, activity in the residential buildings market remains at a relatively high level, though it may appear that the growth potential has been realized[17].

The number of new residences being constructed is closely related to investments in residential buildings. According to Statistics Norway, slightly fewer commissioning permits were awarded for new residences in 2013 compared with the previous year. Construction of new residences has also levelled out, but the level remains high.

The price of electricity has declined in the past three years and, seen in isolation, a low electricity price reduces interest in energy conservation in households. Annual investments in homes have remained high. With an annual rehabilitation rate of about 1.5 per cent, this means that, every year, about 20,000 homeowners make decisions that could have a significant impact on the quality and energy standard of their residence.

While profitability is often decisive for commercial decision-making, comfort and trends are more important for households. The right energy choices are made when energy and climate-friendly solutions deliver the best performance in the qualities desired by users. Then it becomes attractive to be energy and climate-friendly, creating a positive trend in the residential buildings market.

In order for a larger percentage of investments in residential rehabilitations to be used for energy-related measures, suppliers and demanders in the residential buildings market must place greater emphasis on energy efficiency. Enova has the *Support for energy guidance* and *Support for upgrading your residence* programmes for homeowners. Through these programmes, homeowners receive advice on possible energy measures and their impact at an early stage in the upgrade process. This increases the inclination to include energy efficiency measures in rehabilitation of their own residence. The programme was launched in 2013. The response to the energy advice support programme is considered good and demand is growing. Some players take the next step and submit an application for an ambitious upgrade of their residence.

To develop the supplier side, Enova, together with the Low Energy Programme, developed and implemented a series of courses for carpenters and builders. Enova's involvement in the courses was concluded in 2013, and the concept has been taken over by the market players. A growing number of these players are now offering energy advice for energy-efficient residences.

A new programme directed at replacing oil burners in homes was launched in 2013. The programme will ensure restructuring to renewable, flexible heating solutions in Norwegian residences. The programme also includes support for introduction of new technological residence components with a major energy potential. The number of inquiries to the Ask Enova helpline increased substantially when the new residential programmes were announced in the spring of 2013, and questions regarding Enova's support options were most frequent.

Enova's work aimed at children and young people, *The Energy Challenge,* received international recognition in 2013 when the production company Fabelaktiv and NRK Super won the prestigious *Emmy Kids Awards* for the children's TV programme. *The Rainmaker's Day* is a little different from the average school day with a focus on energy and energy activities. The Rainmaker's Day fulfilled all expectations: knowledge, excitement and fun.

Prospects

The pace of construction of new buildings and rehabilitation rate for residences are expected to remain high in upcoming years, and the demand surplus for residences in urban regions is expected to last. We also expect the price of electricity to remain low.

Enova will continue to support market players that want to lead the way in development towards more energy-efficient solutions and use renewable energy in residences. We are looking for new and improved solutions that can also be successful in the market.

We are continuing our efforts in residence upgrades, the energy advice programme and efforts in increased application of renewable heating solutions and phase out of oil burners.

15 Prognosesenteret (2013). Analyses and prognoses of building and construction activity.

16 Enova (2012). Study of the potential and barriers: energy efficiency in Norwegian buildings).

17 Confederation of Norwegian Business and Industry (2013). Financial overview 4. Prospects for 2013-2014.

CLEANER ENERGY: By replacing the oil burner, Nina Merete Wiley makes sure her coming twins can breathe cleaner air. (Photo: Therese Alice Sanne/ VG /NTB Scanpix).

Oil burner phase-out

An investment for the future

Nina Merete Wiley was one of around 2000 Norwegians who got rid of their old oil burner in 2013, with help from Enova.

"The oil burner has kept us warm, but we felt that we had to get it out of the house now. We would have had to get rid of it regardless due to the upcoming ban. Still, the environmental concern is most important," says Wiley, who lives with her husband and child in an old house in Drammen, Norway.

The Parliament has signalled that, from 2020, using fossil oil for heating will be prohibited. The Wiley family received a NOK 25,000 incentive subsidy for replacing the oil burner with a geothermal pump.

"We believe this is an investment for the future," says Wiley.

Facts

Aggregated figures based on 1961 subsidy recipients:

Programme: Residential energy measure subsidies

Support amount: NOK 49 million

Energy result: 25.5 GWh

Climate result: 7 727 tonnes CO_2 equivalents (oil burner phase-out)

Year funded: 2013

Scheduled completion: 2013 - 2014

New energy and climate technology: An innovation perspective

Market, potential and goals

Developing new energy and climate technology is essential in meeting the global climate challenge and ensuring a shift towards a low emission society by 2050[18]. The key to success is a high level of focus and efforts directed at research and innovation that result in new sustainable energy solutions.

Development of new technology in the energy market comes through innovation processes in many sectors, in all parts of the value chain. The common denominator is development of services, products and business opportunities which promote clean energy and climate-friendly solutions. The potential in new energy technology is vast, but much of this potential is difficult to realize.

The path from idea to market introduction can be long and the lack of capital often restricts good ideas. Enova's policy instruments can be found in the part of the innovation chain for new technical solutions where the need for capital is greatest. Through demonstration and introduction of energy and climate technologies, Enova can help realize more projects with a high innovation rate, and contribute to helping solutions reach the market.

Market situation 2013

New technologies often arise through research and are further developed when they are utilized and established in a market. Norway has leading expert environments within energy and climate research, and considerable relevant expertise and experience from oil and gas, as well as the process and power industries. This gives Norwegian companies a unique opportunity to establish themselves at the top of technology development.

Most technology development takes place in private businesses and energy is a prioritized area for commercial research efforts in Norway. In 2010, the private sector invested about NOK 800 million in renewable energy research[19]. The public contribution to research in renewable energy sources is historically high in Norway compared with other OECD countries. The contribution increased during the period 2008-2010 as predicted in the 2007 Climate Agreement[20].

Norway has a higher cost level and lower energy prices compared with many competing countries. This could negatively impact companies' interest to invest in new energy and climate technology and cause delays in investment decisions. In addition, the banks' restrictive loan practices make access to venture capital even more difficult[22]. The consequence is less capital for innovation and a slower innovation rate in the market.

Introduction of new technologies in a company is challenging. The company's investment funds must be distributed between several interesting and important projects where development of new technology is one of many alternatives. Significant uncertainty and high costs related to technology development mean that the ideas that are the best fit in the established scenario often become the winners.

This is where the authorities and public policy instruments can play a part. Support along the entire innovation chain, clarified roles between policy instrument players such as the Research Council of Norway, Innovation Norway and Enova reduce the risk, reduce uncertainty and help more creative ideas and innovative products arrive in the market.

Enova's efforts in new energy and climate technology ran through three programmes, of whichhe *Energy and climate technology in industry* and *New technology in the buildings of the future* programmes were launched in 2013. Enova is in a dialogue with large parts of power-intensive industry and is experiencing growing interest in energy and climate projects. It is clear that the major companies have shifted their focus towards energy and climate.

Prospects

The world is steadily increasing its focus on the energy and climate challenges. This influences established markets and creates new ones. Restructuring of the energy supply in Europe provides significant value creation opportunities for Norwegian energy players. The Government is signalling that further development of the Norwegian energy industry will be facilitated within energy production and technology development[22]. In order for Norway to maintain a leading position within energy and climate technology we need to take advantage of our competitive edge.

Norwegian businesses have a unique starting point with our resource base, technological expertise and experience. Good cooperation between authorities, market players, research environments, the supplier industry and investment environments provides us with a unique opportunity to develop future-oriented and competitive markets.

We believe the key to the future low emission society lies in conscious efforts in Norway's competitive edge within certain technology areas. The initiative must come from the players that dare to lead the development, and in cooperation with the public policy instruments. We want more market players to see the significance of green competitiveness, and we want to strengthen our technology efforts for the players that are leading the way.

18 Storting White Paper No. 21 (2011-2012) Norwegian Climate Policy.

19 The Research Council of Norway (2012). The Norwegian research and innovation system – statistics and indicators.

20 Storting White Paper No. 34 (2006-2007). Norwegian climate policy.

21 Confederation of Norwegian Business and Industry, Statistics Norway (2013). Financial overview 3.

22 Government's political platform, Sundvollen, 7 October 2013.

WIN-WIN: Gaute Nyland from Alcoa (left) praises the cooperation with Anders Sørhuus and Alstom (centre): "For us this is a 'win-win'. The heat recovery exchanger cools the gas which improves the cleaning process and increases capacity in the facility. At the same time, we can use the heat recovered in the district heating grid. And now we can also produce electricity which is sent in to the local grid." Jøran Daleng (Alcoa) right.
(PHOTO: Nils Inge Haagensen)

Alstom Norge and Alcoa

Making electricity from gas in Mosjøen

In Mosjøen, Norway, global industry giant Alstom has joined forces with one of the world's largest aluminium producers Alcoa, to test new technology which will utilize energy that was previously lost. If the pilot is successful, it could help reduce global greenhouse gas emissions.

"Waste gas is formed during production of the anodes used in aluminium production. It was previously not possible to utilize the waste heat in these gases. However, Alstom has developed heat exchangers which allow the waste gases to be used – not only for heating purposes, but also for production of electricity which can be used in the anode production," says Anders Sørhuus, in Alstom Norge AS.
The technology also has a major transfer value for similar industrial facilities, and could in the long term contribute to more efficient and cleaner energy use, not just in Norway, but also globally.

"Alcoa is a very good partner for us in Alstom when we develop efficient environmental technology," says Sørhuus.

Facts

Programme: Introduction of new technology

Support amount: NOK 7.1 million

Energy result: 2.8 GWh

Climate result: 593.6 tonnes CO_2 equivalents (reduction of natural gas)

Year funded: 2011

Scheduled completion: 2014

Bioenergy: Small steps toward a stronger market

Market, potential and goals

Bioenergy is biomass (trees, plants, organic waste) that is used for energy purposes. The biomass is refined in the form of solid or liquid fuels.

Bioenergy consumption in Norway is 14-15 TWh per year. Various studies have shown that the potential for increased production of bioenergy for energy purposes is between 15-35 TWh per year[23]. The potential for biogas production in Norway towards 2020 is estimated to be around 2.3 TWh[24].

One of Enova's goals is contributing towards increased use of bioenergy, thereby strengthening security of supply and reducing greenhouse gas emissions.

Market situation 2013

Bioenergy consumption declined in 2012 compared with the previous year, caused by the development in the industry. Producers within wood processing are the largest bioenergy consumers in the industry. Use of bioenergy for transport purposes rose by 15 per cent in 2012 compared with the previous year. Demand for bio-heating has remained stable in 2012 compared with 2011[25].

The bioenergy market is impacted by oil and electricity prices. The oil price remained at a stable high level in 2013, while the electricity prices were low and declining. The latter negatively impacts profitability of energy measures and bioenergy's competitiveness. Enova has seen that many projects are undergoing restructuring. The need for restructuring is based on changed preconditions such as low electricity prices and delayed connection of the client base. The demand for bioenergy increases when facilities start operating.

Enova's efforts for increased utilization of bioenergy consists of support for establishment of biogas production facilities and support for establishment of renewable heating production and distribution. The programmes help make biogas available in the Norwegian market, and increase demand for biofuel. Through the projects, we observe development of local biogas markets. There is growth in the renewable heating market based on bioenergy.

In 2013, Hafslund Varme started operation of its wood pellets-fired facility at Haraldsrud in Oslo, nearly doubling the demand for pellets in Eastern Norway.

Prospects

A continued low electricity price is expected. Higher fees for fuel oil will increase this price. The Energiflisordningen[26] will be discontinued from 2014. This could increase the price of chips, thus changing the demand.

Industrial-scale facilities are important to trigger volumes within bioenergy. Enova will continue its bioenergy efforts through the heating and biogas programmes.

Biofuel 2013

Bio-based heating deliveryand production of biofuel supported by Enova in 2013:	381 GWh
Of which:	
Waste energy	20 GWh
Biogas production	45 GWh
Chips	288 GWh
Pellets og briquettes	22 GWh
Other bio	6 GWh

23 NOU 2012:9. Energy assessment – value creation, security of supply and the environment.

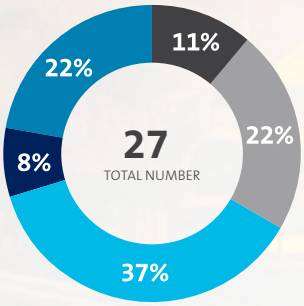
24 Klif (2013). Report TA3020. Support material for cross-sector biogas strategy.

25 Statistics Norway (2013). Energy accounts and energy balance, 2011-2012.

26 The Energy Chip Scheme provides operating subsidies for extraction of forest raw materials for chip production.

Part 4

PROJECTS WITHIN NEW ENERGY AND CLIMATE TECHNOLOGY 2012-2013 DISTRIBUTED BY MARKET



- *Non-residential buildings*
- *Non-industrial plants and facilities*
- *Industry*
- *Renewable heating*
- *Renewable power*

TRIGGERED CAPITAL IN NEW ENERGY AND CLIMATE TECHNOLOGY PROJECTS

SUPPORT AWARDED 2012-2013 → **292** MNOK

TRIGGERED CAPITAL IN THE MARKET → **510** MNOK

New energy and climate technology

New technology for the future's non-residential buildings

In 2010, the total building mass in Norway consisted of 260 million m² of inhabited residences and 128 million m² of non-residential buildings. The ownership is spread, but with an increased concentration of major players in non-residential buildings. The construction industry employs about 140,000 people in a total of 35,000 small and large companies[1]. Annual turnover in 2013 was about NOK 260 billion[2], while new non-residential buildings represent NOK 58.5 billion[3]. The total sales related to rehabilitation in all building categories, i.e. modification, renovation and maintenance (ROT market) are estimated at NOK 129.9 billion. The total annual energy end-use of the non-residential building mass is 35 TWh and 45 TWh in the residential building mass[4]. There is a major energy potential here.

Innovation in the construction industry

Energy efficiency requires implementation of new technology and innovation. The construction market is characterized by low market-driven innovation. The development has been driven by more stringent construction rules. The low innovation rate is e.g. caused by a lack of ability to assess various technical building solutions on the part of the principals/demanders of buildings and building services, and therefore largely leaving it up to the suppliers to define which solutions they receive. The lack of knowledge and influence from the demand side could be considered a market failure. The structure in the construction and craft industry is a corresponding barrier. There are few innovators and the vast majority is served best by following the standard and using well-tested and familiar solutions. In other words, further development in the market depends on a small number of players, that influence to what extent new solutions are spread. The reasons why some players are willing to take on the additional cost and risk of using new technology are many, but the possibility of achieving competitive advantages is also an important driver in the construction market.

In the last decade, we find most innovative investments near the major urban regions of Norway, in cooperation with research and educational institutions and some of the largest advisers and contractors. Several associations and interest groups such as Future Built, Norwegian Green Building Council and Breeam-Nor, Smart Cities, the Low Energy Committee, tNorwegian Solar Energy Society, ZERO and the Norwegian Society of HVAC Engineers also help push the frontier.

TABLE 4.1 SUPPORT FOR RESEARCH, DEVELOPMENT, INNOVATION AND DEMONSTRATION RELATED TO ENERGY EFFICIENCY MEASURES IN BUILDINGS

		Other public players			
	Enova[5]	Skattefunn Tax Deduction Scheme[6]	The Norwegian State Housing Bank[7]	Innovation Norway[8]	Research Council of Norway[9]
	MNOK	MNOK	MNOK	MNOK	MNOK
2009	1	8	6	n/a	10
2010	49	11	14	n/a	29
2011	159	9	12	58	35
2012	243	8	1	81	37
2013	519	8	9	105	41

Tabell 4.1: The table shows examples of public support for R&D related to energy efficiency measures in buildings

1 Byggforsk 2013 T.Jacobsen.
2 Statistics Norway, 2014.
3 Prognosesenteret, Interim report 2014.
4 Enova's study of the potential and barriers 1/3, 2/3, 3/3, 2012.
5 Enova's total funding commitments to passive houses and low energy (excluding households), as well as technology support. Support normally constitutes between 20-30 per cent of the total budget.
6 Tax deduction scheme. Expected tax deduction primarily related to energy efficiency measures in commercial buildings.
7 The Norwegian State Housing Bank, Expertise commitments with a focus on energy efficiency in all building types.
8 Innovation Norway, environmental technology scheme.
9 Research Council of Norway, annual subsidy to relevant energy efficiency projects related to buildings from Renergi and EnergiX.

State support for R&D, new technology and innovation
Research and development (R&D), as well as innovation takes place at several levels; internally in companies and in cooperation with national and international players. The total scope of R&D and innovation is not well-documented and there is no overview of the demand. Table 4.1 only shows parts of these efforts, the Norwegian State Housing Bank's block grant is not included, among others.

The public policy instruments provide support and guidance. The most important players here are the Research Council of Norway, Innovation Norway, the Norwegian State Housing Bank and Enova. Overall, they have programmes which cover the development course from research and development to demonstration.

International research and development does not take place in a vacuum, but through mutual influence and development. Norwegian participation in international forums such as the International Energy Agency (IEA), European Energy Network (EnR) and various research programmes, ensures both information dissemination and elevation of expertise. Several of the projects supported by Enova are Research Council of Norway projects, such as Powerhouse Kjørbo, Skarpnes Boligfelt and Rema Kroppanmarka.

Energy use in non-residential buildings
Generally, energy use in buildings can be related to the applicable construction regulations. Figure 4.1 shows the development in requirements for energy end-use kWh/m^2, based on technical construction rules and regulations. Trend-setting innovators can naturally construct individual buildings with lower energy end-use.

The total energy end-use in the existing building mass is related to m^2 per construction year corrected for rehabilitation and condemned buildings. A realistic energy potential in 2020 calculated for the entire building mass and non-residential buildings is 7.5 and 5.6 TWh, respectively, if new buildings and rehabilitated buildings are elevated to a TEK10 level. The existing building mass, commercial buildings, offices, light industry/workshops and school buildings in particular, have the greatest potential[10].

FIGURE 4.1 DEVELOPMENT IN ENERGY END-USE PER M^2 FOR VARIOUS BUILDING TYPES

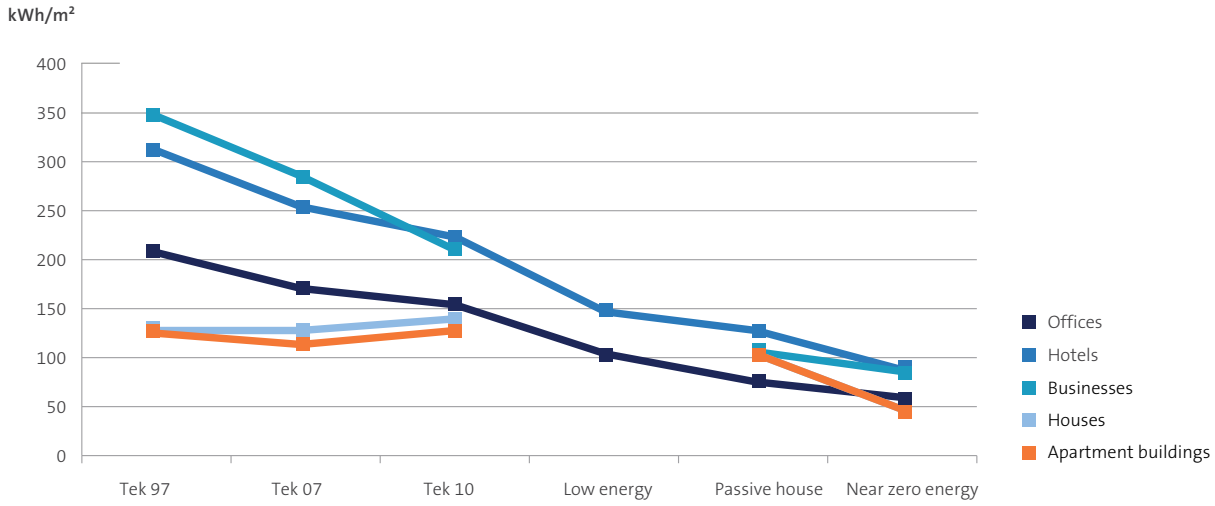


Figure 4.1: The figure shows the change in requirements for energy use per m^2 for various building types in regulations and standards
Source: Enova study of the potential and barriers 1/3, 2/3 and 3/3, 2012

10 Enova's study of the potential and barriers 1/3, 2/3, 3/3, 2012.

FIGURE 4.2 NERGY END-USE FOR VARIOUS PURPOSES IN OFFICES WITH DIFFERENT TECHNICAL STANDARDS

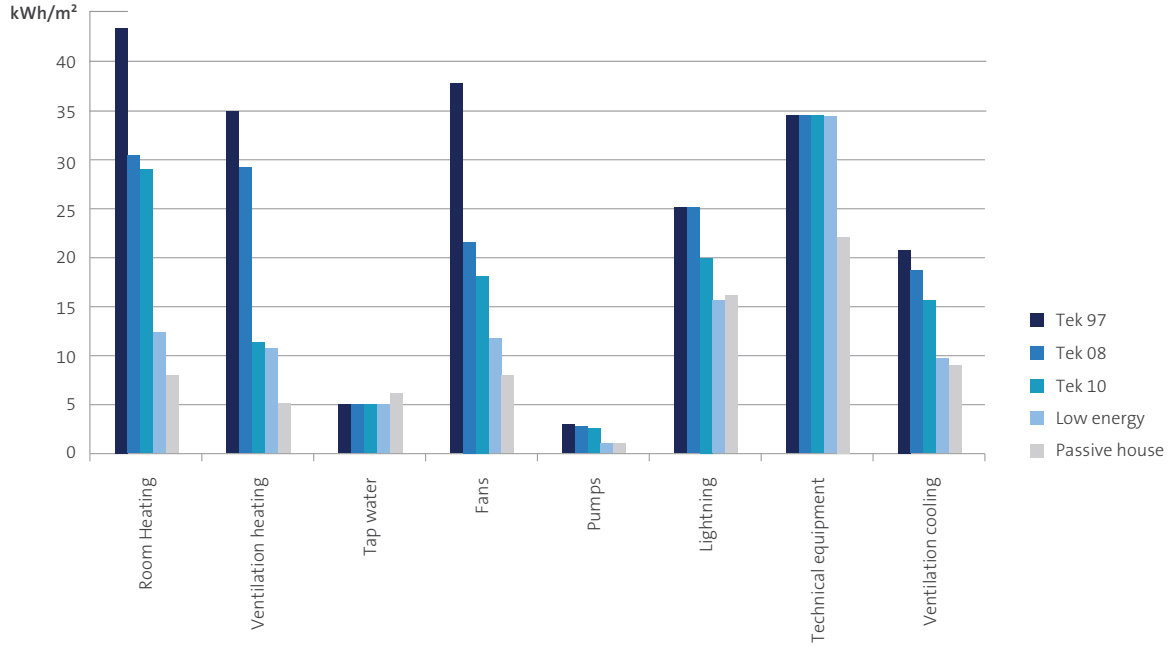


Figure 4.2: The figure shows the change in energy end-use for various purposes in offices with different technical standards (typical values based on requirements in regulations and standards) Source: Byggforsk 2013, T. Jacobsen

Figure 4.2 shows how the change in construction standard impacts the relationship between energy used for various purposes, at the same time as total energy use is reduced. In particular, the percentage related to heating has been reduced, and the largest remaining energy items are technical equipment, energy for heating and fans for ventilation systems and lighting. For additional energy reductions in the building mass, this entails a shift in focus from the actual building structure to other technologies.

Enova's services

Enova's instruments will push the frontier in the market, helping the development towards more energy-efficient buildings move more quickly than would otherwise have been the case. Enova has contributed investment support to the projects at the top when it comes to energy performance; first to the prototype projects from 2005 and from 2010 to the projects related to the low energy and passive house programmes. The number of non-residential building projects has increased from 32 during the period 2005-2009 to 344 during the period 2010-2013. Correspondingly, the number of involved municipalities has increased from 19 to 88, and building categories from 8 to 13 and with a better geographical distribution. The number of rehabilitated buildings is still low.

Until 2010, support was awarded to few individual projects, but a comprehensive strategy was developed from 2010 aimed at developing the market. At the same time as the low energy and passive house programmes were established, Enova also started offering assessment support, education and an advisory team service, development of continued and further education courses for advisors, as well as contributions towards development of information material, standards and detailed construction sheets. It is difficult to identify the effect of the individual measures and programmes, but the comprehensive approach has contributed to market change. In 2013, support was awarded to buildings with a total area of more than 1 million m^2 of non-residential buildings, which constitutes about 15-25 per cent of the total new building area for non-residential buildings[11].

The instruments directed at prototype projects have impacted the new building market, as well as the market for energy measures in existing buildings by placing the focus on the best available technology.

Technology maturity and development

Norwegian technology development, innovation and implementation take place in an interaction between Norwegian needs, trends and internationally developed products and solutions. New technology for the buildings of the future is thus not a static term. What was considered new and revolutionary in the early 2000s is now a given in all building types. This e.g. applies to both physical measures in the building, such as insulation and density, as well as installations such as balanced ventilation, thermostats and heat timers. There has been a gradual shift to more energy-efficient solutions for the building sector. For all building categories, a combination of technical measures can achieve the desired energy performance. A reduced heating

11 Prognosesenteret 7 Jan. 2014.

demand can, for example, be achieved with walls and windows that are better insulated, ventilation air and other sources, as well as only using technical installations when needed.

Price is considered an important parameter for describing a technology's level of maturity. Over the course of the period during which Enova has supported passive house projects, the additional cost associated with passive houses has dropped by 30 per cent[12]. The price gap between buildings at a TEK10 level (NOK 1300-1600/m^2) and passive house level (NOK 1360-1670/m^2) has now been significantly reduced[13]. Zero emission buildings will be higher, from NOK 1600-1900/m^2, depending on the standard and chosen technology.

In line with the development in energy performance for non-residential buildings, there is a corresponding development for individual technologies and solutions. Energy efficiency has improved over time for most technologies. To illustrate the development, we will take a basis in a few of the technological solutions related to various requirement levels.

The building structure, windows and façade layout impact the heating and cooling need. As illustrated in Figure 4.4, the heating demand in low energy buildings has been reduced to a fourth compared with TEK97. Standardized methods have been developed that describe how desired U-value and airtightness can be achieved.

To reduce heat loss, the first low energy and passive houses were constructed with thick mineral or glass wool walls. At the beginning, emphasis was only placed on a low U-value. However, the thickness of the outer walls came at the expense of usable living area, and new products have started entering the market. The focus has changed to taking both the outer wall's U-value and structure's area use into consideration.

FIGURE 4.3 FUNDING COMMITMENTS AWARDED TO ENERGY-EFFICIENT, INNOVATIVE NON-RESIDENTIAL BUILDINGS FROM ENOVA

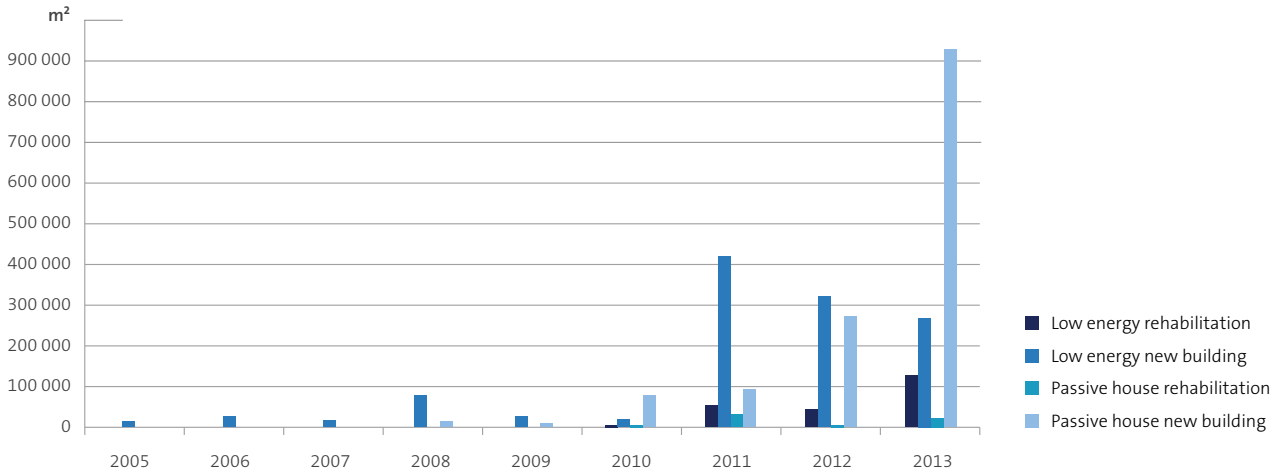


Figure 4.3: The figure shows the number of square metres supported by Enova within energy-efficient, innovative non-residential buildings during the period 2005-2013

12 Cost optimality Energy rules in TEK, Sintef and Multiconsult 2012, as well as systematisation of experiences with passive houses – follow-up SINTEF Building and Infrastructure 90/2012.
13 Multiconsult Interim report, 2014.

The development and use of windows with low U values have contributed to increased availability, market share and reduced prices. Though windows only represent 5-10 per cent of a building's surface area, they can contribute to 40 per cent of heat loss in the building. Before Enova launched the "Enova Recommends" brand in the autumn of 2007, there was only one manufacturer of windows with a U value of less than 1.0. More than 20 suppliers now offer 3-layer windows, and the technological development has also contributed to a U-value of 1 now being possible with 2-layer glass. The price gap is now so small that these types of windows are also chosen for projects with lower energy ambitions.

Enova also supports installation of new façade solutions. Development is ongoing within solutions that provide both increased daylight, reduce the need for energy for lighting and prevent excess temperature. This is not yet generally available, but is a part of individual projects Enova has supported.

In principle, a reduced heating demand entails a need for development of new heating solutions to prevent over-dimensioned systems. TABS (Thermo Active Building System/concrete core activation), which utilizes the thermal capacity in concrete will be tested in the new public library in Oslo, with support from Enova.

The total energy use from lighting is increasing, and development in LED technology has led to somewhat reduced prices. The price level is still about twice that of traditional energy-efficient T5 fluorescent tubes (NOK 7500 vs. NOK 3-4000) A market change is expected here in line with increasing supply and a lower price level.

Management and regulation is very significant in the operation of buildings to achieve desired energy performance. In recent years, needs based management has become a common requirement when engineering buildings. Products' user-friendliness, ability to regulate and availability are improved for both the new buildings and rehabilitation segments. The number of players and products is presumably increasing, but this is not reported in publically available statistics.

The buildings' requirements for an increased percentage of renewable energy for non-residential buildings opens the door for other renewable energy and climate-friendly solutions such as solar collectors, solar cells and utilization of waste heat. Local energy production is limited in Norway, and connection to the district heating grid or a heat pump is usually chosen for non-residential buildings. The number of installed heat pumps is stable

FIGURE 4.4 PRICE PER M² WINDOW WITH DIFFERENT U VALUES

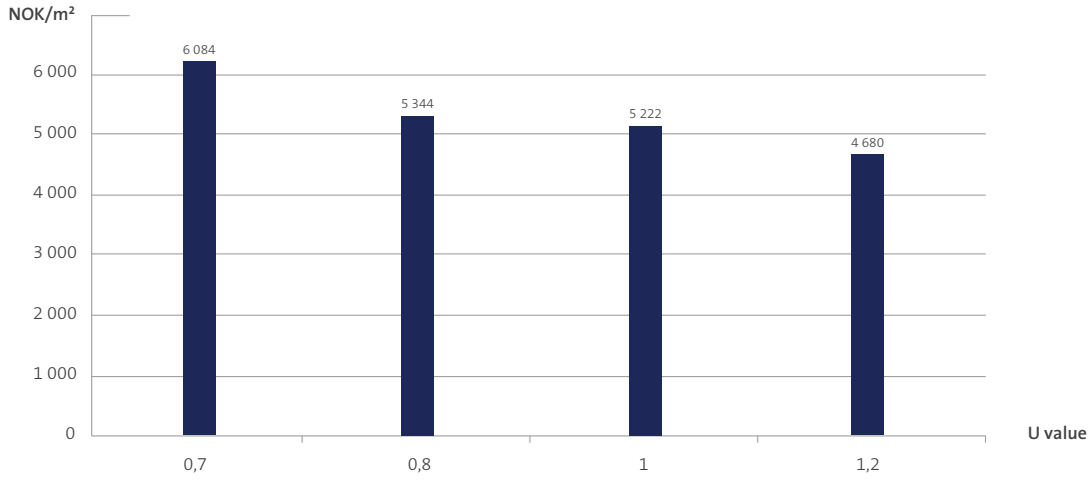


Figure 4.4: The figure shows the price per m² for various U values. Source: Prognosesenteret

14 Statistics Norway based on the number of new non-residential buildings during the period november 2012-2013.

at about 650 per year, and is increasing slightly for new non-residential buildings, which corresponds to every fifth new building. Nearly twice as many heat pumps are installed during rehabilitation. Relatively few non-residential buildings have installed solar collectors, and even fewer have solar cells. The price of solar cells has declined, but the cost level here is still higher than alternative energy production14. The market harnesses experience through implementation in selected projects supported by Enova. For example, utilization of waste heat from cooling in stores has increased, and correspondingly, the percentage of cooling plants that use CO_2 as a cooling medium has increased. Whether the change is due to increased availability of components for this type of solution has not been confirmed, but is plausible.

Future development

Most likely, future energy-efficient development courses will run along three trajectories; building structure, technical systems and energy supply.

Though the heating demand is reduced, new and, not least, more area-efficient materials for insulation and making buildings airtight should be developed. More efficient and integrated technical systems for heating, cooling, lighting and other internal use will be developed. We expect continued development in management and regulation systems, both with regard to self-learning systems and forecasting systems that take into consideration the expected outdoor temperature, internal need and energy price.

We believe the building's energy supply will be viewed in a new light. The energy use can be optimized, for example by assessing how potential periods with excess energy can be utilized either locally, stored or utilized by other surrounding buildings. Most likely, we will see combinations of renewable energy either produced locally, decentralized or delivered via different central grids. A special challenge here is in relation to the difference in time of day and season between production of energy and need. Technologies for local production of energy will require storage or other recipients. Another perspective is the development of methods for lifecycle assessment, LCA, which also includes energy and greenhouse gases originating from the building and associated installations. Tools are expected to be forthcoming which make it possible to evaluate greenhouse gas emissions along the same lines as energy end-use for buildings.

A big picture mind-set with full integration of technical systems for heating, cooling, ventilation and lighting and utilization of potential excess heat can contribute to further energy efficiency.

The gap between research and development should be covered better, where demonstration projects could play an important role. Enova's *New technology* for the buildings of the future programme could contribute to this, while the *Support for energy-efficient new buildings* programme will provide opportunities for those with a higher ambition level than the existing TEK10.

Financing of the Powerhouse Kjørbo rehabilitation project is a good example of what can be achieved by construction clients with high ambitions, with a combination of innovative solutions, new technology and Enova's support schemes.

Investing in those willing to take the lead is an important part of Enova's strategy to reduce energy end-use in existing and future non-residential buildings. Enova will continue to prioritize this going forward.

BUILDING OF THE FUTURE: Powerhouse Kjørbo is the "world's most environmentally friendly office building" according to Kristin Haug Lund, director of project development and technology in Entra Eiendom. (Photo: Bo Mathisen)

Powerhouse Kjørbo

A building for the future

In the past year, the two office buildings in Kjørboparken in Sandvika, Norwa have gone from being typically 1980s to providing the answer to the buildings of the future. By combining familiar technology in new ways, the Powerhouse cooperation has succeeded in rehabilitating a commercial building in Norway that, over the building's entire lifetime, will produce more energy than it consumes.

As the first rehabilitation project in Norway, Powerhouse Kjørbo has achieved the BREEAM-NOR certification 'Outstanding'. With this certification, the world's first rehabilitated plus building can also bask in the glory of the venerable title as "world's most environmentally friendly office building".

"Currently, buildings are responsible for 40 per cent of all energy use, and we know that nearly 80 per cent of the current building mass will still be here in 2050. That is why rehabilitation to an energy-plus-house is a very important environmental contribution. This makes buildings part of the solution, instead of being a part of the environmental and climate problem," says director for project development and technology in Entra Eiendom, Kristin Haug Lund.

Powerhouse Kjørbo uses energy wells for heating and cooling, a façade of burnt wood, efficient ventilation, insulation and lighting, and also has 1556 m2 of solar cells on the roof, which will generate 200 MWh annually. With this, the building will generate more energy than is used for production of building materials, erection, operation and disposal of the building, calculated over a lifetime of 60 years.

"The energy potential in Norwegian non-residential buildings is vast, and we need more Powerhouses to extract this potential. The goal is for more to utilize the good solutions from Powerhouse Kjørbo, so the positive energy and environmental contribution can really start to make a difference," says Lund.

Facts

Programme: New technology for the buildings of the future

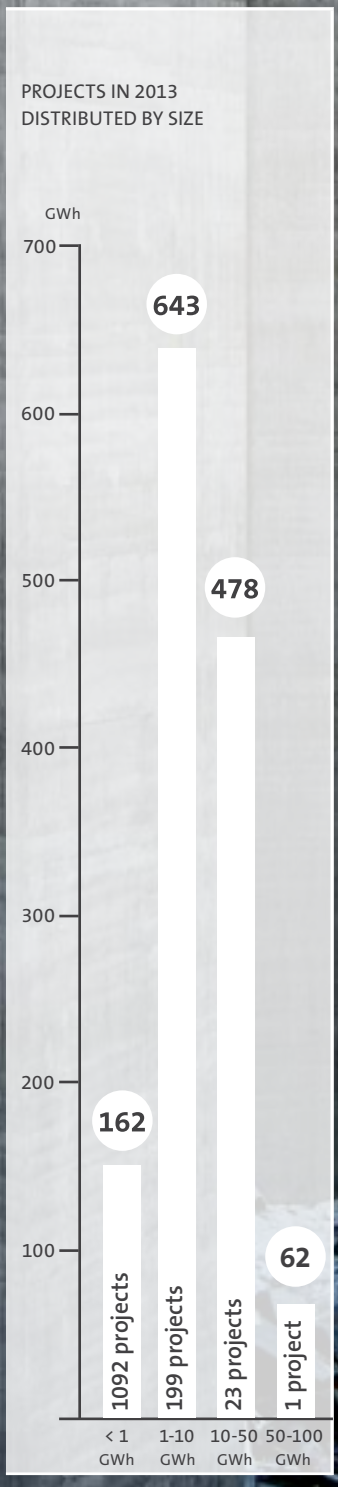
Support amount: NOK 13 million

Energy result: 0.35 GWh

Year funded: 2013

Completed: 2014

Part 5



Reporting – the Energy Fund 2012 and 2013

Enova's main goals

Enova's mandate and responsibility within energy and climate technology in the agreement between the MPE and Enova for the period 2012 – 2015 has been strengthened compared with previous periods.

> *Enova promotes environmentally friendly restructuring of energy end-use and energy production, as well as development of energy and climate technology.*

Enova's historical areas are continued along with the expanded responsibility. Enova's purpose is further elaborated in six main goals:

Four of the main goals focus on what we must achieve:

- Development and introduction of new energy and climate technologies in the market
- More efficient and flexible use of energy
- Increased use of other energy carriers than electricity, natural gas and fuel oil for heating
- Increased use of new energy resources, including through energy recovery and bioenergy

These main goals cover the areas where it is natural to quantify energy results. The main goals overlap to some extent and cannot be added up to a total sum. The energy result from management of the Energy Fund for the period 2012 to the end of 2015 must constitute at least 6.25 TWh. The primary objective of investments in new energy and climate technology is that it will contribute to reducing greenhouse gas emissions and support the restructuring of energy end-use and energy production in the long term by the development and utilization of technologies and new solutions that can contribute to this.

The remaining two main goals in the agreement indicate how Enova should work:

- More well-functioning markets for efficient solutions that are environmentally and climate-friendly
- Increase awareness in society of the possibilities of utilizing energy-efficient, environmentally and climate-friendly solutions

For these two goals, it is more natural to find other units of measurement than energy result to assess progress.

Main goal 1:
Development and introduction of new energy and climate technologies in the market.

This main objective is a direct result of the Climate Agreement in the Storting in 2012. Development of new energy and climate technologies is very important in order to solve the global climate challenges, but if these new technologies do not reach the market, their impact will be very limited.

With its capital base and proximity to the market, Enova can bring technology initiatives from the pilot phase and over to first introduction. This is a critical phase for the projects where they will demonstrate to the market that the technology functions under normal conditions. It is also a very capital-intensive phase. Some of the technologies succeed and gain a foothold which can be built on.

However, making it through the critical phase is no guarantee for immediate success in the market. For many technologies, the first encounter with the market will reveal a need to test new approaches and concepts, which may entail having to take one or more steps backwards in the innovation chain. Other technologies are weighed and found wanting in the competition with other technological solutions.

Enova awarded support to a number of technology projects in 2013 while being aware that some of them will not be successful in the market in the long run. Others will succeed. However, it is challenging, if not impossible, for Enova to pick out the winners in advance. Our role is allowing the technologies to be tested in the market, and then it is up to the market to pick the winners.

The energy results in all of the technology projects are relatively modest in relation to the support they receive. This is natural for these projects. The gains will come in the long run when the technology in question is widely used and the technology cost is reduced.

In 2013, Enova supported 19 technology projects, NOK 176 million in total.

Main goal 2:
More efficient and flexible use of energy.

Norway's energy system is dominated by hydropower. In the near future, increased renewable power production as a result of the electricity certificate system, and a relatively modest growth in the demand for energy, will entail a power surplus in

normal years. Relatively low power prices are expected going forward.

However, it is important to maintain a high level of focus on efficient and flexible use of energy. A significant part of energy end-use comes from buildings and heavy industrial processes. This means that the choices made with regard to building structure and production processes will determine energy end-use for many years to come. If we do not take advantage of the possibilities available in choosing energy-efficient solutions, we will be bound to unnecessarily high energy use for many years in the future. In the same way, many of the choices we make today influence how flexible and robust the energy system will be in the next decades.

Enova's programmes for buildings and industries are fulfilling this main goal. In 2013, Enova invested in projects in these markets corresponding to almost 800 GWh.

Main goal 3:

Increased use of other energy carriers than electricity, natural gas and fuel oil for heating.

Even with prospects signalling a power surplus in coming years, it is important to ensure the energy system does not become too dependent on electricity alone. During dry and cold years we could end up in a situation where certain regions have a very strained security of supply. In this case, a deficit in the energy balance over the year is not the problem, it is the deficit in the power balance. Increased use of energy carriers such as bioenergy and district heating for heating will reduce pressure on power balance in dry years. An added benefit is that it provides end users with a greater opportunity to switch between different energy carriers based on price.

Enova's programmes for district heating and heating plants are particularly directed at this main goal. Enova also conducts targeted work to phase out oil boilers in households. Over the course of 2013, Enova has supported projects under this main goal corresponding to more than 600 GWh.

Main goal 4:

Increased use of new energy resources, including through energy recovery and bioenergy.

Norway holds a unique position globally with regard to the high percentage of hydropower, while also having a considerable potential for continued increased renewable energy production. The electricity certificate system is directed at new renewable power production that is based on available technology. For new technologies for renewable power production that are at an early stage in the innovation phase, the electricity certificates are not very relevant. For these, Enova's programmes within new technology are of more interest.

Next to a considerable potential for renewable power production, Norway also has a significant potential for increased use of bioenergy and heat recovery from industries.

Main goal 5:

More well-functioning markets for efficient solutions that are environmentally and climate-friendly.

Enova will make the efficient, environmentally and climate-friendly solutions the preferred solutions in the market. By supporting innovators and early users, we create market development by making the good solutions more competitive as a result of increased demand and reduced unit costs. Well-functioning markets also depend on expertise and competition from suppliers and informed demanders.

Enova has several instruments that, overall, will create better markets for future energy, environmentally and climate-friendly solutions. Through the subsidy programmes, we increase demand for future energy solutions in the professional market. Furthermore, we help develop the supply side by testing and marking products available in the market. Through energy measures in homes, we are stimulating demand in private households. Another instrument is familiarizing consumers with the good solutions already in the market.

Main goal 6:

Increase awareness in society of the possibilities of utilizing energy-efficient, environmentally and climate-friendly solutions.

Information and knowledge impacts our attitudes and our behaviour. Enova therefore works in a systematic and targeted manner with communication measures to increase use of efficient and environmentally friendly energy solutions. We give advice to households and the professional market to increase awareness regarding environmentally friendly energy solutions, highlight possibilities and trigger measures. We offer professional advisory teams, provide guidance through applications processing and organize courses. We have a nationwide information and advisory service that serves a diverse audience through telephone, email and social media.

Target and results for the Energy Fund

In 2013, Enova awarded support to new energy projects corresponding to 1.4 TWh, with a total of NOK 1.8 billion. This is somewhat lower than we hoped for, primarily due to the absence of major industrial projects as a result of low investment activity and low energy prices.

Aggregated for 2012 and 2013, the results are distributed as 1.2 TWh from non-residential and residential buildings, a scant 1 TWh from industries and non-industrial plants and facilities and about 750 GWh from renewable heating.

The accumulated energy result is 3 TWh for both 2012 and 2013. To deliver on the goal of 6.25 TWh by the end of 2015, we need to achieve growth in 2014 and 2015.

In 2013, the highest results were achieved within non-residential buildings, with a total of 482 GWh distributed between 327 GWh in existing buildings, 119 GWh in new buildings and 37 GWh from heating plants. Enova's services for existing non-residential buildings were revised and simplified over the course of 2013. Experience indicates that it takes some time before new services are used by the market, and we expect growth in 2014.

An external factor that impacts the inflow of new projects and the funding level is low and declining energy prices.

For energy efficiency measures and new renewable energy production, low energy prices lead to less focus on energy costs and reduced profitability in the projects.

FIGURE 5.1 TARGET AND RESULTS FOR THE ENERGY FUND

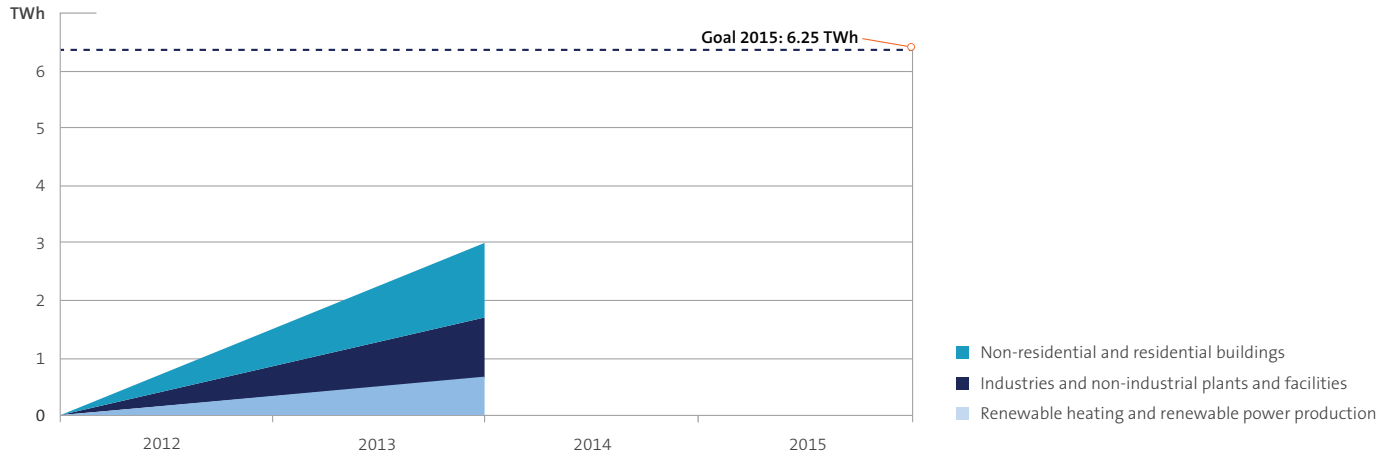


Figure 5.1: The figure shows accumulated energy results distributed by market in the period 2012-2015. The figures are corrected for cancelled and projects where a final report has been submitted.

For building owners, low energy prices make it uninteresting to reduce energy use, as financial savings are limited. At the same time, we see that building energy efficiently and rehabilitating is of major interest. This is reflected in the interest in building passive and low energy houses.

The results for 2013 within the industry market are characterized by the absence of major individual projects in the power-intensive industry. This is the primary explanation for the decline in the result from about 550 GWh in 2012 to 407 GWh in 2013. On the other hand, there has been a positive development in other industries. There we see increased interest in becoming more energy efficient. In particular, our *Support for Introduction of Energy Management in Industry and Non-industrial Plants and Facilities* programme, which was launched at the end of 2012, has been well-received. This programme constitutes about 150 GWh of the total energy results within the industry in 2013.

As for energy efficiency measures, profitability in heating projects, both district heating systems and heating plants, is highly dependent on the energy price. A low energy price results in low profitability and a correspondingly high need for funding. Normally, this would lead to declining results within renewable heating, but the results show the opposite. This could mean that the market is expecting energy prices to increase again in the long term.

TABLE 5.1 **THE ENERGY FUND'S ENERGY RESULTS AND ALLOCATIONS 2012-2013**

	2012		2013		2012-2013	
	GWh	MNOK	GWh	MNOK	GWh	MNOK
Renewable heating	322	287	422	498	744	785
Renewable power production	8	62	6	13	15	75
Industry	555	521	407	311	962	832
Non-industrial plants and facilities	22	13	13	35	35	47
Non-residential buildings	618	649	482	734	1 101	1 382
Residential buildings	30	87	76	190	106	277
International projects	-	4	-	10	-	14
Advisory services and communications	-	59	-	70	-	129
External analyses and development measures	-	36	-	28	-	64
Administration	-	98	-	110	-	208
Total	1 555	1 815	1 407	1 999	2 962	3 813
Of which						
General energy projects	1 539	1 469	1 351	1 591	2 890	3 060
New energy and climate technology projects	16	117	56	176	72	292

Table 5.1: The table shows aggregated energy results and resources allocated from the Energy Fund in 2012 and 2013, corrected for cancelled and final reported projects as of 31 December 2013. Projects within the programmes for new technology are distributed between respective market areas. The heating plant programmes were previously reported under renewable heating. They have been distributed in the industry and non-residential buildings market areas in this report. The 2012 figures are adjusted for this.

Management of the Energy Fund's resources

Each year, the Energy Fund is supplemented with new funds that will be used to fulfil the mission in the agreement between the MPE and Enova. The income in the Energy Fund comes from the return on deposits in the Fund for Climate, Renewable Energy and Energy Restructuring, and from the parafiscal charge on the grid tariff, which constituted a total of NOK 1.7 billion in 2013. There is also an allocation directly over the fiscal budget of NOK 20 million in connection with the Environmental technology campaign.

In addition, Enova can allocate transferred funds from previous years, returned funds from cancelled projects, as well as the interest income from the Energy Fund. These additions constituted just over NOK 2.2 billion in 2013.

A decision was made in connection with the Climate Agreement to strengthen the Fund for Climate, Renewable Energy and Energy Restructuring with NOK 25 billion up to and including 2016, creating a total volume of NOK 50 billion. The first allocation of NOK 10 billion was made on 1 January 2013 at an interest rate of 2.2 per cent. The returns on these funds will not be available until 2014. They will then amount to NOK 220 million, and can be used by Enova to support energy and climate technology projects in the industry.

When Enova decides to award support for projects, the amounts are earmarked in the Energy Fund as commitments. The relevant amount is then disbursed in arrears based on actual project costs. The disbursement does not normally take place in the approval year. The earmarked amount in the Energy Fund is released for other projects if projects are cancelled.

Enova's ability to transfer unused funds from one year to the next is one of the Energy Fund's strengths. This provides a flexibility that is particularly important for major, capital-intensive individual projects. These are projects that Enova normally has a close dialogue with for a long time prior to an application, but where it is often difficult to predict with any certainty when the projects are ready for a support decision. Major energy and climate projects often have a long project development time. The possibility of transferring funds gives projects assurance that the time of application and decision will not impact the outcome of the project portfolio management. Transferred funds therefore allow Enova to carry the major individual projects, including full-scale production lines in the industry, in the remaining part of the agreement period.

Enova has committed a total of NOK 2 billion in 2013, including NOK 110 million in administration. This is NOK 300 million more than new allocations in 2013. Low energy prices and market unrest have caused support recipients from previous periods to stop their projects. This has resulted in cancellations, particularly within renewable heating and industry. It is still challenging for Enova to transfer major funds from one year to the next. Although we are on schedule for 6 TWh, we would have liked to have seen more good projects that were qualified for support in both 2012 and 2013.

At the same time, it is important to note that Enova, in accordance with the guidelines for state subsidies and the agreement with the MPE, must consider whether each project actually needs support, how much support it needs and whether it will provide environmental gains in the form of energy or climate results. This is followed up and means that projects could be rejected, even if funds are available.

Enova has awarded funding commitments totalling about NOK 1.8 billion in support for projects in 2013, which will in turn trigger just under NOK 6 billion from the market in connection with the projects that received the support. This will create total investments of more than NOK 7-8 billion in energy and technology projects approved in 2013.

FIGURE 5.2 ALLOCATION OF THE ENERGY FUND'S RESOURCES

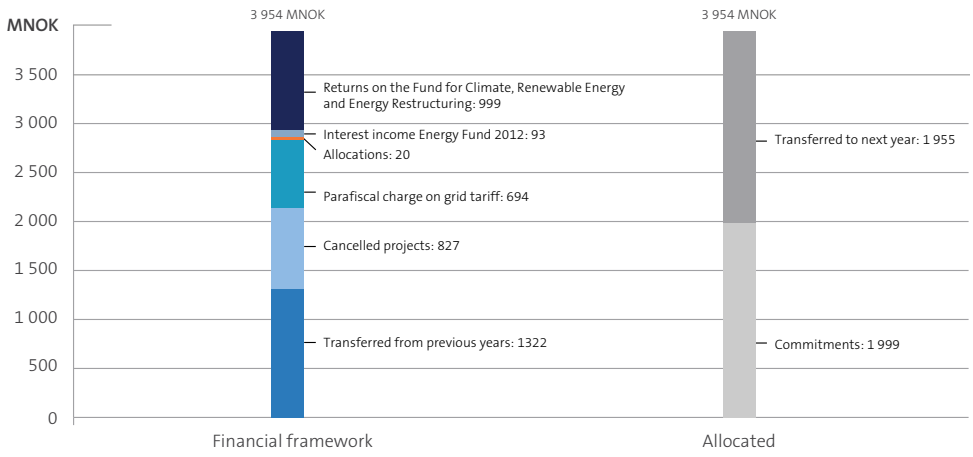


Figure 5.2: The figure shows a comparison of the Energy Fund's various sources of income and allocations thereof. Projects that are approved and cancelled in the same calendar year are not included in cancelled projects or commitments.

New energy and climate technology

New technology in general, and energy and climate technology in the industry in particular, were the subjects of increased focus through the new agreement entered into between the MPE and Enova in 2012. As a follow-up of the new agreement, Enova has established a separate programme for technology projects in the industry. The goal of the technology projects is harnessing experience that will contribute to expertise development, innovation and diffusion of the technology both nationally and internationally, thus contributing to reducing greenhouse gas emissions and supporting the energy restructuring development.

NOK 176 million in support was awarded to a total of 19 projects in 2013. Of these, seven projects and NOK 93 million were within new energy and climate technology in industries. The remaining projects are relatively evenly distributed across other market areas.

TABLE 5.2 SUPPORT FOR NEW ENERGY AND CLIMATE TECHNOLOGY 2012-2013

Market area	Programme	2013			2012-2013		
		Number of projects supported	Contractual energy result	Contractual support	Number of projects supported	Contractual energy result	Contractual support
		Stk	GWh	MNOK	Stk	GWh	MNOK
Renewable heating		**2**	**2**	**8**	**3**	**3**	**15**
	Support for Introduction of New Technology	2	2	8	3	3	15
Renewable power production		**4**	**6**	**13**	**6**	**15**	**75**
	Support for Introduction of New Technology	4	6	13	6	15	75
Industry		**8**	**39**	**93**	**10**	**43**	**115**
	Support for Introduction of New Technology	1	0,1	0,5	3	4	22
	Support for New Energy and Climate Technology in Industry	7	39	93	7	39	93
Non-industrial Plants and Facilities		**2**	**8**	**30**	**2**	**8**	**30**
	Support for Introduction of New Technology	2	8	30	2	8	30
Non-residential buildings		**3**	**1**	**31**	**6**	**4**	**57**
	Support for Introduction of New Technology	-	-	-	3	2	26
	Support for Introduction of New Technology in the Buildings of the Future	3	1	31	3	1	31
Total		**19**	**56**	**176**	**27**	**72**	**292**

Table 5.2: The table shows energy results and allocations within new energy and climate technology in 2012 and 2013, distributed by market area.

The agreement with the MPE stipulates that at least 10 per cent of the annual available funds in the Energy Fund are earmarked for technology projects within the agreement period. This has been followed up by Enova in 2012 and 2013. Based on experience, the scope of technology projects varies from year to year, and in 2013, the technology projects constituted just under 9 per cent of allocated funds.

The allocations of NOK 20 million which were added to the Energy Fund for 2012 and 2013 earmarked for environmental technology, were included in the funding awarded to the tidal power project Flumill in 2012. The support contributes to the full-scale demonstration of patented new Norwegian tidal power technology in Norwegian waters.

Untested and immature technology will generally be significantly more expensive than standard solutions. As a result of this, the support need will also be considerably higher than for projects based on well-tested technology. This is reflected in a relatively modest energy result of 56 GWh based on overall support of NOK 176 million. This corresponds to about NOK 3/kWh compared with a scant NOK 1/kWh for ordinary energy projects within industries.

The technology projects cover a broad area from industries to residential buldings. Table 5.3 provides an overview of the ten largest projects that received support from Enova through 2013, with Hydro's pilot facility in Årdal (Sogn og Fjordane county) as the largest project with just under NOK 40 million in support.

All of the technology projects, with the exception of the projects initiated by Scanbio Bjugn and Resitec, have relatively modest energy results in relation to the support they receive.

Enova has new and exciting energy and climate technology projects in the 2013 portfolio. It is very important to us to follow the portfolio of technology projects over time. We have experienced that it can be challenging to gather venture capital. Enova finds that the response in the market is good. The spirit of innovation is definitely present.

Table 5.4 provides extensive information on Enova's portfolio of projects within new energy and climate technology.

TABLE 5.3 TEN LARGEST PROJECTS WITHIN NEW ENERGY AND CLIMATE TECHNOLOGY 2013, MEASURED BY AWARDED SUPPORT

Project	Company	Market	Programme	Contractual energy result (GWh)	Contractual support (MNOK)
HAL4e Pilot Plant Technology Program. Rebuilding/relining of test cells at the Årdal Reference Centre (ÅRC) (in Sogn og Fjordane County	Hydro Aluminium AS	Industry	Support for new energy and climate technology in the industry	5.1	**39.2**
Greenfield Datasenter (in Akershus County)	Greenfield Property AS	Non-industrial plants and facilities	Support for introduction of new technology	7.4	**30.3**
Simplified, energy-conserving value chain for production of solar cell grade silicone (in Vest-Agder County)	Solin Development BV	Industry	Support for new energy and climate technology in the industry	1.4	**25.3**
Powerhouse Kjørbo (in Oslo County)	Kjørboparken AS	Non-residential buildings	Support for new technology for the future's buildings	0.3	**13.0**
Huldra Økogrend (in Akershus county)	Aktivhus Entreprenør AS	Non-residential buildings	Support for new technology for the future's buildings	0.5	**12.9**
New continuous process for high strength chain (in Vest-Agder county)	Nøsted Kjetting AS	Industry	Support for new energy and climate technology in the industry	5.0	**12.0**
New energy-efficient drying process of fish peptides (in Sør-Trøndelag county)	Scanbio Bjugn AS	Industry	Support for new energy and climate technology in the industry	19.0	**11.4**
Electricity production at Follum (in Buskerud county)	Hønefoss Fjernvarme AS	Renewable power production	Support for introduction of new technology	4.7	**6.6**
Skarpnes Boligfelt (in Aust-Agder county)	Skanska Norge AS	Non-residential buildings	Support for new technology for the future's buildings	0.3	**5.3**
Installation of plant for recycling of silicone waste for reduction of energy use (in Vest-Agder county)	Resitec AS	Industry	Support for introduction of new technology	8.7	**4.8**

Tabel 5.3: Ten largest projects within new energy and climate technology 2013, measured by awarded support.

TABLE 5.4 PROJECTS WITHIN NEW ENERGY AND CLIMATE TECHNOLOGY 2012-2013

CONTRACT YEAR	PROJECT OWNER	PROJECT DESCRIPTION	TECHNOLOGY SUPPLIERS	SUPPORT AWARDED (NOK)	PROJECT'S ENERGY RESULT (KWH/YEAR) [kWh/år]
Renewable heating					
2012	Nord-Trøndelag county authority	Dynamic thermal energy storage (DTES) in low-temperature local heating system at Mære Landbruksskole in Steinkjer (Nord-Trøndelag county)	Technology developer: Gether AS Management systems/cybernetics: NTNU Analysis: UiO Development of energy circulation system: Kværner Piping Technology AS	6 756 755	1 400 000 Conversion from electricity, oil and natural gas
2013	Oslo Airport AS	Snow cooling plant at Oslo Airport Gardermoen (Akershus county)	Technology developer: Oslo Airport and Team-T AS (e.g. Norconsult and Cowi are partners) Contractor: Veidekke AS	4 260 306	940 000 Production of free cooling, as an alternative to electricity
2013	Agder Energi Varme AS	New solutions for heating from hydronic systems for low energy buildings in Kristiansand (Vest-Agder county)	Developer of solution: Agder Energi Varme	3 813 750	810 000 New application of district heating (from waste), as an alternative to electricity
Renewable power production					
2012	Tjeldbergodden Kraft AS	Tjeldbergodden Gjenvinningskraftverk, low-pressure turbine for power recovery from waste water (seawater) from the methanol plant at Tjeldbergodden in Aure (Møre og Romsdal county)	Turbine, generator: CleanPower AS Runner: Oshaug Metall AS Expertise for the runner: Evald Holmén Consulting AB Generator configuration: InPower AS	4 774 792	3 300 000 Production of electricity
2012	Flumill AS	Flumill tidal power plant – pilot plant for power production in Rystraumen in Tromsø (Troms county)	Turbine: Flumill AS Electromechanical system: Siemens AS Composite parts: Sørkomp AS	57 304 504	5 100 000 Production of electricity
2013	Returkraft AS	Combined heat and power production from low-temperature waste heat from Returkraft's waste combustion facility in Kristiansand (Vest-Agder county) using CraftEngine piston engines	Technology developer: Viking Heat Engines AS Partners in development of piston engine: Insitute for Product Development (IPU), AVL Schrick GmbH	3 361 526	150 000 Production of electricity
2013	Asker municipality	Combined heat and power production from disposal gas from Yggeset waste park in Asker (Akershus county) using stirling engines	Stirling engine: Cleanergy AB Partner: Wärmeprozesstechnik Gmbh Gas plant: MGE Teknikk	1 468 120	670 000 Production of electricity and heat
2013	Nordre Follo Renseanlegg IKS	Combined heat and power production from biogas using micro gas turbines at Nordre Follo's wastewater treatment plant (Akershus county)	Technology developer: Adigo AS (system engineering and development management system) Gas turbines: Capstone Turbine Corporation	1 310 000	600 000 Production of electricity
2013	Hønefoss Fjernvarme AS	Power production through utilization of available excess heat from low-pressure steam from bio boiler at Follum in Hønefoss (Buskerud county) using Tocircle expanders	Technology developer: Tocircle Industries AS	6 571 344	4 698 268 Production of electricity
Non-industrial plants and facilities					
2013	Greenfield Property AS	Greenfield Datasenter in Fet (Akershus county). Construction of cost-efficient, safe and environmentally friendly data centre using free cooling and adiabatic cooling, built as a cable route for cooling with advanced management and regulation	Technology developer: Lefdal Gruve Drift AS (Lefdal Mine)	30 300 000	7 358 400 Energy efficiency
2013	Andersen Gartneri AS	Installation of AGAM dehumidifier in greenhouse in Råde (Østfold county). Uses low-temperature regeneration of hygroscopic salt	Technology developer: Agam FlexTechnic Aps	191 500	176 000 Energy efficiency and reduced use of propane
Industry					
2012	Hydro Aluminium AS	Hal4e Amperage Increase Project – Reduced specific energy use in aluminium production through amperage increase on the HAL4e cells at the test centre in Årdal (Sogn og Fjordane county)	Technology developer: Hydro Aluminium	16 230 000	1 506 000 Energy efficiency
2012	Sør-Norge Aluminium AS	Reduced specific energy use in aluminium production with new design of electrolysis ovens at Sør-Norge Aluminium in Kvinnherad (Hordaland county)	Technology developer: Sør-Norge Aluminium	5 600 000	2 352 000 Energy efficiency

PROJECT'S CLIMATE RESULT IN NORWAY (KG CO_2 EQUIV./ YEAR)	PROJECT STATUS	INNOVATION	EXPERTISE DEVELOPMENT
379 000 Conversion from oil and natural gas	Engineering	• Dynamic thermal energy storage • Multiple innovations in system, individual technologies, storage and management for optimisation of performance and utilization of low-temperature ambient heat • First-time combination of technology with low-temperature local heating systems • Patented technology	• Cooperation with the Norwegian University of Science and Technology (NTNU), University of Oslo (UiO) and Bioforsk, as well as Nord-Trøndelag county authority (NTFK). NTFK builds operative experience in relation to other market actors • Research arena at Mære landbruksskole • Publications at national and international conferences • Master and doctorate degrees at NTNU
0	Engineering	• Utilization of snow as source for free cooling	• Demonstration facility • Knowledge about system development, functionality and suitability of the technology • Dissemination of project plan and results to several associations, e.g. the Norwegian Society of HVAC Engineers and the Norwegian District Heating Association, as well as through presentations at conferences
0	Under development	• Innovative composition of technology, introduced in new market segment • Simplified and more efficient hydronic system inside the building, suitable for industrialization • Utilization of hydronic heating system for previous electricity-specific consumption results in more balanced heat balance curve over the year	• Demonstration facility for the district heating industry, architects and property developers • Cooperation with other expertise environments (major contractors, the HVAC sector, Bellona) • Consumption measured by specific purpose for verification and analysis • Tailored metering programme offered to end user for customer follow-up and increased awareness • Planning courses/guidelines for the plumbing sector • Presentations in meeting arenas and at conferences
0	Under commissionin	• Turbine and generator in the same unit makes gearbox unnecessary • Adapted to temperate seawater to avoid corrosion • Replaceable runner for seasonal variation in water volume • Patenting of technology is under consideration	• Reference facility for the industry • Facilitated for monitoring, measurement and learning • Relevant for connection to research projects and education • Dissemination through presentations at conferences, nationally and internationally
0	Under establishment	• Design: Screw (helix) and configuration (hinged frame) • New application area for the composite material. Low cost. Floating. • No movable parts in the turbine and natural uplift system results in low wear • Patented technology	• Cooperation with the University of Tromsø (UiT) and Asplan VIAK (environmental mapping) • Cooperation with the hydrodynamic environment in Southern Norway through the University of Agder (UiA), CFD Marine and Acona (calculation of effects, forces and behaviour in the water masses) • Information dissemination through presentations at conferences and to potential industrial partners • Master at the Norwegian University of Science and Technology (NTNU), several planned at the University of Tromsø (UiT) and University of Agder (UiA)
0	Under commissioning	• Known motor technology (piston engine) adapted to new area of application • Simple high-efficiency design • Several patents, e.g. on heat exchanger and valve system (injection system)	• Demonstration facility (Returkraft has about 3 000 visitors each year) • Several cooperation projects with research and educational institutions, e.g. Sintef, Teknova, Denmark Technical University (DTU) • Doctorate at DTU
0	Under commissioning	• Verification of stirling engines' suitability for power production from low-quality disposal gas with low methane content. Can tolerate impurities in gas • Several patents, e.g. for the burner, gas cooler and piston	• Demonstration facility. Premises facilitated for tours and courses in connection with the facility • Dissemination to and via the industry organization and trade journals, as well as municipal professional journals
0	Engineering	• Newsworthy as this is a first-time implementation of micro-turbine at a wastewater treatment plantin Norway for production of power and heat (co-gen) • Development of complete management system	• Demonstration facility. Available for visitors from industries and academia • Web-based monitoring of the facility enables easy data acquisition and sharing
0	Engineering	• Enables power production from steam with low pressure and temperature • Flexibility in using multiple machines adapted to seasonal fluctuations • Patented technology	• Demonstration facility • Included in Viken Skog's efforts in "Treklyngen" at Follum, a business cluster for comprehensive and coordinated utilization of forestry, including sharing of expertise
0	Under development	• Use of free cooling and adiabatic cooling – no use of local room cooling • Use of the building as a route for ventilation air	• Company network established • Participating contractor is building expertise
19 000 Reduced use of propane	Under commissioning	• Reduces energy use for dehumidification by 25% due to energy-efficient low temperature regeneration of hygroscopic salt	• Company network established • Metering and documentation ongoing
39 000 Reduced process emissions	Under commissioning	• Improved anode production technology • Next level process management and operating procedures	• Included in Hydro's reference centre in Årdal • Increasing expertise in Hydro's technology environment and with external partners such as the Norwegian University of Science and Technology (NTNU) and SINTEF • Connected projects have several doctorates in subjects highly relevant to the project
226 000 - 376 000 Reduced process emissions	Under establishment	• Maintains stability in the oven at very high amperage through magnetic compensation in the electrolysis ovens • Patented technology	• Reference project for SørAl • Dissemination with goal achievement to the industry, e.g. through presentation at international industry conference (TMS)

ACHIEVED ADOPTION OF TECHNOLOGY	FURTHER DEVELOPMENT AND DIFFUSION
• First implementation of full-scale facility in Norway and globally	• Particularly suited for buildings with glass/atriums, historical buildings, energy efficiency for buildings on small lots, cooling in supermarkets • Technology supplier estimates own technology potential to several thousand plants in Norway • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology that can result in conversion to renewable energy and reduced greenhouse gas emissions
• First snow cooling plant in Norway • Implemented in one plant in Sweden. Concepts evaluated in Japan, but realization status is unknown	• Suitable for meeting cooling needs in buildings and facilities in areas with snow and frost in the winter and large areas available for snow harvesting and storage • International potential for diffusion of technology in regions with similar climatic conditions, which can yield greater use of renewable energy for cooling and reduced greenhouse gas emissions
• Parallel development underway through Enova's competition for simplified heating solutions	• This technology makes hydronic heating a more suitable solution in buildings with very low energy use Industrialization will make the solution suitable for hydronic systems throughout Norway
• Pilot is being tested in the Nea watercourse (Statkraft is project owner) • Agreement signed for 3 "turbinators" (integrated generator and turbine) for delivery to "45 Mile Hydroelectric Project in Oregon, USA • Sales agent agreement with company in Puerto Rico (covers the Caribbean, Central America, and northern South America)	• Transferable to hydro power systems with minimum flow requirements in the watercourse. Potential increases with implementation of the EU's Water Directive • Transferable to water canals and dams connected to irrigation/ water supply • Technology supplier estimates potential for diffusion of technology to approximately 20 industrial plants in Norway, with comparable water consumption • International potential for diffusion of technology that can yield improved utilization of waste water for power production and reduced greenhouse gas emissions
• First full-scale implementation in Norway and globally	• Technology supplier estimates potential for diffusion of the technology in Norway to 5 TWh, of which the 6 most interesting projects account for 2 TWh. The international potential could be 100 to 300 systems over the next ten years • International potential for diffusion of technology that can yield increased renewable power production, and reduced greenhouse gas emissions
• First implementation in Norway and globally	• Suitable for other energy sources: solar thermal, biomass and geothermal energy • Technology supplier estimates own market potential to 2000 units globally by 2015, increasing to 4000 units total by 2016 • International potential for diffusion of technology that can yield increased production of electricity from renewable energy and energy recovery, and reduced greenhouse gas emissions
• First implementation of technology for this application area in Norway • Implemented abroad. Used on landfill gas at one facility in Sweden • Technology supplier will now deliver facilities in the UK	• Suitable for landfill facilities and methane gas plants. In Norway: 62 landfills in operation and 85 methane gas facilities • Generally suitable for biogas, natural gas, mixtures of natural gas and biogas, peak load solution • Technology supplier is in dialogue with several interested parties in Europe • International potential for diffusion of technology that can yield increased production of electricity and reduced greenhouse gas emissions
• First implementation in Norway • Implemented in several facilities internationally, e.g. in the US and Europe	• Suitable for biogas plants, landfill facilities and facilities for handling food and other waste. In Norway: 20 biogas facilities which treat drain mud from cleaning plants. 62 waste disposal sites in operation and 85 methane gas plants. Primarily relevant for medium-sized facilities • Suitable for large greenhouse facilities which need power, heating and CO2 • International potential for diffusion of technology that can yield increased production of electricity from renewable energy and energy recovery, and reduced greenhouse gas emissions
• The project is a second-time implementation of a full-scale facility • Turbine previously implemented at Senja Avfall IK	• The project creates a platform for further diffusion of steam expander technology in the Nordic countries, and then internationally • Repetition of expander production and run-time enables roll-out of other energy solutions with similar technology, e.g. Organic Rankine Cycle (ORC) systems • Technology supplier estimates own technology potential to about 20 district heating plants in Norway, and 90 plants in the rest of the Nordic countries • International potential for dissemination of technology that can yield increased production of electricity from waste heat, and reduced greenhouse gas emissions
• First implementation in Norwegian data centers • Implemented abroad/Sweden	• Several building stages planned in the same location, estimated total area of 33 000 m2 • Potential for diffusion of technology not determined, but the Norwegian industry within the field is assumed to be growing and expansion is expected • Transferable to Norwegian data centers • International potential for diffusion of technology which could increase energy efficiency and reduce greenhouse gas emissions
• First implementation in Norway • Implemented in Denmark/Israel	• Suitable for implementation in greenhouses • The project owner estimates that the there is a potential for use of the technology in 60% of all greenhouses In Norway • Potential for reduction of greenhouse gas emissions in Norway.
• First implementation of the technology in Norway and globally	• Included as part of the overall technology development in Hydro Aluminium and very significant for future facilities • Some spin-off potential for transferring to Hydro's existing facility • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which can increase energy efficiency and reduce greenhouse gas emissions
• First implementation of the technology in Norway and globally	• Suitable for implementation in existing aluminium production facilities based on end-to-end technology • Project owner estimates a potential for diffusion to their entire production facility • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which can increase energy efficiency and reduce greenhouse gas emissions

New energy and climate technology

Developing new energy and climate technology is essential in meeting the global climate challenge and ensuring a shift towards a low emission society. The efforts within new energy and climate technology shall contribute to reducing greenhouse gas emissions and support the restructuring of energy end-use and energy production in the long term by the development and utilization of technologies and new solutions that can contribute to this.

In the years 2012 and 2013, Enova has supported 27 technology projects, with MNOK 292 million in total.

Facts

Enova supports market introduction of new technology and provides investment support for players that lead the way.

There were three subsidy programmes for new technology in 2013:

Support for New Energy and Climate Technology in the Industry
The programme is aimed at players that introduce either more efficient energy use, energy recovery, conversion from electricity or fossil fuels to renewable energy sources, or reduce greenhouse gas emissions from the production process.

Support for New Technology for the Buildings of the Future
The programme is directed at projects consisting of concrete, physical installations. Technology that is supported cannot previously have been introduced in the Norwegian market. Technology that has only been tested on a small-scale can be supported. The projects must have defined innovation goals. These goals must be documented and must entail a significant improvement in relation to established practice or standard.

Support for Introduction of New Technology
The programme is aimed at players that introduce or deliver technology that contributes either to more efficient energy use, energy recovery or increased renewable energy production. The support goes to demonstration of energy technology under real operating conditions. The energy gains per unit may not be major, but the potential scope of the technology is substantial

TABLE 5.4 PROJECTS WITHIN NEW ENERGY AND CLIMATE TECHNOLOGY 2012-2013

CONTRACT YEAR	PROJECT OWNER	PROJECT DESCRIPTION	TECHNOLOGY SUPPLIERS	SUPPORT AWARDED (NOK)
Industry				
2013	Vulkan Infrastruktur og Drift	Heat recovery plant for using steam from bakery ovens in a new production site for Mesterbakeren AS in Oslo (Oslo county)	Technology developer: Foodtech Bakeri og Industry AS HVAC engineering: Erichsen & Horgen AS	467 003
2013	Mostad Mekaniske AS	Energy cap on existing building in Oppdal (Sør-Trøndelag county), for insulation and capture and storage of solar heating, with underground thermal energy storage (energy well) for utilization of variation in seasonal production and energy consumption	Technology supplier: Mostad Mekaniske	42 580
2013	Solin Devlopment BV	Simplified, energy-conserving value chain for production of solar cell grade silicone at Elkem Solar's production facility in Kristiansand (Vest-Agder county)	Technology developers: Elkem Solar, BSB Cooperatieve UA Production, development: Pillar JSC Design, development: Tesys Ltd. Engineering, analysis: University of Konstanz Modelling: Ife (Institute for Energy Technology)	25 292 509
2013	ReSiTec AS	Improved energy utilization through recovery of silicone from the waste flows from silicone production at Elkem Solar's facility in Kristiansand (Vest-Agder county)	Technology supplier: ReSiTec	4 766 500
2013	Nøsted Kjetting AS	New continuous process for production of high strength chain at Nøstad Kjetting's facility in Mandal (Vest-Agder county)	Technology developer: Nøsted Kjetting Welding technology: ESAB, Robotics: ABB Heat treatment and automation: SINTEF Raufoss Manufacturing AS Project development: Enøk Total AS Adiabatic cutting: Schubert, EFT Induction technology	12 000 000
2013	Metallco Aluminium AS (formerly Toten Metall AS)	Use of induction for drying aluminium shavings for aluminium recycling at Metallco Aluminium's facility in Vestre Toten Oppland county)	Technology developer: Plasma Kraft AS and Metallco Aluminium AS	283 463
2013	Hydro Aluminium AS	HAL4e Pilot Plant – Technology programme. Further development and prototype testing of the next generation HAL4e cells at the reference centre in Årdal (Sogn og Fjordane county)	Technology developer: Hydro Aluminium	39 181 500
2013	Scanbio Bjugn AS	New energy-efficient drying process of fish peptides at Scanbio Bjugn in Bjugn (Sør-Trøndelag county)	Scanbio Bjugn Management system: VisionTech AS Engineering: Multiconsult AS	11 350 000
Buildings				
2012	Lerkendal Invest AS	Lerkendal Hotel in Trondheim (Sør-Trøndelag county), an energy-efficient hotel at a passive house level and comprehensive system solution with focus on needs-based management and regulation, decentralized ventilation, solar collector, and LED lighting	Principal design: Rambøll Norge AS, HENT AS Management system: GK Norge AS, Bravida Norge AS Cooling: GK Norge AS, K.Lund AS Ventilation: GK Norge AS	14 000 000
2012	Rema Eiendom Nord AS	Use of new energy technology and development of comprehensive energy system for the future's grocery stores, implemented at the store Rema Kroppanmarka in Trondheim (Sør-Trøndelag county)	Principal design: SINTEF Energi AS Management system: Danfoss AS Cooling system: Carrier Refrigeration AS Ventilation: Systemair AS Façade: Aerogel Norge AS	1 000 000
2012	City of Oslo, Kulturbyggene in Bjørvika	The new public library in Oslo (Oslo county). Heating and cooling with TABS (Thermoactive building elements), reduces energy use and maximum power capacity for cooling and heating, in addition having passive house design (needs-based management, decentralized hybrid ventilation, low SFP, free cooling)	TABS and façade: Multiconsult AS	10 839 144
2013	Kjørboparken AS	Powerhouse Kjørbo in Bærum (Akershus county), the world's first rehabilitated energy plus office building. The building will produce more energy over the course of its lifetime than is used during construction and operation. Innovative total concept, with a focus on building structure, technical installations and local production of energy	Concept solutions: Skanska Norge AS, Snøhetta AS, SAPA Building System AB, Asplan Viak AS, Multiconsult AS and ZEB. Suppliers: Systemair AS, SunPower Corporation, Hunter Douglas Norge AS (Ventral), Acusto AS, Hubro AS, SAPA Building System AS	12 960 447
2013	Skanska Norge AS	Skarpnes Boligfelt (neighbourhood) in Arendal has a passive house standard for houses and apartment buildings that produce as much energy as they consume over the year, with local storage and delivery to the grid	Principal design: Skanska Norge AS, ZEB	5 271 853
2013	Aktivhus Entreprenør AS	Huldra Økogrend in Hurdal (Akershus county), Eco-village consisting of 34 area-efficient buildings, equipped with a smart natural ventilation system with sensors, electric inlet valves, diffusion materials, integrated blinds, solar cells connected to the grid, and LED lighting	Principal design: Aktivhus AS/Aktivhus Entreprenør AS Management system, ventilation, solar cell, LED lighting, windows w/blinds: Isoreflect Energy Products AS	12 866 302

PROJECT'S ENERGY RESULT (KWH/YEAR)	PROJECT'S CLIMATE RESULT IN NORWAY (KG CO_2 EQUIV./YEAR)	PROJECT STATUS	INNOVATION	EXPERTISE DEVELOPMENT
75 000 Heat production	0	Under establishment	• Verification of possible achievable energy recovery and energy utilization	• Demonstration facility • Case study for the industry must be prepared to communicate and highlight the possibilities • Can provide relevant experience data to SINTEF's project INTERACT (supported by NFR), which covers expertise development in excess heat utilization
30 000 Heat production, as an alternative to electricity	0	Under establishment	• Embedding hydronic heating pipes for solar heating on roofs. The heating system is connected to energy storage in an existing energy well	• Tailored measurement and follow-up forms the basis for further development and optimisation • Planned publication of results in professional journal
1 428 000 Energy efficiency	0	Under development	• Simplification of solidification process from two to one steps • Transition from batch to continuous mode • Several patents	• Included as part of ES' overarching R&D within production of solar cell silicone and use of solar cell electricity, e.g. internal research unit, several doctorates, as well as cooperation with the University of Agder (UiA)
8 665 200 Energy efficiency through recycling	3 320 000 Reduced process emissions	Under establishment	• Use of known separation methods applied in a new way to clean waste flows from silicone production and upgrading it to silicone powder with a high value and multiple applications • Added substance to prevent oxidation for cuttings • Separation and cleaning in several stages • Briquetting of silicone powder without mentionable pollution	• Close cooperation with the Eyde network, e.g. in the "zero waste" project • Cooperation with Teknova and others, where results from this project will be shared and used • Planned publication of application and result at an international conference (EuroPM or EU PVSEC)
5 000 000 Energy efficiency	30 000 Reduced use of fuel oil	Under establishment	• Reducing number of production steps from 19 to 10 steps, of which the number of heating steps is reduced from 5 to 2 • Transition from production machines to integrated process. There is at present no commercial equipment for this	• Important learning within energy management, new processes with reduced resource consumption, energy and raw material utilization • Collaboration with the University of Agder (UiA) and Umoe: Establishment of a centre for innovative design for smart production • Expertise sharing between the involved expertise suppliers through an extensive test programme • Two Master's degrees at UiA
135 000 Reduced use of propane	29 000 Reduced use of propane	Under development	• Verification of suitability for use of induction for drying metal • Increased material and energy utilization and reduced energy use during the melting process is achieved as the technology is also used for combustion of organic elements on ingoing materials, for example lacquer and undesirable hydrocarbons, before the material is added to a smelter	• Building expertise through experience with testing and operation • Dissemination will depend on and be assessed after the operating period with verification of the technology • Planned development of contract network with various expertise and certification environments in the industry
5 100 000 Energy efficiency	510 000 Reduced process emissions	Engineering	• Innovative cathode and anode design solutions • Next level procedures for process management and operation	• Included in Hydro's reference centre in Årdal • Increasing expertise in Hydro's technological environment and with external partners such as the Norwegian University of Science and Technology (NTNU) and SINTEF • Connected to technology programme supported by Innovation Norway, where SINTEF is one of the participants • Connected projects have several doctorates in subjects highly relevant to the project
19 018 000 Reduced use of heating from fuel oil	5 762 000 Reduced use of fuel oil (diesel)	Under establishment	• New specially designed evaporator • New system for washing with extraction substance • Regeneration of electricity in one of the process systems	• Possibility to licence the technology to others in the same sector in Norway and abroad, alternatively enter into a joint venture with the partners that want to use the technology
1 968 200 Energy efficiency (electricity and heating)	0	Under development	• Sum of many measures focusing on needs-based management and regulation • Decentralized ventilation systems, two on each floor	• Demonstration building • Reference project for the hotel industry • Dissemination through presentations in industry networks and at conferences
123 750 Energy efficiency (electricity and heating	0	In operation	• Waste heat utilization from cooling to heating of floors and ventilation. Energy storage in accumulator tanks • Ventilation solutions with bypass. Reduced fan energy • Very advanced integrated SD facility • Nanomaterial in translucent façade connected together with light management (façade solution)	• Metering after commissioning show a 30% reduction in energy use (Aug.-Dec. 2013) • Spin-off from the CREATIV research project • Master and doctorate at the Norwegian University of Science and Technology (NTNU), to be taken further internationally
325 300 Energy efficiency (electricity and heating)	0	Under development	• The project also received support from Enova from the programme Support for Passive Houses and Low Energy Buildings • Newly developed transparent façade with increased exposure to daylight • Reduced cooling need due to TABS (concrete core activated cooling)	• Participating actors are building expertise
349 364 Energy efficiency, conversion and production of electricity, heating and cooling	0	Under development	• Low energy use for construction, reuse of materials, better insulation and airtightness than passive house level, innovative façade solutions • State of the art lighting and management system • Energy-efficient hybrid ventilation system • Energy production covers energy for operation and construction	• Demonstration and flagship building • Spin-off from the Powerhouse Alliance and ZEB • Important expertise development for all actors, advisers, producers, suppliers • Masters and doctorates at the Norwegian University of Science and Technology (NTNU) associated with the project
271 800 Energy efficiency and production of electricity and heating	0	Engineering	• 100% renewable energy supply, solar collectors, heat pump, energy well, heat storage, solar cells • App for controlling own energy use • Development of the Plus customer programme • Hot fill dishwasher and washing machine	• Demonstration area • Connected to R&D, EBLE, pilot in ZEB, solar irradiation measurement with Teknova/Sintef, grid connection cooperation with Agder Energi, sustainable buildings with Agder Wood • Master at the University of Agder (UiA)
497 710 Energy efficiency (electricity and heating) and production of electricity	0	Under development	• ZENShome advanced management and regulation system for ventilation and heating via a pipeline grid • Covers entire residential areas • Satisfies passive house energy level without balanced ventilation	• Reference project with an entire neighbourhood will make it possible to conduct comparative studies

ACHIEVED ADOPTION OF TECHNOLOGY	FURTHER DEVELOPMENT AND DIFFUSION
• First implementation of the technology in Norway • Previously tested in Germany	• Suitable for implementation in all industrial bakeries. Can also be considered for smaller operations • Technology supplier estimates potential of technology diffusion to 30-40 facilities in Norway • International potential for diffusion of technology which could provide increased utilization of waste heat and reduced greenhouse gas emissions
• First implementation in Norway • Not aware of any other corresponding system solutions internationally	• Suitable for large existing and new buildings with a heating demand and energy storage possibilities
• First full-scale implementation in Norway and globally • Pilot tested in Ukraine	• Technology developer and partial owner in the project, Elkem Solar, estimates a potential for technology diffusion to all of Elkem Solar's production in Norway (capacity of 7 500 tonnes silicone per year), as well as potential new facilities • International potential for diffusion of technology which could increase efficiency of solar cell silicone production and reduce greenhouse gas emissions
• First implementation of the technology in Norway and globally	• Suitable for implementation in connection with solar cell silicone production and kerf • International potential for diffusion of technology which could increase efficiency and increased material utilization and reduce greenhouse gas emissions
• First implementation in Norway and globally	• Project owner estimates a potential for diffusion of technology to own production, as well as globally to about 100 installations (of which five are in Scandinavia, the rest in Europe) • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which can increase efficiency, reduce consumption of raw materials (steel), and reduce greenhouse gas emissions
• First implementation of the technology in Norway and globally	• The technology can be transferred to industries that use drying technology on semi conductive materials • Suitable for combustion of several types of organic elements (lacquer, hydrocarbons) on inbound material in the same process • Project owner estimates that the technology could be implemented in its entire production • Technology supplier estimates an international potential for diffusion of technology , focusing on aluminium producers in Russia, the EU and US/CND • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which can increase energy efficiency, reduce use of propane, and reduce greenhouse gas emissions
• First implementation of the technology in Norway and globally	• Included as part of the overall technology development in Hydro Aluminium and is very significant for future facilities • Spin-off potential for transferring to Hydro's existing facility • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which can increase energy efficiency and reduce greenhouse gas emissions
• First implementation of the technology in Norway and globally	• Suitable for all drying processes where proteins are involved, both marine (for example fish feed) and animal (for example slaughterhouse waste), etc. • Project owner/technology developer estimates a potential for diffusion of technology to their facilities nationally and internationally • National potential for reduced greenhouse gas emissions • International potential for diffusion of technology which could reduce use of fossil fuels, and reduce greenhouse gas emissions
• First implementation in Norway • Not aware of any other corresponding system solutions internationally	• Comprehensive concept relevant for hotels in Norway • All or parts of concept interesting internationally • International potential for diffusion of technology which could increase energy efficiency and reduce greenhouse gas emissions
• First implementation in Norway • No identical projects tested internationally, but elements are being tested in Switzerland and Germany	• Suitable for implementation in other grocery stores, several have shown interest • Several of the solutions and technologies are suitable for other types of non-residential buildings • Technology developer indicates that they aim to have the the technology and solution implemented in the EU • International potential for diffusion of technology which could increase energy efficiency and reduce greenhouse gas emissions
• First implementation of TABS in Norway. Has been implemented abroad • First implementation of façade solution in Norway and globally	• Suitable for implementation in several types of non-residential buildings • Technology developer indicates an international potential for selling the façade solution • International potential for diffusion of technology which could increase energy efficiency and reduce greenhouse gas emissions
• The world's first energy plus house in a lifetime perspective. First Norwegian plus house which includes embedded energy	• Relevant for all future Norwegian rehabilitation and new buildings • Particularly interesting for rehabilitation in cold areas • International potential for diffusion of technology which can increase energy efficiency and conversion, and reduce greenhouse gas emissions
• First implementation in Norway • No identical projects implemented internationally, but elements have been tested	• Relevant for future residential area development • International potential for diffusion of technology which could increase energy efficiency, increase production of renewable electricity and reduce greenhouse gas emissions
• First implementation in Norway • No identical projects implemented internationally, but elements have been tested	• Relevant for housing development • Project owner and technology developer indicate a potential in further development locally, as well as nationally (in Finnmark County)

New energy and climate technology

Returkraft

The waste management company Returkraft in Kristiansand municipality (Vest-Agder county) has low-temperature excess heat that has gone to waste during periods with low heating demand. Now they have implemented a total of three 10 kW CraftEngine machines that are developed to produce electricity from low-temperature waste heat. This will help Returkraft achieve its goal of 50% energy utilization from the solid waste they process. For technology developer Viking Heat Engines, this is an important step in verifying their own patented technology solutions, on the road towards having the technology installed at thousands of facilities nationally and internationally.

Enova supported the project with NOK 3.4 million in 2013.

Scanbio Bjugn

Scanbio Bjugn in Sør-Trøndelag county will now implement their own developed technology to build a new drier for production of hydrolyzed fish meal in Bjugn. The project will reduce greenhouse gas emissions by reducing the need for fuel oil for the drying process. Also, the quality of the fish protein being produced will be improved. The project has a considerable application potential both nationally and internationally.

Enova supported the project with NOK 11.4 million in 2013.

Oslo Airport Gardermoen

Oslo Airport Gardermoen is testing new energy solutions as the airport is being expanded with a new terminal building. The snow being removed from the runways during winter will in the future be stored and the melt water used to cool the terminal buildings throughout the year. The solution has not been tested in Norway before. The potential for using it to cool buildings both here in Norway and abroad in regions with plentiful access to snow is considerable.

Enova supported the project with NOK 4.3 million in 2013.

Reporting on climate results

Enova supports energy projects that also have climate results. We support technology projects that, in the long run, can be very significant for reaching the climate goals through diffusion of the technology nationally and internationally.

We report climate results in CO_2 equivalents. This unit indicates the combined effect of CO_2 and other greenhouse gases (for example CH4, N2O). We differentiate between climate results achieved through reduced use of fossil fuels and what follows from reduced use of electricity or production of electricity from renewable sources:

- *Climate result from reduced use of fossil fuels:* Changes in emissions of greenhouse gases as a result of reduction in the use of fossil fuels. This can be achieved by converting from fossil to renewable energy sources or improving efficiency in the use of fossil fuels.
- *Climate result from direct reduction of non-energy-related greenhouse gas emissions:* Changes in greenhouse gas emissions as a result of reductions in direct emissions of greenhouse gases.
- *Climate result from reduced use of electricity or production of electricity from renewable sources:* Changes in greenhouse gas emissions as a result of reductions in the use of electricity or production of electricity from renewable sources. The emission coefficients for electricity will vary depending on the mix, technology or country for which the results are calculated, with a corresponding variation in climate result. We take a point of departure in three different scenarios for electricity: Nordic mix, European mix and Nordic coal power.

Table 5.5 shows climate results from reduced use of fossil fuels in 2013 and 2012-2013 for the various market areas that Enova is involved in. The two first columns show total reduced oil consumption. The market that achieves the largest reductions in oil consumption in both 2013 and for 2012-2013 is renewable heating, followed by projects within the industry and non-residential buildings. Direct climate impact shows the climate result from reduced use of fossil fuels. The emission coefficients for the oil, gas and other types of fossil fuels were retrieved from the Ecoinvent v31 database. The results show that projects within renewable heating in 2013 have a climate result corresponding to about 50 kilotonnes of CO_2 equivalents. Overall, the 2013 portfolio achieves emission reductions corresponding to 114 kilotonnes of CO_2 equivalents, while the 2012-2013 portfolio achieves emission reductions of about 177 kilotonnes of equivalents.

Table 5.6 shows the climate result from reduced use of electricity or production of electricity from renewable sources. The calculations take a basis in three scenarios for electricity: Nordic mix, European mix and coal power. They have emission coefficients of 117 g CO_2 equiv./kWh, 477 g CO_2 equiv./kWh and 819 g CO_2 equiv./kWh, respectively.

As expected, the results are very dependent on the preconditions used as a basis for the alternative power supply. If we use the European mix as a basis, the aggregated portfolio achieves a climate result of 905 kilotonnes of CO_2 equivalents. For the technology projects, the climate impact will come as a consequence of the diffusion of successful projects nationally and internationally.
Table 5.7 shows the number of projects in companies that are subject to emission allowances within the European Emission Trading System (EU ETS), per market area. In 2013, a total of 22 companies in the sector subject to emission allowances represented 38 projects, corresponding to about 185 GWh and 13.5 kilotonnes of CO_2 equivalents.

Figure 5.3 shows the measure cost for reduced greenhouse gas emissions as a result of Enova's energy results for the 2013 portfolio. As for climate impact, the measure cost is highly dependent on which electricity mix we use as a basis. With a basis in the funding level in 2013 and estimated reduction of greenhouse gases for each scenario for electricity, this corresponds to a measure cost of about NOK 195-727/tonne CO_2 equivalent. For comparison, the average emission allowance price in 2013 in the EU Emission Trading System (ETS) was NOK 38 per tonne CO_2 emitted in December 2015.

TABLE 5.5 REDUCTION IN OIL CONSUMPTION AND DIRECT CLIMATE RESULT FROM PROJECTS SUPPORTED WITHIN THE ENERGY FUND IN 2012-2013

Market area	Reduction in oil consumption		Direct climate result	
	2013	2012-2013	2013	2012-2013
	tonnes	tonnes	ktonnes CO_2 - equiv.	ktonnes CO_2 - equiv.
Renewable heating	9 889	16 092	50	88
Renewable power production	0	0	0	0
Industry	4 194	6 897	37	49
Non-industrial plants and facilities	2	1 314	0	5
Non-residential buildings	2 765	3 084	19	26
Residential buildings	2 213	2 256	9	9
Total	**19 063**	**29 643**	**114**	**177**

Table 5.5: The table shows direct climate result from projects supported by Enova measured in reduction of oil and CO_2 emissions (CO_2 equivalents) per market in 2013 and aggregated for 2012 and 2013. The two columns that represent climate impact in Table 5.5 also include reduction of other types of fossil fuels (for example propane gas).

TABLE 5.6 CLIMATE RESULT FROM REDUCED USE OF ELECTRICITY/PRODUCTION OF ELECTRICITY FROM RENEWABLE SOURCES

Market area	Nordic mix		European mix		Nordic coal power	
	2013	2012-2013	2013	2012-2013	2013	2012-2013
	ktonn CO_2 - ekv.	ktonn CO_2 - ekv.	ktonn CO_2 - ekv.	ktonn CO_2 - ekv.	ktonn CO_2 - ekv.	ktonn CO_2 - ekv.
Renewable heating	30	54	124	215	213	379
Renewable power production	1	2	3	7	4	11
Industry	16	71	66	291	113	500
Non-industrial plants and facilities	2	5	6	9	11	16
Non-residential buildings	16	80	65	326	111	559
Residential buildings	5	11	33	58	56	99
Total	**70**	**223**	**296**	**905**	**508**	**1 565**

Table 5.6: The table shows climate results from projects supported by Enova in 2012 and 2013 seen from three different electricity scenarios. Results are shown by market area.

TABLE 5.7 NUMBER OF PROJECTS SUBJECT TO EMISSION ALLOWANCES 2013

Market area	Number
Renewable heating	21
Renewable power production	0
Industry	17
Non-residential buildings	0
Non-industrial plants and facilities	0
Residential buildings	0
Total	**38**

Tabell 5.7: The table shows the number of projects approved in 2013 from companies with emissions subject to emission allowances.

FIGURE 5.3 MEASURE COST FOR REDUCED CO_2 EMISSIONS

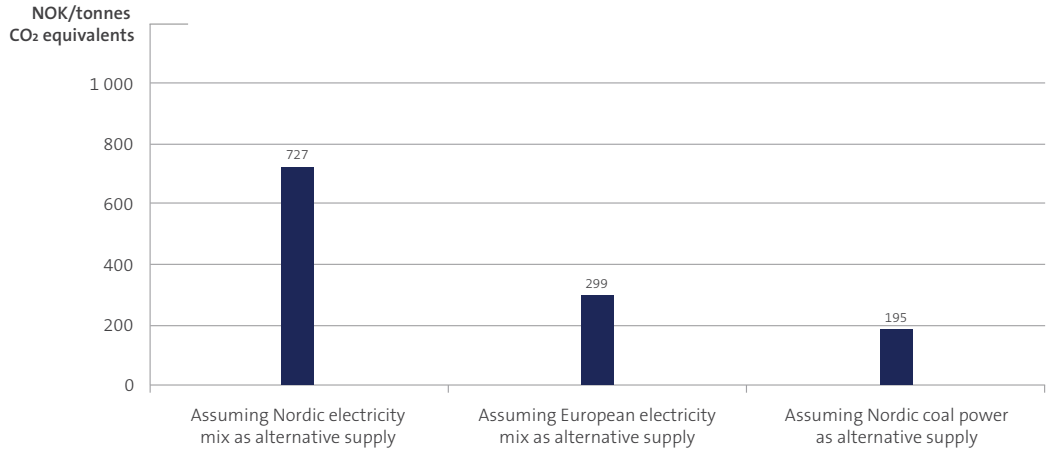


Figure 4.3: The figure shows the measure cost for reduced CO_2 emissions as a result of Enova's energy results for 2013

1 Weidema BP, Bauer C, Hischier R, Mutel C, Nemecek T, Reinhard J, Vadenbo C O, Wernet G. (2013). Overview and methodology. Data quality guideline for the ecoinvent database version 3. Ecoinvent report 1(v3). St. Gallen: The ecoinvent Centre.

2 Source: Thomson Reuters Datastream, average price level for CO_2 emission allowances (Dec. 2015) traded on European Energy Exchange (EEX) in 2013.

In-depth reporting

Energy results

In accordance with the agreement with the MPE, Enova must record the results from projects in the year the contract between the project and Enova is entered into. This means that the contractual result will be an estimate of a future energy result which is not implemented and achieved until the project is actually carried out. The time from when the contract is signed until completion varies from project to project. When projects are completed, they deliver a final report with updated figures for expected energy results based on what was actually carried out, and will subsequently be followed up through actual measurements of achieved results.

Of the projects with which contracts were signed in 2013, few have been completed by the end of the year. Some projects have been cancelled, meaning they were never started. Table 5.8 shows that contracts were signed for 1 421 GWh in 2013, but that some were cancelled over the course of 2013. The total contractual energy result at the end of 2013 was thus 1 407 GWh. The few minor projects that submitted final reporting in 2013 have not led to major changes in estimates at the time of final reporting.

Looking at the entire project portfolio for 2012 and 2013, one can see that cancelled projects represented 77 GWh, so the total contractual energy result is 2 963 GWh compared with the gross contractual energy result of 3 040 GWh. Minor corrections have also been made for projects that have submitted final reports.

TABLE 5.8 ENERGY RESULTS 2012-2013 DISTRIBUTED BY MARKET AREA

	2013			2012-2013		
Market area	**Gross contractual result**	**Contractual result**	**Contractual corrected for final reported result**	**Gross contractual result**	**Contractual result**	**Contractual corrected for final reported result**
	GWh	GWh	GWh	GWh	GWh	GWh
Renewable heating	425	422	422	768	744	744
Renewable power production	6	6	6	15	15	15
Industry	408	407	407	966	962	962
Non-industrial plants and facilities	15	13	13	37	35	35
Non-residential buildings	487	483	482	1 118	1 102	1 101
Residential buildings	80	76	76	136	106	106
Total	**1 421**	**1 407**	**1 407**	**3 040**	**2 963**	**2 962**

Table 5.8: The table shows contractual energy results (in GWh) distributed by market areas, both before and after correction for cancelled and final reported projects. The "Contractual results" column shows the energy result by the end of 2013 corrected for cancellations.

Funding level

One of Enova's most important requirements is cost efficiency, which entails that Enova should get the most value in the form of kWhs for the support it provides. Enova measures this by support (NOK) per energy result (kWh). For energy projects in particular, the funding level is an important assessment criterion for Enova. Expertise development, potential of technology diffusion and innovation are more relevant assessment criteria for the technology projects

How much support each project receives is a consequence of what is necessary to ensure the project is implemented. The project's profitability, or lack thereof, is crucial. The energy price is an important factor for the energy projects. The lower it is, the more the project depends on support. Apart from oil, energy prices in 2013 have been low and this has resulted in a general need for a higher funding level.

Another reason for the increase in the average support need is the composition of the projects that have received support from Enova. The funding level varies between different types of projects. Projects focusing on innovation and technology development are usually significantly more expensive than projects that involve more mature technology. As these projects are very different, the average funding level will vary from year to year. In 2012, the average funding level for these technology projects was NOK 7.25/kWh, while it was NOK 3.14/kWh in 2013.

Industries and non-industrial plants and facilities were the most cost-effective areas in 2013. There was also a decline in the average funding level from 2012 to 2013 in industries. An important reason for the decline from NOK 0.91 to 0.59/kWh is that energy management projects constitute a significant share of the projects in 2013. These projects are very cost-effective.

There was an increase in the average funding level from NOK 0.88 to 1.16/kWh from 2012 to 2013 for renewable heating. The low power price, and thus low district heating price, contributed to an increased need for support.

Within non-residential buildings, the average funding level increased from NOK 1.0 to 1.46/kWh from 2012 to 2013, largely reflecting the popularity of the programmes aimed at passive house and low energy buildings in 2013.

The increase in average funding level for residential buildings between 2012 and 2013 from NOK 2.05/kWh to NOK 2.36/kWh is due to the interest in passive houses and low energy residences and new measures supported within the Energy Measures in Residences programme, for example the oil boiler phase-out.

For projects under non-industrial plants and facilities and renewable power production, the average funding level will vary considerably from year to year as a result of few projects within these market areas.

Enova also looks at cost efficiency over the project's entire lifetime. This makes it easier to compare projects with very different lifetimes. The longer a project's lifetime, the more years over which to distribute the support. Table 5.9 assumes an average lifetime within the various market areas. In the same way as there could be significant variation in funding level between projects within the same market area, the lifetime could also vary considerably. The lifetime has been included to illustrate annual levels.

Though we take the lifetime of projects into consideration, the general picture remains the same. The projects supported in 2013 are generally more expensive than in 2012, and the projects within industries are still the most cost-effective in 2013.

TABLE 5.9 FUNDING LEVEL WITHIN THE ENERGY FUND 2012-2013 (EXCL. NEW ENERGY AND CLIMATE TECHNOLOGY)

		2012		2013		2012-2013	
		Distributed by contractual energy result	Lifetime-adjusted	Distributed by contractual energy result	Lifetime-adjusted	Distributed by contractual energy result	Lifetime-adjusted
	Lifetime	øre/kWh		øre/kWh		øre/kWh	
Renewable heating	20 år	88	4,4	116	5,8	104	5,2
Renewable power production	20 år	0	0,0	0	0,0	0	0,0
Industry	15 år	91	6,0	59	3,9	78	5,2
Non-industrial plants and facilities	15 år	56	3,7	80	5,4	61	4,0
Non-residential buildings	15 år	100	6,7	146	9,7	120	8,0
Residential buildings	15 år	205	13,7	236	15,7	227	15,2
Total		**95**	**5,9**	**118**	**6,9**	**106**	**6,4**

Table 5.9: The table shows the funding level – both as support distributed by contractual annual result, as well as support distributed over the total energy result measured over the lifetime. The results are corrected for cancelled projects. Projects within new energy and climate technology are not included in the table.

Energy results by project category

The projects supported by Enova can be divided into four categories: Production, energy efficiency, distribution and conversion.

If we look at how the overall energy result for 2013 is distributed, we can see that most projects, by number and energy result, are energy efficiency projects. These are projects with the goal of increasing the efficiency of end users' energy use, either as reduced energy use or reduced specific energy use per produced unit. This category of project constitutes 57 per cent (807 GWh) of the overall energy result in 2013. Production projects include all projects where electricity and/or renewable heating are produced. We do not differentiate between whether the produced energy is for sale to external parties or will be used by the producers themselves. Expansion of district heating plants entails development of new infrastructure, and these projects are characterized as distribution projects. The conversion projects are projects where the energy carrier has been changed from electricity or fossil energy carriers to renewable energy carriers based on, for example, bioenergy.

TABLE 5.10 NERGY RESULT 2013 DISTRIBUTED BY PROJECT CATEGORY

Market area	Energy efficiency	Production	Distribution	Conversion
	GWh	GWh	GWh	GWh
Renewable heating	1	57	337	72
Renewable power production	-	6	-	-
Industry	381	-	-	19
Non-industrial plants and facilities	13	-	-	-
Non-residential buildings	397	1	-	49
Residential buildings	16	-	-	60
Total	807	64	337	199

Table 5.10: The table shows contractual energy results in 2013 distributed by project category and market. The numbers are corrected for cancelled projects.

FIGURE 5.4 RESULTS 2013 DISTRIBUTED BY PROJECT CATEGORY

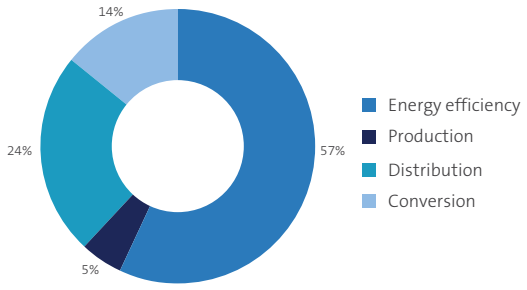


Figure 5.4: The figure shows contractual energy results in 2013 distributed by project category. The numbers are corrected for cancelled projects.

The scope of energy efficiency projects measured by GWh is approximately the same in 2012 and 2013, with 820 GWh in 2012 and 807 GWh in 2013.

Production projects were reduced from 539 GWh in 2012 to 64 GWh in 2013, a decline of almost 0.5 TWh. The main cause is primarily the absence of major individual projects in the industry in 2013. This type of project is often very large and an increase or drop in the number of major industrial projects has a big impact.

Conversion and distribution projects have increased from 2012 to 2013. The distribution projects have increased by 200 GWh to 330 GWh in 2013 and conversion projects have increased by just under 100 GWh to 199 GWh. The main reason for the increase in distribution projects is several projects related to expansion of existing district heating plants.

Results distributed by renewable energy sources/carriers

Table 5.11 shows the energy result within production, distribution and conversion distributed by energy carrier. Overall, the energy result is 600 GWh. Increased use of bioenergy (mainly chips) represents the largest share, with 361 GWh. After this, conversion to heat pumps represents the largest energy result, with 153 GWh.

TABLE 5.11 ENERGY RESULTS WITHIN PRODUCTION, DISTRIBUTION AND CONVERSION DISTRIBUTED BY ENERGY CARRIER

Energy carrier	Energy result (GWh)
Waste	20
Bioenergy	361
Biogas	*1*
Chips	*288*
Pellets	*22*
Other bio	*51*
Waste heat	48
Heat pump	153
Geothermal	0,2
Solar	1,7
Other renewable	16
Total	**600**

Table 5.11: The figure shows the energy results in 2013 within production, distribution and conversion distributed by energy carrier.

Portfolio composition

The number of supported projects in 2013 was about 1 350, nearly twice that in 2012, which was about 750. Energy measures in residences have not been included in this overview. At the same time, the energy result between 2013 and 2012 has declined by 200 GWh to 1 407 GWh. Most projects that received funding commitments in 2013 were small projects with an expected energy result of less than 1 GWh. At the same time, there were no large projects with more than 100 GWh in 2013.

The distribution of projects and development of the project composition over time highlight two important trends. Firstly, it shows that the general awareness regarding energy and climate measures has increased. This development is positive and gives hope that there will be many exciting projects in the future.

The second development trend is how much Enova's overall results are impacted by major individual projects. With regard to results, very many small projects are needed to compensate for one "missing" project of more than 100 GWh.

The change in project composition between years 2012 and 2013 towards more small projects is illustrated when comparing 2012-2013 with 2013.

FIGURE 5.5 PROJECTS 2013 DISTRIBUTED BY SIZE

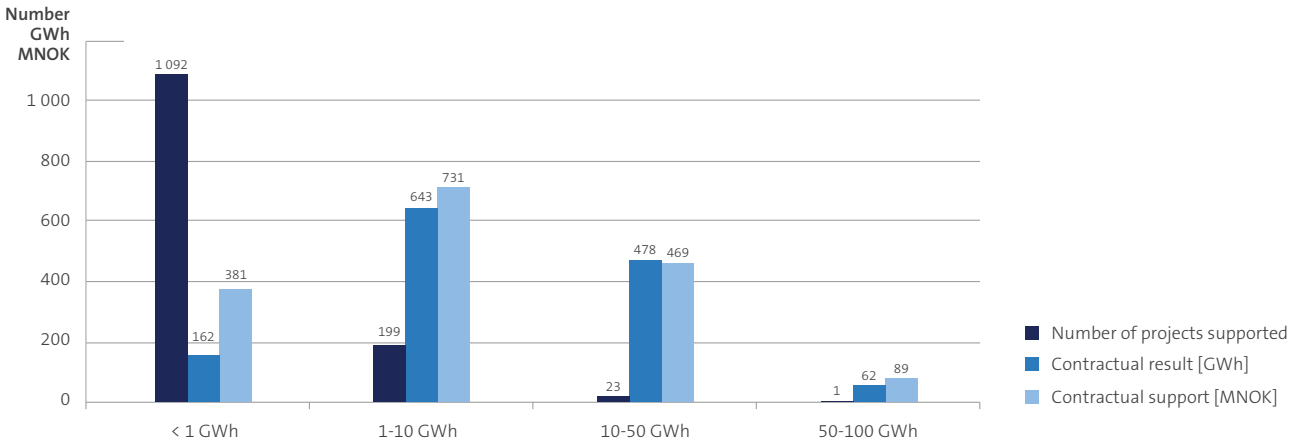


Figure 5.5: The figure shows distribution of projects entered into in 2013 grouped by project size in GWh. Results from the programme Energy Measures in Residences is not included in this overview. (Note; The interval from 50 – 100 GWh is changed from the Norwegian printed version)

FIGURE 5.6 PROJECTS DISTRIBUTED BY SIZE 2012-2013

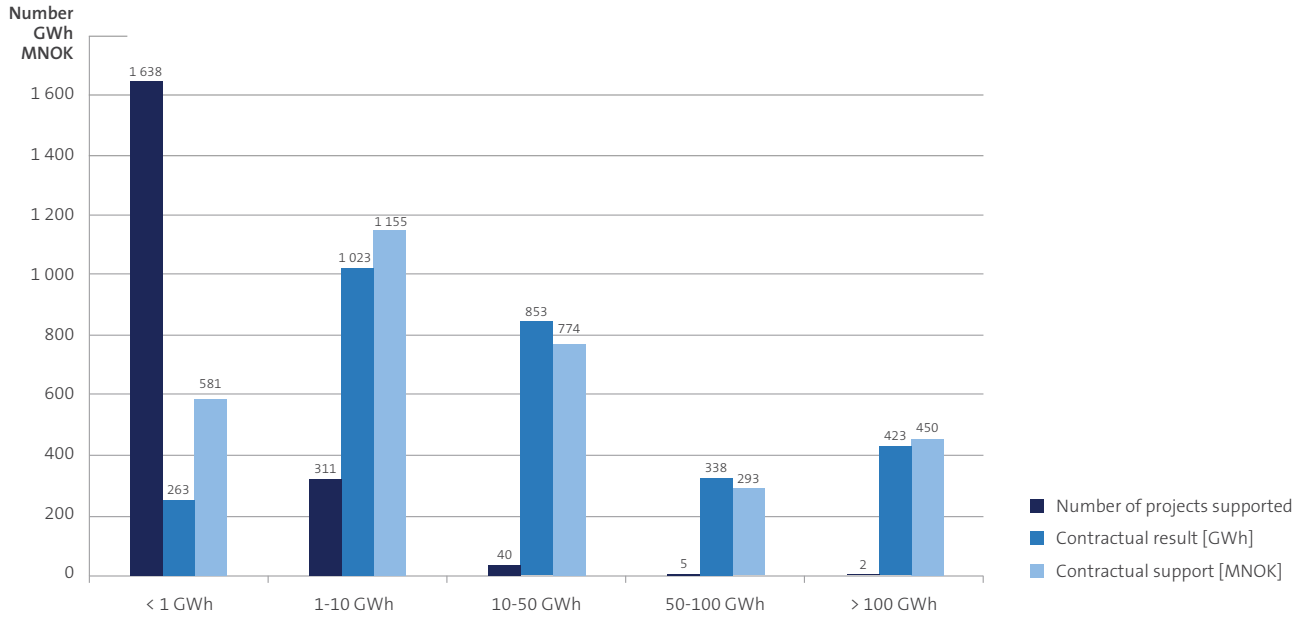


Figure 5.6: The figure shows distribution of projects entered into in 2012 and 2013 grouped by project size in GWh. Results from the programme Energy Measures in Residences is not included in this overview. (Note; The interval from 50 – 100 GWh is changed from the Norwegian printed version)

There is a correlation between the size of the projects and project implementation time. Small projects have a significantly shorter implementation time compared with large projects. Small projects are typically related to energy management and smaller measures in homes, non-residential buildings and industries, while the major projects involve considerable engineering, investments in major physical measures and naturally take longer to complete.

The small projects have an expected final date one year after the approval date, on average. Final reports are expected from ninety per cent of the projects that were approved in 2013 by the end of 2015. They constitute approx. 55 per cent of the year's contractual energy result.

Enova is concerned with ensuring projects that receive support are carried out as quickly and efficiently as possible. A quick implementation time reduces the risk of outside factors negatively impacting the projects.

The overall number of applications in 2013 is perceived as good. There is a good influx of small projects and less large projects. Enova received and processed about 8 700 applications and granted support for 8 200 individual projects over the year.

Most applications and decisions are related to energy measures in homes with more than 7 000 applications and just under 6 900 decisions for approval. Phase-out of oil boilers represented about one-third of these decisions. We can see that the new programmes supporting energy management in industries and support for energy advising in residential buildings are popular in the market. At the same time, we can see that the programme for support for passive houses and low energy buildings reached the target group.

There is a natural explanation for the difference in the number of received and processed applications in a year. Applications received at the end of a year are not fully processed until the beginning of the following year. In other words, the project portfolio management is shifted somewhat between years.

The reason why some processed applications do not receive support is primarily because they either do not fulfil the support criteria, have not been sufficiently documented, or the project is too expensive or too profitable to receive support from Enova.

FIGURE 5.7 PROJECTS 2013 DISTRIBUTED BY CONTRACTUAL FINAL DATE

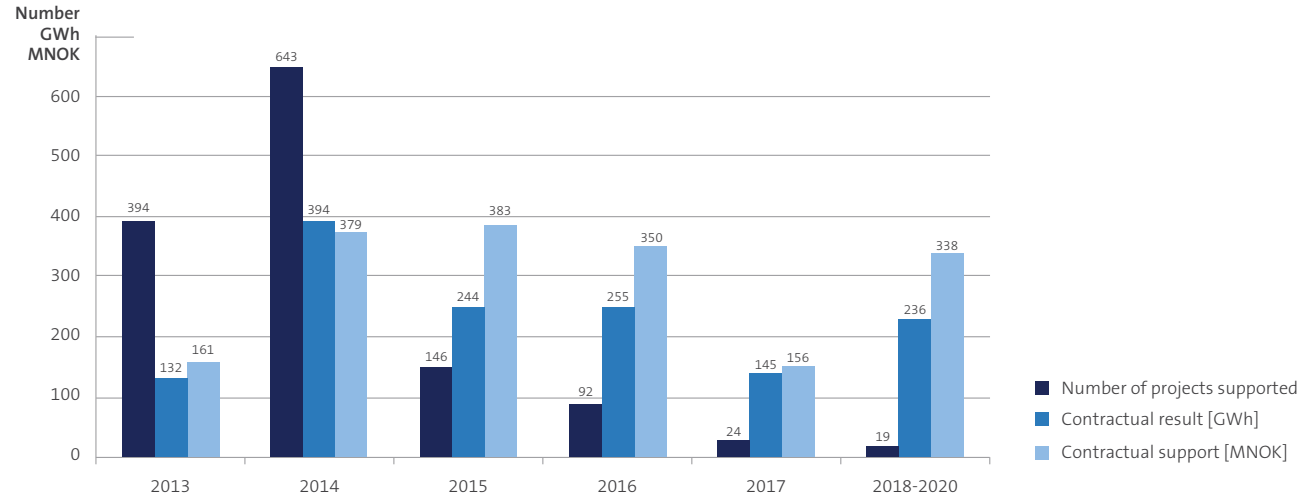


Figure 5.7: The figure shows distribution of projects entered into in 2013 distributed by the project's contractual final date. Results from the programme Energy Measures in Residences is not included in this overview.

FIGURE 5.8 PROJECTS 2012-2013 DISTRIBUTED BY CONTRACTUAL FINAL DATE

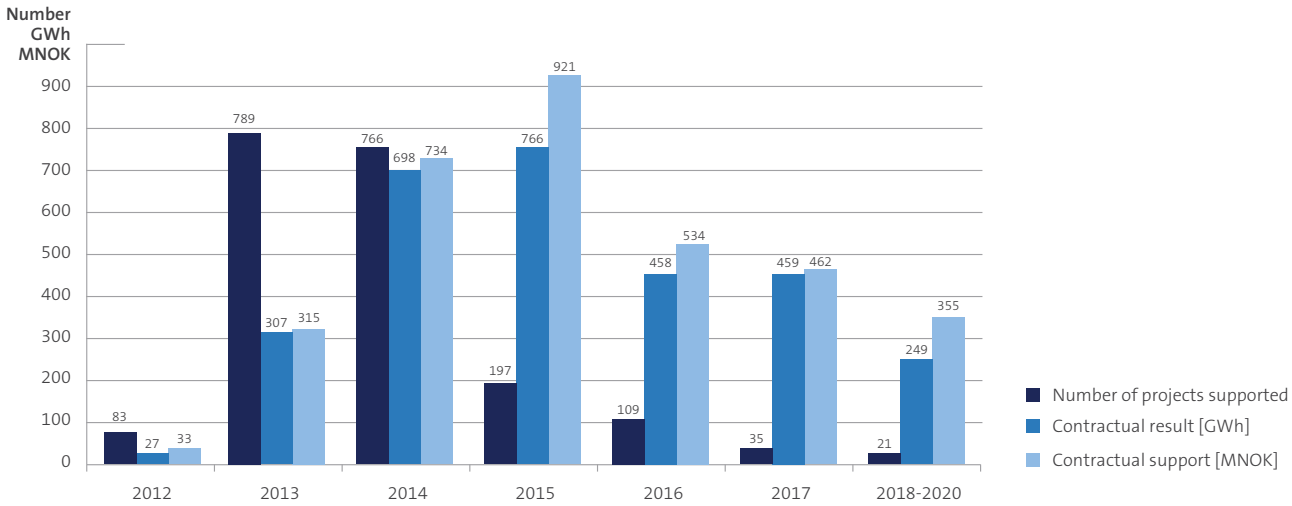


Figure 5.8: The figure shows distribution of projects entered into in 2012 and 2013 distributed by the projects' contractual final date. Results from the programme Energy Measures in Residences is not included in this overview.

TABLE 5.12 ACTIVITY OVERVIEW ENERGY FUND 2013

Market area	Number of applications received	Number of applications processed	Number of projects supported	Contractual energy result	Contractual support
				GWh	MNOK
Renewable heating	**81**	**82**	**62**	**422**	**496**
Support for Biogas Production	1	1	1	45	40
District Heating Programme	78	79	59	375	448
Support for Introduction of New Technology	2	2	2	2	8
Renewable power production	4	4	4	6	13
Support for Introduction of New Technology	4	4	4	6	13
Industry	**223**	**215**	**169**	**407**	**311**
Support for Energy Measures in the Industry	53	55	47	190	147
Support for Introduction of Energy Management in Industry and Non-industrial Plants and Facilities	72	80	71	154	42
Support for New Energy and Climate Technology in the Industry	9	7	7	39	93
Support for Introduction of New Technology	11	9	1	0.1	0.5
Heating Plants Industry	34	39	22	17	14
Heating Plants Extended	**26**	**9**	**9**	**8**	**6**
Pre-project Support for Energy Measures in the Industry	18	16	12	-	9
Non-industrial plants and facilities	20	19	15	13	35
Support for Energy Measures in Non-industrial Plants and Facilities	18	17	13	5	4
Support for Introduction of New Technology	2	2	2	8	30
Non-residential buildings	**759**	**779**	**586**	**483**	**734**
Support for Existing Buildings	236	220	166	326	292
Support for Passive Houses and Low Energy Buildings	232	213	165	119	375
Support for New Technology for the Future's Buildings	3	3	3	1	31
Heating Plant Extended	22	67	33	23	19
Heating Plant Simplified	140	143	118	13	7
Support for Passive House Feasibility Studies	78	91	70	-	8
Pre-project Support - Buildings	45	39	28	-	2
Pre-project Support -- Heating	3	3	3	-	0.3
Residential buildings	**7 986**	**7 578**	**7 345**	**76**	**179**
Support for Existing Buildings	7	7	9	3	2
Support for Passive Houses and Low Energy Buildings	70	75	73	8	67
Support for Passive Houses and Low Energy Private Residences	128	107	80	1	7
Support for Upgrading Residences	32	25	24	1	2
Support for Energy Advising	362	292	285	-	1
Support for Passive House Feasibility Studies	13	15	13	-	1
Energy Measures in Residences	7 410	7 057	6 861		98
International activities	**29**	**31**	**21**	**-**	**8**
IEA Pre-project Support	1	2	1	-	0,2
IEE II Pre-project Support	15	16	9	-	1
IEE II National Co-funding	13	13	11	-	6
Total	**9 102**	**8 708**	**8 202**	**1 407**	**1 775**

Table 5.12: The table shows an overview of the number of applications received, processed (i.e.: a final decision on approval or rejection has been made), the number of projects supported[3] ,as well as funds granted within applicable programmes and associated energy results[4] in 2013. The table only shows support for applicable programmes and not allocations for other activities within the Energy Fund. Applications for the programme "Support for Introduction of New Technology" are distributed by market area based on the type of project.

3 Number of projects approved, corrected for cancellations. This applies to 18 projects in 2013.

4 Awarded funds and contractual energy results are corrected for cansellations.

Activities

Activities within non-residential buildings and residential buildings

In May 2013, Enova modified the programmes offered for residential buildings. The household subsidy programme was replaced by the *Energy Measures in Residences* programme, which e.g. provides support for phasing out oil boilers. Support was also introduced to private individuals that have ambitious plans for conducting energy upgrades of their homes. In addition to a major launch campaign, a smaller campaign was carried out in the autumn of 2013. The Rainmaker's Day was held for the very last time in its present form in the summer of 2013.

Enova's advisory service for passive houses has been aimed at players within the non-residential buildings and residential buildings segment since 2010. The service was established to increase knowledge and expertise regarding passive houses and will provide greater certainty when aiming for a passive house level. The service included the following measures in 2013:

- Preliminary advising aimed at property developers with the ambition of building a passive house. Relevant projects must be in an early phase, but there are no size restrictions related to the project.
- The project-specific advice aimed at projects in the detailed engineering or construction phase.
- Start courses in planning a passive house aimed at design engineers and property developers. The objective of the course is providing insight into what a passive house is, and laying the foundation for the design engineer to be able to plan and design passive houses.

FIGURE 5.9 DECISIONS WITHIN ENERGY MEASURES IN HOUSEHOLDS, DISTRIBUTED BY TECHNOLOGY

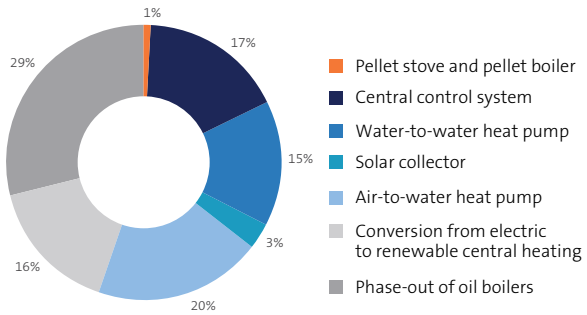


Figure 5.9: The figure shows the relative distribution of technologies/measures for the supported projects within the programme Energy Measures in Residences in 2013, distributed by number.

TABLE 5.13 ACTIVITIES WITHIN THE RESIDENTIAL BUILDINGS MARKET AREA

	Performance indicator	2012	2013	Comments
Ask Enova	Number of inquiries	28 215	41 792	More inquiries and page views compared with previous years, despite a continued low electricity price and relatively less attention regarding energy conservation in the media. Positive response to campaign regarding the changed programmes.
Daily page views, enova.no/privat	Number of page views	1 806	2 667	
Daily page views, Enova Rainmakers	Number of page views	727	717	About 58 000 visits and 260 000 page views in 2013.
Enova Rainmakers - Rainmaker schools	Number of schools that have implemented and reported 1-5 of the Rainmaker activities at www.regnmakerne.no	118	132	132 schools have registered 1-5 activities on the internet. In addition, 82 schools ordered materials (student and teacher folders).
Enova Rainmakers - "real" Rainmaker schools	Number of schools that have implemented and reported all 5 Rainmaker activities on www.regnmakerne.no	64	52	
Participants at the Rainmaker's Day (formerly Energy Friends Day)	Number of pupils	6000 (Drammen)	5000 (Ålesund)	Good participation at the event. Participation from schools in 14 out of 19 municipalities in the region.
Ratings for the episodes of the Energy Challenge	Number of viewers	150 000 - 170 000	n/a	The Energy Challenge was not aired in 2013.
Applications for the Support for Energy Measures in Residences programme	Number of applications	6 731	7 410	Positive response to change in programmes
Disbursements from the Support for Energy Measures in Residences programme	Number of disbursements	3 099	2 704	

Table 5.13: The table shows activities with in the residential buildings market area. The number of inquiries to Ask Enova shows the number of inquiries to the residential buildingsmarket area.

TABLE 5.14 ACTIVITIES WITHIN ENOVA'S ADVISORY SERVICE

Activities	2012	2013	Comments
Project-specific advising	34	25	Nedgang i både innledenede og prosjektspesifikk rådgivning tyder på at flere og flere byger passivhus uten å ha behov for bistand.
Introductory advising	57	20	
Start-up courses in planning passive houses	4 (130 participants)	3 (120 participants)	Decline in both introductory and project-specific advising indicates that more and more are building passive houses without the need for assistance.

Table 5.14: The figure shows activities within Enova's advisory service in 2013. The advisory team's services are offered to projects within both non-residential and residential buildings.

Activities within communications and public relations

Enova's communications strategy is anchored in the enterprise's business strategy. Naturally, activities in 2013 have been directed at supporting new programmes vis-à-vis the professional market.

The Enova conference "The Green Gold" in January was a successful continuation from 2012. In total, 629 external participants from various market areas within the private and public sector met in Trondheim to discuss opportunities within renewable power production and energy efficiency.

Enova's subsidy programme for replacing oil boilers was mentioned several times in daily newspapers, primarily regional newspapers. However, our presence is greatest in the trade magazines that show regular interest in our activities. This is very much in line with our desire to reach special target groups in commerce and industries.

A major marketing campaign in the autumn of 2013 aimed at the construction sector yielded very good visibility on television, in printed and digital media. Enova conducts surveys every year to map the familiarity with and knowledge of the company, as well as its reputation. The overarching result from the 2013 survey shows that there is good familiarity, varying knowledge and that the reputation is increasing positively in line with increased knowledge about Enova.

TABLE 5.15 ACTIVITIES WITHIN COMMUNICATIONS AND PUBLIC RELATIONS

	2012	2013	Comments
Articles about Enova	3 344	2 636	There were fewer articles about Enova in 2013 regarding consumer issues, but there was good coverage within articles directed at industry and commerce. Enova plays an important role in the work on triggering energy and climate measures, and it is important to reach industry and commerce players in the building, industries and heating markets.
Inquiries to Ask Enova	40 152	49 062	More inquiries than in the previous year. Positive response to campaign regarding introduction of new and changed programmes within residential buildings.

Table 5.15: The table shows activities within communications and public relations. The number of articles about Enova includes mention of Enova in Norwegian broadcasting, digital media, as well as paper-based media. The number of inquiries to Ask Enova includes both the private and professional markets.

International activities

International work is a learning arena for expertise sharing and exchange of experience. Through international cooperation and involvement, Enova shares and obtains information on ongoing activities and best practices in other countries. We use this knowledge to design national policy instruments. Participation in international forums provides Enova and Norway with the possibility to influence the agenda, content and results of international technical energy development.

Enova is represented in multiple international forums:

- Management of the EU programme Intelligent Energy - Europe (IEE) in Norway
- Norway's representative in seven of the International Energy Agency's (IEA's) management groups, so-called Implementing Agreements (IA), and projects organized by these
- Norway's representative in the European Energy Network (EnR) – a European network for Enova's sister organizations
- Board membership in the European Council for an Energy Efficient Economy (ECEEE)

Table 5.16 provides an overview of IEA activities where Enova represents and/or contributes funds.

Enova provides support for the preparation of new projects for participation in the IEA Implementing Agreements where Enova is the representative for Norway. The objective is to facilitate the establishment of additional IEA projects with Norwegian participation and leadership.

Enova manages Norway's participation in the IEE, the EU's non-technological programme within the energy area. Through concrete projects, this programme contributes to acheiving the EU's climate and energy targets for 2020. 2013 is the last year in the IEE programme period. As of 2014, IEE has been incorporated into the EU's new framework programme Horizon 2020.

Enova's administration of IEE entails marketing the programme vis-à-vis Norwegian market players and administration of the national support programmes included under the IEE programme.

This is done in the form of annual national information meetings, participation in the EU's Programme Committee for National Contact Points and the EU Commission's information meetings. The IEE projects are collaboration projects between several European countries, and Enova allocates support for Norwegian project participants. A total of 11 projects were granted pre-project support and nine received national co-funding commitments in 2012.

TABLE 5.16 INTERNATIONAL WORK

International Energy Agency (IEA) Implementing Agreements (IA) - representation by Enova	
IA	**IA Title**
IEA EEWP	IEA Energy Efficiency Working Party (EEWP)
END USER TECHNOLOGIES End-Use Working Party (EUWP)	
EUWP 04	Heat Pump Programme (HPP)
EUWP 05	Demand Side Management (DSM)
EUWP 09	Industrial Energy-Related Technologies and Systems (IETS)
RENEWABLE ENERGY Renewable Energy Working Party (REWP)	
REWP 16	Renewable Energy Technology Deployment (RETD)
REWP 17	Solar Heating and Cooling (SHC)
CROSS-SECTIONAL TOPICS Cross-Sectional activities (CS)	
CS 22	Energy Technology Data Exchange (ETDE)
Bioenergy	
CS 22	IEA Bioenergy
IEA Tasks/Annexes - representation by Enova	
Task/Annex	**Title**
IEA SHC 47	Solar renovation of Non-Residential Buildings
IEA SHC Task 39	SUPOL - Sustainable Polymers for Solar Collector Applications Polymeric Materials for Solar Thermal Applications
IEA SHC Task 41	Solar Energy and Architecture
IEA Bioenergy Task 40	Sustainable International Bioenergy Trade
IEA HPP Annex 37	Measurement of heat pump systems in buildings
IEA HPP Annex 40	Heat pump concepts for near zero-energy buildings
IEA DSM Task 23	The Role of Customers in Delivering Effective Smart Grids
IEA DSM Task 24	Closing the loop - Behaviour change in DSM, from theory to policies and practice
IEA IETS Annex 12	Membranes as energy-efficient technologies for Separation of Hydrocarbons
IEA IETS Annex 15	Industrial Excess Heat Recovery
IEA IETS Annex 16	Energy Efficiency in SMEs
Other IEA	**Project title**
IEA's information centre AIVC	Norwegian participation in the IEA's information centre AIVC - Air Infiltration & Ventilation Centre
Other international (apart from the IEA)	
Forum	**Title**
ECEEE	European Council for an Energy Efficient Economy
EnR	European Energy Network
ISO (International standardization work)	Strategic Advisory Group on Energy Efficiency

Table 5.16: The table shows an overview of IEA activities and other forums where Enova represents and/or contributes funds.

Geographical distribution and the largest projects of the year

Over the course of 2013, Enova approved support for about 1 350 projects distributed across every county in mainland Norway, in addition to the archipelago of Svalbard. The number of projects within each county varies, from one single project on Svalbard to 171 in Akershus County.

Unsurprisingly, Oslo and Akershus counties have the best showing as regards energy result, support and number of projects. This reflects both population density and the focus of financial activity. The rest of the overview largely reflects the same factors, with the exception of Hordaland and Rogaland counties, which both have fewer projects and lower energy results than the region sizes should indicate. On the other end of the scale, we find Nordland County, which has many projects in 2013 as well.

In addition to the projects divided by county, there is also a group of nationwide projects, which involve measures in two or more counties. In 2013, there were relatively few projects in this category (only 11 projects), but these projects accounted for 129 GWh and NOK 164 million in support. For Enova it is very efficient to achieve projects in cooperation with market players that are represented throughout the country.

FIGURE 5.10 ENERGY RESULT AND SUPPORT WITHIN THE ENERGY FUND 2013 – DISTRIBUTED BY COUNTY

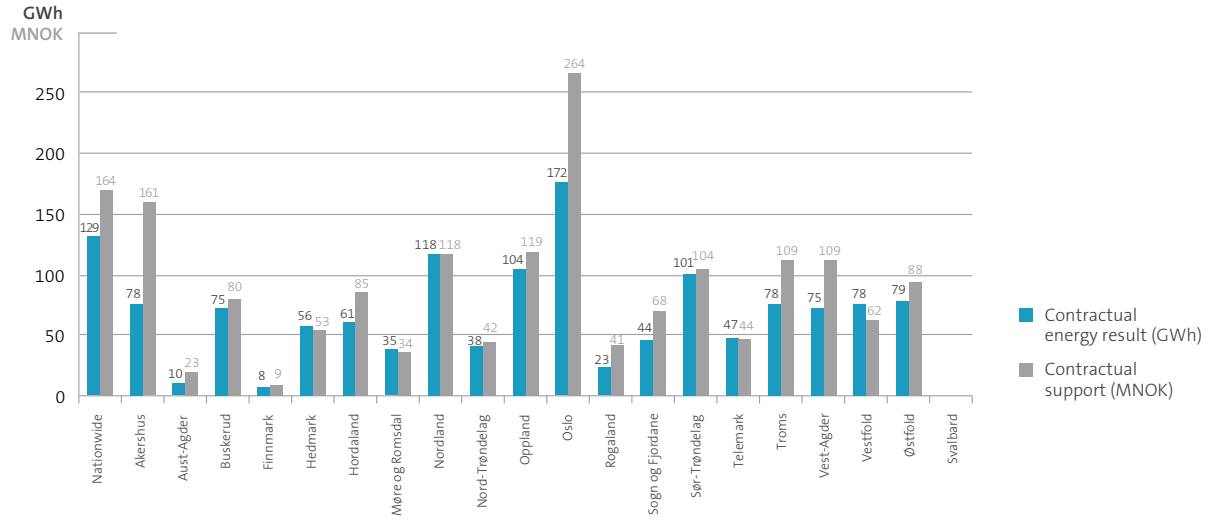


Figure 5.10: The figure shows contractual results and contractual support in 2013 distributed by county. Projects that are characterized as "nationwide" apply to projects that involve measures in two or more counties.

FIGURE 5.11 NUMBER OF PROJECTS SUPPORTED WITHIN THE ENERGY FUND IN 2013 – DISTRIBUTED BY COUNTY

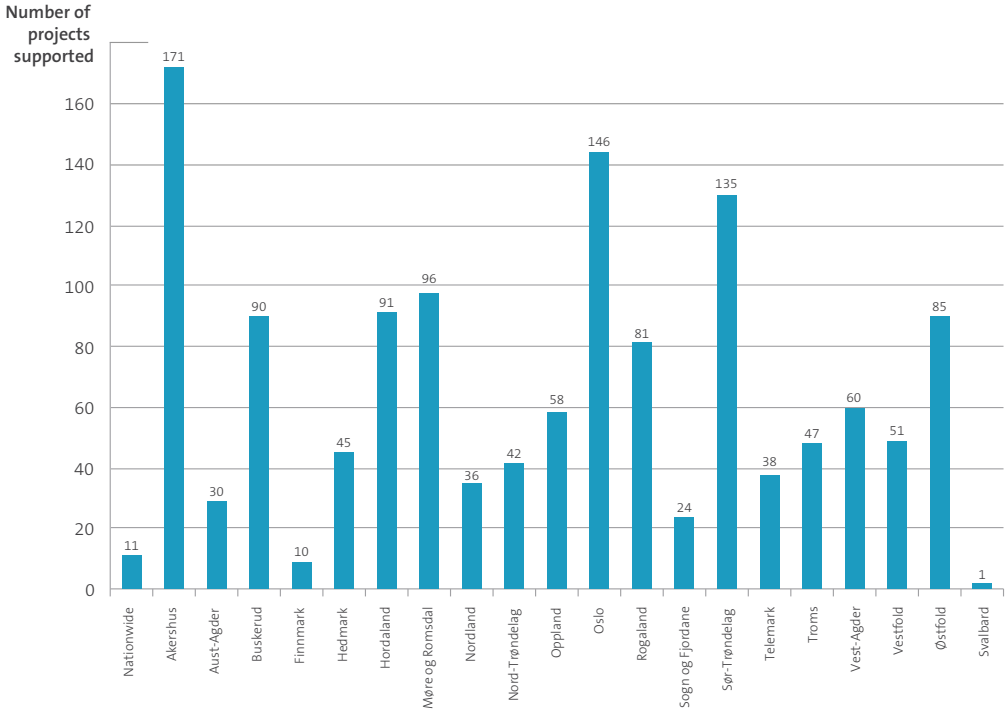


Figure 5.11: The figure shows the number of projects supported in each county in 2012. The projects characterized as "nationwide" apply to projects that involve measures in two or more counties.

TABLE 5.17 TOP 10 IN 2013 – PROJECTS WITH THE HIGHEST AWARDED SUPPORT AMOUNT

Market	Project description	Contractual energy result	Contractual support	Applicant
		GWh	MNOK	
Renewable heating	District heating in Bodø (Nordland county)	62	89	BE Varme AS
Renewable heating	District heating in Gjøvik (Oppland county)	37	52	Eidsiva Bioenergi AS
Renewable heating	District heating in Finnsnes (Troms county)	36	45	Senja Avfall IK
Renewable heating	Biogas Vestfold Grenland (Vestfold county)	45	40	Tønsberg municipality
Non-residential buildings	DNB Energy programme 2013-2017 (Oslo county)	44	40	DNB Næringseiendom AS
Industry	HAL4e Pilot Plant. Technology Program. Rebuilding/relining of test cells as Årdal Reference Centre (Sogn og Fjordane county)	5	39	Hydro Aluminium AS
Renewable heating	District heating in Moss (Østfold county)	26	37	Bio Varme AS
Non-industrial plants and facilities	Greenfield Datasenter (Akershus county)	7	30	Greenfield Property AS
Industry	Simplified, energy-saving value chain for production of solar cell grade silicon (Vest-Agder county)	1	25	Solin Development BV
Renewable heating	New bio boiler for Breivika heating plant in Tromsø (Troms county)	22	23	Troms Kraft Varme AS

Table 5.17: The table shows the ten largest projects in 2013 measured by contractual support amount.

TABLE 5.18 TOP 10 IN 2013 – PROJECTS WITH THE HIGHEST ENERGY RESULT

Market	Project description	Contractual energy result	Contractual support	Applicant
		GWh	MNOK	
Renewable heating	District heating in Bodø (Nordland county)	62	89	BE Varme AS
Renewable heating	Biogas Vestfold Grenland (Vestfold county)	45	40	Tønsberg municipality
Non-residential buildings	DNB Energy programme 2013-2017 (Oslo county)	44	40	DNB Næringseiendom AS
Renewable heating	District heating in Gjøvik (Oppland county)	37	52	Eidsiva Bioenergi AS
Renewable heating	District heating in Finnsnes (Troms county)	36	45	Senja Avfall IK
Industry	Energy efficiency Alcoa Mosjøen 2013-2015 (Nordland county)	27	15	Alcoa Norway ANS
Renewable heating	District heating in Moss (Østfold county)	26	37	Bio Varme AS
Renewable heating	New bio boiler for Breivika heating plant in Tromsø (Troms county)	22	23	Troms Kraft Varme AS
Industry	New energy-efficient drying process of fish peptides (Sør-Trøndelag county)	19	11	Scanbio Bjugn AS
Renewable heating	District heating and district cooling in Førde (Sogn og Fjordane county)	19	20	Sunnfjord Energi AS

Tabell 5.18: The table shows the ten largest projects in 2013 measured by contractual energy result.

Assignments outside the Energy Fund

Energy Technology Data Exchange (ETDE)
ETDE is the International Energy Agency's (IEA's) multinational information programme, which Enova administers on behalf of the MPE. A total of 13 countries participate in the ETDE cooperation, which concerns collecting and providing access to energy-related literature through ETDEWEB's energy database. The database contains more than 4.7 million references to energy topics from books, periodicals, doctoral dissertations, conferences, etc. Many of the references are available in full text versions.

Enova is responsible for following up and funding work related to maintenance and operation of the ETDE database from the Norwegian side. A total of 319 new documents were registered in ETDEWEB in 2013. ETDEWEB has 1 160 Norwegian users, and 2 631 Norwegian log-ins and 409 downloads from the database were registered in 2013. A total of 40 documents were registered in INIS (International Nuclear Information System) in 2013.

NOK 0.75 million out of a total allocation of NOK 1.8 million were disbursed in 2013.

Following an external evaluation of ETDEWEB, Norway decided to end its ETDE cooperation. The agreement with the IEA has a one-year notice period, and Norway ended its participation in 2013.

Intelligent Energy Europe (IEE)
Since 2003, Enova has managed the EU's non-technological programme Intelligent Energy

Europe on behalf of the Ministry of Petroleum and Energy (MPE). Some of the projects in IEE are not covered by the mandate in the Energy Fund. In these instances, Enova has been given the opportunity to use resources outside the Energy Fund to award pre-project support and national co-funding commitments.

No resources were disbursed to IEE projects outside the Energy Fund in 2013.

Natural gas
During the 2003-2009 period, Enova has administered the resources for the support programme for natural gas infrastructure on behalf of the Ministry of Petroleum and Energy (MPE). The last allocation over the fiscal budget was in 2009.

The objective of this arrangement was to facilitate increased domestic use of natural gas, and particular emphasis has been placed on ensuring that the use of natural gas has a positive impact on the environment. Conversion from heavier fuels in industry, shipping and transport were prioritized market areas. Any remaining funds following completion of the projects must be returned to the Treasury.

At year-end 2013, only one ongoing project remains with a residual commitment of NOK 38.5 million.

Part 6

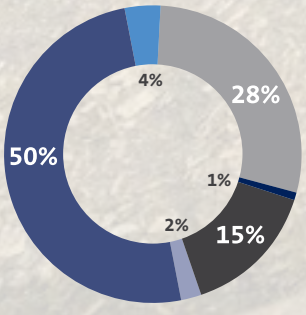
NUMBER OF FINAL REPORTED PROJECTS IN 2013:

471

FINAL REPORTED ENERGY RESULT IN 2013

2,0 TWh

PROJECTS DISTRIBUTED BY MARKET 2001-2011



Reporting on the Energy Fund 2001-2011

Energy results and allocations 2001-2011

Table 6.1 shows the allocation of resources from the Energy Fund and total energy results during the 2001-2011 period at the end of 2013, distributed by market and year. This table takes a basis in the year the resources were allocated. Cancelled projects must be corrected for energy results for the year the contract was originally signed and recorded. The contractual support amount will be released and returned to the Energy Fund so it can be put into new projects that create results. The fact that cancellations are corrected with retroactive effect, results in released funds and transfer of resources between years.

Enova awarded about NOK 8 billion in support for energy projects during the 2001-2011 period. The total investments which the support will trigger amount to more than NOK 40 billion. Enova's support percentage varies from market to market. In building, heating and industrial projects, the support averaged, less than 20 per cent of the projects' total investments during the agreement period. Within new technology projects, the support constituted between 25 and 50 per cent of investments.

TABLE 6.1 ENERGY RESULTS AND ALLOCATIONS 2001-2011

	2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		Total	
	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK	GWh	MNOK
Renewable heating	328	-	173	49	233	31	144	71	167	64	592	285	399	177	717	357	779	591	811	463	398	328	4 740	2 415
Solid biofuel production	-	-	-	-	154	3	255	14	162	6	100	4	167	5	67	3	-	2	-	-	-	-	906	38
Renewable power production	120	-	80	35	127	27	441	186	334	137	-	-	-	-	55	80	453	1 041	498	916	-	-	2 107	2 422
Industry	300	-	157	20	136	16	357	56	248	34	556	92	648	150	250	54	814	327	192	76	93	43	3 749	868
New technology	28	-	1	19	-	-	-	9	-	2	2	7	8	71	1	13	2	45	35	189	9	22	86	376
Non-residential buildings[1]	44	-	138	56	303	65	270	67	542	113	380	106	192	69	339	135	294	515	228	174	523	506	3 252	1 807
Residential buildings[2]	-	-	-	-	-	12	-	12	-	14	-	36	10	45	-	56	-	62	-	74	42	111	52	422
Analyses, development and strategy	-	-	-	7	-	7	-	6	-	5	-	8	-	11	-	9	-	9	-	17	-	31	-	111
International activities	-	-	-	7	-	7	-	7	-	12	-	12	-	6	-	4	-	9	-	8	-	7	-	76
Communications and public relations	-	-	-	113	-	40	-	26	-	47	-	19	-	21	-	44	-	25	-	25	-	59	-	419
Administration	-	-	-	42	-	36	-	41	-	45	-	47	-	61	-	75	-	100	-	93	-	95	-	635
NVE contracts (2001)	-	385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	385
Total	**820**	**385**	**548**	**349**	**952**	**244**	**1 467**	**494**	**1 454**	**479**	**1 629**	**615**	**1 424**	**615**	**1 430**	**829**	**2 341**	**2 726**	**1 764**	**2 034**	**1 065**	**1 202**	**14 893**	**9 972**

Table 6.1 shows the percentage of final reported projects for each year retrospectively. We see that the percentage of final reported projects increases with the age of the projects. The figure illustrates the time perspective for Enova's investment support. In 2013, we have final reported projects in every year between 2002 and 2011. The largest projects from 2007 and 2008 are still active, whereas final results have been reported for most projects from 2006 and earlier.

1 For the 2001-2011 period, non-residential buildings also includes non-industrial plants and facilities.

2 The household subsidy programme for electricity conservation was incorporated in the Energy Fund from 1 July 2011, and the results are recorded from this time.

TABLE 6.2 ENERGY RESULTS 2001-2011, CORRECTED FOR CANCELLATIONS, FINAL REPORTING AND ACHIEVED RESULTS

Total for the period 2001-2011, as of 2013				
	Gross contractual result[4]	Contractual result	Contractual corrected for final reported result	Contractual corrected for final reported and achieved result
	2001-2011	2001-2011	2001-2011	2001-2011
Market area	GWh	GWh	GWh	GWh
Renewable heating	6 676	4 845	4 740	4 896
Solid biofuel production	1 035	891	906	773
Renewable power production	3 750	2 108	2 107	1 971
Industry	5 670	3 802	3 749	3 765
New technology	213	136	86	87
Non-residential buildings[1]	3 648	3 161	3 252	3 263
Residential buildings[3]	90	52	52	52
Total	**21 083**	**14 995**	**14 893**	**14 809**

Table 6.2 : The table shows contractual energy results (in GWh) distributed by market area and year, both before and after correction for cancelled, final reported and achieved results. The "Contractual result" column shows the energy result as of the end of 2013 corrected for cancellations during the 2001-2013 period.

Table 6.2 shows contractual energy results for the period 2001-2011 distributed by market area and year, before and after correction for cancelled, final reported and achieved results. We see that the gross contractual energy result is approximately 40 per cent higher than the sum of contractual results for the period. The contractual energy result is corrected for cancelled projects. We see that the total contractual energy result is marginally changed after correction for final reported and achieved results. There are individual differences at a market area level. For non-residential buildings, the projects generally have better energy results measured after a few years of operation, while renewable power production and solid biofuel production show the opposite development.

3 With the exception of certain measures in 2007, energy results within the Residential buildings market area were not contractual until 2011. The household subsidy programme was incorporated in the Energy Fund from 1 July 2011, and the results are recorded from this time.

4 The gross contractual result presented in the 2012 report erroneously omitted 820 GWh from NVE projects in 2001. These have now been included.

Figure 6.1 shows the percentage of final reported projects for each year retrospectively. We see that the percentage of final reported projects increases with the age of the projects. The figure illustrates the time perspective for Enova's investment support. In 2013, we have final reported projects in every year between 2002 and 2011. The largest projects from 2007 and 2008 are still active, whereas final results have been reported for most projects from 2006 and earlier.

The figure also differentiates between active projects where disbursement has started and active projects where disbursement has not started. The risk of project cancellation is significantly lower when disbursement of support has begun.

There is still a certain cancellation risk for projects from 2010 and 2011, since about ten per cent of the projects are still awaiting disbursement at the end of 2013. In total, the active projects where disbursement has not started constitute around two per cent of the energy results.

Enova carries out active follow up of the projects' progress and implementation. Systematic and sound follow-up contribute to the projects being implemented in line with the applicable agreements. In those cases where projects are not implemented for various reasons, close follow-up ensures that we avoid unnecessarily tying up funds in projects with no progress.

FIGURE 6.1 PERCENTAGE OF FINAL REPORTED PROJECTS

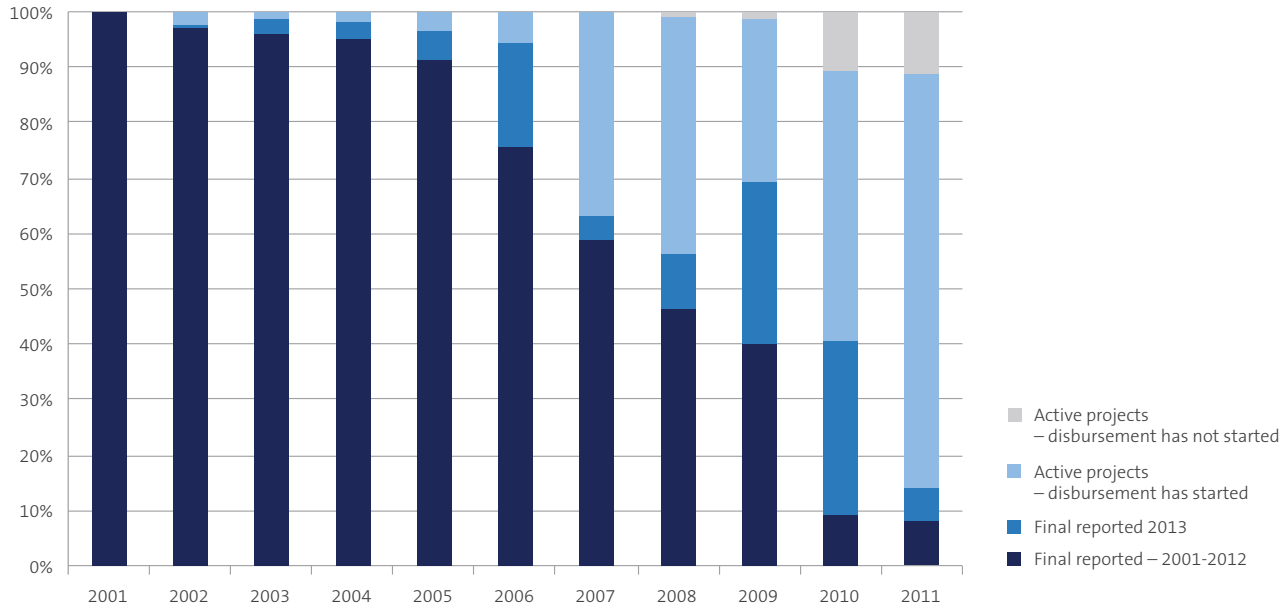


Figure 6.1: The figure shows the percentage of final reported and active projects at the end of 2013, distributed by the year the contracts were signed. The figure also shows the percentage of the active projects where disbursement has started.

Final reports have been submitted for about 2 TWh in 2013 from projects whose contracts were entered into in 2001-2011.

Figure 6.2 shows contractual energy results from contracts entered into between 2001 and 2011, distributed by the year the contract was signed.

The figure shows how cancelled projects retroactively affect annual net energy results.

The figure shows that the scope of cancellations increases with the age of the projects, but also that the level varies from year to year. The scope of project cancellations from 2011 is at 22 per cent, while the average is 29 per cent.

Many projects take several years from project application to completion. Then the implemented solutions must enter an operational phase to harvest the energy results. After three years of operations, Enova measures which energy results have been achieved from the project.

FIGURE 6.2 ENERGY RESULTS AND CANCELLATIONS PER CONTRACT YEAR

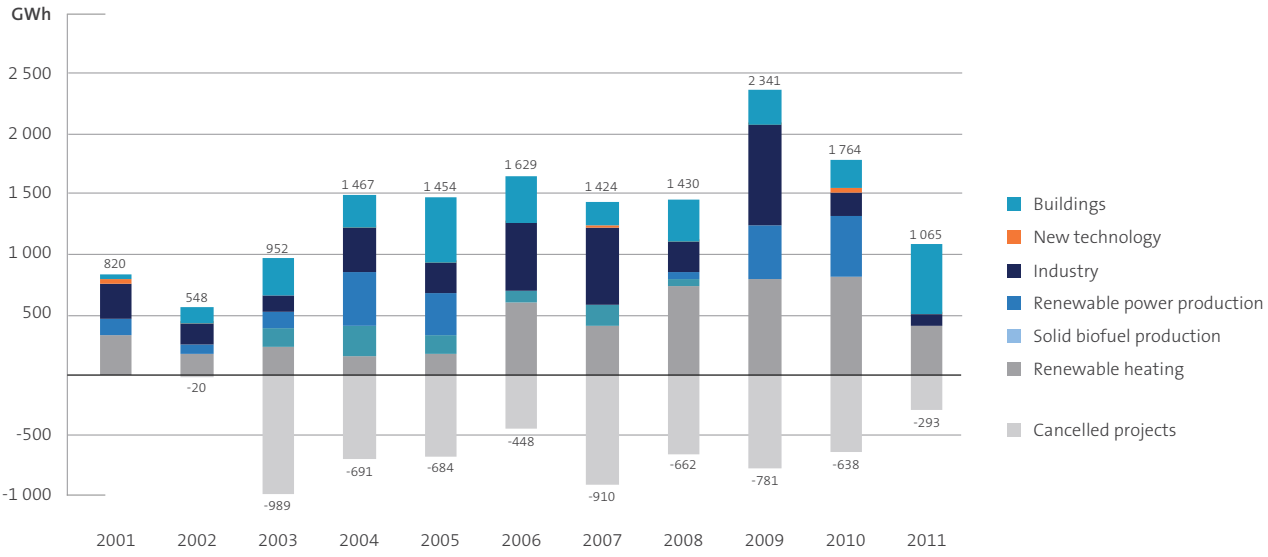


Figure 6.2: The figure shows the contractual energy results for 2001-2011, distributed by contract year.. The figure shows how cancelled contracts impact annual net energy results. Overall, the columns show the contractual energy result for each year. Cancellations contribute to an annual accumulated deduction (the negative part of the columns) from Enova's net energy result (the positive part of the columns). The figures are corrected for changes in the energy results in final reported projects.

Achieved results

When Enova grants support for a project, the support recipient must achieve a certain energy result in the future. It takes time from project application until energy results can be harvested after project implementation. Implementation takes several years for the largest projects supported by Enova. The results, in the form of energy saved or renewable production, then vary from year to year.

Enova has existed for twelve years, and the oldest projects in our portfolio have accumulated sufficient operational experience to report what results they have actually achieved. Enova examined the results from projects that were implemented in the period from 2001 to 2010. Enova decided to support more than 2 000 projects during this period. Of these projects, 633 were completed within the period, and are a potential source of empirical data.

Main results

In a normal year, these projects are expected to achieve a total energy result that corresponds with their final reported result. Most of the projects, about two out of three, have achieved the results they expected to, or more. In particular, wind power projects and projects within solid biofuel production achieve lower results than the final reports. Both of these areas have been phased out. The other market areas have fulfilled contractual and final reported energy results.

Overall, the projects expect result fluctuations between -20 and +15 per cent from year to year.

Achieved results within the market areas

Figure 6.4 shows the contractual and final reported energy results for each market area, and the achieved energy result during a normal year. The expected interval for variation in energy results from year to year is indicated by horizontal lines on the column for the achieved results. Each project has reported the annual energy result they expect in the best and worst case scenarios, and the intervals are derived from this.

Projects within renewable heating achieve about ten per cent higher energy results than expected when the projects are completed. The projects expect considerable variations from year to year, but the energy results predicted upon completion will usually be higher – as much as 30 per cent higher than expected in some cases.

Industrial and building projects consistently achieve higher energy results than expected upon project completion. These groups of projects also report the least uncertainty from year to year.

Wind power projects (renewable power production) are unable to deliver the expected energy results. The normal annual

FIGURE 6.3 ACHIEVED RESULTS COMPARED WITH CONTRACTUAL AND FINAL REPORTED RESULTS

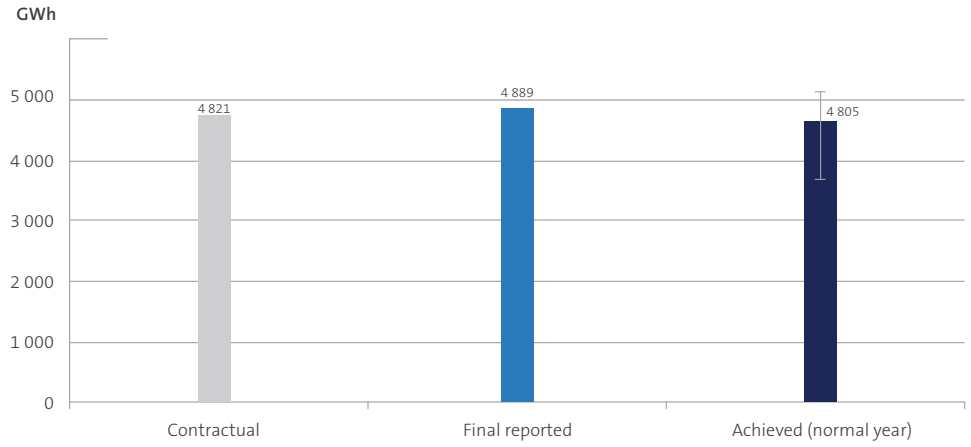


Figure 6.3: The figure shows aggregated results as of 2013 for projects that were final reported before 31 December 2010. The total contractual, final reported and achieved in a normal year. Natural discrepancies from a normal year are also shown for achieved results

FIGURE 6.4 ACHIEVED RESULTS FOR EACH MARKET AREA COMPARED WITH CONTRACTUAL AND FINAL REPORTED RESULTS

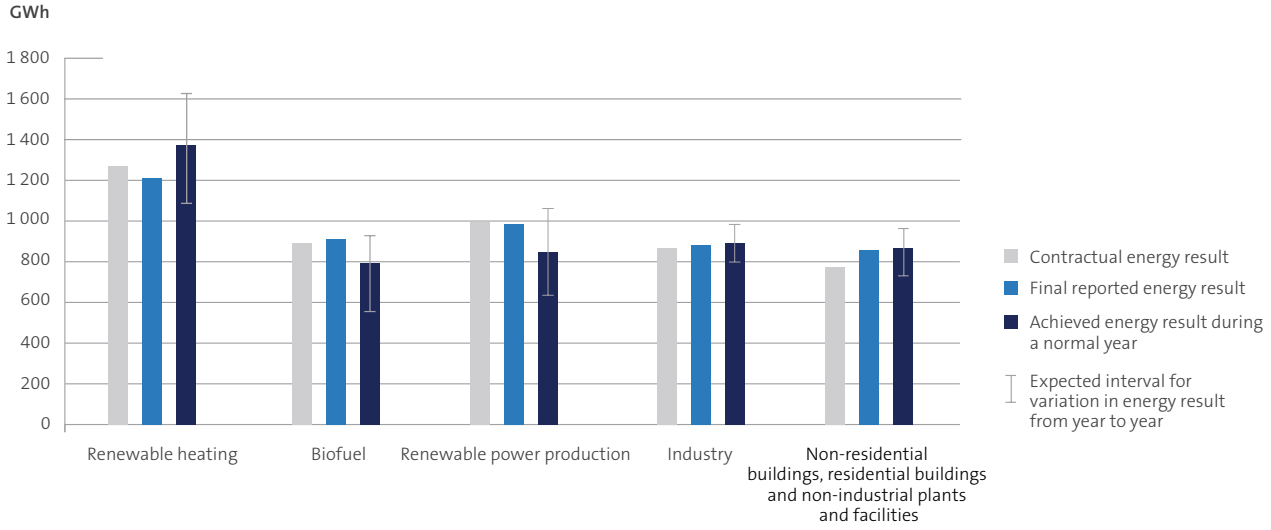


Figure 6.4 The figure shows achieved results during a normal year for each market area as of 2013, compared with contractual and final reported results for projects for which final reports were submitted by 31.12 2010. The expected intervals for variation in energy results from year to year are indicated with vertical lines on the columns for achieved results.

production is about 15 per cent lower than production estimates used as a basis upon completion of the projects. However, in a good year, it is possible to generate the expected volume of energy. These projects carry substantial uncertainty from year to year.

Projects within solid biofuel are unable to deliver the expected results, and the projects report a high risk of not delivering enough results. At worst, the result is 40 per cent lower than expected when the projects were completed.

Composition of Enova's total energy results

Figure 6.5. shows how Enova's total energy results are distributed across projects with varying maturity. One year could both include contractual results from projects still in the start phase, as well as achieved results from completed projects that have been operational for several years. The earlier the year, the larger the percentage of final reported and achieved energy results.

FIGURE 6.5 CONTRACTUAL, FINAL REPORTED AND ACHIEVED ENERGY RESULTS 2001-2011

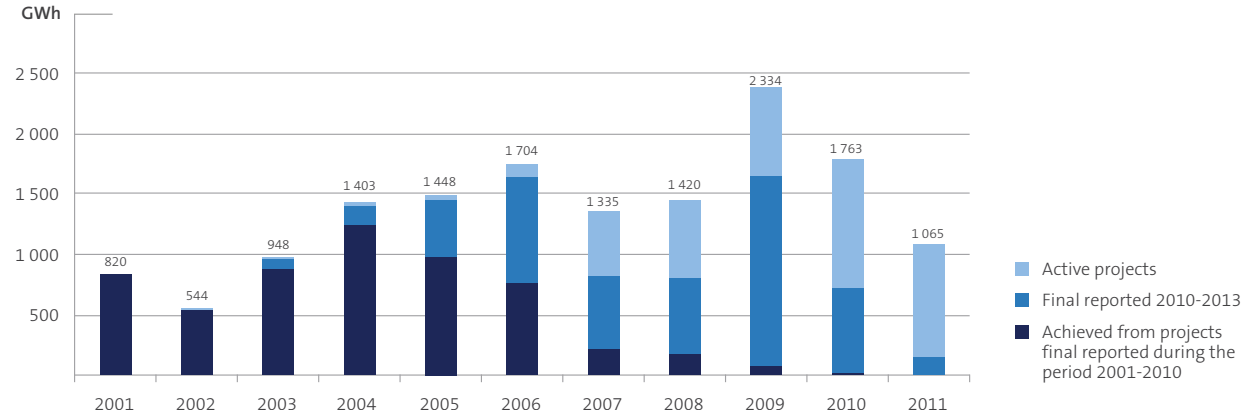


Figure 6.5: The figure shows the net contractual, final reported and achieved energy results distributed by the year the contract was entered into. The Energy results are updated for projects after final reporting and ex-post evaluation.

Reporting on climate results

This chapter summarizes climate results from previous periods, i.e. for the 2001-2011 period.

Climate results are reported in CO_2 equivalents. This unit indicates the combined effect of CO_2, as well as other greenhouse gases (for example CH_4, N_2O). We differentiate between climate results achieved through reduced use of fossil fuels and what follows from reduced use of electricity or production of electricity from renewable energy sources:

- *Climate result from reduced use of fossil fuels:* Changes in emissions of greenhouse gases as a result of reduction in the use of fossil fuels. This can be achieved by converting from fossil to renewable energy sources or improving efficiency in the use of fossil fuels.
- *Climate result from direct reduction of non-energy-related greenhouse gas emissions:* Changes in greenhouse gas emissions as a result of reductions in direct emissions of greenhouse gases. These climate results have not been assessed in the 2001-2011 portfolio.
- *Climate result from reduced use of electricity or production of electricity from renewable sources:* Changes in greenhouse gas emissions as a result of reductions in the use of electricity or production of electricity from renewable sources. The emission coefficients for electricity will vary depending on the mix, technology or country for which the results are calculated, with a corresponding variation in climate result. We take a point of departure in three different scenarios for electricity: Nordic mix, European mix and Nordic coal power.

Table 6.3 provides an estimate of the reduction in annual oil consumption as a consequence of Enova's results for the 2001-2011 period, and presents climate results from reduced use of fossil fuels.

We established a database in 2012 which provides us with access to oil reduction data from each project we support. This helps quality-assure the data basis for calculating oil reductions. However, the impact on oil consumption for the 2001-2011 portfolio is based on a routine assessment of each market area. It is estimated that half of the energy result from renewable heating will replace oil. Projects within the industry and buildings market areas are directed both at heating and electricity consumption. The reduction in oil consumption will generally constitute a smaller share of the results from these market areas. It has turned out that each kWh in energy result from industries leads to an estimated 34 per cent reduction in oil consumption for the 2001-2011 period. Energy results from renewable power production and new technology are estimated to have a 100 per cent impact via electricity as an energy carrier. The reduction in oil consumption has therefore been estimated at zero in these areas. Projects within the buildings market area are expected to yield a proportionately smaller reduction in oil consumption of just over ten per cent.

The *Reduction in annual oil consumption* column shows an estimated reduction in the use of oil for the different market areas. The *Climate result* column shows the estimated reduction in greenhouse gas emissions as a result of reduced oil

TABLE 6.3 REDUCTION IN OIL CONSUMPTION AND DIRECT CLIMATE RESULT FROM PROJECTS SUPPORTED WITHIN THE ENERGY FUND 2001-2011

Market area	Reduction in annual oil consumption (tonnes)	Climate result
		ktonnes CO_2 equivalents
Renewable heating	231 893	718
Renewable power production	0	0
Industry	124 719	386
New technology	0	0
Non-residential buildings[6]	38 183	118
Residential buildings	611	2
Total	**395 406**	**1 225**

Table 6.3: The table shows the direct climate result of projects supported during the 2001-2011 period measured in reductions in oil and CO_2 emissions (CO_2 equivalents for each market area).

consumption. The figures are based on a routine assessment and are uncertain.

Table 6.4 shows the total climate result, i.e. the climate result from reduced use of fossil fuels and reduced use of electricity or production of electricity from renewable sources for 2001-2011. Three different scenarios are used for electricity: Nordic mix, European mix and Nordic coal power, with respective emission coefficients of 117 g of CO_2 equivalents/kWh, 477 g of CO_2 equivalents/kWh and 819 g of CO_2 equivalents/kWh.

Emission coefficients for the different energy carriers in the calculations were retrieved from the Ecoinvent v36 database.

Renewable heating, industry and non-residential buildings are the market areas with the best climate results. Results for this share of projects are naturally dependent on what electricity mix is used as a basis in the calculations. The best case is a scenario where Norwegian power replaces Nordic coal power, where the 2001-2011 portfolio corresponds to a total reduction in greenhouse gas emissions of approximately 9 million tonnes of CO_2 equivalents, or approx. 17 per cent of the total greenhouse gas emissions in Norway in 2012, according to Statistics Norway (SSB).

TABLE 6.4 TOTAL CLIMATE RESULT (DIRECT + INDIRECT) FROM PROJECTS SUPPORTED WITHIN THE ENERGY FUND 2001-2011

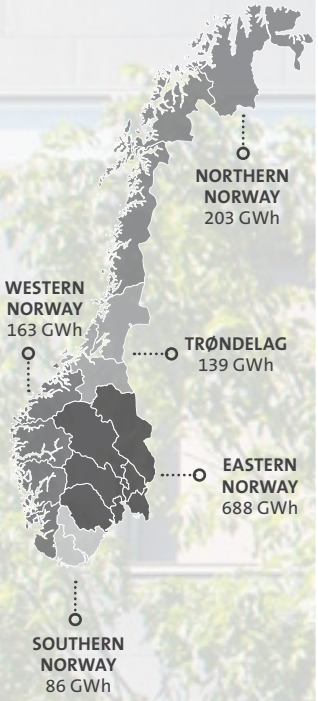
Market area	Nordic mix	European mix	Nordic coal power
	ktonnes CO_2 equivalents	ktonnes CO_2 equivalents	ktonnes CO_2 equivalents
Renewable heating	995	1 849	2 659
Renewable power production	247	1 005	1 726
Industry	676	1 567	2 413
New technology	10	41	70
Non-residential buildings[6]	453	1 483	2 462
Residential buildings	7	24	40
Total	**2 388**	**5 969**	**9 370**

Table 6.4: The table shows the total climate result (direct and indirect) of projects supported during the 2001-2011 period seen from three different electricity scenarios. The results are shown for each market area.

6 For the 2001-2011 period, non-residential buildings also includes non-industrial plants and facilities.

Appendices

ENERGY RESULTS 2013
DISTRIBUTED BETWEEN
NORWAY'S FIVE REGIONS



*Nationwide projects: 129 GWh

Did you know that...
Over the course of 2013, Enova has supported more than 1 300 projects distributed in our markets. In addition, more than 6 800 measures have been supported through the Energy Measures in Residences Programme.

For information about the specific project in 2013, see the project list on **www.enova.no/prosjektliste2013**

Submitted viewpoints on hearings

Enova provided consultation submissions in the following cases in 2013:

The MPE's request for viewpoints regarding the Report on district heating regulations.

Nordic Ecolabelling's (the Swan's) request for viewpoints regarding the report on Nordic Ecolabelling of Audiovisual equipment.

Publications

Enova's Annual Report 2012
Enova 2013

Enova Annual Report 2012 – Results and Activities
Enova 2013

Fact study - cost of electric and central heating
Conducted by Cowi for Enova 2013

Suitable heating and cooling solutions in buildings
Conducted by Cowi for Enova 2013

The forest as an energy carrier
Conducted by Rambøll for Enova 2013

Cost study – solar power in Norway
Conducted by Multiconsult for Enova 2013

Definitions of terminology

Achieved energy result
Achieved energy results are measurements or estimates of actually achieved energy results after a metering has been completed, and its effects can be observed. Unlike contractual and final reported energy results, the achieved energy result is based on observations, not expectations. The achieved energy result is based on a review/audit of what energy results the projects have actually achieved. In practice, it can be challenging to quantify achieved results, and the challenges can vary for energy production and energy use. It also takes time from when the measures are implemented until achieved results can be reported.

Climate result
Climate result means the change in greenhouse gas emissions as a result of various energy initiatives, and is reported in CO_2 equivalents. The report distinguishes between climate results from reduced use of fossil fuels, climate results from direct reduction of non-energy-related greenhouse gas emissions and climate results from reduced use of electricity/production of electricity from renewable sources. The latter will vary depending on the electricity mix, and thus the emission intensity, that is used as a basis.

CO_2 equivalent
CO_2 equivalent is a unit used in climate accounting and equals the effect a volume of CO_2 has on global warming over a certain period, normally 100 years. There are several types of greenhouse gases, and emission of these gases is converted to CO_2 equivalents according to their heating potential.

Contractual energy result
Contractual energy result is the annual energy result a project is expected to achieve in the future. The energy result is included as part of the contractual basis between the support recipient and Enova. All grants within a calendar year are included in the calculation of gross contractual energy result for the year in question.

Cost efficiency
One of the objectives when establishing Enova was to achieve a more cost-effective effort within renewable energy and efficient energy end use. Enova prioritizes projects based on the size of the support need in relation to the energy result (NOK/kWh), given the project's lifetime and the goals stated in the agreement with the MPE. Projects applying for support from Enova are evaluated in three stages. First, the technical energy content of the project is assessed, followed by the financial aspects of the project and the need for support, and finally, Enova's cost connected to the project (support) is assessed against the energy result (kWh). Projects that do not deliver a high enough energy result in relation to the support amount, will not succeed in the competition for resources.

Energy restructuring
The contract between the MPE and Enova stipulates that the Energy Fund will be used to promote an environmentally friendly restructuring of energy end-use, energy production and development of energy and climate technology. The energy restructuring is a long-term effort in the development

of the market for efficient and environmentally friendly energy solutions that contribute to strengthen the security of energy supply and reduce greenhouse gas emissions.

Energy result
Enova manages the Energy Fund to achieve energy results through reduced use of energy or through increased production of renewable energy.

ESA
The EFTA Surveillance Authority enforces the state aid regulations in the EEA Agreement. Government support granted to enterprises must as a rule be reported to the ESA.

Final reported energy result
All projects submit a final report upon the project's conclusion. The final reported energy result is an updated forecast of a project's expected achieved annual energy result. Enova assesses whether the project's final reported energy result is reasonable when the final report is submitted.

Free ride
Enova's definition of a free ride is a support recipient who receives support for projects which the recipient would have implemented anyway, i.e. cases where the Energy Fund's resources are not necessary to trigger the project. See also the definition of triggering effect.

Lifetime
A key issue related to new production of energy and reduced energy end-use is how long we will reap benefits from the results. Here one can differentiate between technical and financial lifetime. The technical lifetime is connected to how long the equipment can function with normal maintenance, while financial lifetime is related to how long it will take before it will be more profitable to replace the equipment with new and improved technology. Enova bases its lifetime consideration on financial lifetime. This is also reflected in Enova's investment

analysis. In addition to the importance of project lifetime as a parameter in the assessment of the support need, it also expresses how long we will benefit from the energy result provided by the project. The project's lifetime multiplied by annual energy result [year*kWh] will express the project's total energy result over its lifetime. Similarly, the energy cost is also expressed over the lifetime [NOK/[year*kWh]].

Passive houses/buildings
Passive houses/buildings are buildings which require very little heating. Norwegian standards have been established both for passive residential buildings (NS3700) and passive non-residential buildings (NS3701), adapted to Norwegian climatic conditions.

Programmes
Enova has chosen to organize its activities in programmes. A programme is an instrument directed towards one or more specific target groups, with set application deadlines and application criteria. This organization has been chosen to focus the use of policy instruments.

Renewable energy
Enova uses the same definition of renewable energy used in the EU's Renewables Directive (2001/77/EC). In the directive, renewable energy is defined as renewable, non-fossil energy sources (wind, solar, geothermal energy, tidal energy, hydropower, biomass, gas from treatment plants and biogases). Biomass is furthermore defined as biologically degradable fractions of products, waste and agricultural remnants (plant or animal-based), forestry and associated industries, in addition to biologically degradable fractions from industrial and municipal waste.

The Energy Fund
The Energy Fund's objective is to promote environmentally friendly restructuring of energy end-use and energy production. The Energy Fund is a predictable and long-term source of financing for the restructuring work.

The overarching and long-term goals for application of the Energy Fund are related to energy restructuring and production of new renewable energy and other environmentally friendly energy, as well as development of energy and climate technology. The Energy Fund is financed through allocations in the fiscal budget and a parafiscal charge (small additional charge on electricity bills) on the electricity grid tariff. As of 2013, the parafiscal charge for electricity consumption in households will be NOK 0.01 per kWh, while all other end users will pay NOK 800 per year per Measure Point ID.

The allocations to the Energy Fund mainly consist of returns from the Fund for climate, renewable energy and energy restructuring. At year-end 2013, the capital in this fund was NOK 35 billion. In connection with the Climate Agreement in 2012, a decision was made to strengthen the Fund for Climate, Renewable Energy and Energy Restructuring with a capital contribution of NOK 10 billion in 2013, NOK 5 billion in 2014 and NOK 5 billion in 2015, cf. Storting White Paper No. 21 (2011-2012).

In 2013, the Energy Fund received NOK 999 million in returns from the Fund for Climate, Renewable Energy and Energy Restructuring. The resources from the Energy Fund are managed by Enova SF.

The Energy Fund is based on Section 4-4 of the Act relating to amendment of Act No. 60 of 29 June 1990 relating to the generation, conversion, transmission, trading, distribution and use of energy, etc. (Energy Act), cf. Odelsting Proposition No. 35 (2000-2001) and Recommendation to the Storting No. 59 (2000-2001). The Ministry of Petroleum and Energy (MPE) determines the statutes for the Energy Fund.

Triggering effect
As an administrator of public resources, it is important for Enova to ensure that the resources we manage are used in the best possible manner. This principle is stipulated in the agreement between Enova and the MPE in that support must contribute to triggering projects that would not have been implemented otherwise. Projects with a low cost per generated or reduced kWh will often be profitable by themselves, and therefore do not require support from the Energy Fund. Support is also considered to be triggering if it advances a project in time, or if a project has a larger scope than it otherwise would have had.

Enova is a government agency which promotes environmentally friendly restructuring of energy end-use, renewable energy production and new energy and climate technology. Our goal is to create lasting changes in the supply of and demand for efficient and renewable energy and climate solutions.

Enova's reports can be found at **www.enova.no**

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