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Work Package 4: Policy context and measures

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Note

Currency: 100 øre = 1Nkr = about 10 pence = about 11 €c at April 2009.

1 Introduction

1.1 Purpose

- 1.1.1 This report provides a summary of the organisation and governance of the HP industry and market in Norway, and of the issues faced by the industry. It complements the more detailed analyses of the industry and markets in the *ProHeatPump* partner countries, and should provide useful comparisons and lessons.

2 Norway's energy sector

- 2.1.1 Norway is rich in hydropower, oil, gas, and forests for biofuel.¹ Supply of cheap electricity has contributed to this being the main form of energy used for heating, especially in the residential sector. Electricity is the main energy carrier. Norway has large energy-intensive industries that depend on cheap electricity. Oil use has decreased since 1976. Biofuel use is small but slowly increasing.

2.2 Energy use in buildings

- 2.2.1 Buildings account for 38% of Norwegian energy use. The property sector represents the main growth in energy use in the last 30 years.
- 2.2.2 Most major cities and towns have (some) district heating, and DH currently supplies 1% of heating for buildings in Norway.² There is a connection requirement (*tillknytningsplikt*), which means that all large new buildings are required to connect to district heating if there is a supply. According to HP industry representatives, however, this is not a major barrier to HP adoption.³

2.3 Residential sector

- 2.3.1 About 2.2 million homes were registered in 2008. Of these, half were detached houses (*eneboliger*).⁴ Eight out of ten households own their home. But the proportion of those renting has increased since 1999, particularly in urban areas.
- 2.3.2 Heating represents 50% of energy use in households. Energy consumption is decreasing per unit area and per household, and is a decreasing part of households' expenditure.⁵
- 2.3.3 Larger flats and houses, and increased levels of comfort are driving increased use of energy for heating. Increasing energy efficiency is counteracted and surpassed by increasing demand. Energy demand for heating is however reaching a plateau – while continuing to grow for other uses.
- 2.3.4 Electricity is the main energy source for heating in Norwegian households. 80% of households also have other heating technology, mainly wood fuelled.⁶ Increased demand for gas for cooking has led to a growth in gas infrastructure.⁷

3 HP industry and market in Norway

3.1 HP actors in Norway

3.1.1 The main actors in the HP market in Norway are:

- installers
- NOVAP (Norwegian Heat Pump Association) and
- Enova (a public enterprise owned by OED, the Ministry of Petroleum and Energy) [5.2.5].

Other significant organisations include *Kulde og varmepumpeentreprenørenes Landsforening*, *KELF* (National Organisation of Cooling and Heat-pump Entrepreneurs).⁸

3.2 HP demand and installations: residential

3.2.1 Between 2 and 4% of households have HPs.⁹ HP sales started growing in the late 90s and demand has increased rapidly since. Growth was roughly exponential from 1997 up to 2003. From 1997 to 2002 electricity prices fell, and this probably contributed to the popularity of HPs.¹⁰

3.2.2 Electricity prices then hit a peak in 2003. In the same year Enova ran a subsidy scheme for HPs among other technologies [6.2]. 8% of households invested in new heating technology, as compared to 5% in a normal year. Of those, 25% installed new HPs. Overall HPs and wood-fuelled ovens were the most popular investments.¹¹

3.2.3 Sales of HPs were stable in 2004 and 2005, but then increased again: in 2006 twice as many HPs were sold as in the previous year. About 95% of HPs have been installed in the last five years.¹²

3.2.4 Approximately 15 000 GSHPs were estimated to be operating in Norway in 2007.¹³ In 2008 air-to-water HPs appeared to make a significant breakthrough into the market, judged by the continued increase in applications for government grants.¹⁴ Most HPs installed in houses are air-to-air, however, and the residential sector is the main market for these.¹⁵ They are dominant because water-based central heating is relatively rare and air-to-air HPs are easier and less expensive to install than GSHPs.

3.2.5 For many households the opportunity cost of switching to a HP is high because of the widespread use of electrical equipment, especially electric radiators (*panelowner*).

3.3 HP demand and installations: commercial and public

3.3.1 In the commercial and public sectors, 50% of the energy used for heating is provided via central heating. 3% of buildings with central heating systems have HPs.¹⁶ Most of the increase in energy used in service sector (*tjenestytende*) buildings since 1970 has come in the form of increased electricity use rather than heating.¹⁷

4 Barriers to HPs in Norway

4.1 Competing technologies

- 4.1.1 HPs compete with the planned expansion in the use of natural gas, with wood pellets as fuel for stoves and district heating, and with other renewable technologies like solar energy.¹⁸
- 4.1.2 The share of newly built residential buildings with water-based central heating is around 10 to 15%. This share is increasing now, after a reduction in the 1980s and at least part of the 1990s.¹⁹ The figure is over 40% for new detached houses. The number of rental homes with water-based central heating is increasing rapidly.²⁰ Despite the increased adoption of water-based central heating, however, electric heating remains the norm, and the lack of water-based central heating thus remains a barrier to the installation of HPs. Water-based central heating is also more expensive than for example in Sweden, since the Norwegian market is smaller and there is a lack of specialists (*fagfolk*).
- 4.1.3 Information on the cost of energy options is often vague or difficult to acquire for users or buyers of properties. Commentators suggest that energy labelling would help. Competition for construction and development projects results in pressure to reduce building time, and this favours electric heating.²¹
- 4.1.4 As in other countries, commentators suggest a range of other obstacles to the uptake of alternative heating solutions, including
- an immature technology and market;²²
 - low electricity prices;
 - higher investment costs for alternatives;
 - higher market and technological risk.²³
- 4.1.5 Local councils grant building permits. Practice on permits for HPs has varied between councils. A recent statement by the Norwegian National Office of Building Technology and Administration (*Statens byggingstekniske etat*) says that councils should not require permits for HP instalments that do not change substantially the façade of the buildings.²⁴

5 Policy context

5.1 Background

- 5.1.1 The Norwegian energy market was deregulated in the early 90s.²⁵
- 5.1.2 Current Norwegian energy policy dates mainly to a Parliamentary Note from 1998-99.²⁶
- 5.1.3 There is a well-established environmental dimension to Norwegian energy policy, but also a historical lack of focus on alternative energy because of the abundance of hydropower. Recent changes have been driven by international environmental and climate policy processes, and by demand rising faster than supply, with consequences for security of supply and price.²⁷

5.2 Government agencies in energy policy

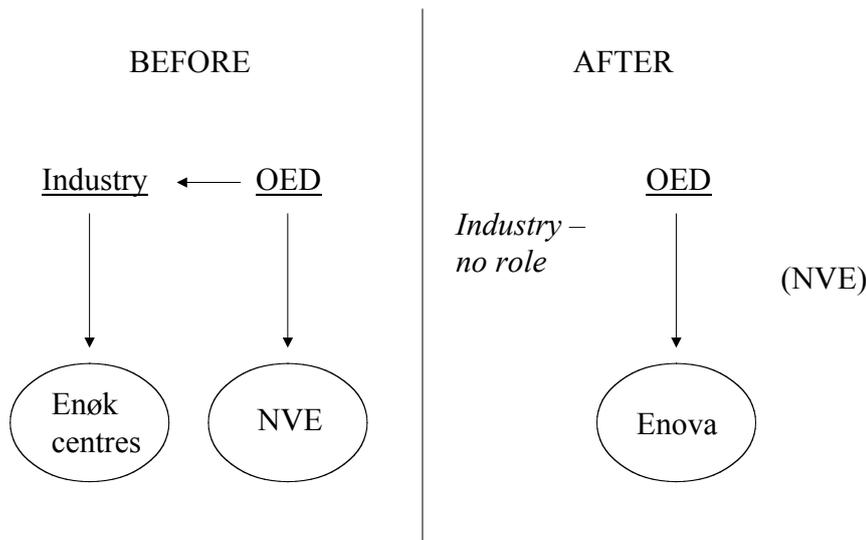


Figure 1 Norway's governance structure before and after 2001 in the area of renewables and energy efficiency. Circled organisations are the organisations charged with implementation as opposed to policy development.

- 5.2.1 The mission of the OED (Ministry of Petroleum and Energy) is to provide a coordinated and comprehensive energy policy. A key goal is to secure high value-creation through efficient and environmentally friendly management of energy resources.²⁸
- 5.2.2 Under OED are several agencies and public companies, including NVE [5.2.4] and Enova [5.2.5], plus Gassnova, which promotes gas power-generation technology with CO₂ capture, and Statoil, the state oil and gas company.²⁹
- 5.2.3 The Ministry of Local Government (*Kommunal- och regionaldep.*) also produced in 2005 a plan for energy use in local and regional public sector buildings, but it did not contribute any significant new measures.
- 5.2.4 The mission of NVE (Water Resources and Energy Directorate) includes the aims of working for a cost-efficient energy system and contributing to efficient energy use. It holds management responsibilities under the Energy Act as well as water legislation, and has the power to issue regulations, to make specific decisions, and to prepare cases for resolution by the OED. One of the agency's tasks includes working towards better knowledge about energy provision, including energy use.³⁰
- 5.2.5 Enova was established in 2001 as a public enterprise owned by OED. Its main mission is to contribute to environmentally sound and rational production and use of energy, relying on financial instruments and incentives to stimulate market actors and mechanisms to achieve national energy policy goals.³¹ It has no regulatory powers, does act as a consultant on policy proposals. Its objectives are:³²
- to limit energy use considerably more than if developments were allowed to continue unchecked;
 - to increase annual use of water-based central-heating based on new renewable energy sources, HPs and waste heat, to 4 TWh by 2010;
 - to install wind power generating 3TWh/y by the year 2010 and;

- increase environmentally friendly land-based use of natural gas.

Enova also manages the expansion of domestic natural gas use,³³ but has been given no explicit directives on how to deal with the conflict between gas and renewables.

- 5.2.6 Enova's role replaced a model in which energy policy goals were implemented by NVE, financed from the government budget, and the utilities, financed from a levy on electricity transmission.³⁴ NVE now has little role in the area of renewables and energy efficiency, but still produces analyses and statistics. The utilities worked via regional energy economy centres (*Enøksentre*), offering information and advice. The Enøk centres were not considered very effective, but some are still active.³⁵
- 5.2.7 Enova is intended to 'catalyse' conversion – that is, encourage projects that would not otherwise happen, through investment support to counter market and technological risks. It invests through Public Service Obligations (PSO) contracts. It also deploys subsidies, advice and information, network construction and demonstration projects. Its information and advice are mainly targeted to construction companies and property developers, local councils and the health sector, but it also issues general information for households and for children through schools. It is considered to have extensive contacts with its constituencies, but not to have systematised cooperation sufficiently for example through advisory groups, though it does have cooperative agreements with some industry organisations.³⁶
- 5.2.8 Enova was set up with considerable autonomy and with a strong orientation to targets that were relatively long-term. An evaluation of the agency, however, has claimed that it has had too much focus on results defined by quantitative indicators and too little on less quantifiable effects such as acceptance of new technologies.³⁷
- 5.2.9 Enova's programme on buildings (BBA: *Bygg, Bolig og Anlegg*) focuses on three main types of project: large energy deals with property developers or owners, households and extensions (*enkelthbygg og tiltak*), and demonstration projects. Enova claims to have contributed to a shift in the housing market towards low energy buildings through its direct subsidies and cooperative agreements.³⁸

5.3 Energy system 'Conversion'

- 5.3.1 'Conversion' of the energy system is a major policy goal. It envisages a shift away from using oil for stationary energy generation, more use of renewable energy sources, and more efficient energy use.³⁹
- 5.3.2 The proposal under which public involvement in the sector was reorganised and the new agency Enova established [5.2.5], expressed a new political consensus early this decade not to invest further in hydropower, and to build new renewables capacity.
- 5.3.3 The potential role of HPs in the context of the conversion policy was suggested in 2006 in the report of a major public inquiry charged with answering the question: 'what does Norway have to do to reduce its carbon emissions by 50-80% before 2050?'⁴⁰ Under the heading 'Conversion to CO₂-Neutral Heating', the report argued that the use of HPs in Norway could reduce electricity consumption for heating by two thirds on average. It argues for a long term and regular investment in low emissions technologies such as HPs.

5.3.4 The report recommended that all use of oil and natural gas for combustion heating should be replaced with biofuels, other renewable heat sources including HPs, and waste incineration. To this end it suggested a ban on the installation of new oil or gas heaters, possibly in combination with a take-back/recycling grant on old equipment, increased taxes on fossil fuels, and government subsidies for conversion to biofuels and other renewable energy sources. It also suggested that building codes should require flexible energy solutions in all major new builds, so that it would be easier to adopt future (e.g. water-based heating) technologies.

5.4 Increasing energy efficiency through revised building regulations

5.4.1 Ryghaug and Sørensen suggest the achievements of the Norwegian government over three decades in promoting energy efficiency in building design 'may at best be described as modest'.⁴¹

5.4.2 A revision in 1997 of Norway's building regulations was aimed at more energy efficient buildings, but indicators of energy use in buildings continued to increase. Ryghaug and Sørensen argue that policy-makers assumed that economic incentives provided by energy prices, and the formulation of *ENØK* – *Energiøkonomisering* (energy economising) – the central principle of Norwegian policy on energy efficiency from 1980 onwards [note 46] – would be sufficient to encourage building industry actors to improve the energy performance of buildings. Moreover, they did not provide tangible policy measures at an operational level to accompany the general policy, and the already ambiguous *ENØK* principle only translated into a vague notion that energy was important.⁴²

5.4.3 The provisions on energy use in the regulations were revised again in 2007.⁴³ The regulations are complex, but involve a choice of complying with a standard for energy use (measured in kWh/m²), or complying with a set of technical requirements, including insulation, double glazing, heat recovery, ventilation, limits on the use of cooling, and in some types of buildings reduced temperatures in evenings and weekends. All new buildings, apart from holiday homes (*fritidsboliger*) must include provision for using energy other than electricity or fossil fuels for a 'substantial part' of the heating need.

5.4.4 It is expected that the new EU buildings directive will be implemented in 2009.⁴⁴

5.4.5 An interesting study by Ryghaug and Sørensen has analysed the receptivity of the Norwegian construction industry to innovations and the difficulties in getting it to adopt energy efficient design.⁴⁵ The authors identify three influences:

- deficiencies in public policies to stimulate energy efficiency, particularly arising from the ambiguous message of the 'energy economising' policy (*ENØK*) that preceded *Enova*.⁴⁶
- the autonomy given to the industry and limited governmental efforts to regulate it [5.4.1]; and
- a low level of investment in R&D and innovation, and conservative practices and culture, in the industry.⁴⁷

5.5 Energy efficiency in public buildings

5.5.1 In 1998 a government resolution on energy use in public sector buildings aimed at promoting more flexible heating systems that could run on energy from different sources. It covered buildings larger than 1000 m², and new buildings as well as those undergoing 'thorough' renovations. There have since been discussions to

include buildings down to 500m², but no similar requirements for private sector buildings have been discussed.⁴⁸

5.5.2 Energy producers are required to perform local energy investigations, covering production, transmission, distribution and use, but not alternative solutions or systems.⁴⁹

5.5.3 There are signs of a greater policy emphasis on renewables and energy efficiency, with budget plans of 1.6 billion Nkr per year after 2010.⁵⁰

5.6 Energy taxes

5.6.1 The basic energy tax in Norway is 9.88 øre per kWh. As from July 2004, the corresponding tax for industry is 0.45 øre, although exceptions apply. Enova is funded through a fee on electricity supply of 1 øre/kWh. There is a tax on oil for fuel, and a CO₂ tax (which excludes gas fuelled stationary utilities). A new CO₂ charge for natural gas heating was also recently introduced.⁵¹

5.7 Observations on Norwegian policy

5.7.1 The notion of 'conversion' has been criticised for being too vague and non-committal about precisely what energy consumption should be reduced and what forms of production 'converted'.⁵²

5.7.2 Energy policy in Norway is seen to have inconsistent objectives with no explicit solutions of the conflicts between:

- 'conversion' and competitiveness or security of supply;
- renewables and natural gas with carbon capture [5.7.4];
- renewables and efficiency [5.7.6];
- different renewables options.

5.7.3 These inconsistencies are reflected in the organisation of energy governance. Enova is the main agency for efficiency and renewables, while other agencies work for the security of supplies and competitive energy prices.

5.7.4 While the national energy policy explicitly aims for 'conversion' in the sense of moving away from fossil fuels towards more sustainable energy sources, both renewables and gas with CO₂ capture – using facilities such as *Sleipner* – are seen as climate mitigation measures, and the latter option is taken to imply increased use of natural gas. This is reflected particularly in the granting of building permission for at least eight new gas-fired power stations by the Norwegian Government under Jens Stoltenberg.⁵³

5.7.5 Apart from existing legislation regarding building standards, there is little energy policy focus on buildings, nor on microgeneration technologies at the household level, and no consistent policy for energy efficiency in houses.

5.7.6 Specific conflicts are also seen between energy efficiency goals and renewables:

- electricity is often more convenient for heating, discouraging uptake of renewable heat options;
- the establishment or expansion of district heating networks requires adequate heat demand, and low-energy buildings may discourage its uptake;

- the power crisis in the winter of 2003 led to a new policy focus on security of supply, and to support measures for district heating.⁵⁴

5.7.7 For investors in energy efficiency and renewable options, there are significant uncertainties in the policy environment:⁵⁵

- in electricity taxes;
- in policy towards electricity production based on natural gas and CO₂ capture;
- in emissions trading schemes – here commentators expect no more stringent policies – and
- in policy on and regulation of the extension of natural gas supplies, which sometimes compete with biogas.

6 Support mechanisms for HPs

6.1 History

- 6.1.1 A central policy instrument has been grant schemes for renewable energy including HP installations. Enova administers the Energy Fund (*Energifondet*). There is also a separate grant scheme (*Enova Støtter*) specifically targeting the residential sector, which will fund HP installations and other renewable energy technologies. This scheme, set up in 2003, contributed substantially to a high rate of installation that year, as well as to reduced prices and an increased range of suppliers and products. The scheme received an additional 70 million Nkr in 2008, suggesting it will continue to operate.⁵⁶ In the previous year, however, air-to-air HPs were excluded from it, as the market for these had ‘exploded’.⁵⁷
- 6.1.2 Support for HPs began in 1990. Support for domestic HPs has however been intermittent since then. A brief time line for public support for HPs can be sketched out:⁵⁸
- from 1976 onwards, support for research and development;
 - in the 1980s and 90s, support measures for investment and development, prototype or demonstration installations;
 - from 1990 to 1993, programme stimulating uptake, including a year’s support for air-air HPs;
 - from 2002, investment support from Enova for alternative heating solutions including HPs – initially large projects, briefly expanded in 2003 to include households, and thereafter reverting to large projects;
 - from 2006, support from Enova for alternative heating solutions and energy savings in households.
- 6.1.3 A 40% subsidy for HP installations in the residential and industrial sectors was introduced in 1992, partly in political negotiations to ‘sweeten the pill’ of deregulation in the energy market. The measure was soon to become controversial, in terms of both the expenditure and its intervention in private choices. Other arguments related to its cost effectiveness: that a rebound effect would reduce the gains and that free-riding would make the scheme inefficient. There was also a reticence among market actors who viewed small household HPs as having poor economics and low quality, an evaluation reinforced by bad experiences of installations in the 1980s.⁵⁹

6.1.4 An evaluation in 2003 concluded that 70% of the non-residential installations receiving subsidies were free riders. (Because of the low returns residential installations were assumed not to offer that opportunity.) The ensuing policy change removed the subsidy.⁶⁰

6.2 2003 Enova subsidy scheme

6.2.1 In 2003 a new measure was introduced with subsidies for households investing in new alternative energy solutions, covering HPs as well as pellet stoves and heat control technology.⁶¹ Initially the measure was funded with 50 mNkr, later increased to 225 mNkr. The scheme was intended to support installations that reduced energy use and that could be put into operation quickly. The technologies were selected on the grounds that they

- were environmentally beneficial;
- were novel;
- required significant investment and might benefit from subsidy; and
- had a small existing market.

Various technical requirements were imposed, for example concerning the choice of refrigerants.

6.2.2 Applications under the new scheme were limited to one per household, in houses currently heated by electricity. The measure in practice favoured large homes, higher income households and houses with more occupants. 50 600 applications were received – about 90% of them for HPs – and 47 000 were successful. Only 19 700 grants were used; the other applicants most often decided the installation would still be too expensive.⁶²

6.2.3 Many users claimed they would have gone ahead with the investment without the subsidy.⁶³ However, the technologies supported showed better sales compared to competing technologies in that period, indicating the measure had a catalysing effect, and many applicants claimed it provided an additional incentive.⁶⁴

6.2.4 Aside from installations supported by grants, others – the evaluators suggested perhaps as many – might have been indirectly stimulated by the measure, possibly because of the attention HPs received from the scheme. It is however difficult to demonstrate such an effect.

6.2.5 The measure also contributed to reducing prices and furthering the development of the three technologies. However, as before, demonstrating a link between the scheme and such development is difficult. Development of the market may have played a greater role than technical development. The subsidy led to the entrance of many new suppliers and new products. However, sales has also risen in the year before, and so it is difficult to separate the effects of the subsidy from the existing market trend.⁶⁵

6.2.6 The main problems with HPs reported by installers and users were ice on the outdoor part of the equipment, clogging of filters, problems during installation, and problems with programming and settings.

6.2.7 Some industry organisations claim that Enova's requirements were set too low, and that consequently Norway was swamped with bad technology. The evaluators, in contrast, claim that HPs installations met current standards. Enova required systems to be installed by a certified installer.⁶⁶

6.2.8 One effect of the boom in sales in 2002 and 2003 was to 'normalise' HPs so that they were no longer seen as a technology only for those with a special interest. The certification scheme for suppliers and installers introduced in 2000 helped this development. Sale of HPs in DIY shops in the early 2000s also contributed to this normalisation effect and to a reduction in prices.

6.2.9 The official evaluation of the scheme judged it overall at least marginally beneficial in social and economic terms.⁶⁷

6.3 2006 Enova subsidy scheme

6.3.1 In autumn 2006 OED introduced a measure for limiting energy use in households, and a new subsidy scheme was approved, based on a perception that there was considerable interest among householders in alternative energy solutions.⁶⁸ Enova introduced grants for households, again covering pellet stoves, HPs (but excluding air-air HPs this time) and heat control systems. 59% of applications were for HPs, mostly air-water.⁶⁹

6.4 Recent results

6.4.1 A specific policy goal for Enova is to establish 4 TWh/y hydronic heating based on renewables by 2010, much of which is expected to be from district heating. In 2004, 2.5 TWh were produced, of which about two thirds were used for commercial buildings.⁷⁰ In its 2008 results, current investment contracts under its Energy Fund amount to 3.3 TWh/y of heating energy from renewable sources. Less than ten per cent (316 GWh/y) of the contracts relate to HPs.⁷¹ The contribution of HPs is dwarfed by that from bio-fuels (1.41 TWh/y) and heat from waste (1.16 TWh/y). Of more than 200 projects funded in 2008, only 16 used HPs.⁷²

6.4.2 While Enova's measures constitute the most concrete support for renewable heat, they are criticised as disconnected from other policy instruments.⁷³

7 Other initiatives

7.1 Provision of information and advice

7.1.1 Enova provides information and advice targeting households, particularly through two websites: *My Energy*, set up in 2006; and for the young (partly via schools and teachers), *The Rain Makers*.⁷⁴ Enova also targets teaching staff at universities and professionals in engineering and architecture, through courses, conferences, etc.⁷⁵ Enova undertakes 3 or 4 special information campaigns a year, about half of which target households. Information channels include: internet, schools, TV and trade fairs. Enova also funds other organisations' campaigns. Specifically Enova also provides brochures for prospective buyers of different types of HP.⁷⁶

7.1.2 A publicly funded organisation, *Forbrukerrådet* (Norwegian Consumer Council) provides advice for consumers. It published a test of HPs in September 2004, in cooperation with the equivalent Swedish government agency, and performed by SP in Sweden.⁷⁷ A key point of the test report was that few of the HPs on the market at the time were designed to suit the northern climate; most did not work well in low temperatures (below -9°C), and were useless below -20°C.

7.2 Training and certification of installers

- 7.2.1 The scheme *Varmepumpeanordningen* was initiated in 2000 by NVE and industry organisations and is run by NOVAP. It provides training and accreditation for installers, and sets standards for installation and service. It requires a documentary record of commissioning and written guidance for use and maintenance.⁷⁸

Notes

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- 42 *ibid.*
- 43 NVE, *TEK: nye energikrav til bygninger* (TEK: New Energy Requirements for Buildings), 2007. <http://www.nve.no>
- 44 NVE, *Bygningsdirektivet* (The Building Directive), <http://www.nve.no>
- 45 Ryghaug & Sørensen, *op. cit.* [note 41]. While their focus is on efficiency measures, it can be expected that the same problems may apply to the adoption of microgeneration and to the integrated design of building envelope and services that better energy performance requires.
- 46 The basic message was to save both money and energy through increasing energy efficiency. In general interpretations, the notion of 'energy economising' produced a conflict between minimising the cost of construction and reducing use of energy (and hence operating costs). How the balance was struck in practice was complicated by a lack of robust data for calculating the future cost saving from energy conservation measures, and this tended to favour minimising building cost rather than maximising energy efficiency. The tenant-owner dilemma – builders and owners are less concerned with future energy cost than tenants – further exacerbated this problem. *ibid.*
- 47 Ryghaug & Sørensen point to short time horizons; hasty design processes tending to re-use existing solutions; poor knowledge transfer and sharing; inflexible contract regimes preventing later changes; and project management structures that separate the owner and user. *ibid.*
- 48 Rasmussen, Knudsen & Ruud, *op. cit.* [note 2].
- 49 *ibid.*
- 50 Enova, *Enovas resultat-... 2006* [note 33]
- 51 Norwegian Government, *Forslag til endring av forskrift om særavgifter* (Notes from Hearing on Levy on Natural Gas for Heating), Apr 2007. http://www.regjeringen.no/upload/FIN/Vedlegg/sl/Horingsnotat/2007/hnotat_ghd.pdf
- 52 Rasmussen, Knudsen & Ruud, *op. cit.*, 55 [note 2].
- 53 M Gjerset, *Gas Power Plants in Norway* (*Gasskraftplanene i Norge*), Zero.no, <http://www.zero.no/fossil/co2/prosjekter/gasskraftplanene/>
- 54 Rasmussen, Knudsen & Ruud, *op. cit.* [note 2].
- 55 *ibid.*
- 56 *ibid.*

- 57 J Nilsen, 'Using Heat Pumps for Cooling (*Bruker varmepumpe til nedkjøling*)', *Teknisk Ukeblad*, June 2007. <http://www.tu.no/energi/article97332.ece>
- 58 Grorud, *op. cit.*, 15 [note 18].
- 59 P Næsje, 'Governing Measures: User Stories and Heat Pump Subsidies', in K Sørensen & R Williams (eds.), *Shaping Technology, Guiding Policy: Concepts, Spaces and Tools*, Edward Elgar, Cheltenham, 2002.
- 60 *ibid.*
- 61 E Bjørnstad, J Grande, R Sand & C Wendelborg, *Evaluering av tilskudsordningen til varmepumper, peletskaminer og styringssystemer* (Evaluation of the Subsidy Scheme for Heat Pumps, Pellets Ovens and Heat Control Systems), Nord-Trøndelagsforskning, 2005. Self-installed HPs were excluded.
- 62 *ibid.*
- 63 52% of applicants responded that they would have proceeded anyway with the same unit and 14.5% with a cheaper unit, 14.2% would not have proceeded, and 19.4% did not know. *ibid.*
- 64 The evaluators speculated that investments may have been made earlier than otherwise, or the respondents may have been referring to the effects of information and the legitimacy provided by Enova support, rather than the financial support *per se*. *ibid.*
- 65 *ibid.*
- 66 *ibid.*
- 67 *ibid.*
- 68 Enova, *Enovas resultat-... 2006* [note 33]; NOVAP, *Stor interesse for varmepumper i boliger* (Large Interest in Heat Pumps for Houses). <http://www.novap.no>
- 69 Enova, *Høy gjennomføringsandel for pellets-kamin* (High Implementation of Pellet Stoves), <http://www.enova.no>
- 70 Havskjøld & Ingeberg, *op. cit.* [note 3].
- 71 *ibid.*, 10.
- 72 *ibid.*, 37-42.
- 73 Rasmussen, Knudsen & Ruud, *op. cit.* [note 2].
- 74 <http://www.minenergi.no>; <http://www.regnmakerne.no>. Information provision to households appears to have been the object of more sustained efforts than subsidies. Næsje points out that information provision may be politically more useful and more flexible. Direct results are less crucial, and presumably harder to measure. In the early 1990s Norwegian policy-making was dominated by a view of users as wasteful, using too much energy in a quest for increasing levels of comfort. Energy use was seen as a moral problem, rather than – say – an economic one, making economic instruments less useful, or so it was argued. Næsje, *op. cit.* [note 59].
- 75 Enova, *Enovas resultat-... 2006* [note 33].
- 76 Enova, *Hjelp til deg som ska kjøpe luft/luft-varmepumpe* (Guidance for those Planning to Buy an Air-air Heat Pump); *Hjelp til deg som ska kjøpe luft/vann-varmepumpe* (Guidance for those Planning to Buy an Air-water Heat Pump); *Hjelp til deg som ska kjøpe vann/vann-varmepumpe* (Guidance for those Planning to Buy a Water-water Heat Pump). <http://www.enova.no>. Among other sources of information is a bimonthly magazine, *Kulde*, dedicated to HPs and air-conditioning systems, with a print distribution of about 3500 and a website with news and product promotions. *Kulde Skandinavia: Tidsskrift for kuldetechnik, air-conditioning og varmepumper*. <http://www.kulde.biz/>
- 77 Forbrukerrådet, *Finn riktig varmepumpe* (Find the Right Heat Pump), *Forbruker-rapporten 09/2004*.
- 78 Enova, *Valg av leverandør* (Choice of Supplier). <http://www.enova.no>; Klima og Varmeteknik AS, *Alle typer varmepumper* (Types of Heat Pumps). <http://www.kvt.no>; enøk-senteret Møre og Romsdal, *Gode råd om valg av varmepumpesystem* (Advice on Choosing a Heat Pump System). http://www.husogheim.no/4/4_15.html.