Energy Efficiency in Small and Medium Sized Enterprises

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Executive Summary

The European Union's Directive 2012/27/EU on energy efficiency, which was adopted in October 2012, sets requirements for small and medium sized enterprises (SMEs). The Directive obliges Member States to develop programmes to encourage SMEs to improve their energy efficiency by implementing energy audits and the recommendations that stem from these audits. To support the Nordic countries' efforts to implement the part of the Directive that is aimed at SMEs, a joint Nordic project was initiated by the Nordic Committee on Energy under the Nordic Council of Ministers.

The aim was to generate knowledge about barriers to energy efficiency in SMEs, and propose uniform solutions for energy management, including how to encourage individual companies to implement appropriate energy efficiency measures. A combination of different methods including desk study, interviews, and workshops were used in order to gather relevant information about the Nordic SME sector's current energy consumption and existing policy instruments and to generate recommendations to support implementation of the Directive.

The study concludes that although the consumption per company is often low, the SME sector as a whole consumes a significant amount of energy. With the right measures, SMEs can also contribute to energy efficiency improvements. SMEs cannot be effectively targeted with solely uniform solutions even though many of them face similar barriers. The current policy instruments include many elements that could help encourage SMEs, but more emphasis needs to be placed on sharing information and best practices and making sure that SMEs actually implement energy efficiency improvements. Getting started with the energy management should be made as easy as possible for the companies. Energy efficiency guidance of SMEs should be implemented into existing processes.

It is recommended that direct, targeted, and tailored information should be provided to a correct person in the SMEs at a correct time and form. Energy efficiency guidance should be incorporated into existing encounters with SMEs. Authorities, associations, and existing networks should be better organised to share best practices and information with each other and with SMEs. It should also be ensured that no artificial barriers exist for SMEs to apply the existing policy instruments.

Among the recommendations presented in this study, the following are suggested for implementation at the Nordic level:

- Designing a concept for an energy efficiency award campaign.
- Developing a Nordic benchmarking tool on energy consumption levels and savings potential.
- Reviewing existing calculation methods for energy saving potential and establishing a standard to be spread as best practice among financing institutions.
- Developing a joint Nordic database for energy audit data – this could potentially be combined with the benchmarking tool.

These measures would best support national level actors in each country to implement the Directive. The effective organisation of other measures between national organisations and municipal/regional/industry association levels will differ in each Nordic country. It is suggested that national energy agencies review the recommendations and outline a suggestion to be confirmed with relevant actors on the roles that each party should take, including who should carry responsibility for each recommendation.

While this study has identified numerous barriers to implementing the Directive, the positive outcome is that many good practices already exist. Furthermore, all parties involved in this study, which also include those stakeholders key to implementing the recommendations, were motivated to improve energy efficiency among SMEs. The potential has been widely recognised, now it is just a question of taking action.

1. Introduction

1.1 Background and objectives

The European Union's Directive 2012/27/EU on energy efficiency was adopted in October 2012. The Directive has set requirements concerning small and medium sized enterprises (SMEs), among other requirements. The Directive obliges Member States to develop programmes to encourage SMEs to improve their energy efficiency by implementing energy audits and the recommendations that stem from these audits. The directive allows the establishment of support schemes for SMEs and calls for highlighting concrete examples of how energy management systems could help their businesses.

Of all major sectors consuming energy, SMEs are the most challenging for policy makers. Energy consumption per company is typically small, and energy is not a priority for most of the SMEs. Unlike larger energy intensive companies, SMEs seldom have large enough financial incentives or possibilities in practice to use the company's own resources to plan and implement energy efficiency activities. SMEs are not as homogenous a sector as households. Targeting energy efficiency policy measures is difficult as the business activities, location, and other conditions can vary considerably between SMEs. In most countries, the energy consumption of SMEs is not even known in any sufficient granularity.

It is also challenging to get a comprehensive view on what actions should be taken to best serve SMEs. People with practical first-hand knowledge on the problems of SMEs are hard to find and activate to share their knowledge, as they must focus their resources on running their own companies. The large number of subsectors amplifies the challenges as the problems of one SME are not necessarily applicable to others even in the same sector or location.

Currently, there are some differences in the ways that Nordic Countries have addressed energy efficiency development in SMEs. For example, in Finland and Sweden, SMEs can receive support to conduct energy audits. In Norway, a benchmark solution has been developed for companies to post their data on energy consumption and production and to compare themselves with others in the same industry. Although there are some differences in the Nordic countries in how SMEs take on ener-

gy efficiency improvement, the shared cultural background and common welfare economies provide a good starting point for a joint Nordic effort to tackle the challenges of energy efficiency.

To support the further development of instruments in the Nordic countries, the Nordic Committee on Energy under the Nordic Council of Ministers granted the Nordic Working Group for Energy Efficiency a mandate to conduct a joint Nordic project. The project's main objective is to support the Nordic countries' efforts to implement the part of the Directive that is aimed at SMEs. The aim is to generate knowledge about barriers to energy efficiency in SMEs, and propose uniform solutions for energy management, including how to encourage individual companies to implement appropriate energy efficiency measures.

1.2 Methodology

In order to fulfil the objectives of the study, a combination of different methods were used. For generating knowledge about current barriers in SMEs and existing instruments for energy management, the study draws on existing research on the topics through *desk studies*. A lot of academic, technical and strategic documentation exists already on energy efficiency in SMEs not only on the Nordic level, but also internationally. Official statistics, national and EU-level research reports provide a solid basis for forming a coherent picture of the SME landscape and their energy use in the Nordic countries.

The statistical data related to SMEs and energy consumption has been mainly retrieved from the Eurostat database to ensure comparability between the countries. The statistical data is from the year 2010. In general, the Icelandic data is missing from the Nordic countries' average figures due to lack of comparable data. The energy consumption data is expressed in final energy consumption. According to the Eurostat definition:

“Final energy consumption is the total energy consumed by end users, such as households, industry and agriculture. It is the energy which reaches the final consumer's door and excludes that which is used by the energy sector itself.”¹

¹ Eurostat (2013e).

The data describing the number of SMEs in different sectors is based on the Eurostat Structural Business Statistics database. The data cover the “business economy” including industry, construction, trade, and services.² However, the data does not cover the enterprises in agriculture, forestry, fishing or the largely non-market services such as education and health. Additionally, the European Commission’s SME country fact sheets have been used as a data source.

The statistics related to agriculture have also been retrieved from the Eurostat database. The number of the agricultural firms is based on the number of agricultural holdings in each country. According to the Eurostat definition:

“An *agricultural holding* is a single unit, in both technical and economic terms, operating under a single management, which produces agricultural products. Other supplementary (non-agricultural) products and services may also be provided by the holding.”³

All agricultural enterprises have been assumed to be SMEs. The assumption is based on the finding that 99.998% of the agricultural firms in Finland were SMEs in 2010.⁴

The data for Iceland presented in Chapter 2 is mainly based on the estimates presented in the European Commission’s SME country fact sheet of Iceland.⁵ The figures are estimates for 2010 based on figures from the National Statistical Office.⁶ The European Commission definition of micro, small and medium sized enterprises has been used in this study. While the definition includes criteria for turnover and balance sheet, the criterion for categorising SMEs in this study has been the number of employees (due to a lack of data on turnover and balance sheet). The categories by number of employees according to the European Commission definition of SME are: micro < 10, small < 50 and medium < 250.

The data from the desk study was complemented with several *interviews* in order to gain the most up-to-date insights from stakeholders involved in energy management in Nordic countries and especially those dealing with SMEs. A list of experts interviewed for this study has been

² “Business economy” as defined in the European industry standard classification system (NACE). The sectors mentioned correspond to NACE Rev. 2 Sections B to J and sections L, M and N.

³ Eurostat (2013b).

⁴ Statistics Finland (2013).

⁵ European Commission (2012e).

⁶ The estimates have been made by Cambridge Econometrics.

presented in Appendix 1. The initial findings from the desk study and interviews were shared with the study Reference Group.⁷ Comments provided by the Reference Group validated the initial analysis.

The study continued with a review of the instruments currently existing in the Nordic countries to support and encourage SMEs to improve energy efficiency. In addition, a series of *workshops* were arranged, one in each Nordic country,⁸ in order to share experiences of these instruments among Nordic countries. The workshops also aimed to gather ideas on how to improve existing instruments, to facilitate learning from best practices among Nordic countries, and to generate new ideas for supporting the SME sector.

This final report includes an overview of the SME landscape in Nordic countries and the current state of energy efficiency, an analysis of the existing instruments and recommendations on how they could be improved including suggestions on whether some instruments in one country could be introduced in other countries and ideas for new instruments.

The project was conducted in 2013 by Gaia Consulting Ltd, a Finnish consultancy specialising in sustainability, energy issues, risk management, innovation processes and bioeconomy. The project team included Iivo Vehviläinen (Project Director), Julia Illman (Project Manager), and experts Laura Oja and Marika Bröckl. Juha Vanhanen was responsible for Quality Assurance. Marit Sandbakk from Enova SF, a public enterprise owned by the Norwegian Ministry of Petroleum and Energy, acted as the project leader on behalf of the Nordic Working Group for Energy Efficiency.

⁷ The Reference Group is composed of representatives from Nordic Energy Agencies including the following experts: Marit Sandbakk (Enova, Norway), Hille Hyytiä (Motiva, Finland), Thomas Björkman (Swedish Energy Agency), Sigurður Ingi Friðleifsson (National Energy Agency, Iceland), Thomas Drivsholm and Brigitte Brange (both from Danish Energy Agency).

⁸ The workshop in Norway was replaced with a series of telephone interviews due to a lack of participants for the initially scheduled workshop.

2. The SME landscape in the Nordic countries

In 2010, there were over 1.3 million SMEs in the Nordic countries representing 99.8% of the total number of companies. The shares of SMEs from the total number of companies, employment and value added in different Nordic countries are presented in Table 1. SMEs play a key role in Nordic countries economy. SMEs employ 65% of the people working in Nordic countries and their share of the value added is 62%. In addition to the figures in Table 1, there were 223,680 agricultural holdings. The distribution of the agricultural holdings by different Nordic countries is presented in Figure 1.

Table 1: Share of SMEs, 2010

	Share of SMEs according to...		
	Number of companies ⁹	Employment ¹⁰	Value added ¹¹
EU27 total	99.8%	67%	58%
Nordic total	99.8%	65%	62%
Denmark	99.7%	66%	64%
Finland	99.7%	62%	57%
Sweden	99.8%	64%	58%
Norway	99.8%	69%	70%

⁹ Eurostat (2013a), figures do not include agriculture.

¹⁰ European Commission (2012a-2012e).

¹¹ European Commission (2012a-2012e).

Figure 1: Agricultural holdings in Nordic countries, 2010

The share of SMEs in different sectors in Nordic countries is presented in Table 2. The sectors with the largest share of SMEs out of the total number of companies at the Nordic level are wholesale and retail trade (17.5%), professional, scientific and technical activities (16.8%), agricultural holdings (14.6%) and construction (13.6%). The share of SMEs in each sector per country is illustrated in Figure 2.

Table 2: Number and distribution of SMEs per sector in Nordic countries, 2010¹²

	Nordic SMEs	Sector/Total
Wholesale & retail trade	270,024	17.5 %
Professional etc. activities	259,426	16.8 %
Agriculture holdings	226,270	14.6 %
Construction	210,336	13.6 %
Real estate activities	133,851	8.6 %
Manufacturing	108,549	7.0 %
Information & communication	88,188	5.7 %
Transportation & storage	86,180	5.6 %
Administrative etc. activities	76,841	5.0 %
Accommodation & food service	64,257	4.2 %
Repair of computers etc.	9,310	0.6 %
Water supply	6,200	0.4 %
Electricity supply etc.	5,204	0.3 %
Mining & quarrying	2,776	0.2 %
<i>No. of SMEs (incl. agriculture)</i>	<i>1,547,412</i>	<i>100.0 %</i>

¹² Eurostat (2013a).

Figure 2: The main SME sectors per Nordic country

In 2010, the total final energy consumption in the Nordic countries¹³ was 96,600 thousand TOE. The consumption figure is equal to about 8% of total energy consumption in the EU-27.¹⁴ The Nordic final energy consumption by sector in 2010, excluding Iceland, is illustrated in Figure 3. The largest energy consuming sectors are the industry and transport sectors as well as buildings whilst services account for 12% of final energy consumption.

¹³ Excluding Iceland.

¹⁴ Eurostat (2013d).

Figure 3: Nordic final energy consumption by sector (excluding Iceland)¹⁵

The SME landscape in each country is summarised briefly in the following.

In 2010, there were a total of 207,661 SMEs in *Denmark*. In addition, there were 42,100 agricultural holdings. In general, Denmark can be considered a good example of the structure of the SME sector in the Nordic countries. Compared to the Nordic average, the Danish SME share from employment is only slightly higher (66% vs. 65%).¹⁶ Similarly, the Danish SME share from value added surpasses slightly the Nordic average (64% vs. 62%). On the other hand, there is a relatively higher concentration of small and medium sized businesses than in other Nordic countries, where very small firms (micros) are comparatively more prevalent. The distribution by sector of SMEs resembles closely the Nordic average. The Danish SME sector is characterized by a slightly higher proportion of SMEs in services such as accommodation and food service activities (5% vs. 4%) and a comparatively lower concentration of SMEs in manufacturing (6% vs. 7%) and construction (13% vs. 14%).¹⁷

¹⁵ Eurostat (2013d).

¹⁶ Excluding agricultural holdings.

¹⁷ Eurostat (2013a).

In 2010, *Finland* had a total of 223,902 SMEs.¹⁸ In addition, there were 63,870 agricultural holdings. When excluding agricultural holdings and comparing to the Nordic average, the SME share from employment is below the Nordic average (62% vs. 65%). Moreover, in Finland the SME share from value added is the lowest compared to the other Nordic countries (57% vs. 62%). The wholesale and retail trade sector, as well as real estate activities, are of less importance for Finnish SMEs compared to other Nordic countries in terms of proportion number of SMEs in the sectors. The share of many other sectors is comparatively higher, i.e. manufacturing, construction, transportation and storage and, most notably, agricultural holdings (22% vs. 15%).¹⁹

Sweden had total of 622,106 SMEs in 2010.²⁰ The number of agricultural holdings was 71,090. The SME sector employs 64% of the Swedish workforce and SMEs share from value added is 58%. The figures are slightly below the Nordic average. The sector specialisation of Swedish SMEs presents somewhat the same overall picture as the aggregate numbers for the Nordic countries. The main difference is that the proportion number of SMEs in professional, scientific and technical activities sector is notably higher than the Nordic average (22% vs. 17%). On the other hand, the share of agricultural holdings is substantially below the Nordic average (10% vs. 15%).

In *Norway* there were 267,473 SMEs in 2010. In addition, there were 46,620 agricultural holdings. SMEs' importance for Norwegian economy exceeds the Nordic average. In Norway, SME share from employment is 4 percentage points higher and SME share from value added is 8 percentage points higher than the Nordic average.²¹ There is a smaller share of micro firms, which is due to the larger share of small businesses. In terms of value added, mining and quarrying is the most important sector for Norwegian SMEs.²² However, the largest numbers of SMEs are found from other sectors. The sectors where the proportional share of SMEs is above the Nordic average are construction, transportation and storage and most notably real estate activities (14% vs. 9%).

According to the European Union findings on the number of SMEs in the EU, the *Icelandic* SME sector closely resembles the EU average. The

¹⁸ Eurostat (2013a).

¹⁹ European Commission (2012d).

²⁰ Eurostat (2013a).

²¹ Eurostat (2013c).

²² European Commission (2012c).

main difference is that the data for all sizes of SMEs except micro firms are slightly above the EU average. Construction, real estate services, and manufacturing are the most important sectors for Icelandic SMEs. The number of agricultural holdings was 2,590 in 2010.²³

²³ European Commission (2012e).

3. The Current State of Energy Efficiency

This chapter presents an overview of energy efficiency in different sectors. First, the sectors have been prioritised and then each prioritised sector has been evaluated in light of the data available from different statistics and information gathered through the interviews. This chapter also presents the barriers identified, that hinder SME sector efforts to improve energy efficiency.

3.1 Sector prioritisation

The sectors to be evaluated in this study have been selected considering the following criteria:

- Number of SMEs in the sector.
- Size of SMEs in the sector.
- Current energy consumption in the sector.
- Current energy efficiency of the sector.
- Potential for energy efficiency improvement in the sector.

The evaluated potential for energy efficiency improvement depends on the size of energy consumption, current energy efficiency and availability of possibilities for improving energy efficiency.²⁴ The logic follows that the higher the number of companies, the larger they are in size, the higher their current energy consumption and the lower their current efficiency, the bigger the potential for improvement.

Based on the above criteria and the data presented in Chapter 2, the following sectors were prioritised for further analysis:

²⁴ Constantinos *et al.* (2010).

- Manufacturing of food and beverages.
- Manufacturing of chemicals, metals, rubber and plastics.
- Construction.
- Retail and wholesale trade.
- Hospitality: accommodation and food services.
- Agriculture.

This study has focused on stationary energy use. Therefore the transportation sector has been excluded from the study scope even though the sector's energy consumption is notable.

The total amount of SMEs and their proportion by size category in the selected sectors are presented in the Table 3.

Table 3: SMEs in selected sectors by size category in Nordic countries²⁵

	Micro	Small	Medium	Total SMEs
Manufacture of food products and beverages	73%	22%	5%	8,625
Manufacture of chemicals, basic metals, rubber and plastic	72%	19%	9%	5,555
Construction	93%	6%	1%	210,336
Wholesale and retail trade	91%	8%	1%	270,024
Accommodation and food service activities	88%	11%	1%	64,257
Agriculture	99.8%	0.2%	<0.1%	226,270

In a Danish study,²⁶ the medium and small enterprises have been identified as the most interesting target groups for developing energy efficiency initiatives. Some of the medium sized companies have high enough energy costs to justify involving internal staff and commercial consultants in energy management planning. This group of companies comprises of, for example, dairies, the plastic industry and major office buildings. Companies with annual energy costs between 0.5 to one million EUR were found to have a higher focus on promoting energy efficiency. Small SMEs generally lack both resources and competences to improve energy efficiency and they tend to focus on the most urgent and possibly mandatory activities. Micro SMEs, which typically comprise of, for example, smaller shops, have been found to be impossible or at least very expensive to involve in energy efficiency improvement. They are short of knowledge, resources and money for investments.²⁷

The final energy consumption of the prioritized sectors in the Nordic countries is presented in Figure 4. The total energy consumption of the

²⁵ Eurostat (2013a).

²⁶ Drivsholm & Petersen (2012).

²⁷ Drivsholm & Petersen (2012).

selected sectors is around 28,400 thousand TOE, representing just under 30% of total Nordic energy consumption. The data in Figure 4 captures order of magnitude differences, since sector categorisation in the Nordic countries differ slightly from one and other.²⁸ It nonetheless presents a sufficient overview of the distribution of energy consumption for the purposes of this study.

Figure 4: Final energy consumption of the prioritized sectors in Nordic countries, 2010^{29,30}

One way to measure the level of *energy efficiency* of a business is to calculate energy consumption per unit of value added. Table 4 presents data on this indicator for the Nordic countries for both the services and

²⁸ For example, Food and tobacco have been presented as one category, and here only manufacturing of food is relevant to this study.

²⁹ Service sector includes all services, not only the selected Retail and wholesale trade and Hospitality sector. Manufacturing includes non-ferrous metals, chemical and petrochemical, non-metallic minerals. Agriculture includes also forestry.

³⁰ Eurostat (2013d).

manufacturing sectors.³¹ Differences in manufacturing energy use are largely explained by the differences in the composition of the economies. Nordic countries have more energy intensive industries, such as metals, chemicals, and paper industry, than EU.

Table 4: Energy consumption per unit of value added (koe/€2005p)³²

Energy efficiency (2010) ³³	Services ³⁴	Manufacturing ³⁵
European Union	0.018	0.162
Denmark	0.021	0.125
Finland	0.039	0.386
Norway	0.027	0.409
Sweden	0.025	0.233
<i>Nordic average</i>	<i>0.025</i>	<i>0.180</i>

It shows that energy consumption of services per unit of value added is above the EU average. Similarly, the energy consumption of manufacturing per unit of value added in Nordic countries is above the EU average. While this does not provide significant insight into sector specific efficiency, it can generally be concluded, that energy efficiency in Nordic countries is slightly lower than the EU average for services and manufacturing. Denmark scores highest both for services and manufacturing sector. Further discussion on sector specific energy efficiency is included in the next section.

3.2 Energy efficiency improvement potential

The total number of SMEs, the share of small and medium sized SMEs as well as energy consumption, efficiency and potential per sector in the Nordic countries are listed in the Table 5.

³¹ Figures include all companies, not only SMEs.

³² Odyssee (2010).

³³ With climatic corrections.

³⁴ The indicator for services sector covers from the sectors hotels & restaurants, wholesale & retail trade and agriculture. In addition to the prioritised sectors the indicator covers health, education, administration and private offices.

³⁵ The manufacturing indicator has been calculated based on data from the following sectors examined in this study: construction, manufacturing of chemicals, metals, rubber and plastics as well as food and beverages. In addition, the indicator covers the following industries: non-metallic mineral, paper & printing, textile, transport equipment, miscellaneous industries, wood and mining.

Table 5: The total number of SMEs, share of small and medium sized SMEs, energy consumption, efficiency and potential (2010)³⁶

	Number of SMEs	Share of small and medium sized SMEs	Energy consumption per company	Energy efficiency	Potential
Manufacture of food products and beverages	8,625	27%	Medium	High	Medium
Manufacture of chemicals, basic metals, rubber and plastic	5,555	28%	High	High	High
Construction	210,336	7%	Low	Medium	High
Wholesale and retail trade	270,024	9%	Low	Low	Medium
Accommodation and food service activities	64,257	12%	Low	Medium	High
Agriculture	226,270	<1%	Low	Low	High

The *manufacturing of food and beverages* sector has been estimated to have medium energy efficiency potential as their current energy efficiency is already relatively high.³⁷ There is a higher share of small or medium sized companies in the sector compared to some of the other selected sectors and the sector consumes considerable amounts of energy especially in heating and cooling. It has been estimated that the share of energy costs from the industry's turnover is between five to ten percent.³⁸ There is reasonable energy saving potential for example in dairy where large amounts of energy is used simultaneously and intensively in heating and cooling throughout the year. The potential improvement actions include cogeneration of power and heat recovery, but there is also potential for thermal and photovoltaic solar energy applications.³⁹ For example in a Norwegian dairy producing cheese, the installation of a hybrid heat pump for elevated recovery temperature has resulted in 50% savings in both energy costs and water costs. The payback time for the system was about two years.⁴⁰

As in the manufacturing food and beverages sector, there is a higher share of small or medium sized companies in the *manufacturing of chemicals, metals, rubber and plastics* sector. The sector is energy intensive and has high energy efficiency potential even though current energy efficiency

³⁶ Eurostat (2013a, 2013c and 2013d) and Constantinos *et al.* (2010).

³⁷ Constantinos *et al.* (2010).

³⁸ Elintarviketieteidien Seura (2008).

³⁹ Target GmbH (2013).

⁴⁰ Torbjørn (2008).

is already relatively high.^{41, 42} For example according to the European Chemical Industry Council, Cefic, the energy costs can represent up to 25% of SME's total production costs. In spite of this, many small companies don't see energy efficiency as a priority or are not equipped to set up effective energy management programmes. Cefic states that improving energy efficiency makes economic sense for small companies. Based on results from chemical industry initiatives in the United Kingdom and the Netherlands, energy savings of 15% or more are possible. Moreover, investments in energy efficiency often pay off already in the short term.⁴³ Similarly, in the manufacturing of metals and plastic,⁴⁴ savings of around 10% have been recorded almost without any investment costs. The total potential for energy savings in manufacturing of metals is roughly estimated at 25–30%. The potential energy saving measures includes e.g. optimisation and regulation of the heating system.⁴⁵

There are total of 210,336 SMEs in the Nordic *construction* sector. The sector's total energy consumption was 951 thousand TOE in 2010. The construction sector has a large number of companies and current energy efficiency is medium.^{46, 47} The sector's energy efficiency efforts focus on improving energy efficiency during use building phase by following the tightening building standards. There is also great potential for energy efficiency improvements during construction phase. The sector is characterized by a large number of micro firms with only one worker and a van. Reaching those firms with energy efficiency incentives is estimated to be relatively ineffective and costly. On the other hand, the small and medium sized companies which are, for example, doing concrete moulding, might be potential target groups for energy management plans.

The number of SMEs in *wholesale and retail trade* is as high as 270,024.⁴⁸ The impact per company is low but so is their current level of energy efficiency.⁴⁹ Moreover, the number of companies in this sector is

⁴¹ Eurostat (2013d).

⁴² Constantinou *et al.* (2010).

⁴³ European Chemical Industry Council (2013).

⁴⁴ Potential measures in manufacturing of plastics: disconnecting of transformers, shut down of cooler for drying of compressed air, shut down ventilation when not used, hot air from cooling of compressor is reused in heating the facilities.

⁴⁵ Target GmbH (2013).

⁴⁶ Eurostat (2013a).

⁴⁷ Constantinou *et al.* (2010).

⁴⁸ Eurostat (2013a).

⁴⁹ Constantinou *et al.* (2010).

high and therefore the potential for energy savings is medium. Around 9% of the SMEs are small or medium sized. Especially grocery stores consume significant amounts of energy due to the need for cooling systems. The share of energy costs from the operating total costs is high in these companies. On the other hand, the energy efficiency potential of very small grocery stores, kiosks or specialty shops is limited.

There are altogether 64,257 SMEs in the *accommodation and food services* sector from which 12% are small or medium sized companies. Energy consumption per company in the sector is low and energy efficiency is decent. However, due to the large number of companies, the total impact of energy consumption is big and the overall energy efficiency potential is high.^{50, 51} Especially heating, cooling and consumption of hot water consume large amounts of energy in hotels. Additionally, there is a large amount of holiday cottages which are often poorly isolated in the Nordic countries. When it comes to food service activities, especially institutional kitchens like school restaurants, hospitals etc. could have a great energy saving potential due to large volumes. Small and medium sized restaurants, on the other hand, have fewer resources to make energy efficiency improvements and payback times of energy efficiency investments might get long.

The number of *agricultural holdings* in Nordic countries equals 226,270.⁵² The number of micro sized SMEs is significantly high. However, in the agriculture sector, the size of the fields or the number of animals in the farm are more significant factors in defining the attractiveness of energy management plans than the personnel count, which has been used as a basis for this analysis. Greenhouses have been identified as one of the sectors with high energy savings potential and where some focused efforts toward energy efficiency improvement exist. Agriculture, excluding forestry, includes some activities with relatively high energy consumption and together with a high number of agricultural holdings, energy saving potential is high. On average, more than 60% of the energy consumed in agriculture goes to working machines and production facilities. The share of wheat drying and residential buildings is 20% each.⁵³ For example in a dairy farm,⁵⁴ 20% electricity consumption sav-

⁵⁰ Eurostat (2013a).

⁵¹ Constantinou *et al.* (2010).

⁵² Eurostat (2013c).

⁵³ Motiva (2011).

⁵⁴ Note! Dairies which also have their own cattle belong to the agriculture sector whereas dairies which only buy the milk and process it further belong to the manufacturing of food and beverages sector.

ings have been achieved by installing a variable speed drive milking pumps. The payback time of the investment is estimated to be less than five years.⁵⁵

All the selected sectors present medium to high potential for energy savings. It must be noted that there is significant diversity in each sector. Therefore, the sectors have been further studied according to the types of businesses they include. Table 6 presents some example business types that have been identified. These have been further classified according to the types of companies that could benefit from energy efficiency improvements.

Some significant energy saving potential is expected to be found in the chemicals, basic metals, rubber and plastic manufacturing sector, wholesale and retail, accommodation and food service activities and agriculture. Even though the number of SMEs is low in the manufacturing sector, the share of small and medium sized companies is high and there are some energy consuming activities such as melting of metal. Manufacturing of food and beverages has some benefits as well. Construction on the other hand, due to large number of micro firms, is estimated to have fewer possibilities for energy savings.

In Finland, SMEs participating in energy audits during 2006–2011 recognised potential energy savings averaging between 14–18% per year.⁵⁶ In Sweden, energy savings of 20% have been reached on an average, with a range between 5% and 50% in companies which have conducted energy audits, while the EU has set a target of 25%.⁵⁷ The heterogeneous nature of SMEs results in significant variation between sectors and companies.

⁵⁵ Target GmbH (2013).

⁵⁶ Motiva (2013).

⁵⁷ Karlsson, M. *et al.* (2012).

Table 6: Characterisation of SMEs by sector and benefits of energy efficiency improvements.

	Number of SMEs	% of small and medium sized SMEs	No benefits	Some benefits	Significant benefits
Manufacture of food products and beverages	8,625	27%	Micro firms (e.g. small bakery)	Brewery	Dairy
Manufacture of chemicals, basic metals, rubber and plastic	5,555	28%	Micro firms	Rubber and Plastic	Metals (melting), Chemicals
Construction	210,336	7%	Micro firms (e.g. man + van company)	Small and Medium (concrete moulding)	
Wholesale and retail	270,024	9%	Micro firms (e.g. kiosks, open air market shops)	Specialty shops, small shops	Grocery stores (heating and cooling)
Accommodation and food service activities	64,257	12%	Micro firms (e.g. grill kiosks, small bars and cafes)	Small and Medium sized restaurants, hotels (heating, air conditioning, cooling)	Cottages and separate holiday houses (heating), institutional kitchens (school restaurants, hospitals)
Agriculture	226,270	<1%	Small farms (small farm size e.g. 5 cows)	Open land gardening and cool storing (cooling)	Animal farms (heating & cooling), large fields (working machines), wheat drying (oil- > wood chips), greenhouses

According to European Commission research, energy efficiency normally plays a key role in resource efficiency. At the European Union level, up to 24% of SMEs actively engage in actions to reduce their environmental impact. The actions concentrate mainly on the reduction of energy consumption. There are some country-level differences on how actively SMEs take actions. For example, a lower than average share of Danish SMEs take measures to increase the resource efficiency of their activities. A possible reason for this is that the Danish SMEs benefit less from public support measures for such actions. The SMEs in Finland, on the other hand, have invested in resource efficient measures more than the SMEs in EU in general. In Finland, the public support measures to promote resource efficiency actions are a particular strength. According to the European Commission, the proportion of SMEs that report that they have benefited from such support is more than twice the corresponding EU figure. In Sweden, activeness in resource efficiency and public support for it, as well as the production of “green” product and services, are very close to the EU average. Norwegian enterprises have implemented

comparatively more resource efficiency measures, even though they have been receiving less public funding. Icelandic SMEs have implemented fewer resource efficiency measures than in the EU SMEs in general, even though they receive equal public support measures (9% for both Icelandic and EU average SMEs).⁵⁸

3.3 Barriers to improve energy efficiency

Despite the need and potential for increased energy efficiency, studies and the experience of energy agencies and other stakeholders indicate that cost efficient energy conservation measures are not always implemented. Barriers to implementing energy efficiency measures in SMEs have in this study been identified through a desk study of relevant literature⁵⁹ and through interviews with experts:

- Lack of information and knowledge.
- Lack of time.
- No dedicated personnel with responsibility for energy issues – no motivation, no systematic way of working with energy efficiency.
- Low management interest and low priority.
- Lack of incentives:
 - Low energy prices lead to lack of interest and focus.
 - SMEs are generally not targeted by government incentives.
 - Government incentives sometimes perceived as too bureaucratic for SMEs.
- Lack of capital for implementing measures and competing investment priorities.
 - Investments into core processes may be prioritized.
 - In international companies, investments are prioritized on an international scale – better incentives in other countries may influence investment allocation.
- Lack of possibility to influence energy efficiency e.g. in leased facilities.
- Problems finding consultants and subcontractors.

⁵⁸ European Commission (2012e).

⁵⁹ E.g. Fawcett (2010) and Drivsholm & Petersen (2012).

- Risks.
 - Uncertain payback time.
 - Difficulty of calculating lifecycle benefits.
 - Risk for interruptions and hassle.

The barriers identified have also been mapped along a typical process for improving energy efficiency. This is presented in Figure 5. Any policy interventions and other supporting instruments should therefore focus on preventing and removing these barriers in different phases of the process.

Figure 5: Barriers and policy instruments in the energy efficiency improvement process

The identified barriers are fairly similar in most Nordic countries, with the exception of Iceland where the situation differs in many ways. In Iceland the main barriers are the low energy prices and the fact that energy is mostly sourced from thermal sources and therefore the environmental arguments used to motivate energy conservation are not as strong. It is therefore more difficult to motivate companies to invest in energy efficiency measures or to conserve energy in Iceland.⁶⁰

The barriers presented above are described in more detail in the following.

⁶⁰ Interview, Sigurdur Fridleifson, Energy Agency Iceland.

3.3.1 Lack of information and knowledge, no dedicated personnel or systematic way of working with energy efficiency

SMEs often have no designated personnel for energy issues and have in many cases little knowledge of energy efficiency in-house. In most cases the person responsible for energy acquisitions and for choosing consultants, contractors and energy solutions will be responsible for many other things as well. The in-house personnel will not necessarily have the time required to gain sufficient insight into the issue – even when information would be readily available from easily accessible sources.

The challenges posed by the lack of knowledge and expertise spans from identifying the potential processes or sites where energy efficiency improvement can be made, to finding consultants to help with energy audits, making investment calculations and choosing suitable technological solutions.

The level of knowledge of internal personnel is highly dependent on how energy intensive the operations of the company are. If energy is a major cost for the company, and the production is energy intensive, then there will naturally be more focus on the issue and the personnel needs to be more knowledgeable in these issues.

SMEs often do not have a systematic way of working with energy questions. Companies seldom have an energy management system or a system which would integrate the energy question into other management processes or management decision making, which would bring the necessary management focus on energy issues.

In some cases SMEs also lack sufficient data on their energy consumption because energy consumption is not measured on a detailed enough level (e.g. being able to identify which sub-processes are the most energy intensive).

3.3.2 Low management interest and low priority

Low management interest and low status of energy management as a process may lead to low focus on energy questions throughout the company. In companies where energy savings has a low priority, this may also be linked to other organisational failures, such as long decision chains and lack of ownership of the question.

There is a strong link with the lack of data and low management interest resulting in reluctance to implement measures and invest in efficiency. If consumption is not measured on a detailed enough level and if energy costs do not have an impact on a department's results or can't be

followed-up, there is little motivation and opportunity for management to take an interest in energy efficiency. Energy efficiency improvements will not be a priority.⁶¹

3.3.3 *Lack of incentives*

Low energy prices that have been seen during the last two years have had an impact on the interest in energy saving. When energy prices are high, interest in improving energy efficiency is also higher. In this context, one of the main barriers for implementing energy efficiency measures in particular in Iceland is the low energy price and relatively abundant availability of domestic energy.⁶²

Many SMEs have not been targeted by government incentives or have not had access to information through existing networks and communication channels, such as for example, through industry associations. Most government incentives and information efforts have been focused on energy intensive companies (or household consumers) where the impact of energy efficiency improvement is the largest and which are easier to reach. SMEs are perceived as very heterogeneous, with differing processes and needs. The costs of targeting individual SMEs, is seen as high considering the energy savings potential.

The existing incentives, which aim to promote energy efficiency by subsidising energy audits or offering investment support, often involve requirements for reporting and other administrative tasks, which are considered burdensome for SMEs. One practical example which illustrates the question is the requirement for always calculating energy savings potential on a project basis. This is a demanding task requiring expertise and time. This is required for instance in the Norwegian investment support scheme. Some SMEs would prefer an approach with standardised savings, which could lower the threshold for implementing measures eligible for investment support.

⁶¹ Rohdin Patrik and Thollander Patrik (2006).

⁶² Interview, Sigurdur Fridleifson, Energy Agency, Iceland.

3.3.4 Lack of capital for implementing measures and competing investment priorities

Some SMEs, especially micro companies, have difficulty accessing capital at present because of the economic downturn. Investments into developing core processes will often be prioritized and even profitable investments will not be made. Access to capital may not be a barrier to all SMEs. The existing capital may be prioritized into other projects than energy conservation even if conservation measures would be profitable.

In companies where operations span several countries, the existing government supported incentives in each operating country vary influencing investment decisions. Funds for energy efficiency improvements may be channelled to countries with more attractive investment support schemes.

3.3.5 Lack of possibility to influence energy efficiency e.g. in leased facilities

One technical barrier identified in this study is the lack of access to data on energy consumption and lack of influence on energy efficiency investments in facilities not owned by the company. Dialogue between facility owners, investors and end users rarely includes considerations of energy efficiency. This is starting to change with some more progressive facility management companies providing energy efficiency services (including more accurate consumption data) to tenants.

3.3.6 Problems finding consultants and subcontractors

When using external competence is necessary, many SMEs do not necessarily have the networks to enable finding suitable contractors and consultants. They may not be aware of the services offered or even of the information offered by various actors. Looking for dependable consultants or contractors may be time consuming and can drive costs. The quality of contractors and the provided services may prove difficult to evaluate, especially if there is not a system where consultants or contractors are “certified”⁶³ by official authorities or industry associations. If peer networks where these types of issues can be discussed and information exchanged do not exist, the task becomes burdensome.

⁶³ This does not mean an accreditation by a third party, but for instance that the consultants follow guidelines set by energy agencies.

3.3.7 Risks

Perceived risks also influence how investments are prioritized. In a Swedish study on energy efficiency in non-energy intensive manufacturing industry, the lack of funds was not the most important barrier for implementing energy efficiency measures, but instead the technical risk for the production process, cost of production disruption, hassle, inconvenience, lack of time and other priorities for funding.⁶⁴

There may also be challenges associated with estimating the lifetime savings and payback periods of the investment. This may especially influence investment decisions related to improving the energy efficiency of facilities. If the facilities are sold, there is no guarantee that the sales price will reflect the additional investments, which have been made into improved energy efficiency.

Furthermore, investment calculations can be challenging to make, especially in sectors where production is linked to cyclical economic variations. Energy price fluctuations, which can be dramatic, also make it difficult to calculate the economic impact of energy savings investments and the length of payback times. Investment decisions related to improving energy efficiency are often not based on thorough analysis and often decisions are made on best estimates or rule of thumb.

⁶⁴ Rohdin Patrik and Thollander Patrik (2006).

4. Instruments to support SMEs

This chapter presents an overview of the different kinds of policy instruments and support measures provided by the Nordic governments and energy agencies.

4.1 Denmark

The main policy instruments for promoting energy efficiency in SMEs are the energy savings obligations of the energy companies and the efforts by the Danish Energy Agency (DEA) to promote energy efficiency. DEA manages the voluntary energy savings agreements which target companies with energy intensive processes. These companies also include some SMEs.⁶⁵

4.1.1 *Legal and regulatory instruments*

The most important regulatory instrument for promoting energy efficiency in Denmark is the *mandatory energy savings obligation system of energy companies*.⁶⁶ It can be classified as a cross-cutting measure.

In the obligation system energy companies have energy savings obligations. The savings are to be generated mainly by the end-users. The energy companies are credited for the energy savings, which they have directly been involved in facilitating.⁶⁷ In the Danish obligation system emphasis has been put on applying a market based approach. The energy savings obligations are meant to be allocated to sectors where results can be reached most efficiently.⁶⁸ An element of the market based ap-

⁶⁵ Brange (2013).

⁶⁶ Network and electricity distribution companies, district heating companies, natural gas companies and oil companies in Denmark have energy savings obligations.

⁶⁷ The companies can also buy “energy savings” from other utilities – a trading possibility exists.

⁶⁸ Interview, Birgitte Brange, Danish Energy Agency.

proach is that it is possible to trade savings between different parties within the obligation scheme.⁶⁹

The energy savings goals for the period 2013–2014 are in total 10.7 PJ per year and 12.2 PJ yearly for the period 2015–2020. The savings obligations are distributed per energy sector. The energy sectors included are natural gas providers, electricity distribution service providers and oil-companies. Sector specific targets do not exist on how the actual savings are to be distributed between households, service sector or industry.^{70, 71}

The parties with the energy savings obligations are not themselves allowed to implement the energy efficiency initiatives, which generate the savings. They pass the projects to energy service providers such as installers, craftsmen, engineering companies, lighting companies etc. Behavioural impacts and the results of independent information campaigns are generally not included in the obligation scheme. A list of eligible savings measures and the estimated savings related to these measures is updated every three years.⁷² ESCO services exist widely in Denmark and they target primarily the public sector.⁷³

The obligation scheme is a supplement to the legal measures such as energy taxes, building codes, energy labelling of buildings, special requirements for the public sector, minimum energy efficiency requirements for products (eco-design) and labelling.

4.1.2 Voluntary energy efficiency agreement

The Danish Energy Agency manages energy savings agreements, which target companies with energy intensive processes.⁷⁴ A large part of the Danish greenhouse sector participates (70% of the production area in m²) in the voluntary agreement scheme as energy makes up a proportionately large share of their total production costs. Some of these participating companies are medium sized companies.

⁶⁹ Minister for Climate, Energy and Building (2012).

⁷⁰ In total DK 1,6 Billion is collected yearly from energy users to finance the scheme. All customers pay proportionally to the obligations scheme in relation to distributed energy. The funds which have been collected are then used for specific initiatives. These are selected according to where the best results can be reached most effectively.

⁷¹ Minister for Climate, Energy and Building (2012).

⁷² Thingvad (2013).

⁷³ Brange (2013).

⁷⁴ These are e.g. companies like the enzyme manufacturer Novozymes, the cement producer Aalborg Portland, the steel rolling mill NLMK DanSteel in Frederiksværk, the iron foundry Vald, The Danish Malting Group and the glass-making company Ardagh Holmegaard.

The companies which are eligible to participate in the energy efficiency agreement are obligated to adopt an Energy Management System. The energy management system must be certified according to ISO 50001. Before signing the agreement companies are obligated to conduct an “energy screening” – a type of light energy audit. The “energy screening” helps to identify the parts of a production process which need to be studied more in depth in a *Special Investigation*. The Special Investigations focus on the more complicated processes and include an evaluation of the profitability of specific energy efficiency projects.⁷⁵ Companies are obligated to implement those energy efficiency projects, which have a payback time of under 4 years. The energy efficiency agreement involves yearly reporting to the Danish Energy Agency and yearly audits by the auditor of the Energy Management System.

A requirement for a company joining the agreement scheme is that the company is using an energy intensive process. The official list of identified energy intensive processes includes 32 processes. As of 1st of January 2010, only those related to electricity use are relevant for the voluntary agreements. The company needs to meet criteria which state that the net energy and climate tax payments correspond to at least 4% of the added value over the last 24 months.⁷⁶

4.1.3 Financial incentives

Investment support linked to the *mandatory energy savings obligation scheme* of the energy companies can be received by any type of user, including SMEs, provided the proposed energy efficiency initiative meets the requirements. There is no formal lower limit for which type of energy user is eligible to partake in energy savings efforts. All types of companies, including smaller companies, can be targeted.⁷⁷ The energy companies which have the obligations pay a certain price per kWh for the energy savings to the end user or ESCO. End-users receiving support for energy efficiency improvement can receive up to 50% support. The energy savings in which the energy companies have been directly involved count towards their obligations.^{78, 79}

⁷⁵ Danish Energy Agency (2013b).

⁷⁶ Dal *et al.* (2012).

⁷⁷ Minister for Climate, Energy and Building (2012).

⁷⁸ Brange (2013).

⁷⁹ Investment support is provided to eligible projects and measures which fulfil certain criteria and which count towards their obligations. To promote energy efficiency the energy companies provide a type of

The main target of the energy companies' efforts to facilitate energy savings has so far been large energy consumers.⁸⁰ According to the Danish Energy Association, when the energy companies target SMEs, the main focus is often on local businesses and especially shops.

The main financial incentive for participating in the *voluntary energy efficiency agreement* managed by DEA is a tax subsidy. The companies are reimbursed part of the energy tax.⁸¹ The tax rebates vary for different types of end-uses and depend on whether the production process of the company is deemed as "heavy or light" from the energy intensity perspective.⁸²

The tax reduction is in some cases substantial. This means that the tax rebate works as a very strong incentive to participate in this program. The future of the tax rebate is however unclear as changes to the EU Tax Directive may restrict Member States' ability to apply the rebates in the future.

4.1.4 Supporting measures

The Danish Energy Agency has a budget for promoting energy efficiency, which is primarily used for distributing information.⁸³ Various guides and brochures exist to support energy efficiency work. Some of these target SMEs. DEA is currently in a process of discussing with industry associations how to promote energy efficiency in different sectors, including SMEs.⁸⁴

The energy companies which have energy savings obligations provide advice and give information about energy saving to various degrees. Energy savings count towards their obligations. It is therefore in their interest to provide incentives for energy efficiency. However, the primary target of efforts is larger energy intensive companies and households.

investment support by signing agreements with suppliers of energy savings (for instance ESCOs) or end-users implementing energy savings measures.

⁸⁰ Brange (2013).

⁸¹ In 2010, the energy tax was 0.062 DKK/kWh.

⁸² Changes to the EU Tax Directive may restrict Member States' ability to apply the rebates in the future.

⁸³ Between 2010 and 2012 Denmark had an Energy Savings Trust (GO Energy), which was responsible for promoting energy efficiency in all sectors, including SMEs. After the decision in 2012 to phase out the Energy Savings Trust, the Danish Energy Agency (DEA) has taken over the responsibilities for promoting energy efficiency previously held by the Energy Savings Trust.

⁸⁴ Brange (2013).

4.1.5 Results

Realised savings of *the mandatory energy savings obligation scheme* are reported annually to the Danish Energy Agency (Energistyrelsen) by the energy companies. The realised energy savings are classified by type of activity, energy type, and by final consumption categories (e.g. insulation of buildings, windows, boilers, lighting, compressed air, etc.). Results for households, public sector, production and services are reported separately. More specific sector breakdown, which would make it possible to follow-up results for the SME sector, is not used in reporting or target setting.

It is estimated that the Danish obligation scheme provides for 52% of all yearly energy savings. For 2011 the savings were estimated to be 2,096 GWh.⁸⁵ The costs of the obligations are available for scrutiny by regulatory authorities and as well as to the public. The price for each saved kWh has been estimated to be about 0.034–0.047 EUR/kWh on average for the first year savings.⁸⁶ The average payback time for the savings is about 2 years.⁸⁷

The main focus of the market based approach has been on energy intensive industry and households. The smallest SMEs, for instance shops, are in practice not targeted because of the relatively high transaction costs, which targeting this segment would involve. Energy companies target mainly larger companies, but there is an expectation that smaller companies will be increasingly targeted through the provision of information services.⁸⁸

An additional result of the scheme has been that the number of energy efficiency businesses in Denmark has increased due to a rising demand for energy services. All customers, including SMEs, are free to shop between energy companies regarding the implementation of savings measures.

According to the Danish Energy Agency, studies have deemed the energy savings obligations to be one of the most efficient energy efficiency policy instruments available for policy makers.⁸⁹ This measure has been deemed effective because it promotes competition between market players to achieve energy savings as cost effectively as possible.

⁸⁵ Danish Energy Agency, 2012.

⁸⁶ Thingvad (2013).

⁸⁷ Thingvad (2013).

⁸⁸ Brange (2013).

⁸⁹ Thingvad (2013).

An evaluation of the *voluntary energy savings agreement scheme*, which was made in 2005, concludes that the scheme has had a large impact on the energy consumption of the participating companies. The companies themselves pointed out that systematic and focused work around energy conservation and management has given them an international leading position on energy efficiency. The energy savings have been estimated to be 1,640 GWh/year which represents 0.9% out of the total energy consumption in Denmark (179,916 GWh in 2010).^{90, 91}

4.2 Finland

In addition to energy efficiency requirements in building codes and for appliances, no other legal or regulatory instruments specifically aiming to promote energy efficiency in SMEs have been identified in this study.

4.2.1 *Voluntary energy efficiency agreements*

An important instrument for promoting energy efficiency in Finnish businesses is the voluntary Energy Efficiency Agreement. The agreement is a part of the national implementation of the European Union Directive on energy efficiency and energy services. The agreement aims to promote energy efficiency in industry and in different sizes of businesses, including SMEs. In principle it targets all sizes of companies, but in practice, excludes the smallest companies. For them the agreement may be perceived as too costly as it requires joining a trade association and because it includes yearly reporting obligations. The target set for the agreement is to achieve nine percent energy saving or 17.8 TWh by 2016 compared to a 2008 baseline.⁹²

The agreement has been signed by the Confederation of Finnish Industries and many of its member associations. Specific action programs exist and targets have been set for energy-intensive industry, energy production sector, food and drink industry, chemical industry, plastics industry, wood-processing industry, technology industry, commerce, Finnish Hotel and Restaurant Association FHR, energy services and a general action

⁹⁰ Eurostat (2013d).

⁹¹ Danish Energy Agency (2013).

⁹² Larmio (2013).

program for business and industry. In addition there are separate agreements signed by the agricultural sector and public service sector.⁹³

Each industrial association is responsible for its member companies' adherence to the agreement. The state-owned agency Motiva Oy reports on the results. Companies and public organisations that join the agreement undertake an energy audit and draw up an action plan to improve their energy efficiency. The exact requirements vary per sector agreement. Companies commit to increasing awareness of energy efficiency within their organisations and to annual progress reporting.

4.2.2 Financial incentives

The Ministry of Employment and the Economy provides financial support for conducting energy audits and energy check. The provision of support is managed by the regional Centres for Economic Development, Transport and the Environment (ELY Centres) or by the Ministry of Employment and the Economy.

For small companies, the maximum financial support for energy audits is 50%, with a maximum set sum which is defined by Motiva and which is dependent on the size of the company and its operations. The agricultural sector has its own support scheme for energy audits.

The ministry also issues investment subsidies for investments into energy efficiency improvement. The investment support for implementing energy efficiency measures using commercial technologies is evaluated on a project basis. The investment support generally does not exceed 20% of the eligible costs.

A prerequisite for receiving investment support for energy efficiency measures using commercially available technologies is that a quality controlled (compliance with Motiva's guidelines) energy audit has been conducted. A further requirement is that the project would not have been initiated without the support (requirement of more than 3 years payback time). Companies also need to have joined the voluntary energy savings agreements. All types of companies, including SMEs, are in principle eligible to receive investment support. The requirement for minimum investment may exclude the smallest companies as their investment needs may not be in this range.

⁹³ Hyttiä (2013).

4.2.3 Supporting measures

There is a range of supporting measures available to SMEs. Most initiatives, which involve training or practical management of the energy audits, are the responsibility of Motiva Oy.

Motiva has developed an Energy Management System model with detailed guidance, which can be used by companies. It is regarded as a key element of the Energy Savings Agreements and as an essential tool for making the approach to energy efficiency improvement more systematic. It can also be used by companies not party of the energy savings agreement. The benefit of the system is that it lifts energy efficiency to the attention of management. Adopting an energy management system is mostly feasible for larger and some medium sized companies, which have adequate resources available for the required administration. Small and micro sized companies are clearly not the target.

A key element of the energy efficiency improvement efforts is conducting an energy audit. In the review of the present status of energy efficiency the key measures to improving energy efficiency are identified. A standardised energy audit model has been developed. Follow-up of the energy audits and quality control of the audits is conducted for those energy audits which have received financial support. The data which is collected in the energy audits makes it possible to do some benchmarking of the energy efficiency of, for instance, different building types (office buildings, hospitals etc.). Benchmarking can be helpful in giving an indication of energy efficiency for companies active in similar sectors.

Guidance is provided on energy efficient procurement and the best available technology from an energy efficiency perspective. An important additional tool is to provide case examples of energy efficiency measures which have been implemented in different types of companies. Case examples provide inspiration and guidance for similar companies considering energy efficiency improvement measures. Case examples and guides can be used by different size companies, including SMEs.

General information and guidance for promoting energy savings is provided and there are networking initiatives for specific sectors as well as co-operation with industry associations. The co-operation is built around the energy savings agreements. Most of the above mentioned services are provided or supported by Motiva Oy. Motiva trains and certifies energy auditors. The auditors perform reviews which fulfil Motiva's quality requirements.

4.2.4 Results

In the period 1992–2011, a total of 31.5 MEUR in energy support has been issued by the ministry of Employment and the Economy.⁹⁴ In this period a total of 8,200 energy audits had been conducted (see Figure 6 for a breakdown of reviews per sector). It has been estimated that a total of 650 MEUR in savings have been reached by conducting the energy reviews by implementing the energy efficiency improvements. For 2009 it was estimated that the energy audits and the resulting improvement measures led to energy savings of 860 GWh.⁹⁵ It has been estimated that 85% of the companies which have conducted energy audits are party to energy savings agreements.⁹⁶

Figure 6: Number of energy reviews per sector⁹⁷

⁹⁴ Työ- ja elinkeinoministeriö (2013).

⁹⁵ Työ- ja elinkeinoministeriö (2013).

⁹⁶ Hyytiä (2013).

⁹⁷ Työ- ja elinkeinoministeriö (2013).

The energy intensive and medium sized companies have so far been prioritized in actions by Motiva. An important consideration has been that the medium sized and energy intensive companies have more resources and higher motivation to join the energy savings agreements and are therefore easier to target and reach. Little support has been offered for energy efficiency improvement measures in small- and micro sized companies. The smallest companies are often not interested in joining voluntary energy savings agreements because they mandate yearly reporting and include the requirement that the company needs to join a trade association. Furthermore, these companies often do not have the necessary resources or motivation to fulfil the administrative requirements.⁹⁸

A key action for motivating and activating smaller companies is providing information on energy efficiency. This entails generally raising awareness of the issue and presenting ways to approach energy efficiency improvements in practice. Those companies that are a part of the energy savings agreements are in this respect in a good position. They have good access to information and support. It is more challenging to reach the small companies which are not part of the agreements. They may be much less motivated to actively search for information, even if it is readily available from public sources. Smart and well-targeted communication is the key issue in activating the smaller companies.

Views presented in interviews indicate that it would be important to focus on promoting networking initiatives in order to activate especially small- and micro sized companies in Finland. Promoting networking could be especially useful if it was initiated on a local level, giving more companies easy access to information and services. According to Motiva, the stakeholders which should be involved when networks involving smaller companies are initiated are the Centres for Economic Development, Transport and the Environment, on a regional level and local energy agencies. To avoid overlapping actions it would be necessary for someone to co-ordinate the actions.

Many of the potential measures for improving energy efficiency identified in the energy audits conducted in SMEs are currently not implemented. There is a need to evaluate what would be good ways to support SMEs in implementing the identified energy efficiency improvements after identifying the specific cases where energy efficiency improvement can be made.

⁹⁸ Hyytiä (2013).

4.3 Norway

In addition to energy efficiency requirements in building codes and for equipment, no additional regulatory measures have been identified in this study, which would specifically target energy efficiency in SMEs. Norway does not use voluntary energy savings agreements as a tool for promoting energy efficiency.

4.3.1 *Financial incentives*

Most energy efficiency promotion efforts in Norway are coordinated by Enova. It is the main authority responsible for promotion of energy efficiency and promotion of renewable energy use.⁹⁹

The financial policy instruments available to companies include investment support for necessary analysis and studies related to adoption of energy management systems, financing prefeasibility studies of energy efficiency investments and financing energy efficiency investments. Investment support is considered to have the most significant impact on promoting energy efficiency in Norway. It focuses on those sectors where the greatest impact can be attained for the invested funds. This means that the main targets for the investment support are energy intensive industries.

To receive financial support for investments into energy efficiency improvement, certain requirements need to be met. The investment project needs to lead to minimum annual savings of 100 MWh, the investment support should be a trigger for the investment and commercial technology should be used. This limits the applicability of investment support to larger and medium sized companies, with energy intensive heating and cooling processes.

The decision on the level of financial support is based on deemed effects and cost efficiency of each project in relation to the saved energy (NOK/kWh). Projects compete with each other for funds. Projects that have high energy savings in relation to the funding level are prioritized.¹⁰⁰ Companies with a systematic way of working with energy effi-

⁹⁹ Part of the funding for the activities comes from a supplement to the distribution tariffs, which electricity users are obliged to pay. The available funds were over 3 billion NOK in 2012.

¹⁰⁰ Prioritized projects are: Cost-efficient solutions with substantial reductions in energy consumption and/or conversion to use of renewable energy sources in relation to necessary (triggering) investment support. Projects where the implementation plan includes using energy-efficient, commercial technology. Projects that will most likely lead to additional effects, and where such additional effects are profitable

ciency and for which energy has a high impact on their economic result are prioritized. There is no requirement for implementing an Energy Management System.¹⁰¹

4.3.2 Supporting measures

In addition to investment support Enova also provides supporting measures which aim to promote energy efficiency in different sectors. Few of these measures specifically target SMEs. In general Enova provides cross-sectoral information and guidance on promoting energy savings.

Enova has published a Guide for Implementing Energy Management.¹⁰² Its purpose is to guide smaller companies to adopt structured ways of working with energy efficiency and thereby increase management focus on energy efficiency. Information is provided on good practices and case studies, with examples of projects where good results have been reached. Enova also provides other useful guides on energy efficiency, which includes useful checklists. These can be of benefit to some SMEs.

Enova also provides some information on best available technology and guidance for making energy efficient acquisitions. A system for on-line benchmarking of the energy efficiency of different sectors also exists. It provides some insights into the average energy consumption of some sectors. For some sectors good data exists, which makes it possible to benchmark energy consumption with other companies within the sector. However, not all sectors have data which could be considered sufficiently representative to enable comparison.

Enova organizes seminars targeting both energy efficiency experts (consultants), personnel responsible for energy efficiency within the targeted companies, municipalities. The seminars have as a goal to inform stakeholders of useful measures, good practices and financing incentives available to the companies. The training is in some cases organized regionally together with outside service providers.

Enova provides contact information for energy efficiency experts. They support implementation projects and conduct energy efficiency audits. The competence of the experts is reviewed before contact information is posted on the Enova website.

without further public funding. Projects in companies that have introduced active energy management or that introduce active energy management during the project period.

¹⁰¹ For instance Elkem has received about 300 MNOK in support for a project to increase the use of residual heat.

¹⁰² Enova (2012)

The “Ask Enova” service makes it possible for any type of company to ask any type of question from an Enova energy efficiency expert (phone and online service). Enova also sometimes organizes information campaigns to the general public to raise awareness.

Enova also organizes some Networking initiatives for specific sectors (mostly industrial) and co-operates with industry associations. These networking initiatives do not include many SMEs.

4.3.3 Results

For the year 2012 it has been estimated that the investment support program has resulted in 820 GWh in annual energy savings (and conversion to renewable energy) due to energy related initiatives.¹⁰³ The achieved result represent 0.4% of the total energy consumption (233,135 GWh) in Norway in 2010.¹⁰⁴ Many companies with lower savings potential due to their lower energy intensity are not being targeted by the incentives. SMEs are often not eligible for investment support because of the limitations which have been imposed on the required savings potential. In other cases the reason why eligible companies do not participate in the available investment programs is the expected heavy administration.¹⁰⁵

4.4 Sweden

In addition to energy efficiency requirements in building codes and for appliances, no other legal or regulatory instruments specifically aiming to promote energy efficiency in SMEs have been identified in this study.

4.4.1 Voluntary energy efficiency agreement

In Sweden the most important initiative for promoting energy efficiency in companies is the Program for Improving Energy Efficiency (PFE). PFE is especially aimed at energy intensive companies in the manufacturing industry. The targeted companies represent about 20% or 30 TWh of the total energy consumption in Sweden. Most of the participating com-

¹⁰³ Enova (2013).

¹⁰⁴ Eurostat (2013d).

¹⁰⁵ Sandbakk (2013).

panies represent the pulp- and paper manufacturing sector. It has been estimated that about 30% of the participating companies are SMEs.¹⁰⁶

The first five year period was launched in 2004, and the second period will end in 2014.¹⁰⁷ The future of this program is currently being evaluated by the Ministry of Enterprise, Energy and Communications.¹⁰⁸

A requirement for participation in the program is that the company is energy-intensive. This means that it must fulfil one of the following criteria: a) its energy expenditure amounts to at least 3% of its production value; b) the total energy and carbon dioxide tax for the company amounts to at least 0.5% of its added value.¹⁰⁹ The main incentive which motivates the companies to participate in the program is a reduction of the energy tax. The tax reduction is currently about 0.5 EUR/MWh.

A company which takes part in the PFE program has to sign an agreement with the Swedish Energy Agency. The Swedish program includes a range of supporting elements to ensure effective implementation. During the five year contract period the participating companies have the obligation to conduct an energy audit and they are required to establish an ISO 50001 certified Energy Management System (EMS) within two years of committing to the program. This is a heavy requirement for smaller companies. PFE includes specific requirements on energy efficiency to be met when purchasing electrical equipment and when planning activities, modification and renovation work. A life cycle approach is taken. It considers the energy costs and the cost of the equipment, viewed over the equipment's life cycle.

4.4.2 Financial incentives

SMEs have so far not been a priority when designing energy efficiency improvement measures in Sweden, but in 2010 some measures such as financial support for energy audits and energy checks have been launched, targeting SMEs. Most of these initiatives are the responsibility of the Swedish Energy Agency. In addition, financial support is available for implementing an energy management system. No direct investment

¹⁰⁶ Björkman (2013)

¹⁰⁷ However as soon as a company is accepted in the program the Program for Improving Energy Efficiency Act applies (2004:1196).

¹⁰⁸ Björkman (2013).

¹⁰⁹ Energimyndigheten (2013b).

support is available for investments into implementing energy efficiency measures.¹¹⁰

Energy audits, which target SMEs, can receive 50% or a maximum of 30,000 SEK in financial support. Support can be received by companies with annual energy consumption exceeding 500 MWh. A company trading in the primary production of agricultural products such as a farm of at least 100 animals can also receive support by the program.¹¹¹

Certified energy management systems, which target especially energy intensive manufacturing and some medium sized companies, can receive financial support. Smaller companies can receive financial support for implementing lighter energy management systems, specifically geared towards smaller companies. These energy management systems do not require certification. However, these lighter systems do not make it possible to receive the tax benefits available within the PFE program.

4.4.3 Supporting measures

The Swedish Energy Agency (SEA) website provides information and guidance on energy efficiency measures. A range of manuals has been developed to help implementation, including manuals on energy mapping and analysis, life-cycle costing and procurement as well as guidance on how to conduct energy audits and lighter energy checks. Guidance is also provided for implementing Energy management systems,¹¹² including for a lighter version which is especially geared towards smaller companies which are not participating in the PFE scheme.

The energy audit involves reporting identified energy savings measures to the Swedish Energy Agency. The result of the energy audit along with a list of actions the company intends to implement is then presented in an energy plan. Those measures which will be implemented during the next 2 years must be reported.¹¹³ The energy plan shall also indicate the maximum energy reduction that any action is likely to give, the costs for the company to implement the measure and the intended time period for implementation.¹¹⁴

¹¹⁰ Björkman (2013).

¹¹¹ <http://www.energimyndigheten.se/sv/Foretag/Energieffektivisering-i-foretag/Energikartlaggningscheck---ett-stod-for-energikartlaggning/>

¹¹² Energimyndigheten (2004).

¹¹³ Statens energimyndighets författningssamling (STEMFS), (2010).

¹¹⁴ Also, proposed measures for improving energy efficiency of the firm regarding processes and process equipment, auxiliary equipment (e.g. pumps, fans, compressors and conveyors), peripherals (e.g. ventilation,

The energy check is a lighter version of the energy audit geared specifically to smaller companies. The energy check includes detailed guidance and checklists for reviewing the energy use in SMEs. The energy audit or energy check doesn't involve an obligation to implement the identified measures.

Additional support which is available to SMEs is general guidance and in some cases, sector specific guides and check-lists for implementing and identifying specific energy savings measures. A manual has been developed by SEA to serve as an aid in energy efficiency work in especially small- and medium sized industries.¹¹⁵ The emphasis of the manual is not on the technical side, but on how to create a culture where energy efficiency is part of the daily work.¹¹⁶ Additionally, interesting case studies are highlighted. This information is provided on the SEA website.

Some training of personnel responsible for energy efficiency in companies is organized by SEA. In addition, networking initiatives exist for specific sectors (PFE companies mostly), often in cooperation with industry associations, which can sometimes provide some training. Regional networks also exist, which are promoted by either municipalities or regionally by energy bureaus. These initiatives are supported by SEA.

All municipalities in Sweden provide energy and climate advice.¹¹⁷ Local energy advisors support the public, companies, and other organisations by providing information, guidance and support for energy efficiency measures. There are also larger regional energy offices who receive regional financial support for their activities. The purpose of the local and regional energy efficiency support is to utilise the understanding of local conditions and also promote ease of access to the energy efficiency information. In addition, SEA supports networking between all energy efficiency actors in Sweden, and networking between the municipal advisors in particular.

lighting, and heating), internal transportation and other industry-specific equipment have to be included. (STEMFS, 2010).

¹¹⁵ Energimyndigheten (2010)

¹¹⁶ Björkman (2013).

¹¹⁷ Energimyndigheten (2013).

4.4.4 Results

The goals which have been set up for the PFE program are followed-up mainly on a national level. Sector follow-up is only done if there is an existing co-operation network. One example of a sector with a co-operation network is pulp- and paper manufacturing.¹¹⁸

During the first five year period 2004–2009 the PFE program led to a reduction of 1.45 TWh in electricity consumption. 65% of the savings came from the pulp and paper manufacturing sector. Other sectors represented are mining and ore production (12%), plastics and chemicals manufacturing (9%), steel and metals (5%) and food and beverage sector (3%). In addition to the direct energy savings measures which have been implemented, the companies have reported savings of 174 GWh by following improved procedures when undertaking planning activities, modifications and renovations. It has been estimated that improved procedures for the purchase of electrical equipment have led to 36 GWh in savings.¹¹⁹

The program has led to considerable work being done in reducing energy consumption in other areas of operations than those directly targeted by the program. Many companies have for instance carried out fuel- and heating efficiency improvements and increased their consumption of renewable energy.

A total of 15 MEUR in energy tax reductions were granted in the first period.¹²⁰ The cost for the implemented energy savings has been estimated to be 0.09 EUR/kWh for solely electricity related measures.¹²¹

Several studies and feedback from the interviews have pointed out that a lack of ownership of the energy savings issue and lack of management interest is a barrier for implementing energy efficiency measures. The existence of a management system required by the PFE program seems to address this barrier. Additionally, the structured way of working seems to promote an approach where energy savings are also considered in other areas of operations than those directly within the scope of the PFE.¹²²

The strength of the PFE initiative seems to be that in addition to promoting a structured way of working with energy efficiency, it also

¹¹⁸ Björkman (2013).

¹¹⁹ Energy Savings Agency (2009).

¹²⁰ Energy Savings Agency (2009).

¹²¹ Thollander P, Rohdin, P, Danestig M (2007).

¹²² Björkman (2013).

gives direct economic signals to management and to owners of the participating companies. The savings, which can be reached, are easy to calculate and are very predictable, provided that the production of the company is not too prone to fluctuations. This has been seen as an advantage of the program and is a particular benefit for management.¹²³

4.5 Iceland

The situation in Iceland differs from the situation in the other Nordic countries. In Iceland, mostly renewable energy is used for heating and electricity production. Iceland has an abundance of renewable energy in the form of geothermal energy and hydro power. Additionally, Iceland is not connected to the grid of any other country, which means that energy can't be transported outside of Iceland. This has led to a situation where energy prices have remained low. The low energy prices have not given a strong incentive for saving energy for economic reasons. These factors have contributed to a situation where neither the general public nor private companies currently see environmental or financial benefits in energy efficiency improvement.¹²⁴

The work of the Icelandic Energy Agency has primarily focused on reducing the use of fossil fuels in the transport sector. Some efforts have also been directed towards promoting the use of geothermal energy for heating in those households which still use electricity for heating and which receive subsidies from the government for covering costs. The Icelandic Energy Agency provides information on energy efficiency, but in general there is little activity in this area. There are currently no specific incentives to promote energy efficiency in SMEs other than general information provision.¹²⁵

Despite the unique situation in Iceland, the Energy Agency has identified two reasons why electricity should be saved. One reason is the actual cost savings that can be achieved with reduced electricity consumption which can benefit companies and their bottom line directly. Another reason is that the low price of electricity and heat is one reason why foreign investors are interested in Iceland. Promoting energy efficiency contributes to keeping prices at a low level. Foreign investments into

¹²³ Björkman (2013).

¹²⁴ Fridleifson (2013).

¹²⁵ Fridleifson (2013).

energy intensive production may be attracted if electricity prices remain relatively low. This can potentially result in higher consumption and other unwanted environmental impacts. Electricity is considered a commodity which should be reserved only for specific purposes where electricity use is the only alternative where it can't be replaced by geothermal or other renewable energy.¹²⁶

In a workshop held in November, workshop participants called for new incentives to promote energy efficiency in SMEs. An energy management system geared towards SMEs, which was presented by Icelandic Standards, was seen to have good potential.

4.6 Synthesis of Nordic policy instruments

There are no two countries in the Nordic region with the same system for promoting energy efficiency. However, the practical level and policy level measures for improving energy efficiency can be similar since many of the barriers for implementing measures in SMEs are similar.¹²⁷

Countries differ in what kind of financial support is granted for energy efficiency initiatives and in the requirements and obligations placed on the party responsible for the energy efficiency measures. There are differences in the way in which financial incentive systems are funded and in whether increasing energy efficiency is voluntary or not. Common for the countries is that the main focus so far has been on energy intensive industry and on consumers – less so on SMEs.

In general the SME segment is perceived as having a great deal of potential for energy savings. For instance in Sweden it has been estimated that the largest 100 SMEs account for 70% of the energy consumption. However, promoting energy efficiency in different types of SMEs is considered challenging. The companies are hard to reach because of their sheer number. The companies lack resources – both personnel and funds. They are heterogeneous with different production processes and facilities. Motivation can also be hard to find. This poses challenges for the energy agencies and other stakeholders trying to promote energy efficiency and for policy makers when incentive schemes are designed.

¹²⁶ Fridleifson (2013).

¹²⁷ However, Iceland is an exception. There also the barriers for promoting energy efficiency differ and the way of thinking is quite different because of the energy production system, which is solely based on domestic and moreover renewable energy.

4.6.1 Voluntary energy savings agreements

The programs and policy instruments, which aim to promote energy efficiency in SMEs, are generally run or supported by public energy agencies. These are Enova in Norway, Motiva Oy in Finland, the Swedish Energy Agency in Sweden, the Energy Agency Iceland and the Danish Energy Agency. The Danish, Finnish and Swedish agencies administer what could in most cases be called voluntary energy savings agreements. These agreements are often connected to different types of financial incentives, which target companies directly. Table 7 gives an overview of the voluntary energy savings agreements, which exist in Denmark, Sweden and Finland.

Table 7: Overview of voluntary energy savings agreements

	Denmark	Finland	Sweden
Agreement	Voluntary energy savings agreement for energy intensive companies	Voluntary energy savings agreements with industry associations – companies can join the agreement	Program for Improving Energy Efficiency (PFE)
Financial incentives	Lower energy related tax. Size of reduction depends on sector and if a process is considered “heavy” or “light”	Participants are eligible for investment support for energy efficiency measures and financial support for energy audits	Exemption from energy tax 0.5 EUR/MWh for energy intensive manufacturing industry mainly
Requirements	ISO 50001 certified EMS, energy audit and in depth investigation of potential measures, investments into profitable measures	Depends on sector agreement. Review energy use, yearly progress reporting, strive to improve energy efficiency, consider energy in acquisitions, training of personnel etc.	ISO 50001 certified EMS, energy audit, reporting, implementing profitable measures
Main target group	Companies with energy intensive processes, may include some SMEs	Energy intensive industry, also SMEs	Energy intensive manufacturing industry, also SMEs

One of the key benefits of the voluntary energy savings agreements is that they generally mandate a systematic approach to energy efficiency. In Sweden and Denmark it is mandatory to have a certified EMS in order to receive a tax reduction linked to the agreement. Having an energy management system is very effective in lifting the status of energy efficiency as a topic within a company and bringing it to management attention.

Heavy certified systems are, however, not well suited for smaller companies, which need a less cumbersome and bureaucratic tool. Models for “light” energy management systems exist which some smaller companies could easily apply. If needed, these may be upgradable to a

certified system with reasonable effort. Iceland, Denmark and Norway have recently co-operated in developing a common standard for an EMS, which is especially geared towards SMEs.^{128, 129}

4.6.2 Financial incentives

Financial incentives which aim to promote energy efficiency in the chosen sectors exist in most Nordic countries with the exception of Iceland. The financial incentives, such as tax benefits or investment support for implementing energy efficiency measures mainly target large, energy intensive companies or medium sized companies with high energy intensity. These are considered easier and more resource efficient to target i.e. having a better cost benefit ratio. These incentives have been deemed as effective in promoting energy efficiency.

A financial incentive, which targets smaller and medium sized companies, is financial support provided for energy audits and energy checks. Energy checks are lighter versions of audits especially geared towards smaller companies. Energy audits and checks are one of the most effective ways to get companies to focus on and invest in energy efficiency. An overview of the financial incentives in the Nordic countries is provided in Table 8.

¹²⁸ A draft version exists in Danish and English and is currently translated to Icelandic.

¹²⁹ Sigurdarson (2013).

Table 8: Overview of financial incentives in the Nordic countries

Target of financing	Denmark	Finland	Norway	Sweden
Energy checks	No (previously yes)	Yes, up to 50%	Yes (when part of EMS)	Up to 50 %, max 30,000 SEK
Energy audits/reviews	No (previously yes)	Yes, up to 50 %	Yes (when part of EMS)	Up to 50 %, max 30,000 SEK
Implementation of EMS			Yes	Yes
Pre-studies for energy efficiency investments	No	Yes	Yes – for implementing individual measures	No
Investment support for energy efficiency investments	Obligation scheme for utilities involves “buying” savings from customers ¹³⁰	Up to 20 %, for measures with longer payback time than 3 years	Yes, for additional costs triggered.	No
Tax incentives / lower tax rates	Varying tax rebates from energy tax for energy intensive production committed to Energy Savings Agreement	No	No	Tax rebate of 0,5 €/MWh from energy tax for companies in the PFE program

One key finding related to investment support is that a project based approach to investment support for energy efficiency measures can be cumbersome for smaller companies. Some small or medium sized companies, especially in Norway, have been calling for measures to reduce the required administration. The heavy administration is the result of an approach where individual calculations of the potential savings of specific initiatives/measures are needed. Companies would welcome changes to the program and would like “standardised” handling of some energy efficiency measures.

Standardised savings could be implemented in cases where the initiatives are relatively straightforward. One such example is the installation of a heat pump or insulation curtains for greenhouses.¹³¹ So far this type of standardised handling has been limited to the building sector in Norway. According to Enova, future plans may involve the broader application of these types of solutions, if this is deemed a good way forward. Examples of this type of approach can be found in Denmark where

¹³⁰ Average price 25-35 DK/kWh first year savings.

¹³¹ Sandbakk (2013).

standardised savings using best available technology (BAT) are provided and updated every 3 years for some basic savings measures, which can be easily standardised. An approach with standardised savings could broaden the applicability of the existing investment support programs to include smaller companies and serve to reduce administrative costs associated with a project based approach.

4.6.3 *Supporting measures*

The energy agencies of each country are also responsible for carrying out supportive measures. These are all important tools for activating SMEs regarding energy efficiency. An overview of the types of measures which currently exist in the Nordic countries is presented in Table 9.

Findings in the country workshops, interviews and other existing studies indicate that the provision of well-targeted, easy to understand information can raise awareness and serve to activate businesses, especially if combined with networking initiatives and supportive peer groups. These initiatives could address several barriers – the lack of knowledge and information as well as the lack of motivation, which keeps companies from tackling energy efficiency issues.

Table 9: Overview of supportive measures

	Denmark	Finland	Iceland	Norway	Sweden
Providing information and advice	X	X	X	X	X
Training of energy advisors/ consultants		X		X	X
Training sessions/workshops /seminars		X	X	X	X
Collecting and sharing case studies	X	X	X	X	X
Benchmarking initiatives		X		X	X
Providing check lists	X	X	X	X	X
Providing contact information of energy advisors	X	X		X	X
Networking initiative	Planned	X	X		X
Cooperation with industry associations	X	X	X	X	X

4.6.4 *Policy instruments and supporting measures aim address the barriers to energy efficiency*

Figure 7 below illustrates the way existing policy instruments aim to address the barriers to implementing energy efficiency measures. Some instruments and supporting measures target awareness raising and help with identifying opportunities. Others target the part of the energy efficiency process where energy consumption is audited or reviewed. Finally, others target the implementation of the measures. There are also overreaching policy instruments, such as voluntary energy savings

agreements or tax incentives, often combined with an energy management system, which can be seen as addressing the whole process or at least several critical steps in the process.

Figure 7: Existing policy instruments and supporting measures, which address the barriers to energy efficiency

Many of the existing supportive measures are well suited to start the process of thinking about energy efficiency and identifying existing potentials. Others help companies find ways to implement measures. However, even if quality information and support is readily available and is provided on for instance agency websites, SMEs seldom actively look for the information. This is especially true for small companies or companies which use relatively little energy.

Based on the information from the workshops, the main bottleneck in the process is the first step, where SMEs are not aware of the information provided and might not have energy efficiency on their radar at all. This is why co-operating with industry associations, creating peer groups or local networks have been identified as a good way to trigger interest. Mentored networks could guide companies through the process of identifying savings potential to implementing the energy efficiency measures. This has been a key finding in all country workshops and in most stakeholder interviews. Existing examples of how to work with

networks exist and experiences from these should be used to find effective ways of working with SMEs.

Using networks is also a key element since sufficient resources (in energy agencies) are in many cases not available to promote energy efficiency in SMEs. This is especially true for companies which are not energy intensive or are comparatively small. Most energy agencies in the Nordic countries consider co-operating with industry associations, establishing municipal networking initiatives or sector specific networking as effective. This type of approach could make it possible to reach smaller companies in a structured and efficient way.

It is important to find ways of working which take into account the particular characteristics of a sector. Sector specific co-operation could inspire through provided peer support and by enabling benchmarking with similar companies.

In addition to the issues mentioned above, some more detailed country specific observations and findings have been collated in Annex 2.

5. Conclusions and recommendations

5.1 Conclusions

Small and medium sized companies are significant contributors to energy consumption and therefore need to be encouraged to improve energy efficiency

There are two main reasons why SMEs consume a lot of energy. Firstly, there are sectors that have a large number of small companies whose combined energy consumption becomes significant. Secondly, there are some SMEs whose business requires a lot of energy although the companies otherwise are classified as SMEs. This study analysed different sectors and concluded that the following sectors have the most promising potential for further energy efficiency improvement: the manufacturing of food and beverages as well as manufacturing of chemicals, basic metals, rubber and plastic, wholesale and retail trade, accommodation and food services, and agriculture.

SMEs cannot be effectively targeted with solely uniform solutions even though many face similar barriers

While there is potential for increasing energy efficiency in all sectors, the cost for promoting energy efficiency with different types of incentives is relatively high in the SME segment compared with targeting larger energy intensive companies. As can be expected and as this study has shown, SMEs are a very heterogeneous group of companies and are therefore hard to target with uniform incentives. Even targeting SMEs in a certain sector is difficult, as micro companies can rarely benefit from a more structured approach to energy management. Based on the interviews conducted in this study, SMEs are often also more reluctant to use resources for internal development (i.e. energy efficiency improvement) compared with larger organisations. The higher the energy bill, the more benefits there are to be gained in more systematic and structured approaches to energy efficiency, and therefore, the better the cost-benefit ratio for incentives and supporting instruments.

The barriers to improving energy efficiency in SMEs are similar in the Nordic countries. However, they do differ depending on company size and on the energy intensity of the operations. The most important barriers to implementing energy efficiency measures are lack of motivation, lack of information and knowledge, no designated personnel resources, and problems with accessing capital especially for small companies. Yet even for those companies with access to capital, there may be different priorities for allocating funds and energy efficiency is not seen as a high priority for investments.

Few SMEs work systematically with energy efficiency or have an environmental management system. According to the analysis presented in the study, incentives and instruments aimed at specific sectors may not be an effective way to mobilize the SME sector, because of the large number of different instruments that would be required. For example, in wholesale and retail trade, only grocery stores that use a lot of heating and cooling could gain significant benefits from energy efficiency. Many smaller kiosks and shops are not major energy consumers. Therefore, it is not justifiable to require all SMEs in wholesale and retail trade to, for example, implement energy management systems, as a majority will not benefit from such instruments. It should be noted that actions targeted at specific consumption types can in some case be motivated. However, these should in this case target both SMEs and large companies. For example, a campaign could target energy efficiency of refrigeration in grocery stores, regardless of their size.

The current policy instruments include many elements that could help encourage SMEs, but more emphasis needs to be placed on sharing information and best practices and making sure that SMEs actually implement efficiency improvements

The programs and policy instruments, which aim to promote energy efficiency in SMEs, are generally run or supported by public energy agencies. Voluntary energy savings agreements exist, but they mainly target large companies or SMEs with energy intensive processes. Investment support is available in some countries, but also primarily targets larger companies with high energy consumption. An effective way to promote energy efficiency is the support given to energy audits and energy checks, which also target SMEs. Promotion of energy management systems has been a good way to get companies to work with energy efficiency in a structured way. Lighter versions have been developed for SMEs which serve their needs.

Many of the existing supportive measures are well suited to start the process of thinking about energy efficiency and identifying existing po-

tentials. Others help companies find ways to implement measures. However, even if quality information and support is readily available and is provided on for instance agency websites, SMEs seldom actively look for the information.

Co-operating with industry associations, creating peer groups or local networks have been identified as a good way to trigger interest. This has been a key finding in all country workshops and in most stakeholder interviews. Existing examples of how to work with networks exist and experiences from these should be used to find effective ways of working with SMEs. This type of approach could make it possible to reach smaller companies in a structured and efficient way.

Energy efficiency guidance of SMEs should be implemented into existing processes, the correct messenger chosen and getting started should be made as easy as possible

SMEs do not normally start dedicated energy efficiency projects, but energy efficiency is improved in connection with other changes that need to be carried out (e.g. replacing an old machine when it has come to the end of its life cycle). While trying to convince SMEs on the benefits of energy efficiency, it is important to find the right entrance point that interests the specific company. Normally the CEO is the person to convince, it does not help that there are others in the company who want to do it if top management is not motivated.

Guiding SMEs on aspects related to energy efficiency should be matched with existing, natural encounters with the SMEs, e.g. support provided when starting a new business, when negotiating a loan, when needing to make capital investments etc. It can also be incorporated into existing measures for promotion of trade. Attention should be paid to who is the right person/organisation to bring the message to SMEs. It needs to be a person/organisation who they listen to and trust e.g. a peer group member. Very simple examples and specific down-to-earth advice should be used to raise interest, e.g. highlighting unnecessary costs of standby consumption. Examples that show that the taken measures work in practice should be spread, otherwise SMEs will not dare to take the chance.

Good selling points for SMEs: Energy efficiency increases the bottom line and mitigates the risks of raised electricity and fuel prices

In addition to environmental benefits, increased energy efficiency leads to reduced energy costs and improves the bottom line. This leads to increased competitiveness and possibly e.g. layoffs could be avoided. Often when energy efficiency is improved also other improvements to internal

processes are made. This leads to overall optimisation of internal processes and efficiency which then again creates competitive advantage. In the optimal case, a system of continual improvement is created. Improving energy efficiency often leads to other positive side effects such as lengthening the lifetime of machines. Energy efficiency also limits the risks in the future and therefore also acts as a risk management tool. For example, future law changes can be anticipated and coercive means avoided. The company can anticipate rising energy prices and do sensitivity analyses about the survival of the company in case the electricity price or oil price is raised. Moreover, the supply chain demand for energy efficiency is anticipated to increase more and more due to climate change mitigation concerns.

5.2 Recommendations

This study has provided an overview of current energy efficiency in the Nordic countries and identified the most promising sectors for improvements. The barriers to achieving these improvements have been revealed and the current policy measures in each country have been collated and analysed. Through a series of workshops, these policy measures were evaluated and taking into account the identified barriers, a synthesis was made on which policy measures are working well and which are not as effective in driving improvements in the SME segment. These analyses have resulted in a series of recommendations to enable better implementation of the Energy Efficiency Directive.

This study focuses on recommendations on actions that could be taken on Nordic level. However, due to the versatile needs of the heterogeneous SME sector, it is important to bring Nordic recommendations to the national context and implement them at the appropriate level. Therefore, it is also important to understand which measures are best handled by national energy agencies and which are more effectively implemented by municipal/regional actors. The recommendations to energy audits and implementing measures should also be directly applicable when countries consider the implementation of the Energy Efficiency Directive.

The recommendations of this study are summarized in Figure 8. In the following text, the recommendations are categorised into those that include measures that support the entire process and those that are relevant to one of the three phases of energy efficiency improvement.

Figure 8: Summary of the potential instruments tackling the existing barriers of energy efficiency in SMEs

Measures supporting the entire process

- Direct, targeted and tailored information should be provided to the correct person in the SMEs at the correct time and in the right form using multichannel communication.
 - High priority groups (energy intensive operations, low current energy efficiency) and their decision makers should be targeted, e.g. grocery stores due to their energy intensive cooling devices.¹³²

¹³² See Table 6.

- Multiple channels should be used to spread information and case studies, e.g. YouTube videos with SMEs telling about their achieved savings could be made and spread through industry associations.
- A campaign promoting and rewarding best energy efficiency SME improver could be organised. The concept for the campaign could be planned at Nordic level but localized and implemented at the industry association level in each country.
- Networks should be better structured at different levels and actively used as a way to promote energy efficiency through sharing good practices as well as listings of external help. A possible Nordic network structure is visualized in Figure 9.
 - Nordic level best practices could be shared through Nordic networks¹³³ and fed into national networks.
 - At the national level, networks of two different types should be organized and supported by national authorities: networks of industry associations and local associations,¹³⁴ These networks¹³⁵ should be mobilized and equipped to take action in order to communicate the message while meeting SMEs. Through subsectors also very small companies (bakeries, hairdressers etc.) could be reached cost efficiently. Similar SMEs could be grouped and common trainings with an energy efficiency consultant and other information sharing could be better targeted to cut costs.
 - The networks could list recommended, trustworthy external energy efficiency experts that help to facilitate the energy efficiency process.

¹³³ For example, the Nordic Council of Ministers and Nordic Innovation could communicate more with each other and with national authorities in each country.

¹³⁴ The most effective local networks should be used and these are likely to differ by country.

¹³⁵ Networks could include e.g. the following: local authorities, industry associations, subsectors and chambers of commerce.

Figure 9: Network structure

- Energy efficiency guidance in each country should be incorporated into existing encounters with SMEs.
 - Information on energy efficiency measures should be integrated into promotion of trade,¹³⁶ e.g. into existing promotional and educational¹³⁷ materials as well as into trainings and other meetings.
- It should be checked that there are no barriers for SMEs to take part in or utilize the existing policy measures.¹³⁸

The following measures target a specific stage of the energy efficiency process:

¹³⁶ E.g. Currently in Denmark, municipalities promote trade through consultants visiting SMEs to discuss different aspects of business. Energy efficiency guidance should be integrated into these visits.

¹³⁷ E.g. Information packages that advise newly established businesses on HR, accounting and purchasing.

¹³⁸ For example in Finland, in order to be able to participate in the energy efficiency agreement, the company needs to be a member of an industry association. This is often not feasible for SMEs because of the high annual membership fees of the unions. Alternatives should be developed for SMEs, e.g. not requiring industry association membership or accepting one time (vs. annual) fees for SMEs.

Identifying opportunities

- The Norwegian benchmarking tool could be used as a basis for creating a Nordic benchmarking tool.
 - The online tool enables benchmarking of energy consumption within some sectors. Widening the existing database to include data from all the Nordic countries would provide SMEs and experts with a more useful knowledge base.

Energy audits

- Small scale energy checks should be created and promoted in order to reduce costs and risks for SMEs.
 - The small scale energy check would point out the most important target areas for improvements for example by using energy bills and peer group information (indicators from similar SMEs) as information source.¹³⁹
 - Sector specific indicators could be developed comparing energy costs vs. turnover.
- Research on profitable levels of energy efficiency investments could be created to back-up assumptions.
 - Pilot projects could be financed to check if some profitable improvements can be made for example in small kiosks or in other SMEs where no improvement potential is currently assumed to exist.
- Incentives to motivate SMEs to report measures and energy savings could be created.
 - A deposit system could be implemented whereby the audit cost would include a deposit, which the SMEs would get back after reporting the required information to the relevant authority/database/organisation.

¹³⁹ It has to be noted that small scale energy checks also include some risks since it is harder to achieve benefits from very "light" checks. Therefore, it should be a standardised concept.

Implementing measures

- A standardised method of calculating energy saving potential could be created to ease access to finance. Calculation models already exist; it is just a matter of agreeing on one standard and spreading this as best practices through Nordic financing institutions.
- Governments could offer guarantees to finance institutions for funding provided for measures implemented in SMEs.
 - Current large ESCO actors are not interested working with SMEs due to the threat of SMEs going into bankruptcy. Issuing a guarantee for measures with a certain payback period would lower the risks to finance SMEs
- A public energy audit database should be established from where the performers and financiers of energy efficiency investments could see the needed measures identified in the audits.
- “Green” property maintenance or green lease contracts could be created.
 - These contracts would enable SMEs that do not own their operating premises to benefit from energy efficiency improvements implemented in the building. Green lease contracts specify how savings are allocated among building owners and lessees.

The above presented recommendations attempt to address each phase of the energy efficiency improvement process and therefore also each aspect of the requirements of the Energy Efficiency Directive. Their practical implementation in each country is likely to differ; however, this is why the suggested network approach is ever more important to avoid repetitive work or reinventing the wheel.

From this large list of recommendations, there is a handful which could benefit from implementation at the Nordic level. These include:

- Designing a concept for the energy efficiency award campaign.
- Developing a joint Nordic benchmarking tool based on the Norwegian tool.
- Reviewing the existing set of energy saving potential calculation methods and establishing a standard for this and spreading this as best practice among financing institutions.
- Developing a joint Nordic database for energy audit data – this could potentially be combined with the energy consumption benchmarking tool.

These measures would best support national level actors in each country to implement the Directive. The effective organisation between national organisations and municipal/regional/industry association levels will differ in each Nordic country. It is suggested that national energy agencies first review the recommendations and outline a suggestion on the roles that each party should take, including who should carry responsibility for each recommendation. This outline should then be confirmed with the relevant actors in each country.

While this study has identified numerous barriers to implementing the Directive, the positive outcome is that many good practices already exist. Furthermore, all parties involved in this study, which also include those stakeholders key to implementing the recommendations, were motivated to improve energy efficiency among SMEs. The potential has been widely recognised, now it is just a question of taking action.

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7. Sammanfattning

Europeiska Unionens direktiv 2012/27/EU om energieffektivisering trädde i kraft i oktober 2012, och ställer vissa krav på små och medelstora företag (SMF). Direktivet erfordrar medlemsstaterna att utarbeta program med syftet att uppmuntra SMFs till förbättring av sin energieffektivitet, dels genom befrämjande av energikartläggningar samt genom säkerställande att de i kartläggningarna rekommenderade åtgärderna genomförs. Ett samnordiskt projekt av Arbetsgruppen för energieffektivisering under det Nordiska Ministerrådet har initierats för att stödja de nordiska ländernas insatser i implementeringen av den del av direktivet som berör små och medelstora företag.

Ett av projektets målsättningar var att få ökad kunskap om hindren till energieffektivisering i små och medelstora företag. Andra målsättningar omfattade möjligheterna till hur enskilda företag skulle kunna få genomföra enhetliga lösningar inom energiledning, samt realisera lämpliga energieffektiviseringsåtgärder. Relevant information om energiförbrukning i små och medelstora företag samlades in genom en kombination av olika metoder, tex. dokumentationsgenomgångar, intervjuer och arbetsgrupper/seminarier. Informationsinsamlingen syftade till att skapa en överblick av befintliga styrmedel för att gynna framtagandet av rekommendationer samt till att stöda direktivets implementering.

SMF-sektorn som helhet förbrukar en betydande mängd energi trots att förbrukningen per företag ofta kan vara relativt låg. Med rätt åtgärder kan även SMFs bidra till ökad energieffektivisering. Även om många företag möter liknande utmaningar till energieffektivisering är enhetliga lösningar som appliceras unisont över hela brädet ofta inte effektiva. De nuvarande styrmedlen innefattar många element för att uppmuntra små och medelstora företag till högre energieffektivitet. Större vikt måste dock läggas på informationdelning och spridning av goda erfarenheter, samt säkerställande av att företagen verkligen genomför rekommenderade åtgärder. En ledstjärna i att komma i gång med energiledning är att det ska vara enkelt. Beaktandet av energifrågor bör helst integreras i företagets befintliga processer. I studien rekommenderas att tydlig, fokuserad och skräddarsydd information ges till rätta personer i företagen. Informationen bör ges i rätt form och i rätt tid. Vägledning bör integreras i befintliga möten med små och medelstora företag. Myndigheter,

organisationer och befintliga nätverk bör organiseras bättre för att möjliggöra utbyte av goda erfarenheter och information mellan olika parter och också med företag. Konstgjorda hinder får inte heller försvåra mindre företag att tillämpa och tillgodogöra sig befintliga politiska instrument.

Det föreslås att följande rekommendationer/åtgärder genomförs på nordisk nivå:

- Att utforma ett koncept/energikampanj där en utmärkelse delas ut för lyckade energieffektiviseringsinitiativ.
- Att utveckla ett nordiskt verktyg som möjliggör jämförelse av energiförbrukning och besparingspotential.
- Granska existerande metoder för beräkning av energibesparingspotentialer och etablera en standard för spridning av bästa praxis bland finansieringsinstitutioner.
- Att utveckla en gemensam nordisk databas för energikartläggningsdata - detta kunde kombineras med ett jämförelseverktyg som också möjliggör benchmarking länderna emellan.

Ovan nämnda åtgärder skulle bäst stödja respektive lands nationella aktörer i genomförandet av direktivet. Det bör dock poängteras att skillnader kommer att förekomma länderna emellan gällande hur åtgärder organiseraras i förhållande till nationella organisationer, kommunala och regionala aktörer samt industriföreningar. Det föreslås att nationella energimyndigheter studerar rekommendationerna och tar fram förslag på de olika parternas ansvar i relation till rekommendationerna och deras genomförande. Det är viktigt att rollfördelningar också diskuteras med respektive part.

Även om utredningen har identifierat ett flertal hinder för genomförandet av direktivet, är det positivt att många goda exempel redan finns. Alla parter som deltog i utredningen var mycket motiverade till små och medelstora företags effektivisering av energiförbrukning. Parterna omfattade även ett flertal intressenter som är viktiga för genomförandet av rekommendationerna. Energibesparingspotentialen är vid det här laget allmänt känd. Nu återstår bara att vidta åtgärder.

8. Appendix 1: Interviewees and workshop participants

8.1 The interviewed persons

- Anders Sand, Gartnerinæringen (Norway).
- Jorunn Vormeland Dalen, Kjøttbransjen (Norway).
- Hans Even Helgerud, Konsulent i Norsk Energi (Norway).
- Kamilla Thingvad, Danish Energy Association.
- Marit Sandbakk, Enova (Norway).
- Birgitte Brage, Danish Energy Agency (Denmark).
- Thomas Drivsholm, Danish Energy Agency (Denmark).
- Hille Hyytiä, Motiva Oy (Finland).
- Eini Lemmelä, Suomen Yrittäjät (Finland).
- Sigurður Ingi Friðleifsson, Orkustofnung (Iceland).
- Thomas Björkman, Energimyndigheten (Sweden).

8.2 Workshop attendees

Participants, Denmark 8.10.2013

- Thomas Drivsholm, Danish Energy Agency.
- Birgitte Brange, Danish Energy Agency.
- Henrik Lilja, Håndværksrådet (The Danish Federation of Small and Medium Sized Enterprises).
- Rikke Gilling, Randers kommun.
- Lene Wagner Hartmann, Furesø kommun.
- Nethe Veje Laursen, Confederation of Danish Industry.
- Tina Sommer Kristensen, Danish Energy Agency.
- Preben Aagard Nielsen, Danish Energy Association.

Participants, Finland 15.10.2013

- Patrick Frostell, Teknologiateollisuus Ry.
- Veli-Pekka Reskola, MMM.
- Risto Larmio, Motiva.
- Eini Lemmelä, Suomen Yrittäjät.
- Teemu Kettunen, HSY.
- Antti Numminen, Valonia.
- Minna Nore, Prizztech.

Participants, Sweden 17.10.2013

- Thomas Björkman, Swedish Energy Agency.
- Per Sommarin, Swerea Swecast.
- Mikael Möller, Plast & Kemiföretagen.
- Lara Kruse, Energimyndigheten.
- Filip Ekander, Energimyndigheten.
- Peter Karlsson, Indlast.
- Jenny Ivner, Energiost.
- Björn Svensby, Energimyndigheten.

Participants, Iceland 25.11.2013

- Frida Rakel Linnet, VJI Consulting.
- Bryndís Skúladóttir, Federation of industry.
- Ivar Bjömsson, Remake Electric.
- Friðrik Einarsson, Main Manager.
- Eymundur Sigurdsson, VJI Consulting.
- Francois Froment, Remake Electric.
- Sigurdur Sigurdarson, Icelandic Standards.
- Anna Sigurveig Ragnarsdóttir, UST (The Environment Agency of Iceland).
- Kolbrún Reinholdsdóttir, EFLA Engineering.
- Sövar Arn Aruson, Iceconsult.
- Gylfi Már Geirsson, Landsvirkjun.
- Hjörtur Brynjarsson, VSÓ consulting.
- Sigurður Ingi Friðleifsson, Orkustofnung.
- Helga Bardadóttir, ANR (Ministry of Industries and Innovation)
- Throstur Heltason, Mannvit.

9. Appendix 2: Country specific improvement areas

Country specific improvement areas identified in the workshops

Energy Efficiency in Small and Medium Sized Enterprises

The EU's Directive 2012/27/EU on energy efficiency obliges Member States to develop programmes to encourage small and medium sized enterprises (SMEs) to improve energy efficiency by implementing energy audits and the recommendations that stem from these audits.

This study looks at the barriers that SMEs face and the existing policy instruments in more detail and analyses which practices are working. The study concludes that SMEs cannot be effectively targeted with solely uniform solutions even within the same country and even though many of them face similar barriers. More emphasis is needed on sharing information and best practices and guiding SMEs to implement energy efficiency improvements after having identified the opportunities.

The good news is that many good practices already exist and there is potential to improve. Now it is just a question of taking action.

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