



»» CO₂ Barometer 2014
– Manufacturing Industry Edition
Rising energy costs and more
competition – drivers for investment
in energy efficiency?

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KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Rising energy costs and more competition – drivers for investment in energy efficiency?

1. Introduction and main results

Developed as part of a cooperative project of KfW Bankengruppe and the Centre for European Economic Research (ZEW), the *KfW/ZEW CO₂ Barometer* has been analysing the situation of German companies regulated under the European Union Emissions Trading Scheme (EU ETS) on an annual basis since 2009. The study's objective is to closely monitor firm behaviour in carbon markets in order to regularly provide detailed information to policy-makers, businesses and the research community. In the framework of the KfW/ZEW CO₂ Barometer, KfW Bankengruppe and the ZEW have developed a second annual survey as a complementary study that started last year: the *KfW/ZEW CO₂ Barometer – Manufacturing Industry Edition*. The aim is to shed light on recent developments in the German manufacturing industry that are driven by European climate and energy regulations and the German energy transition in particular. The study is based on a survey among German manufacturing firms. The results are presented in this report which is published subsequent to the *KfW/ZEW CO₂ Barometer – Carbon Edition*. The survey questions in the present version address energy price expectations, investment in energy efficiency and the companies' opinion on the German energy transition. These are the main results of the *KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition*:

- The majority of respondents (74%) have energy costs below 10% of total costs. Nevertheless, the importance of energy costs may increase because half of the respondents expect energy prices to increase significantly (by 10% or more) until 2020.
- The ability to pass price increases on to customers is low for 80% of respondents. The growing importance of markets outside Germany and the EU may enhance energy price competition: Currently, only a minority (14%) of responding companies of the manufacturing industry sell their main products outside Germany. However, 29% expect their most important sales markets to be global in 2020.
- Improving energy efficiency is an important option for coping with rising energy prices and additional competition. Those companies that conduct energy efficiency assessments (68% of respondents) expect their energy consumption to develop more moderately in the next five years.
- Failure to identify investment potential, long amortisation periods and high uncertainty concerning potential cost reductions are the main reasons for not investing in energy efficiency. Energy efficiency assessments that analyse investment and cost reduction potential are thus a prerequisite for investment in energy efficiency.
- Opinions on the German energy transition are quite stable in comparison to last year: More than 50% of companies list grid expansion as the biggest challenge and about

70% of respondents consider the EEG (Renewable Energy Law) levy to be the most important driver of electricity prices in the next two years.

- At least half of the respondents were using external or internal energy consulting, energy management services or services to optimise energy supply and tariffs. However, only a minority of respondents were using energy contracting. Cost savings and the analysis of energy savings potential were ranked as the most important elements of energy contracting.

The survey covered a broad range of topics addressing energy issues. About 1,100 manufacturing companies were invited to participate. In this second interview round, 73 companies responded to the questionnaire. Although the response rate of 6.6% is higher than in the first round of the *KfW/ZEW CO₂ Barometer – Manufacturing Industry Edition* last year (4.7%), the survey still cannot be considered representative. However, the results are in line with other research, e. g. Dieckhöner / Domnick / Schwartz 2014. Thus, the Manufacturing Edition gives a valid measure of the energy issues addressed.

This report compares the answers from the respondents to this survey of manufacturing companies with the answers of the survey of companies of the EU ETS – *KfW/ZEW CO₂ Barometer 2014 – Carbon Edition*. The latter are primarily energy companies or have energy-intensive production. In addition, the results of this year are compared with last year's answers. In 2013 and this year, about 70% of companies participating in the *KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition* were small and medium-sized enterprises (SMEs). Throughout this report, SMEs are defined as companies with an annual turnover of not more than EUR 50 million.

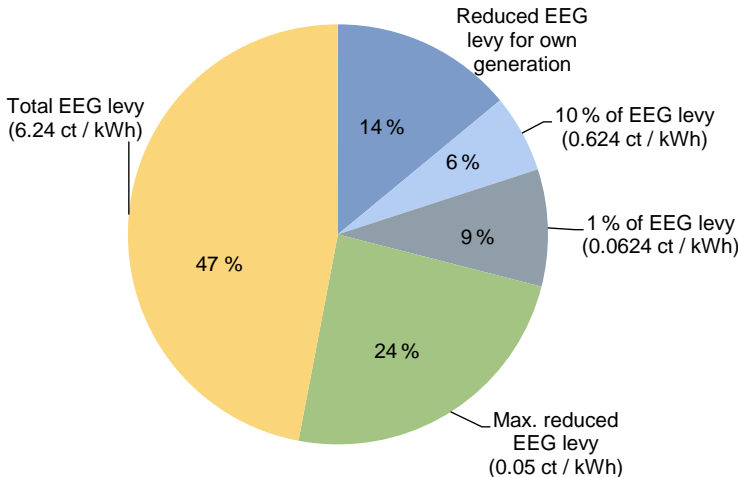
The *KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition* is structured as follows:

Section 2 gives a short review of recent regulatory and market developments. The respondents' current energy costs and expectations of energy prices as well as their assessment of their competitiveness are presented in section 3. Section 4 analyses respondents' investments in energy efficiency and renewable energy systems. Finally, companies' opinions on the German energy transition and on energy contracting are described in section 5. Section 6 concludes.

2. Recent market and policy developments

The *German energy transition* is shaping the German energy landscape and poses challenges for the industry regarding energy supply and costs. The main long-term targets until 2050 are the reduction of greenhouse gases by 80% to 95% against 1990 levels, the reduction of primary energy use by 50% relative to 2008, and lifting the share of renewables to at least 80% in electricity consumption and 60% in final energy use. This year, a reform of the German Renewable Energy Act (EEG) has come into force. New renewable energy systems receive a more market-based remuneration (market premium) instead of feed-in tariffs, and a pathway regulating the expansion of renewable energy systems has been introduced in the form of capacity caps. A tender system is to be launched from 2017 onwards to determine the remuneration of renewable energy systems in a more competitive, technology-specific tender. A first pilot tender is planned for next year (see BMWi 2014a). In addition, the exemption rules of the EEG for electricity-intensive industries that define reduced EEG levies have been adapted according to the requirements of the European Commission’s new rules on public support for environmental protection and energy (EC 2014). Accordingly, the exemption rules for industrial electricity generation have been slightly tightened. However, lower exemptions apply to only few exempted companies (Dieckhöner / Domnick 2014).

Figure 1 shows the percentages of industry exemptions in total industrial electricity consumption. Measured against total industry electricity consumption, a full EEG levy is levied on 47% of industrial electricity consumed, whereas 53% of industrial electricity consumption is exempted to a certain degree. The maximum reduced EEG levy – an EEG levy of 0.05 ct / kWh, which is even below 1% (0.0624 ct / kWh) of the full rate – is imposed on 24% of industrial electricity consumption. Nevertheless, only 4% of the companies surveyed fall under the exemption rules and 97% pay the full EEG levy of 6.24 ct / kWh (BDEW 2014). These companies must be mainly SMEs, for which the effects of electricity costs are worth analysing.

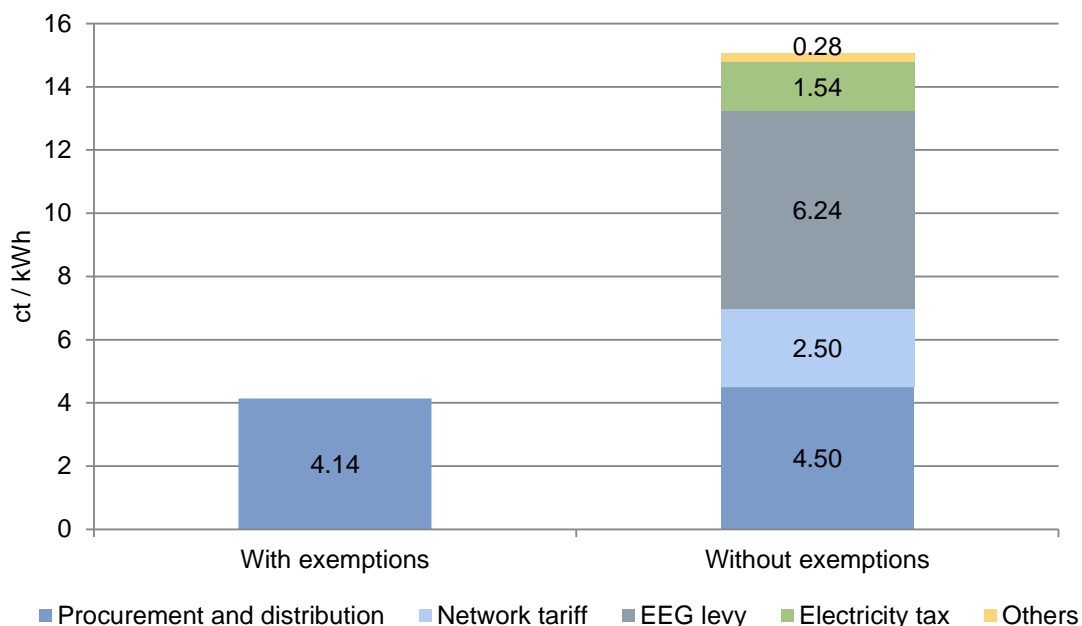


Note: These numbers refer to the mining and quarrying sector and the manufacturing industry (total electricity consumption of about 250 TWh).

Source: BDEW (2014)

Figure 1: Industrial electricity and EEG exemptions in Germany

Although the exemption rules have been adapted to focus more on relative electricity costs (as a percentage of gross value added) than on electricity consumption as before, only few SMEs still fall under the exemption rules. Now, trade intensity is a further criterion, which is easier for larger companies to meet. Figure 2 shows the difference between a company profiting from maximum exemptions (EEG and further levies) and a company with no exemptions, both being large electricity consumers. The difference can be 10 ct / kWh or even more if the non-exempted company is a small enterprise and thus has to pay even higher electricity prices.



Source: BDEW (2014)

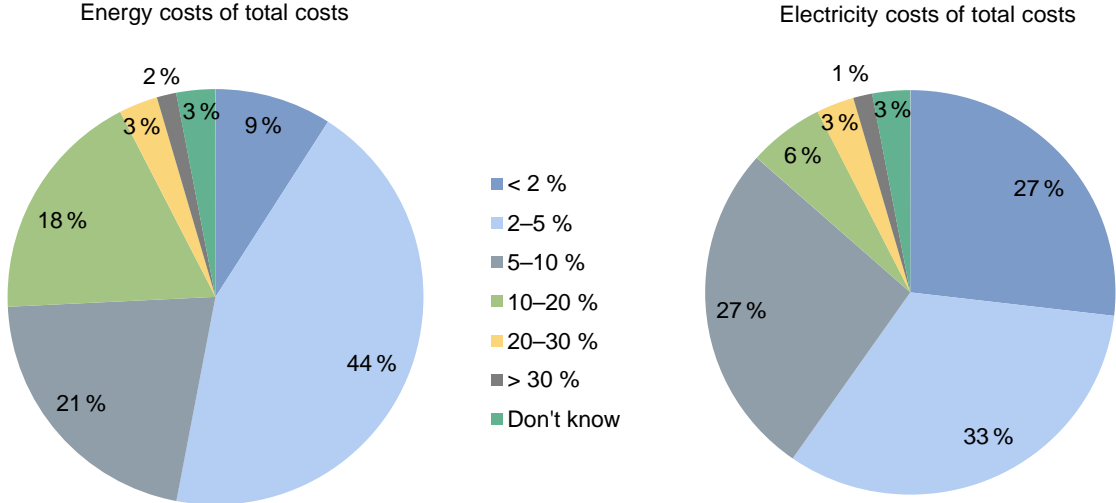
Figure 2: Industrial electricity prices for a large consumer (100 GWh / a) with and without levy exemptions in Germany

The majority, i. e. 70%, of respondents of the *KfW/ZEW CO₂ Barometer – Manufacturing Industry Edition*, were companies with an annual turnover of up to EUR 50 million, which will be referred to as SMEs throughout the report. Forty-two per cent of respondents had some exemptions from electricity tax but only around 6% could benefit from EEG exemptions.

The development of electricity prices, which are significantly determined by taxes and levies, as well as prices of other energy carriers (especially gas prices) drives industrial energy costs and hence is expected to have a major impact on competitiveness, but also on investment in energy efficiency. The manufacturing companies interviewed for this edition of the *KfW/ZEW CO₂ Barometer* were asked a variety of questions on these topics as well as on their opinion about the German energy transition.

3. Energy costs and competitiveness

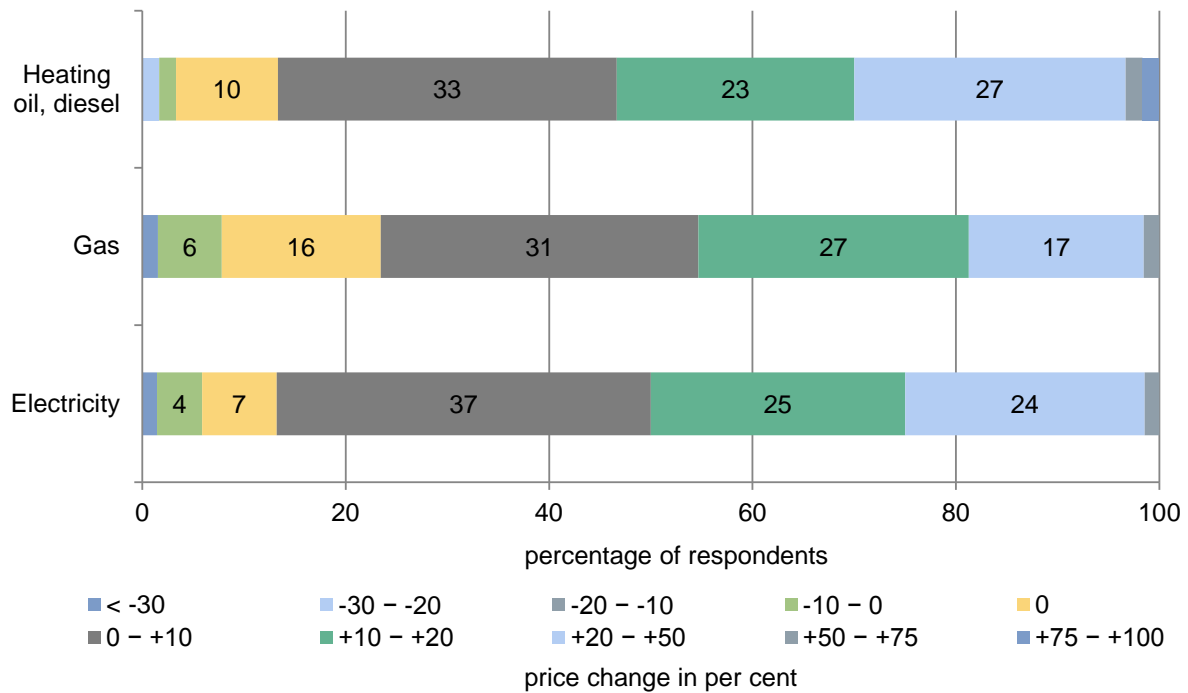
Energy costs range between 1% and 7% of gross production value in the German manufacturing industry, with an average share of 2% (BMW 2014b). The special issue of the *KfW SME Panel* on energy efficiency already shows that energy costs account for a comparatively small share of total costs. Energy costs are below 10% of total costs for 80% of the companies (Schwartz / Braun 2013). Similar percentages are provided by the *KfW/ZEW CO₂ Barometer 2014*, which reported that 74% of the responding manufacturing companies have energy costs below 10% of total costs, 18% exhibit energy costs between 20% and 30% and only 8% have energy costs above 20% of total costs (see Figure 3). Electricity costs as an important part of the overall energy costs are below 10% of total costs for 87% of respondents and below 5% for 60% of respondents.



Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 3: Energy and electricity costs in per cent of total costs

Nevertheless, most companies expect significant energy price increases until 2020: 88% of respondents expect electricity price increases, 76% expect gas price increases and 86% expect oil price increases (see Figure 4). Of note is that oil prices (Brent) were still at over USD 100 per barrel at the beginning of the survey and have now fallen to below USD 80 per barrel. Strong price rises above +10% are expected by about half of respondents. Significant price increases may be a particular concern for manufacturing companies operating in international markets as they could have a significant impact on their competitiveness.

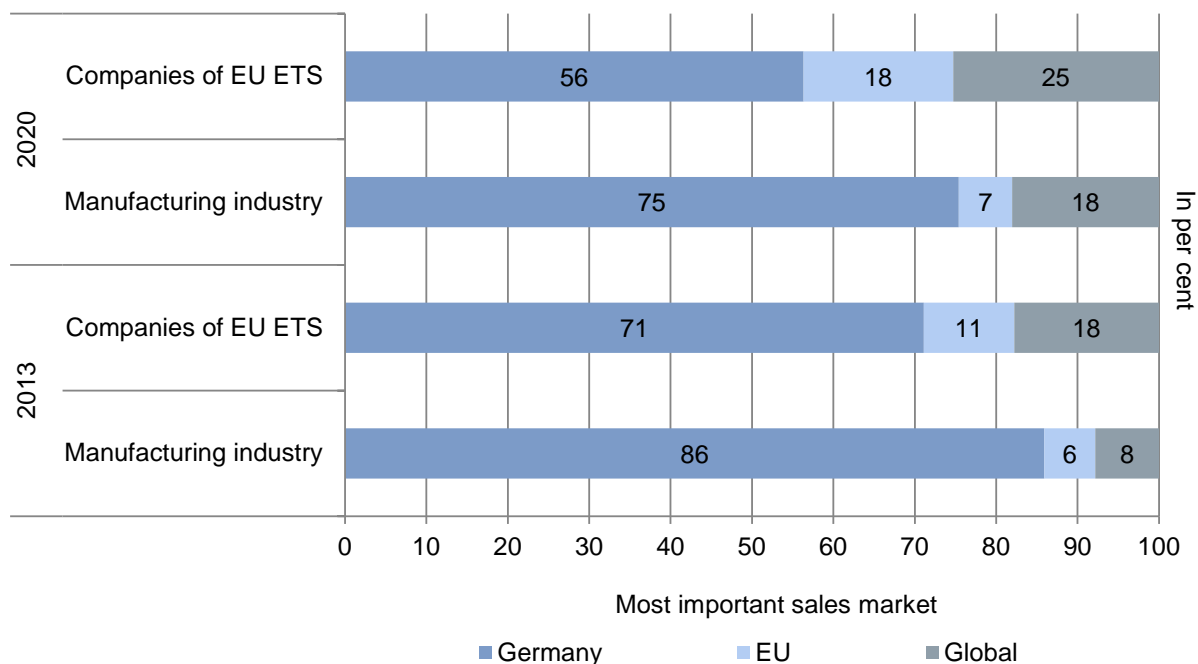


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 4: Expected price changes in percent until 2020

For the majority of the manufacturing industry respondents (86%), Germany is currently the most important sales market. More companies of the EU ETS are engaged in international sales markets, i. e. 11% in Europe and 18% globally. Both respondent groups' expectations for 2020 show a significant change towards more international sales: 25% of manufacturing companies expect European and world markets to be the most important sales markets in 2020 and almost half the ETS companies expect major sales to be international. These companies' additional global activity increases the importance of relative energy prices and may affect their competitiveness.



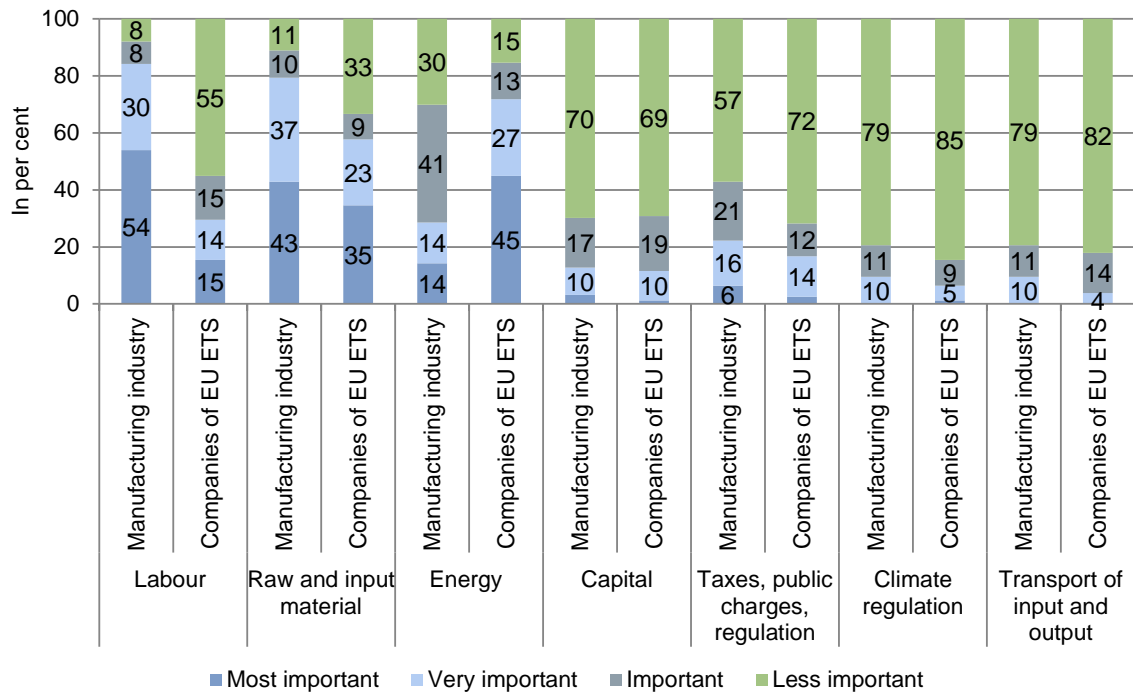
Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled. Companies of the EU ETS were interviewed in the KfW/ZEW CO₂ Barometer 2014 Carbon Edition.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 5: Most important sales market in 2013 and 2020

Asked whether the price or the quality of their products creates a competitive advantage, the majority of respondents (86%) reported a quality strategy as the competitive advantage of their top-selling products. Almost 80% of respondents reported little (or very little) scope for passing on price increases to their customers. Hence, price elasticity of demand seems to be quite high in respondents' markets.

Since the scope for passing on price increases is considered to be low, cost factors are important determinants of companies' competitiveness. For most respondents labour costs, costs of raw and input materials and energy costs are the most critical (see Figure 6). However, comparing the responses from the manufacturing industry with those of ETS companies shows a significant difference between their respective assessments of these three different types of costs. Whereas 92% of manufacturing companies considered labour costs to be important for the production of their top-selling products, only 44% of ETS companies responded similarly. Costs of raw and input materials are also significantly more important for the manufacturing industry than for ETS companies. Most of the companies in the ETS are either energy companies or belong to energy-intensive industries, which explains their high estimate of the importance of energy costs. Conversely, energy costs are significantly less important than labour or input costs for companies of the manufacturing industry, which are not necessarily energy-intensive companies. Notably, taxes, charges and climate regulation are only minor cost drivers for all respondents' top-selling products, although they are significantly more important for the respondents of the manufacturing industry than for companies of the EU ETS.



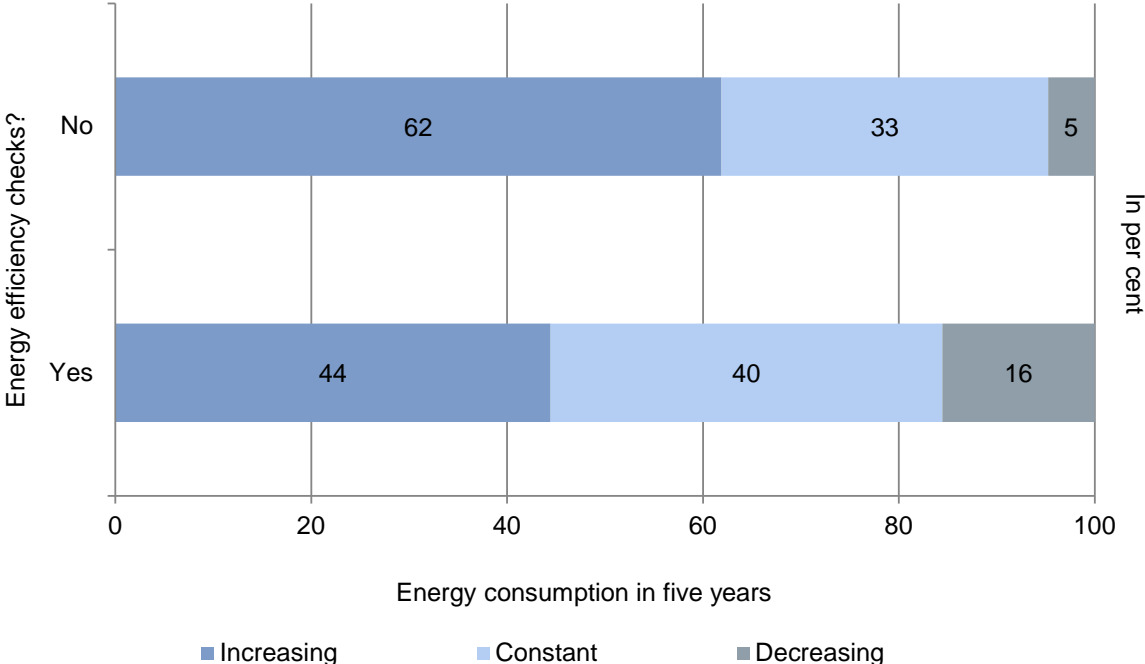
Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled. Companies of the EU ETS were interviewed in the KfW/ZEW CO₂ Barometer 2014 Carbon Edition.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 6: Which cost factors are most important for producing your best-selling product?

4. Investments in energy efficiency and renewable energy systems

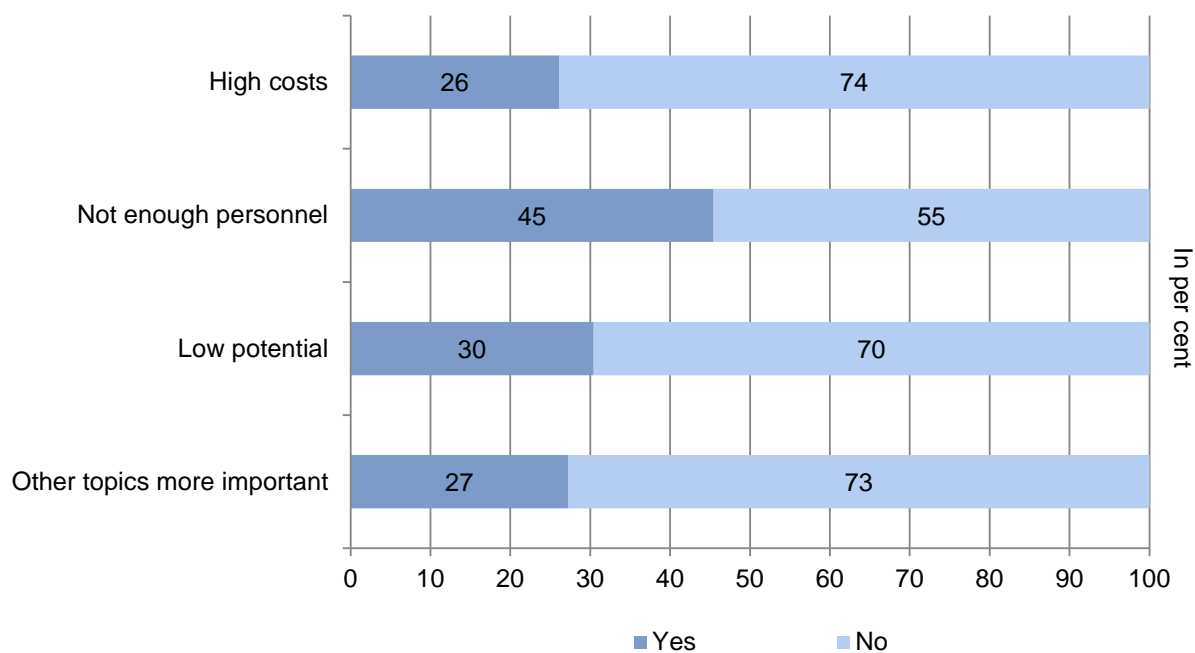
Companies could manage rising energy costs by increasing energy efficiency. Awareness of energy efficiency potential is a first step. Energy efficiency assessments have been conducted by 68% of respondents and 44% of them expect increasing energy consumption in the coming five years. A higher share of those respondents who have not conducted energy efficiency checks, 62%, expect rising energy consumption. Those companies that explore their energy efficiency potential also expect more moderate energy consumption in the next five years than those who do not conduct energy efficiency assessments. Hence, companies identifying energy efficiency potential also expect to be able to use this potential.



Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 7: Energy efficiency assessments and expectations of energy consumption

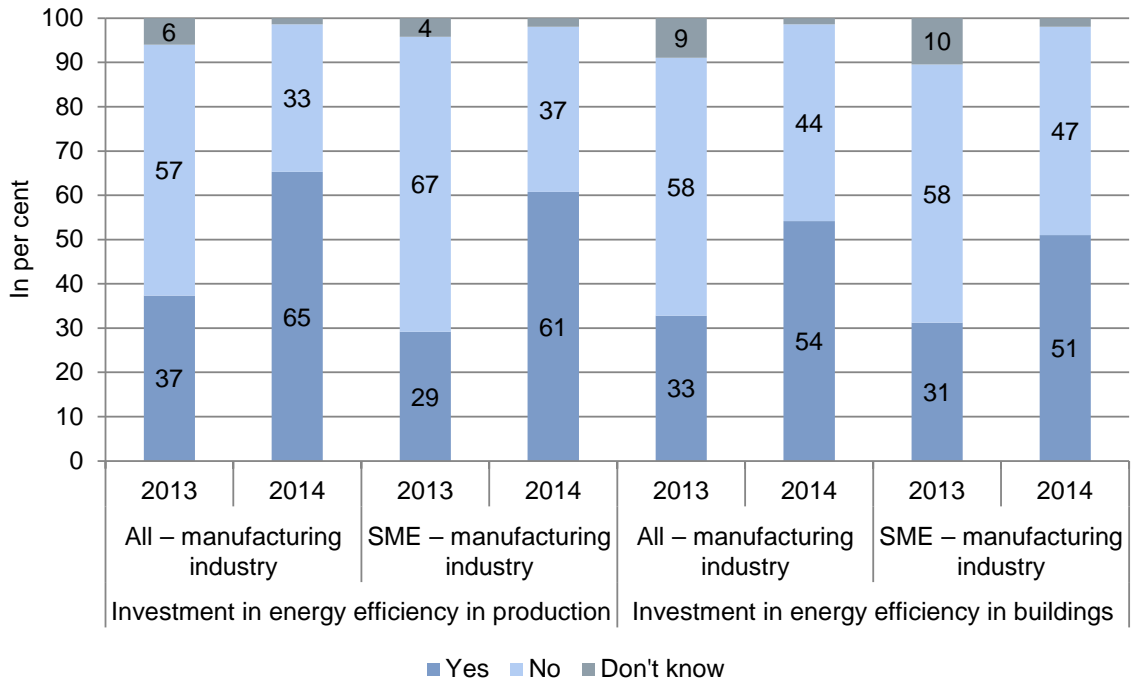
The reasons for not conducting energy efficiency assessments were diverse. A slight majority listed personnel shortages as a major barrier, but costs or expectations of low potential were further reasons. Thus, lack of resources plays an important role for those SMEs (about 70%) that replied to the survey. National implementation of the European Energy Efficiency Directive, which requires the implementation of support schemes for energy audits in SMEs, may thus be a meaningful step to enable more energy efficiency assessments. Lack of personnel, for instance, could be offset by external experts. Hence, promotion of energy consulting and contracting could be helpful. Correspondingly, one of the main advantages named by the companies making use of contracting was (external) analysis of their energy savings potential (see Figure 19).



Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 8: Why did your company not assess the potential for energy efficiency increases (production process or buildings)?

A comparison of 2014 survey results with last year's results shows that the proportion of companies investing in energy efficiency has increased significantly. Last year, 37% responded that they invested in the energy efficiency of production processes (see Figure 9). This number increased to 65% this year. The proportion of companies investing in energy efficiency in buildings has risen by 21 percentage points. The results for participating SMEs were similar. In 2013 and this year, around 70% of participating companies were SMEs, i. e. companies with an annual turnover of not more than EUR 50 million.

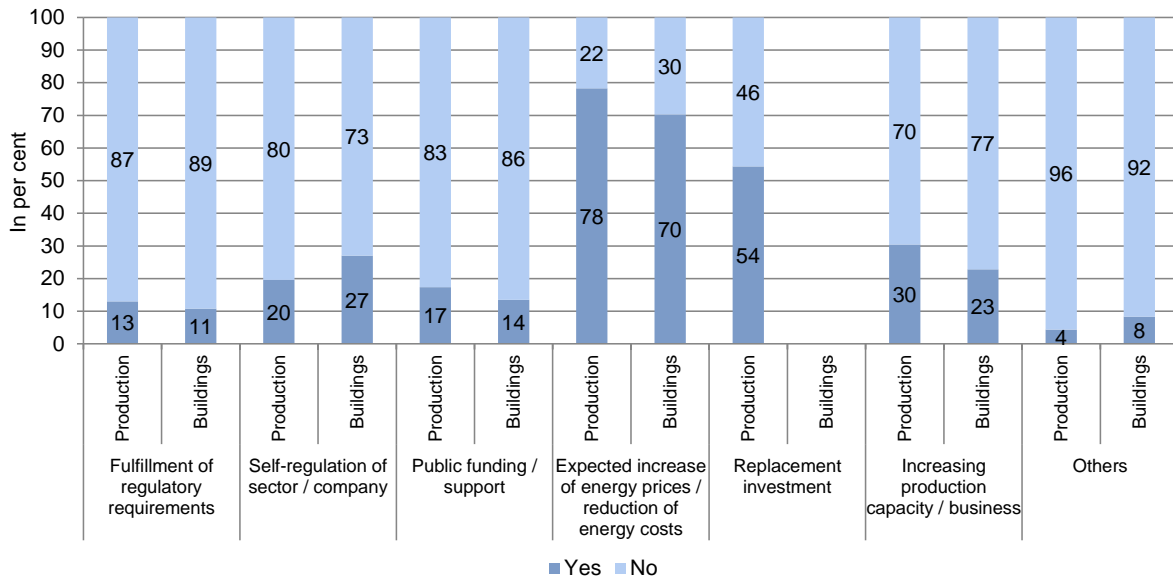


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 9: Has your company invested in energy efficiency (production process or buildings)?

The main reasons for energy efficiency investments in either production processes or buildings were expected energy price and cost increases (see Figure 10). Replacement investments in production processes also play a major role. Increasing production capacities and self-regulation are investment motives for about one fourth to one third of companies. Conversely, meeting regulatory requirements or public funding are motives for only a minority of companies. Thus, market forces in the form of energy prices and costs (including taxes etc.) were the main driver for investment in energy efficiency.



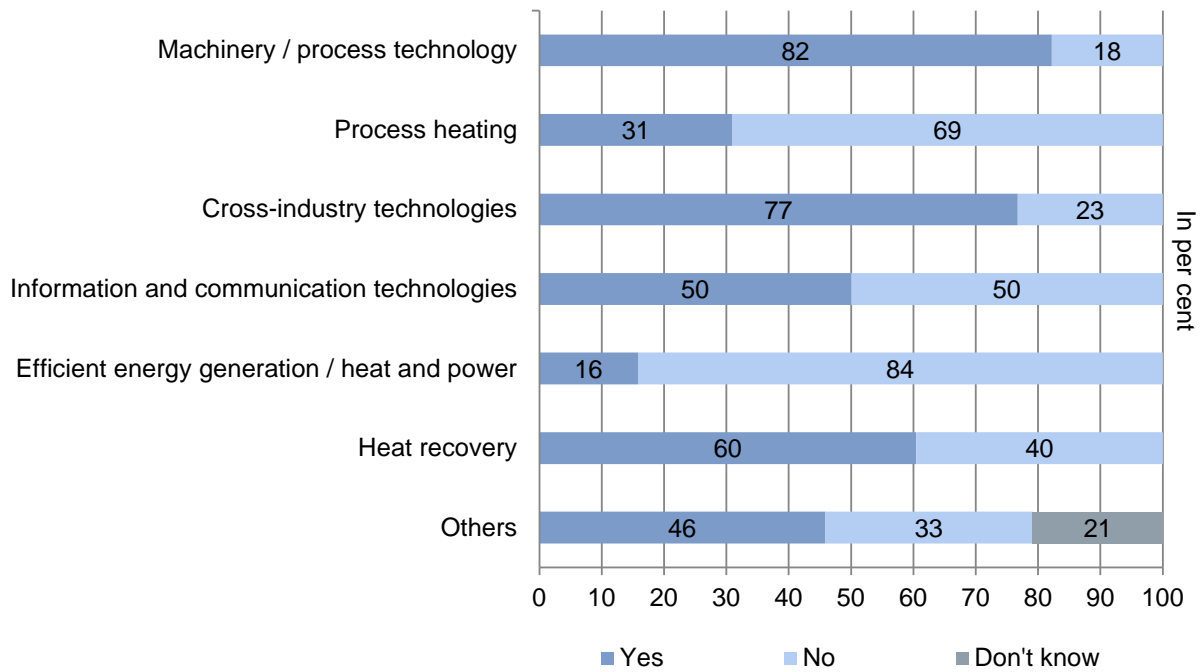
Note: No question has been asked on replacement investments in buildings. Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 10: What were the reasons for energy efficiency investments (production process or buildings)?

Most energy efficiency investments in production were investments in machinery or process technology (82%), followed by cross-industry technologies (77%) and heat recovery (60%). Investments in efficient energy generation represent only 16% of production investments (see Figure 11).

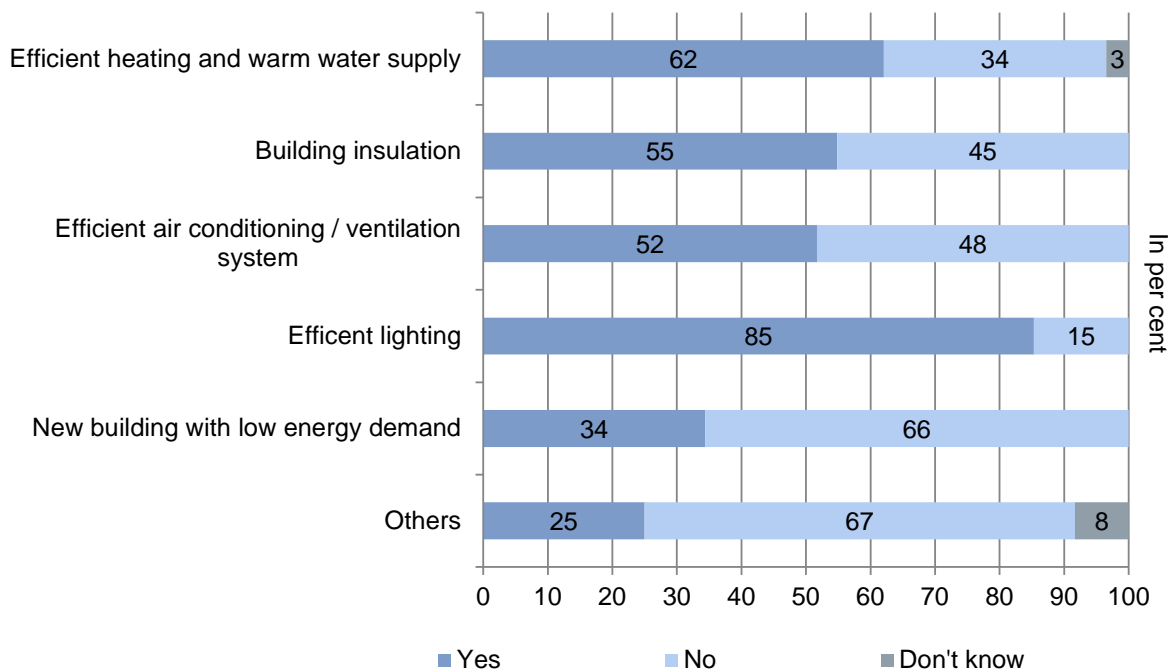
With regard to energy efficiency investments in buildings, 85% of respondents who have implemented measures have also invested in efficient lighting (see Figure 12). These are low-hanging fruits requiring low investment volumes. At least half the investing companies invested in efficient heating and warm water supply, building insulation and efficient air conditioning or ventilation systems. Hence, renovation measures in buildings are a major proportion of realised investments. New buildings only account for one third of building investments.



Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014– Manufacturing Industry Edition

Figure 11: What investments in energy efficiency (production process) has your company made?

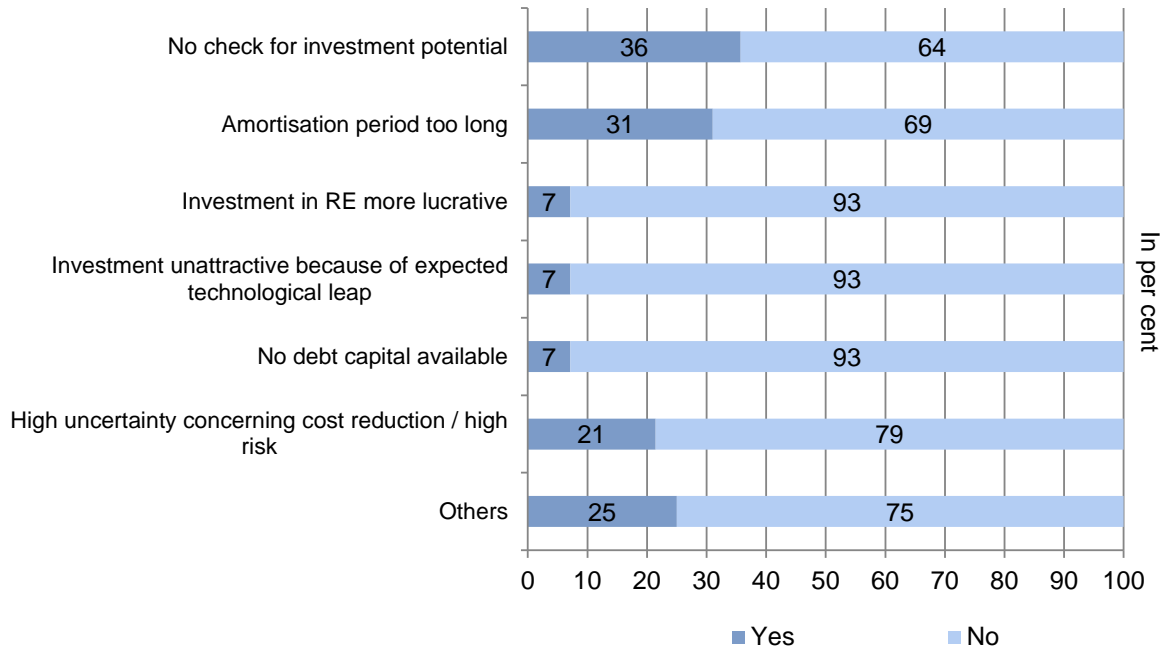


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 12: What investments in energy efficiency (building) has your company made?

The main reasons for not investing in energy efficiency were failure to assess investment potential, long amortisation periods and high uncertainty concerning potential cost reductions (see Figure 13). Energy efficiency assessments that analyse investment and cost reduction potential are thus a prerequisite for investment in energy efficiency. Other aspects such as more lucrative investments in renewable energy systems or expected technological advances that reduce the attractiveness of investments are important for only a minority of companies. Understandably, in the current low interest rate environment, debt capital availability is only a minor issue as well.

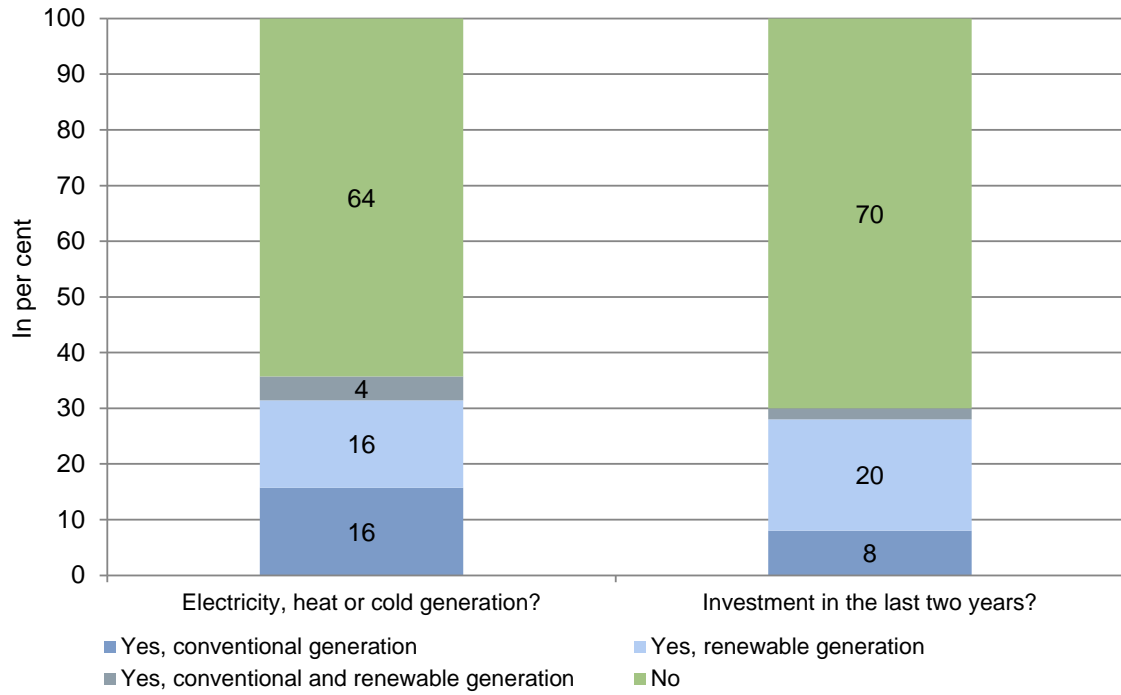


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 13: Reasons for not investing in energy efficiency

Only about one third of respondents are generating electricity, heat or cooling, of which half through renewable and half through conventional generation. The proportion of companies investing in renewable generation is more than twice as high as for conventional generation (see Figure 14).



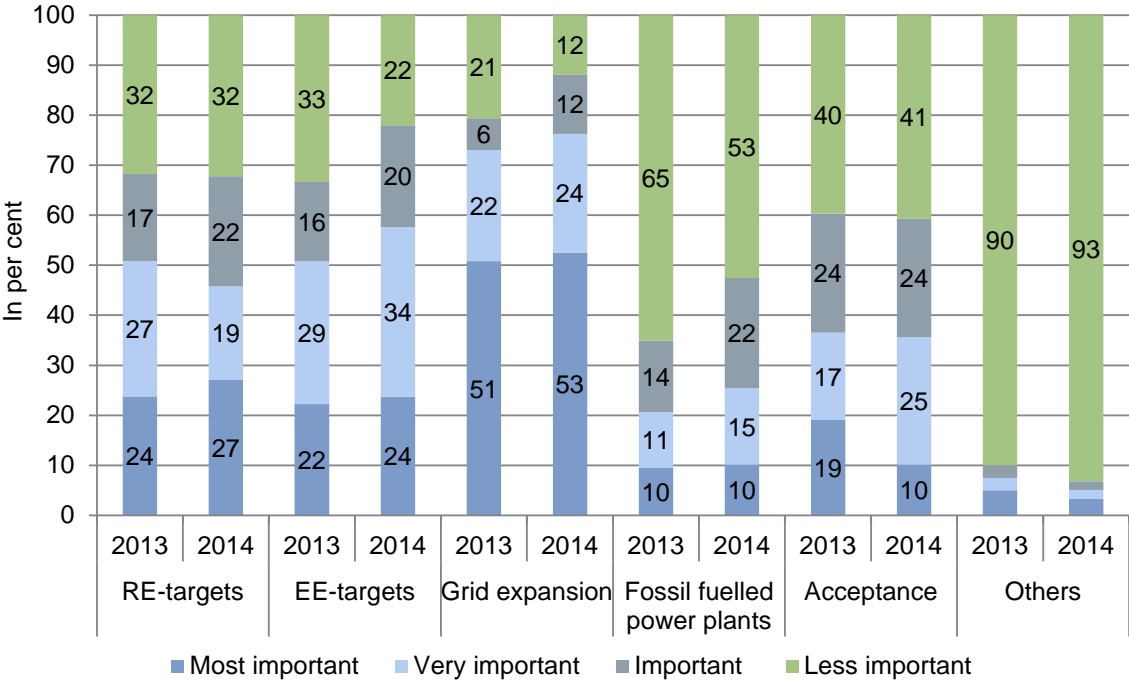
Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 14: Energy generation and investments

5. Opinions on the energy transition and energy contracting

The manufacturing companies have been surveyed again on their opinion on the German energy transition to see whether sentiments towards political targets are changing. Comparing last year's and this year's answers, it can be shown that the companies' assessments of the biggest challenges are quite stable. The majority of respondents ranked grid expansion among the most important challenges, followed by energy efficiency and renewable energy targets. The proportion of companies ranking grid expansion, energy efficiency targets and investments in fossil fuelled power plants as the three important topics has slightly increased by about 10 percentage points (see Figure 15). Grid expansion and an agreement of the German 'Länder' (federal states) on this topic, the European Energy Efficiency Directive and its national implementation as well as the issue of capacity markets for fossil fuelled power plants are major issues on the current political agenda and have obviously driven companies' ratings.

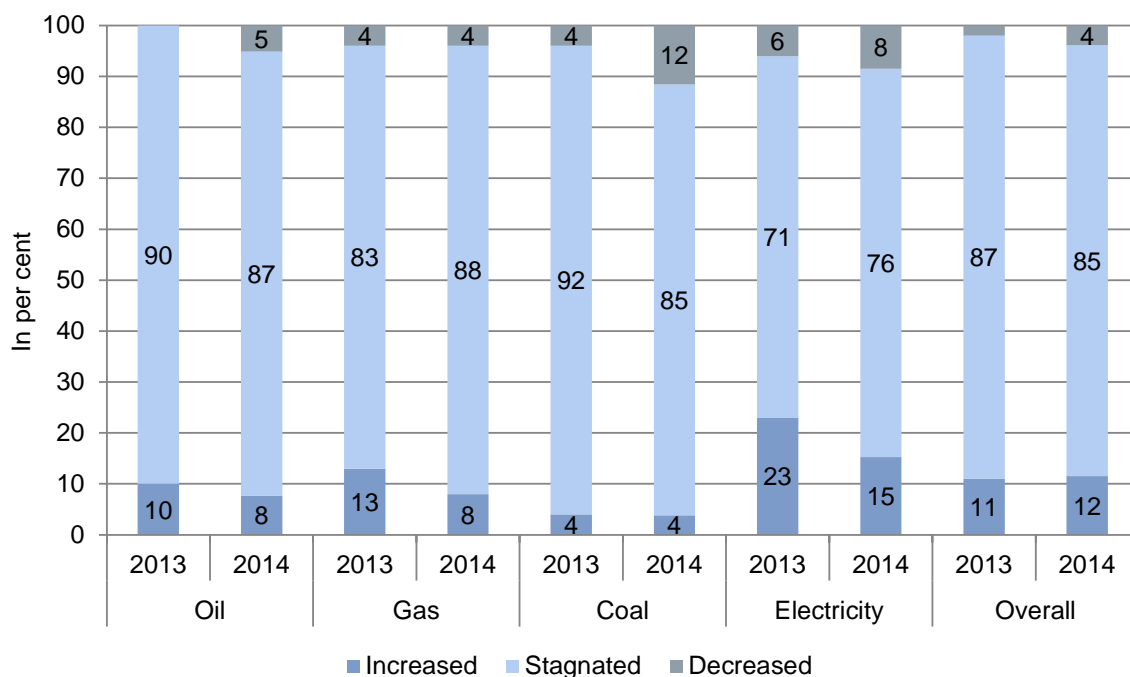


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 15: What are the biggest challenges of the energy transition?

Although grid expansion is considered the biggest challenge, electricity supply security has either stagnated or even increased in importance for 92% of respondents (see Figure 16). Overall, estimations on energy supply security have remained relatively constant in comparison to last year. Only security of coal supply has decreased slightly by 8 percentage points.

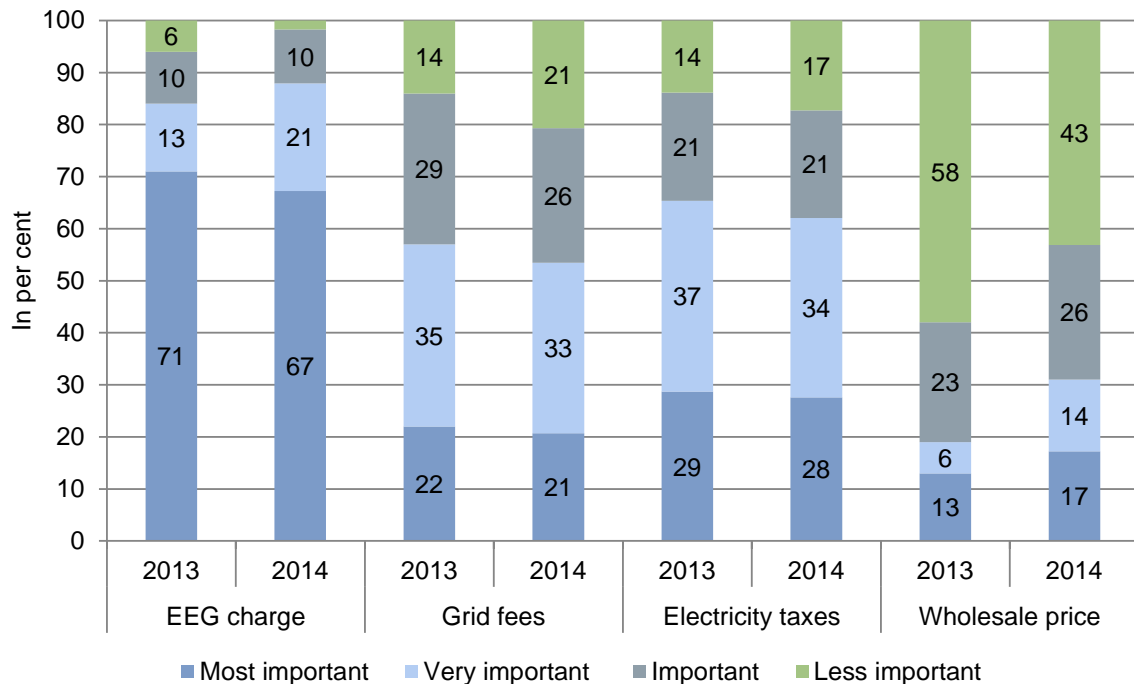


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 16: How did supply security change in your company in the last two years?

Respondents' assessments of the main drivers for electricity prices were also quite stable in comparison to last year's results. The EEG levy was expected to be the major driver for electricity prices in the next two years, followed by electricity taxes and grid fees. Wholesale prices were of comparatively minor importance. However, the proportion of companies considering wholesale prices as an important driver has increased by 15 percentage points. This is surprising as wholesale prices have been falling in the last two years.

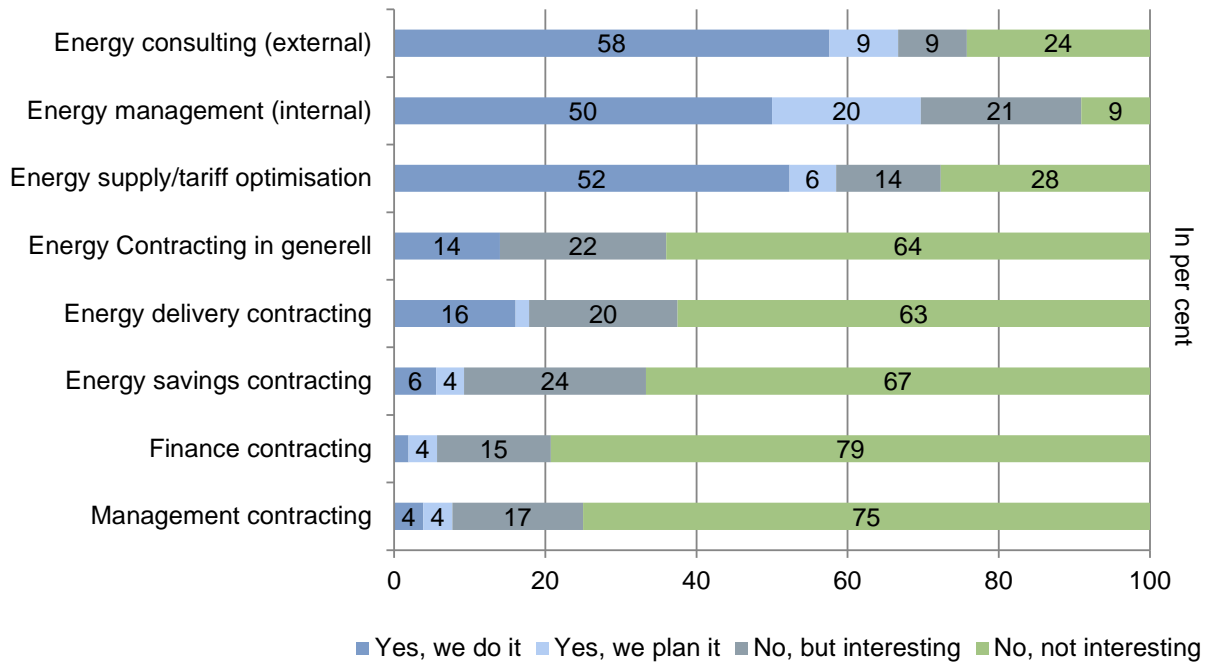


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 17: What will be the main drivers of electricity prices in the next two years?

Energy contracting is defined as the provision of energy services or supplies as well as respective system operations by a contractor. This approach could help to reduce barriers to investment in energy efficiency such as financing or information constraints. Two main basic models are energy supply and energy performance contracting. Energy supply contracting focuses on the efficient supply of energy, i. e. electricity, heat, cooling etc. Energy performance contracting aims to reduce energy consumption through the implementation of energy efficiency measures. Further services such as energy consulting are associated with energy contracting. At least half of the respondents were using external energy consulting services (58%) or services to optimise energy supply and tariffs (52%, see Figure 18). Half the companies were making use of internal energy management. However, energy contracting was only used by 14% of respondents and only a further 22% found it interesting but were not even planning to use it. Thus, only a few companies use energy delivery contracting as the main type of energy contracting. Energy savings, finance or management contracting were of less interest to the respondents. One explanation could be that it is too costly for the majority of SMEs participating in the survey. Nevertheless, energy cost reductions were of importance to all companies in the manufacturing industry irrespective of their size.

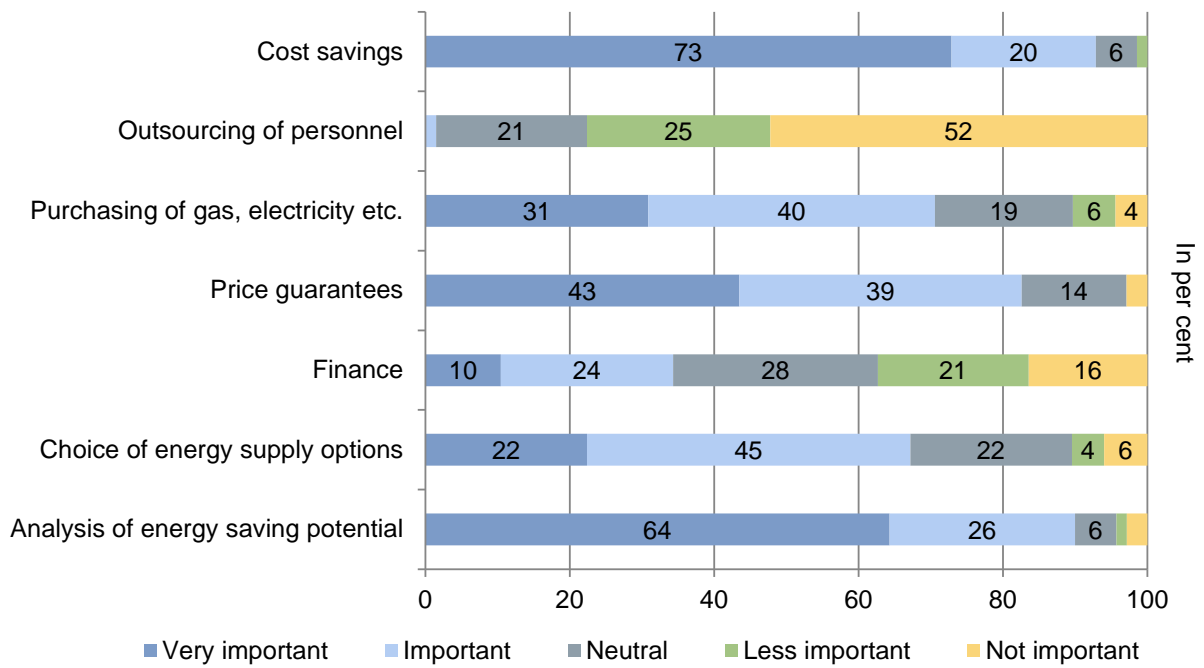


Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 18: Do you use or are you interested in energy contracting?

Although energy savings contracting was hardly being used by respondents, the analysis of energy saving potential was listed as the second most important element of contracting after cost savings (see Figure 19). Further important topics for respondents were price guarantees, electricity and gas purchasing and a choice of energy supply options. Finance or outsourcing of personnel were considered rather less important elements of energy contracting.



Note: Percentages may not add up to 100 due to rounding. Percentages below 4 are not labelled.

Source: KfW/ZEW CO₂ Barometer 2014 – Manufacturing Industry Edition

Figure 19: How important do you consider the following elements of energy contracting?

6. Conclusion

German manufacturing companies have to cope with changing energy policies and rising energy prices, which are especially high for SMEs. Although exemptions from the German EEG levy can be high, most German manufacturing companies (96%) do not fall under exemption rules. The majority of the manufacturing companies participating in the survey are SMEs (about 70%). Despite the reform to the EEG, respondents' opinions on the energy transition were quite stable relative to last year: Grid expansion was listed as the biggest challenge followed by energy efficiency and renewable energy targets. The EEG levy was considered the most important driver of energy prices. Hence, electricity prices could have a significant impact on the competitiveness of manufacturing companies, especially SMEs.

In contrast, total energy costs of most companies interviewed in the survey (74%) account for a comparatively low share of total costs (below 10%). Nevertheless, the importance of energy costs may rise as half the respondents expect significantly increasing energy prices (+10% or more) until 2020. This is not good news, as 80% of respondents feel they have limited scope for passing price increases on to customers.

Only a minority of the responding manufacturing companies consider their most important sales to be outside Germany (14%) or even outside Europe. However, the respondents expect sales in global markets to increase significantly until 2020, which will further intensify the importance of relative energy prices. Labour and input costs were listed as the most important factors for their top-selling products, followed by energy costs.

Expected energy cost increases as well as the anticipated growing importance of competitive export markets outside Germany and outside the EU may explain why more companies invested in energy efficiency in comparison to last year's respondents, whether in production processes or buildings. Reducing energy costs was ranked as the most important motivation. Thus, price signals seem to be important drivers for growing investment in energy efficiency. This is an interesting insight for all policy makers currently dealing with the reforms of the EU emissions trading system, which could send further price signals.

The main reasons given for not investing in energy efficiency were the absence of assessments of energy efficiency investment potential, long amortisation periods and high uncertainty concerning potential cost reductions. Energy efficiency assessments that analyse investment and cost reduction potentials are a prerequisite for investment in energy efficiency. Efficiency assessments are a first step to enhance competitiveness, as those companies that conduct energy efficiency assessments (68%) have a more moderate estimation of the development of their energy consumption in the next years, presumably because their assessment is followed by energy efficiency investment.

The main reason listed for *not* conducting energy efficiency assessments was lack of personnel. After all, at least half the companies use external or internal energy consulting, energy management services or services to optimise energy supply and tariffs. However, energy contracting was being used only by a minority of respondents. Cost savings and the analysis of energy savings potential were considered the most important elements of energy contracting.

In summary, the German manufacturing companies' assessment of energy price develop-

ments as well as energy efficiency assessments and investments reveal a need for further investment. Personnel shortages or cost issues are major barriers for SMEs. National implementation of the European Energy Efficiency Directive requiring public support for SMEs to conduct energy audits could be helpful to enhance energy efficiency investments. For the further progress of the energy transition, electricity price developments driven by taxes and levies (primarily the EEG levy) will be a growing challenge, especially for SMEs in an increasingly global competitive environment.

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