## **Energy Efficiency Improvement From Viewpoint of Enterprises**

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#### ABSTRACT

In response to climate change criticality, a number of policies have been implemented and imposed on all major sectors of energy production and consumption. European Green Deal policies and national climate and energy targets are leading to significant regulatory interventions that are having a major impact on the overall operations and decision-making of the companies and organizations. What do companies think about this and what is their social acceptance and attitude towards the newly imposed measures and energy efficiency? In this study, 711 companies are surveyed to determine their awareness, attitude and knowledge about climate policy and energy efficiency. The results show that company size influences overall understanding and attitudes towards climate and energy efficiency measures. The results show the most common energy efficiency measures implemented by companies that have contributed to significant energy savings. Media and emails are rated as the most common means of communication used by companies to obtain information on energy efficiency.

**Keywords:** energy efficiency, energy savings, energy policy, companies, survey, competitiveness

#### 1. INTRODUCTION

The European Union (EU) has adopted ambitious new targets to curb climate change and committed to making them legally binding through the EU Climate Change Law, adopted in June 2021 [1]. The new law, approved by member states and the EU Parliament, requires the EU to reduce its carbon emissions by at least 55% by 2030 compared to 1990 levels [2].

There are not only common EU objectives, but also specific targets to be achieved by each Member State. How countries pursue these goals is up to them. According to the EU Energy Efficiency Directive [3] one of the segments where the greatest energy savings can be achieved is through large companies (LC) and large electricity consumers (LEC) [4]. This policy measure is one of the most important instruments to make one of the biggest contributions to Latvia's national cumulative energy savings target [5].

Company engagement and understanding of the benefits that energy efficiency and climate change policies bring to business competitiveness and long-term development could lead to better achievement of nationally binding energy savings targets. Therefore, it is crucial to study the general opinion of businesses in order to assess the overall progress of energy efficiency policies and identify critical factors that require more attention from policy makers. The results of the study can be used to develop tailored and effective policy instruments for companies committed to implementing climate and energy efficiency measures [6].

#### 2. METHOD AND DATA

This study applies survey methodology to assess the attitude of the enterprises towards climate and energy efficiency policies. In total company representatives of 711 enterprises in Latvia were surveyed. The total sample size of the study represents the population of companies operating in Latvia, so the results of the study reflect the general state of energy efficiency measures and attitudes in Latvia. In order to take into account the heterogeneity between enterprises, the studied enterprises were divided into four groups according to their annual energy consumption - micro enterprises (MI), small and medium enterprises (SM), corporate (CO) and large corporate (LC). In Table 1 the consumption threshold for each group is shown. The survey was conducted using a computer-assisted telephone interview. In order to obtain competent answers, energy

Selection and peer-review under responsibility of the scientific committee of the 13<sub>th</sub> Int. Conf. on Applied Energy (ICAE2021). Copyright © 2021 ICAE

managers of the companies were interviewed. If this person was unavailable at the time or if it took time to prepare the data, a second call was made to the representative at an appropriate time. Figure 1 illustrates the main steps of the research.



Fig. 1. Research steps.

Table 1 provides an overview of the segmentation of the sample size of the surveyed companies. The distribution by segments is not even, but it represents the distribution of enterprises in Latvia.

#### Table 1

Distribution of surveyed companies by electricity consumption groups

Segment	Sample size	Consumption, MWh/annual		
Micro (MI)	401	0 – 50		
Small and medium (SM)	197	50 - 500		
Corporative (CO)	89	500 - 2000		
Large corporative (LC)	24	2000+		

The questionnaire was prepared in collaboration with industry experts and included the following categories of questions asked:

- Awareness of the EU Green Deal
- EU and national policies and energy targets
- Awareness of energy efficiency
- The most appropriate channels to get information on energy efficiency
- Implemented energy efficiency measures and achieved energy savings
- Future intentions for energy efficiency

The questionnaire was designed based on a 4-point Likert scale in which respondents were asked to rank each response from 1 (very negative) to 4 (very positive). The 4- point Likert scale eliminates the possibility of the respondent choosing a neutral or indifferent answer and therefore forces the respondent to express his or her honest opinion [7]. Survey results were processed and analyzed were using data analysis programs, which allowed to obtain segmented results and search for interlinkages and differences between different company groups.

### 3. RESULTS AND DISCUSSION

The results of the survey are summarized for each question of the questionnaire and analyzed separately for each electricity consumption group.

### 3.1 Awareness of European Green Deal

The results show that the overall level of awareness of the European Green Deal among companies can be considered as relatively low. Less than one fifth (17%) of all respondents are at least aware of the objectives of the initiative and the main action plans. However, the majority of respondents have only heard the name (38%) or know nothing at all about it (44%). The results for the question "How well informed are you about the European Green Deal?" are shown in Figure 2. The results show significant differences between the different electricity consumption groups. Awareness of the European Green Deal is higher in the small and medium enterprises (SM) and corporate (CO) company segments, while it is significantly lower in the micro enterprises (MI) segment. A higher level of knowledge about the requirements of the European Green Deal strategy is observed among large companies with an annual turnover of more than EUR 5 million.

All, n=711	6	11		38			44	
Company								
MI, n=401	5	10		38			47	
SM, n=197	1	כ	21		43	}	25	
LC, CO, n=113	10	) (	16		45		29	

■ Very well informed, I follow the news regularly

Informed about the goals of the initiative, the main actions

Has heard but knows little about it

Knows nothing about it

**Fig. 2** Results for the question "How well informed are you about the European Green Deal?"

The companies that indicated that they had heard of the European Green Deal were asked a further question. Figure 3 illustrates the results for the question "How would you evaluate your attitude towards the European Green Deal?".

Two thirds (66%) of the companies that are informed about the European Green Deal are generally more positive. Those companies that are very well informed and follow the news regularly are more likely to give a positive assessment of the objectives and main measures of the European Green Deal strategy compared to those that have only heard about it but know little about it.



Fig. 3 Results for the question "How would you evaluate your attitude towards the European Green Deal?"

In addition, the survey not only clarified companies' attitudes, but also their predictions about how much these policy goals will affect their company's future operations. Figure 4 shows the results of the question "To what extent could the European Green Deal influence the future of your company?". Almost half of the companies (49%) that are aware of the European Green Deal believe that the policy could have an impact on the future of the company. Small and medium-sized enterprises (SM) and corporate enterprises (CO) are more likely to think the policy will have an impact.

All, n=444	10	39	27	10	) 14		
Company							
MI, n=214	10	38	28	11	14		
SM, n=150	13	50		21	5 11		
LC, CO, n=80	15	51		11 5	17		
<ul> <li>Will be greatly affected</li> <li>Rather will not affect</li> <li>Can't evaluate</li> </ul>			<ul><li>Rather will affect</li><li>Will not affect at all</li></ul>				

**Fig. 4.** Results for the question "To what extent could the European Green Deal influence the future of your company?".

# 3.2 Awareness of EU and national climate and energy policy

Awareness of the European Union's and national climate and energy targets is better among companies than awareness of the European Green Deal. Figure 5 shows the results of the question "How well informed are you about the EU and national climate and energy targets?". Almost a third (32%) of companies are at least superficially informed, 37% of companies have heard of such targets but do not know much, 31% of companies know nothing at all about them. The groups of small and medium enterprises (SM) and corporates (CO) have a higher awareness of climate and energy goals. Furthermore, the results show that companies with a turnover of more than EUR 1.5 million are better informed.



■ Very well informed, follow the news regularly

- Informed on a superficial level
- He has heard but does not know much about it
- He knows nothing about it

Fig. 5. Results for the question "How well informed are you about the EU and national climate and energy targets?"

Further questions on attitudes (Figure 6) and impacts (Figure 7) of the EU climate targets and national climate targets were asked to respondents who are aware of the EU climate targets and national climate targets. The majority (69%) of companies that are aware of these objectives are generally positive. Public sector entities are more likely to give a positive assessment than private sector companies.



Fig. 6. Results for the question "How would you evaluate your attitude towards the EU and national climate and energy targets?"

Just over half (52%) of institutions that are aware of climate and energy targets believe they could have an impact on the future of the organization. This effect is more pronounced among companies in the small and medium enterprises (SM) and corporate (CO) segments. More than half, or 56%, of companies believe that the requirements for companies to meet energy efficiency obligations are positive but cause difficulties. However, 29% have the opposite opinion, these companies evaluate the requirements themselves positively and do not see any difficulties in meeting them. But 11% have a negative opinion because of the difficulties.

All, n=533	11	4	1	29		11	7
Company							
MI, n=273	11	39	Ð	30		12	7
SM, n=164	13		57		17	4	8
LC, CO, n=96	22	2	53	3	1	8	<mark>4</mark> 4
<ul> <li>Will be greatly affected</li> <li>Rather will affect</li> <li>Will not affect</li> <li>Will not affect at all</li> </ul>							

**Fig. 7.** Results for the question "To what extent could the EU's and national climate and energy targets influence the future of your institution?".

### 3.3 Awareness of energy efficiency

Can't evaluate

Figure 8 illustrates the results for the question "How would you rate your knowledge of energy efficiency?". 61% of companies and institutions rate their knowledge of energy efficiency as good, but 39% rate it as rather poor. Corporate companies (CO) are more confident about their knowledge. Those companies that are aware of both the European Green Deal and the EU and national climate targets are more likely to report that they are generally well informed about energy efficiency.



**Fig. 8.** Results for the question "How would you rate your knowledge of energy efficiency?"

## 3.4 The most suitable channels for receiving information about energy efficiency

Since information is one of the means of informing companies and getting them to implement energy

efficiency measures, the survey also asked about the most appropriate channels for obtaining information. Figure 9 illustrates the results for the question "Which of these channels do you prefer to use to get information about energy efficiency?". The results show that receiving information via email is by far the most appropriate way to receive information about energy efficiency. Corporate segment companies (CO) use the media less to obtain information than smaller companies, but prefer seminars, webinars, individual consultations, and industry conferences on energy efficiency.





# 3.5 Implemented energy efficiency measures and achieved energy savings

Figure 10 illustrates the energy efficiency measures implemented by the companies. The most common measures to improve energy efficiency in all three company segments are modernizing lighting and improving the thermal insulation of buildings. The results are consisted with a study by [8] that analyzed results of national energy audit program in Latvia. The results for the implementation of other energy efficiency measures were more spread across the different company groups. Implementation of energy efficiency measures is on average 2 times more frequent among large electricity consumers compared to micro enterprises (MI) and small and medium enterprises (SM).

After identifying the energy efficiency measures taken, the company representatives were asked about

the energy savings achieved, as shown in Figure 11. When analyzing the savings achieved in the segment of micro companies (MI), 48% of the company representatives admit that they cannot name the savings achieved, while about 14% of the companies admit that the savings are more than 20%. There are a similar number of companies in the small and medium companies' segment where it is difficult to state the savings achieved - 47%. The majority (32%) of small and medium-sized enterprises (SM) reported energy savings in the range of 1% to 10%, while only 9% of enterprises achieved savings of more than 20%. In the LC and CO segment, only 30% of the companies admit that they cannot name the achieved savings and most of the companies state that the savings are between 1-5% (24%) and 6-10% (19%). Only 2% of the representatives of LC and CO answered that there were no savings from the measures taken.



All, n=711 MI, n=401 SM, n=197 LC, CO, n=113

Fig. 10. Results for the question "What has your company done to improve energy efficiency?"

Almost half of the companies that have implemented one of the energy efficiency measures say that the economic benefits have already been felt, while 34% believe that the benefits will be felt over time, while 13% say that the planned economic benefits have not been achieved.



Fig. 11. Results for the question "What energy savings do you think have been achieved due to implementation of energy efficiency measures?"

## 3.6 Planned energy efficiency measures

Figure 12 shows which additional measures the entrepreneurs intend to take in the near future to improve energy efficiency.

Lighting modernization **Building insulation Energy consumption** monitoring Improvement of the ventilation system Use more renewable energy sources Increasing the efficiency of production equipment Employee education in energy efficiency Equipping heating devices with thermostatic valves... Make more use of electric transport Another answer Hard to say / Don't know



Fig. 12. Results for the question "What does your institution plan to do to improve energy efficiency in the near future?"

Looking at the results of the planned energy efficiency measures, it can be seen that they are similar to the measures already taken. However, the need for energy monitoring and the interest in using renewable energy sources are more evident. LC and CO select lighting modernization, energy monitoring,

building insulation and employee training as potential measures. This confirms that companies in the largest electricity consumption segment see the potential and benefits of implementing energy efficiency measures.

#### 4. CONCLUSIONS

This study investigated the awareness and attitudes towards energy efficiency and climate policies of 711 companies and organizations operating in Latvia. The results show that the larger the company, the better informed it is about international climate policy and energy targets. In general, the majority of companies have a positive attitude (66%) towards the European Green Deal policy, but 16% of respondents have a negative attitude. The percentage of companies that have a negative attitude towards the European Green Deal is higher among micro companies (17%) than among large corporates (10%). Half of the companies that are aware of the European Green Deal policy and the EU and national climate and energy targets believe that they will significantly influence the company's future activities and decisions.

Large corporates are more confident about their knowledge on energy efficiency compared with smaller enterprises. Media information and e-mails are the most important sources of advice for companies and institutions on the subject of energy efficiency. Large companies tend to use more diverse information tools such as participation in seminars, webinars, conferences and individual consultations on energy efficiency.

Lighting modernization and building insulation are the most common energy efficiency measures implemented by the companies. Other measures such as improving the ventilation system and heating systems, monitoring energy consumption, increasing the efficiency of production equipment and training employees are more likely to be carried out by large companies. This can be partly explained by the fact that large companies may have better access to capital to finance energy efficiency measures. One fifth of the companies (20%) report that energy efficiency measures have led to energy savings of up to 10% in the companies, 13% report energy savings of up to 20%, 7% up to 30% and 7% over 30%.

In general, companies show a strong interest in energy efficiency and plan to continuously work on improving energy efficiency in the company. Lighting modernisation, building insulation and energy consumption monitoring are among the most popular energy efficiency measures that companies plan to implement in the near future.

#### ACKNOWLEDGEMENT

This research is funded by the Ministry of Economics of the Republic of Latvia, project "The pathway to energy efficient future for Latvia (EnergyPath)", project No. VPP-EM-EE-2018/1-0006.

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