

EU-MORE



**European Motor
REnovation initiative**

Motor Policy Review

Review of past and existing policy options for the acceleration of electric motor renovation

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List of Acronyms

Text	Text
EE	Energy Efficiency
EED	Energy Efficiency Directive
EEM	Energy Efficiency Measure
EMS	Energy Management System
ESM	Energy Saving Measure
EU	European Union
IE	International Efficiency standards for motors
MS	Member States
NEB	Non-Energy Benefits
NECP	National Energy and Climate Plans
SME	Small and Medium Enterprises
VSD	Variable Speed Drive



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Executive Summary

Electric motors for industrial applications have the tendency to stay in service longer than their expected lifetime and be replaced only at their end-of-life, limiting the benefits of the higher efficiency of new motors. The EU-MORE project aims to capture the benefits of accelerating the replacement rate of old, inefficient motors through the development of new policies. To accomplish this, a review of past and existing policies targeting industrial electric motors has been conducted for 27 European Member States. The review encompasses 64 policy measures targeting directly and indirectly the early replacement of motors as a measure to improve energy efficiency in industries. Each policy measure is presented with a short description, responsible authority, status, issue date, start date, end date, duration, and reference to the official publication. Additionally, a preliminary estimation of the impact of the analysed measures has been conducted.

The review methodology is based on the contribution of several country experts able to provide a high-level perspective on the national policies under exam.

The results show a strong predominance of financial measures, mostly subsidies and loans (or combinations of them), followed by mandatory standards, fiscal measures and voluntary agreements. The review highlighted a very low implementation of measures targeting trainings and information, particularly relevant for industrial SMEs. On a national level, Germany resulted the country with the highest number of measures involving electric motors, followed by Austria. Very few national policies include systemic approaches to motor systems (i.e. including the overall supply of motive power as well as the demand side for motive power), which generate usually the highest energy savings, as evidenced from case studies.

The report is complemented by an in-depth presentation of measures directly targeting industrial electric motors across the Member States.



1. Introduction

1.1 The EUROpean MOtor RENovation initiative (EU-MORE)

The EUROpean MOtor RENovation initiative (EU-MORE) aims to capture the benefits of accelerating the replacement rate of old, inefficient motors through the development of new policies. The initiative, which started in October 2022, will develop tools for policy impact projection, monitoring and evaluation and promote knowledge exchange on the topic between energy efficiency policy actors at Member State, European and international level. Through these actions, the project will assist Member States (MS) to fulfil their obligations under articles 4 (Energy efficiency targets), 8-10 (Energy savings obligations and alternative measures) and 11 (Energy management systems and energy audits) of the revised Energy Efficiency Directive (EED)¹.

Electric motors have the tendency to stay in service for way longer than their intended lifetime and are typically only replaced when they reach their natural end-of-life, usually about 30-40 years, which is much longer than is typically assumed and has significant energy efficiency implications. Through swift action, the replacement rate of old motors, can be improved. In the European Union (EU), the accelerated replacement of these old electric motors would offer additional energy savings on top of the savings potential of existing regulations (which address, at first, new motors), with all the associated benefits.

An increasing awareness by policy makers, manufacturers, and industry end-users of the extent of this consumption and its associated emissions has led to the introduction of minimum energy efficiency regulations and energy-efficient technologies to meet and exceed these standards. However, penetration of these highly efficient technologies is slower than they could be because motors are often an essential part of the production process, and replacement is seen as complex, and therefore often not considered as viable Energy Saving Measure (ESM) for companies in the industry and service sectors. This issue is amplified by the fact they are often not considered in existing (national) regulation.

In 2015 53% of electricity worldwide was consumed by electric motor systems (10,700 TWh) representing 5.5 Gton CO₂eq in emissions. In 2020 electric motors and their applications represented approximately 70% (650 TWh/yr) of industry's electricity consumption in the EU27 and more than 40% (255 TWh/yr) of the service sector's electricity consumption².

In the drive to replace old motors with new efficient motor technologies, the barriers involve the identification of the total energy efficiency savings potential, the economic barriers and the lack of awareness about the co-benefits of energy efficient motors.

Potential savings are even greater when the efficiency of the entire motor system is improved. Measures addressing systems include appropriate sizing of the motor, digitalisation, proper sensorisation, eliminating unnecessary transmissions, and equipping motors with variable speed drives (VSDs) are all viable improvements and can be expected to offer further energy performance gains. Digitalisation plays an important role in maximising the potential savings resulting from motor renovation^{3 4 5}.

Last, there is the importance of efficient and sustainable use of materials. Electric motors are, for the majority, built with materials that are recyclable and have high residual value, such as cast iron, electrical steel, plain carbon steel, aluminum, and copper. Recirculating these metals and introducing automatized processes for motor recycling and remanufacturing⁶ would greatly reduce the emissions currently

¹ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2023_231_R_0001&qid=1695186598766

² https://www.iea-4e.org/wp-content/uploads/2022/06/EMSA_report_classification_2022june.pdf

³ <https://ee-ip.org/en/article/key-findings-on-digitalisation-technologies-to-increase-energy-efficiency-in-electric-motor-driven-systems-6914>

⁴ https://www.iea-4e.org/wp-content/uploads/2022/06/EMSA_report_classification_2022june.pdf

⁵ https://www.eceee.org/library/conference_proceedings/eceee_Industrial_Summer_Study/2020/4-technology-products-and-systems/digital-technologies-driving-efficiency-in-electric-motor-driven-systems/

⁶ <https://www.mdpi.com/2071-1050/13/17/9668>



associated with producing primary metals, since recycling requires less energy than producing from virgin materials.

1.2 Legislative Framework (EU/EED)

The revised Energy Efficiency Directive (EED), published in the Official Journal of the EC on 20 September 2023, significantly raises the EU's ambition on energy efficiency. The revised directive more than doubles the annual energy savings obligation (Article 8) by 2028, and therefore plays a major role for the overall transition of industry and service companies across the EU to address energy efficiency and the replacement of inefficient electric motors currently in operation.

The EED is the main driver for MS to design and implement policy measures targeting businesses and promote uptake of Energy Saving Measures (ESMs), making it binding for EU countries to collectively ensure an additional 11.7% reduction in energy demand by 2030 compared to the projections of the 2020 EU Reference Scenario (i.e. compared to the energy demand otherwise reached in the PRIMES reference projections established in 2020). As a result, overall EU energy consumption by 2030 should not exceed 992.5 million tonnes of oil equivalent (Mtoe) for primary energy and 763 Mtoe for final energy⁷. By extension, it establishes *energy efficiency first*⁸ as a fundamental principle of EU energy policy, giving it legal standing for the first time, meaning energy efficiency must be considered by EU countries in all relevant policy decisions.

The EED was first adopted in 2012, and later updated in 2018 and again in 2023 to include energy audit obligations for large, energy intensive, companies. In the latest revision ('23), all companies, regardless of their size, that are consuming energy above a certain threshold⁹ are obliged to carry out an energy audit, whereas the situation before ('18) this obligation applied only to the larger energy intensive companies which is also reflected in these observed measures in this policy review.

Although the mandatory audits increased the general consideration of electric motor upgrades for energy performance gains, it did not yet lead to significant improvements in the overall uptake and replacement by newer, higher efficiency classed (IE3 or better) motors in industry, though the mandatory standards for electric motors have largely favored the penetration of IE3 motor classes in the EU (Figure 1).

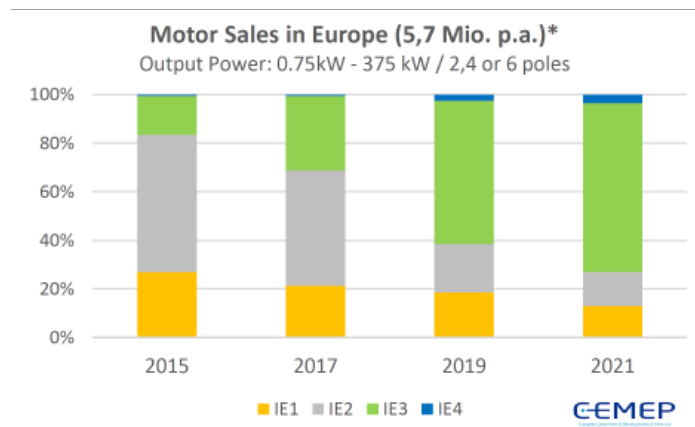


Figure 1: Sales trend of electric motors in Europe across the different efficiency classes¹⁰

What might be a reason for this is that they are seen as being too complex as they are often an essential part of the main production process, and/or too capital intensive to be considered as a viable ESM which

⁷ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en

⁸ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-first-principle_en

⁹ Enterprises with an average annual consumption higher than 10 TJ of energy over the previous three years, taking all energy carriers together, which do not implement an energy management system, are subject to an energy audit. Enterprises with an average annual consumption higher than 85 TJ of energy over the previous three years, taking all energy carriers together, shall implement an energy management system.

¹⁰ <https://cemep.eu/wp-content/uploads/2022/07/CEMEP-Motor-IE-Class-report-202207.pdf>



is often only due to lack of knowledge/competence, also at the auditor's side. This last issue is also seen by the fact that motor upgrades are often simply not included in the final energy audit report as they were simply overlooked.

The latest EED revision seeks to improve on all these aspects by making the introduction of an Energy Management Systems (EMS) a mandatory requirement for large industrial energy consumers to monitor and optimise their energy efficiency. Also, EU MS countries are now required to ensure a level of competence for auditors, aligning them with market needs and enforcing clearer and stricter requirements. Besides auditors, these competence requirements also include energy service providers, energy managers, and installers.

Part of this development is for MS to include dedicated sections for consideration of motors in the mandatory audit reports. Where the EED requires companies to complete a report every 4 years, depending on national law, some MS require more frequent reports as they have set more ambitious targets.

A critical issue that arises is the fact that only a few of the recommended ESMs coming out of the energy audit reports lead to actual actions by companies. This is typically found to be due to uncertainty of the actual savings, the long payback times, difficulties accessing finance, and the limited public incentives.¹¹

To overcome these obstacles, new measures to encourage the uptake of audit recommendations are introduced which includes voluntary agreements, (potentially) tied to financial incentives (often tax related), and obligations to implement the recommended actions with short payback time (e.g. less than three years) within a given period (e.g. 3 to 5 years).¹²

National Energy and Climate Plans

As part of the [Clean Energy for all Europeans Package](#)¹³ adopted in 2019, National Energy and Climate Plans (NECPs) outline how EU countries intend to meet the EU energy and climate targets for 2030 and provide a mid-term planning (10 years), and overview into the steps taken which includes the policy measures introduced to achieve the energy targets set.¹⁴

The first round of submissions happened early 2019, after which the commission prepared an evaluation, and give recommendations to each of the submitted proposals and communicated this in June, leading to the re-submission of the final NECPs by December 2019 – solidifying countries plans and ambitions to achieve its climate goals in the next 10 years.

EU countries were expected to submit their draft updated NECPs by the end of June 2023 (article 14 of the Governance Regulation), overlapping with this reviews data collection timeline, and only happened in part by the MS.

1.3 Project Structure

Key objectives of EU-MORE are to propose new policies for national and EU regulators, to develop (new) tools which predict their impact, and to monitor and evaluate the uptake-, replacement- and implementation-rate in the industry and service sectors.

For this purpose, three distinct actions are defined and carried out over the project duration:

- **1st** is the development of new policies based on desk research, identifying impacts, barriers, and best practices which are already in place.

¹¹ <https://ensmov.eu/wp-content/uploads/2022/11/D5.4-ensmov-policy-recos.pdf>

¹² <https://ieecp.org/projects/audit-to-measure/>

¹³ https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_en

¹⁴ https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en



- **2nd** is the provision and moderation of a well-informed, well-structured knowledge exchange amongst stakeholders. Peer-to-peer dialogues, webinars, related events, and other related activities are organised and hosted through a knowledge exchange platform.
- **3rd** Tools for projection, monitoring and evaluation are created allowing for further granularity required for adequate calculation, monitoring, and evaluation of policy results.

This report is part of the 1st action and provides an overview of past, current, and future related policies within the EU-27 MS. In parallel, a technical analysis of the European motor system market is carried out, providing a comprehensive assessment of the current situation and characteristics on the sector-, national- and EU-level. Specifically, data and information are gathered on the electricity consumption, electricity consumption trends, share of electricity consumption, energy intensity, and new and upcoming technological developments for electric motors or motor systems. See the project website¹⁵ for more information.

1.4 Report Structure

The review method for past and existing electric motor policy measures implemented by 27 EU MS is provided in section (2), while an overview of the findings and results is presented in section (3).

Section (4) presents noteworthy observations from the country reviews.

Section (5) identifies topics for further discussion on the interpretation of the results, while section (6) closes the report and draws some conclusions from the review.

¹⁵ <https://eu-more.eu/>



2. Review Method for Past and Existing Electric Motor Policies

A review of past and existing electric motor policy measures implemented by 27 EU MS has been carried out. For each identified measure a general description of the measure characteristics, an impact evaluation, and lessons learnt are complemented by an introduction to the national policy framework and related national programmes, measures and/or developments of that country. An evaluation of the overall size and scope of the national actions in relation to the replacement of electric motors in industry and service companies is also given.

The review is carried out through a literary desk review of (publicly) available information through (national government) websites, and with (publicly) available assessment reports, data sources and/or impact studies.

This initial assessment is further reviewed through external stakeholders, dubbed 'national experts', which have been approached by the reviewers to provide further information on the measures found, the review takes place through a combination of (where applicable) semi-structured interviews, and or a general assessment of the measure information found for each country. When approached, the national experts contacted are asked beforehand to provide, where possible, further assessment and/or insights into the electric motor policy measures considered in each country.

What follows in this chapter is a description of the main sources used (2.1), the timeline of activities (2.2), delimitation of scope (2.3), and a detailed description of the fields used in the collection template (2.4) and an explanation of the impact calculation method used (2.5).

2.1 Information Sources

Typical sources used over the course of the measure review are the National Energy and Climate Plans (NECPs)⁶, Annual Energy and/or Climate Reports submitted by the respective national governments, the International Energy Agency (IEA) policy database¹⁷, the ODYSSEE-MURE policy database¹⁸, past experiences and personal contacts/networks of the country reviewing author. In addition, policy descriptions and official legislative acts by the national implementing authorities (e.g., ministries, energy agencies) have been consulted. Due to the overlap of the review activity with the publication of the updated NECPs by MS, only a limited number of country reports consider the newly published NECPs. The ambition of the project is to review and include these in a follow-up activity in 2024 when all the updated NECP reports are made available by the EC and MS (as of end of September, 15 countries have submitted their 2023 NECP update).

Furthermore, the extended network of contacts available through the EU-MORE consortium is leveraged during the assessment. An overview of the partner organizations that contributed to the development of this report is provided:

Table 1: Contributing Partners

Partner	Description	Country
ISR-UC	Institute of Systems and Robotics (ISR) is a Portuguese private, non-profit research institution, associated with the University of Coimbra (UC), founded in 1992 with the global purpose of setting up a first-class multi-disciplinary research team, to carry out leading edge research in areas of science and technology.	Portugal
IEECP	The Institute for European Energy and Climate Policy (IEECP) is a non-for-profit, independent research foundation working on climate change mitigation, energy efficiency and renewable energy policy.	Netherlands

¹⁶ https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en

¹⁷ <https://www.iea.org/policies>

¹⁸ <https://www.measures.odyssee-mure.eu/energy-efficiency-policies-database.html#/>



AEA	Founded in 1977, the Austrian Energy Agency (AEA) is a non-profit scientific association whose purpose is to develop, support and implement measures that foster sustainable energy supply and use.	Austria
Fraunhofer- ISI	The Fraunhofer Institute for Systems and Innovation Research (ISI) analyses the origins and impacts of innovations. Researching the short- and long-term developments of innovation processes and the impacts of new technologies and services on society.	Germany
ECI	The European Copper Institute (ECI) is the leading advocate for the copper industry in Europe. Through a team of policy, industry and scientific experts, ECI acts to support copper's role in achieving the EU's policy goals	Belgium
CRES	The Centre for Renewable Energy Sources and Saving (CRES) is the Greek national co-ordination centre in the areas of Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES). Role in EU-MORE: CRES will mainly be involved in the development of policies for accelerating the electric motor renovation rate by carrying out an analysis of past experiences building on them. It will also be involved in project communication and dissemination of results.	Greece

IEECP is the lead organization of this motor policy review and acts as central coordinator of all related research activities.

The sources above are the (most) typical sources used over the course of the review with specific reference to the original source materials stated and included in the individual country reports.

2.2 Timeline for Information Gathering

Information gathering happened in the period between April – September 2023, in which related policy measures were identified and described using a common collection template (section 2.4).

Collection is done through a series of in parallel running desk research activities, and related exchanges between country stakeholders, more general energy saving measure experts, and the assigned country lead reviewers.

The assigned country lead reviewers are a combination of the EU-MORE partners (5), from which much of the data was gathered by the member colleagues of the coordinating partner IEECP (8), contributing to individual country reports.

Flexibility was given to each reviewer to find the best suitable method for data collection, either through the exploitation of existing contacts, networks, source materials or other adequate methods that fitted the timeline (availability).

Downstream the research performed by national experts, an additional internal review was conducted by IEECP to guarantee the quality, coherence and adequacy of the results to the research purposes.

An issue with all policy review activities such as this one is that they tend to provide a snapshot in time of ongoing number of activities and changes. Identified source materials, and/or measure descriptions might have changed or no longer be available. Within the specific country reports a clear statement of the collection period is provided.

2.3 Scope of Electric Motors

Per country reports covering of 27 EU MS are created, feeding into this final overview report and providing a comparison of the status, laggards, leaders, typical barriers, and other shortcomings that surround the identified policy implementation practices.



Any policy measure that affects the replacement rate of old, inefficient electric motors used in the industry and/or services sectors are within scope of this policy review. Measures targeting electric motors used in transport (i.e. electric vehicles), or households are not considered, even though the residential sector may be targeted by general cross-cutting measures. Measures covering multiple sectors and that affect electric motors used in industry or the services sector are also included.

This is not a technical review, though given the nature of the topic some technical criteria are included, the goal of this review is not to provide a technical analysis of electric motors, but analysis of applicable policy options for further consideration. Visit the project website for more information on the technical market analysis of electric motors (D2.1).

2.4 Collection Template for Motor Policies and Measures

In each country report a summary description is provided on the national policy framework and related programmes, measures, and/or developments. This includes:

- General information on the implementing- and regulating authorities,
- the underlying framework,
- a description of the general direction and/or course of actions taken,
- an overview of the major national programmes related to Energy Efficiency (EE) measures,
- key takeaways or highlights in relation to the EU-MORE objectives such as national EE targets.

Furthermore, a brief evaluation is provided by the reviewing author on the overall size and scope of the national actions in relation to the replacement of electric motors.

On the individual policy level data is collected and divided into four topics:

- The general overview of the measure (section 2.4.1),
- The detailed description (section 2.4.2),
- The expected and/or measured impacts (section 2.4.3),
- The lessons learnt (section 2.4.4).

2.4.1 Overview

A simple overview of the measure is presented. Included are a short description, the responsible authority, the measure status, issue date, start date, end date, duration and (main) reference(s) to the official publication(s).

Table 2: Measure Overview

	Overview
Short Description	[Brief summary of the policy measure related to motor replacement](2-3 lines max)
Responsible Authority	[(national) authority responsible for implementation](text)
Status	[Ongoing / Proposed (definitive) / Proposed (early-stage) / Completed](pick one)
Issue Date	[Month, Year](date of announcement)
Start Date	[Month, Year](confirmed/expected)
Ending Date	[Month, Year](confirmed/expected)
Duration	[# Months](confirmed/expected)
Reference:	[Link to main resource](official government publication/announcement/website with information)

2.4.2 Main Description

This section hosts an open textbox section including detailed information on the measure under consideration, the target sector(s), drawing reference(s) to anchoring national law(s), EU directives and/or other legislation(s). Further information included in this field are the measures scope, underlying



conditions, criteria for participation in the scheme, a description of the concrete actions, and data on the specific type of motor(s) addressed, like year of construction, efficiency class(es), power, operating hours, use cases, amongst others. Important developments like continuations, follow-ups, extension, delays, early termination of the measure etc., are also included here.

Key data on the characteristics of the measure are collected through the following:

Table 3: Measure Characteristics

	Characteristics
Budget	[Total amount in EUR](total budgeted/actual amount in EUR; Include any relevant details on the budget distribution. If possible, try to include budgets specific to motor renovation (like range of funding/budget available per beneficiary))
Financing of the measure	[How is the measure funded](i.e. through national funds, ESCOs, trade-in-schemes, tax incentive, other...)
Policy focusses	[Product / service](Indication if the policy support package targets/focuses on product ('physical') interventions or service ('soft') interventions.
Intervention Type	[short keyword that best captures the intervention](equipment upgrade, capacity building, awareness raising, mandatory replacement, ...)
Main Barriers Addressed	[Brief description of the main barriers addressed by the measure e.g. high initial cost, lack of information, general financial viability, return on investment, ease of regulation, emission reduction, waste reduction, ...]
Key Driver(s)	[what "forced" the implementation of the measure](a court ruling, a national law, EU Directive, other?)
Replicability	[high / medium / low](a simple 'gut feeling' assessment of the potential for replication or transfer to other countries; are there any specific local conditions)
EU Inclusion	[Yes/No, + short description](Included in NECP? EED? Other EU wide policy directives?)
Related Characteristics	[open text]

2.4.3 Impacts

Description of the final (expected) results of the measure implementation and any achievements related to the measure implementation in the broadest sense of the word. Data is provided in the form of free textbox format, and where available, a description of the method used for calculating the final energy- and/or cost-savings achieved through the measure is included as well.

As before, some of the key factors from the impacts section are summarised in the following structure table:

Table 4: Measure Impacts

	Impacts
Case level impact	[High (>20%)/ Medium (5-20%)/ Low (<5%)/ Unknown](indicative value based on the expected total % reduction in energy consumption through measure introduction at the case level)
Policy level impact	[High (>0.5%)/ Medium (0.1-0.5%)/ Low (<0.1%)](indicative value based on the expected total % reduction in energy consumption through measure introduction at the industry/sector level)
Size	[Number of electric motors impacted by the action, where possible disaggregated by efficiency level, power range]



Energy	[Estimation of overall Energy / GHG savings through the measure](in MWh or tCO ₂) Where available specify the estimation specific to motors.
Impact evaluation	[Short, bulleted list of the main (expected) results and/or key achievements of the measure implementation](see detailed impacts description section above)

2.4.4 Lessons Learnt

Details on the learnings and/or (initial) feedback are gathered in response to the measure's implementation and are included in an open textbox section. (Where applicable) The main barriers found and/or the conditions that are necessary for the implementation of the measure, are described. A summary overview of lessons learnt specific to that measure are collected and provided in the following structure table:

Table 5: Measure Lessons Learnt

	Lessons Learnt
Key takeaways	[List of key takeaways/learnings](summarized list)
Recommendations	[for the specific improvement of existing National and/or EU policies](please specify)
Linked measures	[list of affiliated measures](follow-up interventions, finalized, discontinued, or planned measures associated with the action)
Reference(s)	[weblink(s)](weblink for further reading e.g. reports, studies, publications, policy evaluations, ...).
Other	[Key associated contacts, organizations, ministries, responsible authorities]
Thoughts, comments, considerations ...	[Links to successful cases, case studies, success stories, further research, or any other relevant reports]

The collection template used for the country measures is included in annex I.

2.5 Impact Calculation Method

The method adopted to estimate the impact of the analysed policy measures involving the replacement of electric motors in industry is reported in this section. The purpose of this method is to quantitatively assess or estimate the impact in terms of reduction of electricity consumption provided by the analysed policy measure at sector- and country-level. This analysis is viewed as a potential indicator for gauging the effects of motor replacement as part of the analysed policy measures. The information provided by Table 4 in the country reports has served as basis to estimate the impact in terms of electricity consumption reduction introduced by each policy measure at sector level. In conducting this analysis, the categorization of policy target sectors reported in Table 6 has been employed. This categorization is primarily drawn from the Odyssee-MURE database's classification¹⁹, integrated with specific sub-sectors when explicitly targeted by a measure, such as "Industry – Energy Intensive Companies" and "Municipalities", which have been defined to better describe the measure from a qualitative viewpoint.

¹⁹ <https://www.measures.odyssee-mure.eu/energy-efficiency-policies-database.html#/>



Table 6: Target sectors categorization adopted for impact calculation

Target Sectors
Industry – All
Industry – SMEs
Industry – Large Companies
Industry – Energy Intensive Companies
Municipalities
Services
Buildings – Public
Buildings – All
All Sectors (excluding Transport)

The “Policy Level Impact” score (Table 4) has been employed to estimate the electricity consumption reduction introduced by each measure as described in the following.

In the first place, data of electricity consumption has been retrieved for each MS for the industrial²⁰, service and residential²¹ sectors. “*Industry – SMEs*” sub-sectorial data²² of final energy consumption has been used as well for Austria, Croatia, Greece, Italy, Poland, Portugal and Slovakia. In this case, the national electricity share in final consumption has been used as proxy to estimate the electricity consumption in the SMEs sub-sector. For the same countries, electricity consumption in the “*Industry – Large Companies*” sub-sector has been estimated as the difference between the total industrial one and the SMEs-related one. For the sub-sectors “*Industry – Energy Intensive Companies*”, “*Buildings – Public*” and “*Municipalities*” no electricity consumption data were publicly available.

The electricity consumption data has been used to quantify the electricity savings introduced by the measure at (sub-)sector level based on the qualitative Policy Level Impact ranking employed in Table 4: High Impact (more than 0.5% of electricity consumption), Medium (between 0.3% and 0.5%) and Low (below 0.1%). For instance, in the case in which a policy measure targeted to the whole industrial sector received a High Policy Level Impact, its savings have been estimated as (at least) 0.5% of the national industrial electricity consumption. Such calculation has been possible for MS and sub-sectors with available data of electricity consumption.

Given a policy measure, its overall impact (i.e., the sum of the impact on each targeted sector) has been thus calculated when all the sector-specific impacts were available. This approach has allowed us to estimate the overall impact of about 60% of the analysed policy measures.

The impact of the combined policy measures at country level has been calculated as well. Since the impact estimation was not feasible for all the (sub-)sectors, these results provide just a lower bound for the actual impact on electricity savings at national level.

²⁰ <https://www.indicators.odyssee-mure.eu/energy-efficiency-database.html>

²¹ <https://ec.europa.eu/eurostat/web/energy/database>

²² <https://leap4sme.eu/wp-content/uploads/2021/07/LEAP4SME-D2.1-SME-energy-and-economic-mapping-in-Europe.pdf>



3. Policy Measures in Numbers (Results)

A complete overview table of all measures included in this review is attached in annex II, this section (3.1) provides an in brief overview, presenting some simple observations. Section (3.2) goes one step further presenting impact calculations.

3.1 In brief

64 measures were found across the EU relating to and promoting the replacement of inefficient electric motors:

Table 7: Number of policy measures found for each MS

Country Index	Country	N. of Measures
1	Austria	5
2	Belgium	4
3	Bulgaria	2
4	Croatia	3
5	Cyprus	3
6	Czech Republic	1
7	Denmark	4
8	Estonia	1
9	Finland	1
10	France	1
11	Germany	7
12	Greece	3
13	Hungary	3
14	Ireland	2
15	Italy	1
16	Latvia	3
17	Lithuania	2
18	Luxembourg	1
19	Malta	1
20	Netherlands	3
21	Poland	1
22	Portugal	3
23	Romania	1
24	Slovakia	1
25	Slovenia	3
26	Spain	1
27	Sweden	3

Out of the measures found, 42 (69%) were included in the final 2019, and/or draft 2023 NECP reports, giving some indication for their relevance in achieving the national 2030 energy targets. Another 21 (34%) of the measures were reported as being a direct adaptation of the EED rules and legislation, showing the EED is an important driver for policy introduction. 41 (64%) focus on product interventions, and another 18



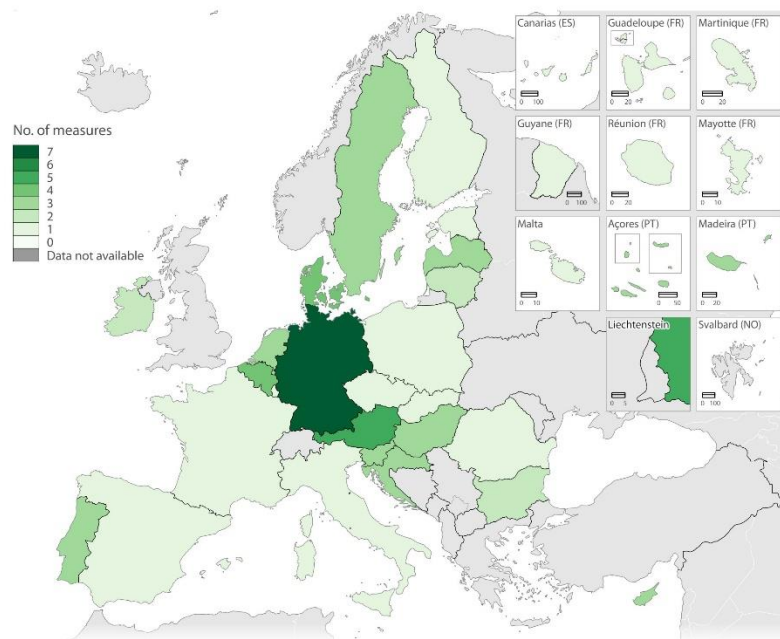
(28%) cover both product and service interventions for a total of 57 (89%) measures tagged as having a 'product' focus.

In terms of the assigned type categories, considering the measure type categorization reported in Table 8, we see a clear preference toward financial measures 36 (56%), consisting of subsidies 30 (45%), combination of Subsidies & Loans 3 (5%) and just loans 3 (5%). With the next category tier covering mandatory standards 7 (11%), and information requirements 4 (6%) for a combined total of 11 (17%) of found measures.

Table 8: Policy Type categorization adopted

Policy Type
General Programme
Mandatory Information
Mandatory Standards
Financial - Subsidies & Loans
Financial - Subsidies
Financial - Loans
Fiscal
Market-based Instruments
Information/Trainings
Voluntary Agreements
Other

Electric Motor Policies



EU-MORE Electric Motor Policy Review

Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat
Cartography: Eurostat – IMAGE, 01/2024

Figure 2: EU-27 Country Map of Policy Measures



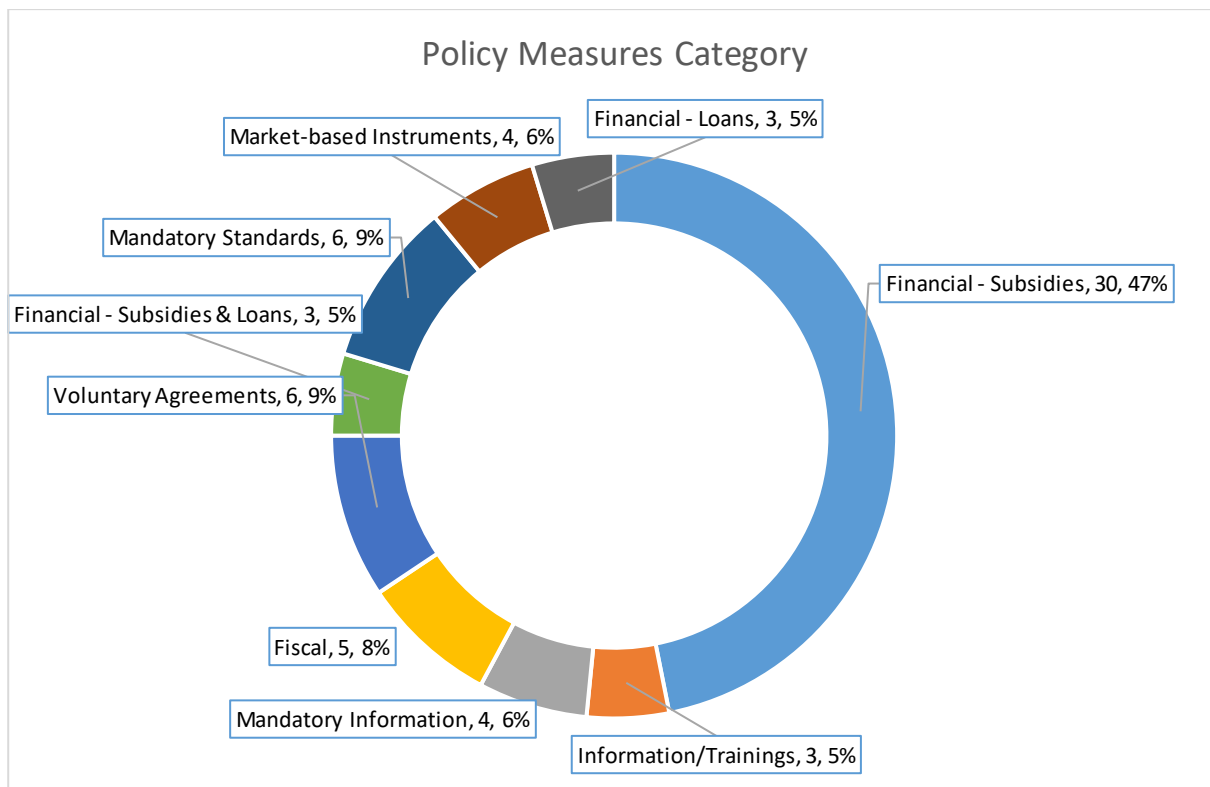


Figure 3: Overview of the policy measures categories

Looking at the defined target groups, 34 (53%) affect companies of the whole industrial sector, with another 11 (17%) focusing on SMEs. 6 measures are specifically targeted to large industrial companies and 4 to energy intensive ones. When combined, 55 (86%) of the measures affect companies active in the

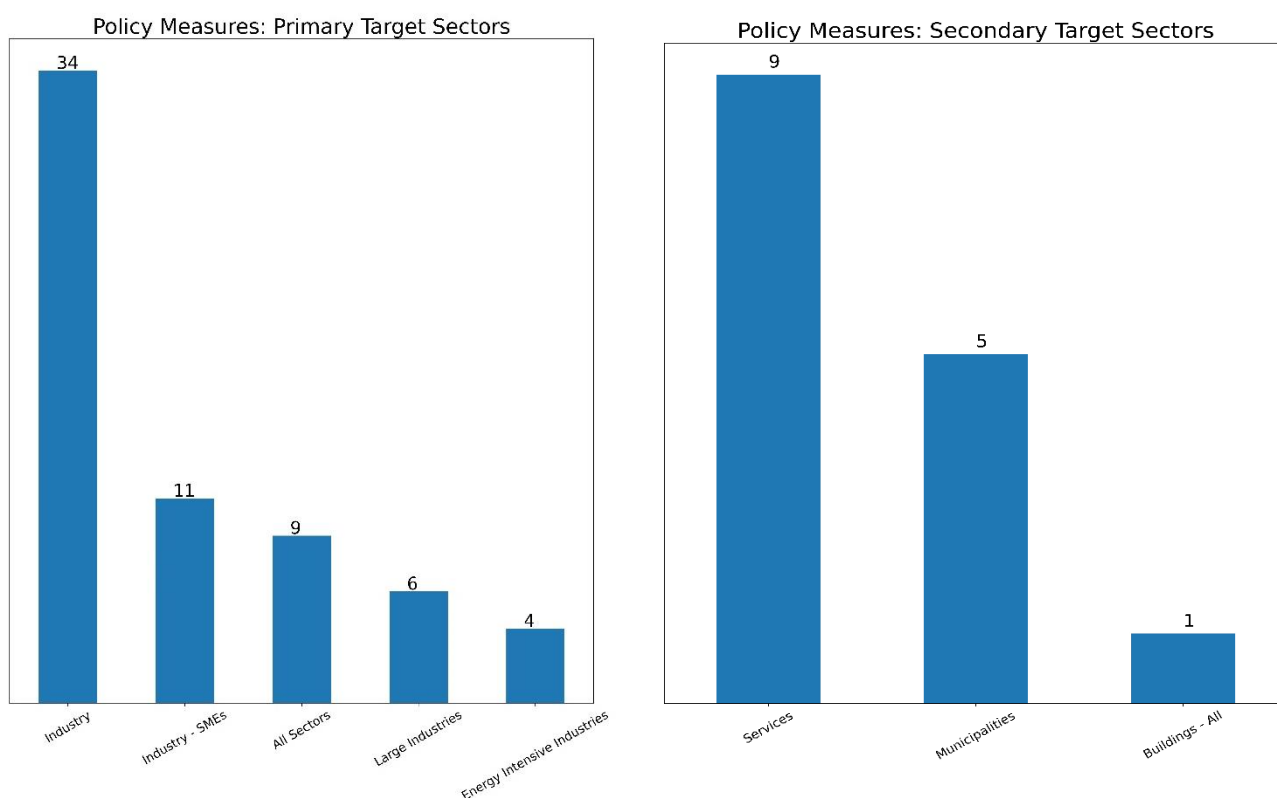


Figure 4: Summary of the primary and secondary sectors targeted by the policy measures



industry sector, with the only other major category being cross-sectoral 9 (14%) and 1 involving primarily public buildings.

At first glance Germany (7), Austria (5), and Denmark (4), appear to be among the frontrunners, in terms of number of measures historically implemented. The oldest measure still active today dates to 1991 and was introduced in the Netherlands, with Austria a close second with a measure included in the review stemming from 1993. 8 (12%) have ended and are no longer supported. 10 measures (16%) have been reported to be active until 2030, while 19 (31%) do not have a defined ending year.

3.2 Impact Calculation (Results)

The results obtained from the application of the methodology of section 2.5 are presented here. Figure 5 shows the impact of each policy measure, codified as reported in Annex II. The *System of white certificates in Poland*, the *Eco-design requirement for energy-using products* and the *KfW Energy Efficiency Programme - Production Plants/Processes* results to be the three policy measures with the highest impact.

When examining the effects of different policy measures on the primary target sector by measure type (

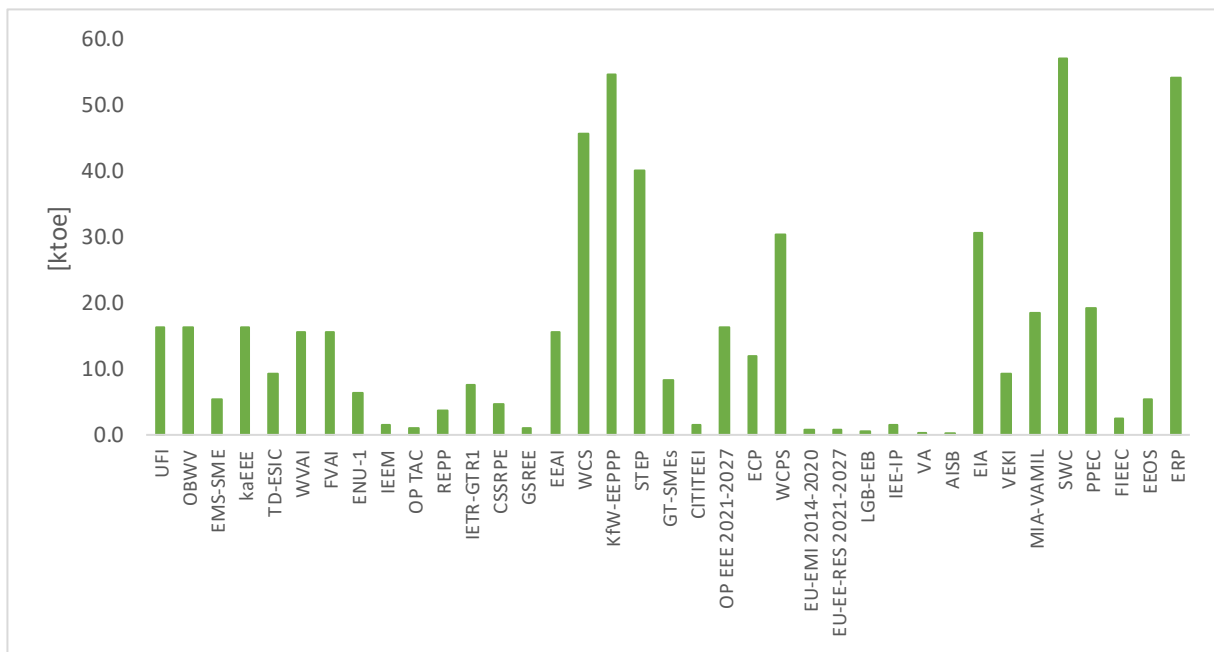


Figure 5: Overall policy impact (ktoe), by analysed policy measure

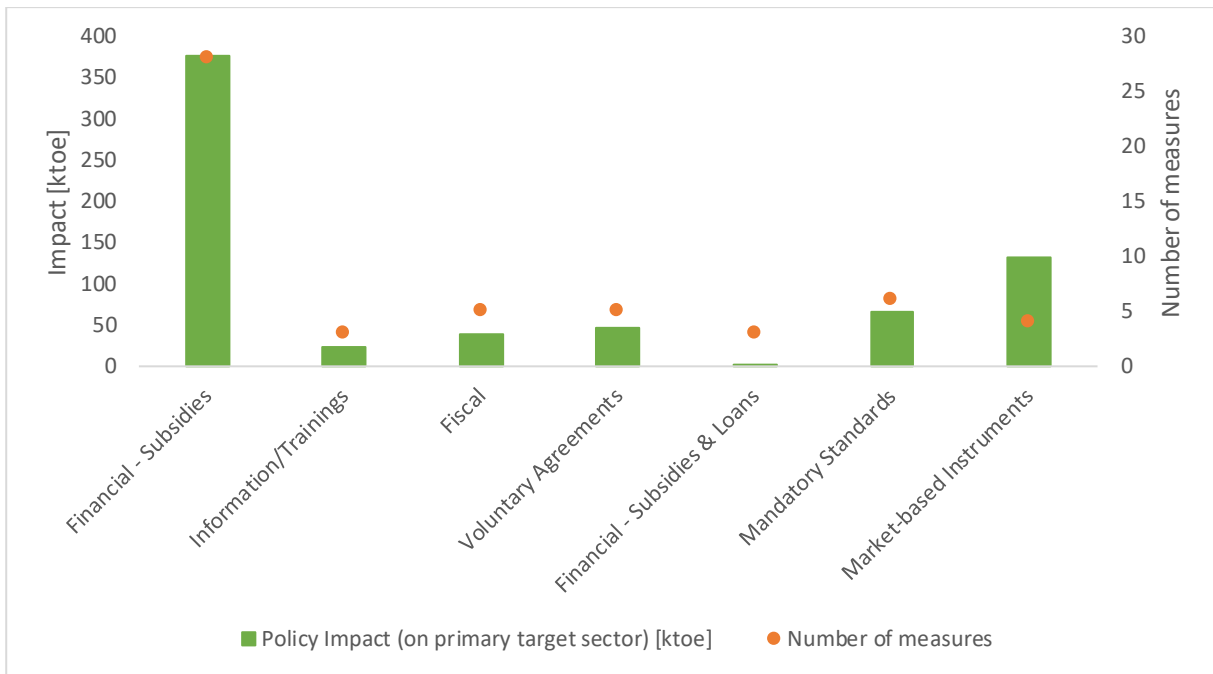


Figure 6), subsidies and market-based strategies exhibit the most significant influence. Subsidies account for their substantial impact mainly because they constitute a substantial portion of the measures (comprising 44% of the total). Nonetheless, the impact of subsidy measures varies considerably depending on the Member State and the specific sector they target. In contrast, market-based instruments (white certificate programmes in this case), despite their limited number, tend to be cross-sectoral and can result in substantial impact.

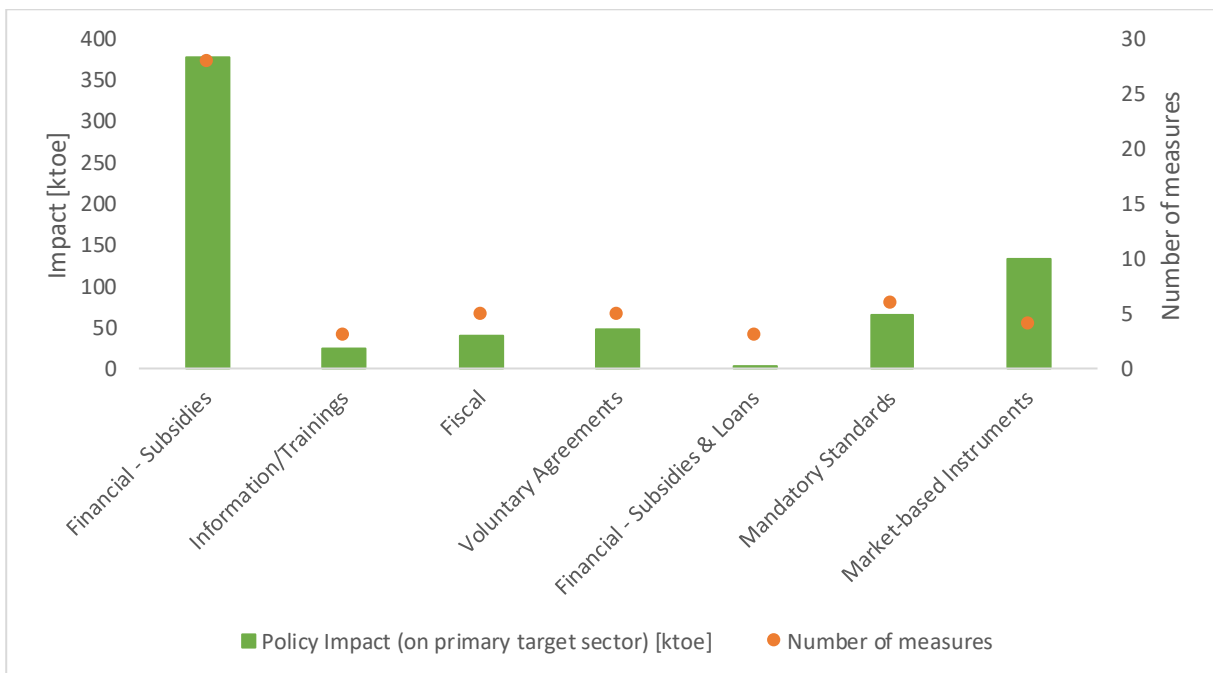


Figure 6: Estimated policy measure impact and number of measures by measure category

In Figure 7 the estimated country-level impact is represented for the EU Member States. The estimation, due to data availability, was possible for 23 MS out of 27. Germany (331 ktoe), Poland (57 ktoe) and Austria (54 ktoe) have implemented the measures resulting in the highest country-level impact. This is due to the

high number of measures implemented, for Germany and Austria, and the high impact and cross-sectoral feature of the white certificate scheme implemented in Poland.

The impacts for the mandatory standards are underestimated, as appears from a quick calculation based on Figure 1 (and data on previous shares of IE-labels for 2010). Between 2010 and 2021, one can estimate that for 200 kW motors (4 poles) the average increase in efficiency was 1.2 percentage points. Taking industry only and assuming that 70% of the industrial electricity consumption in 2021 was used in electric motors (about 650 TWh), the savings calculated from the improved standards from 2010 to 2021 was about 695 ktoe, as compared to 65 ktoe reported in Figure 6. This is due to fact that mandatory technical standards have only partially been captured through the interviews, which were focusing on other mandatory measures.

These results are based on qualitative impact scores provided by policy review experts. The estimation of the impact may be subject to biases and uncertainties in the following areas:

- Bias in the impact score attribution by the country expert: The impact evaluation may differ by Member State depending on the score attribution method of the expert when quantitative data for the measure is lacking.
- Bias in the overall policy impact by country: The lack of impact scores for certain measures prevents the quantitative estimation of the impact, leading to underrepresentation of Member States with fewer measures with attributed impact scores in the overall policy impact.
- Bias in accounting for sub-sectors without final energy consumption data: Sub-sectors without available final energy consumption data were not considered in the overall impact calculation, potentially resulting in the underestimation of the impact for measures targeting multiple sub-sectors.

Overall Policy Measures Impact

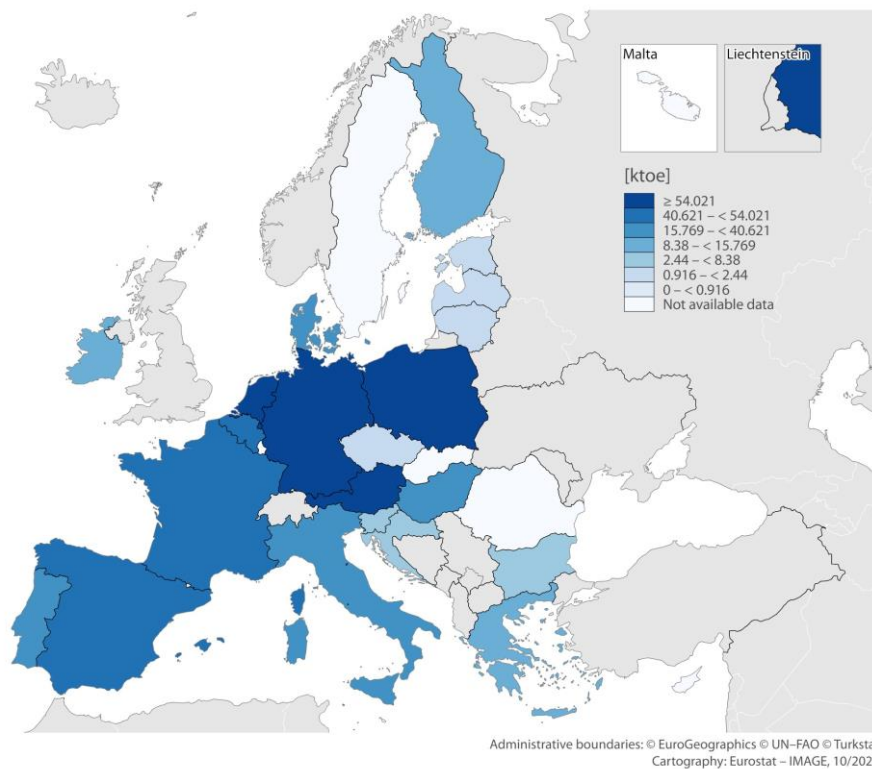


Figure 7: Overall impact of policy measures including motor replacement across European countries

Top-down calculation of energy savings from electric motors

Electricity savings in industry can also be calculated top-down, by making use of the evolution of electricity demand, taken from the ODYSSEE-MURE database (2023) and combining it with the evolution of the industrial production index. By decomposition analysis, top-down savings can be calculated. Given the fact that electric motors and motor systems account for around 70% of the industrial electricity savings, the so calculated top-down electricity savings constitute a relatively good proxy in the case of industry. In the case of services, the correlation is much less pronounced given that electricity demand in services is largely dominated by other end-uses than electricity uses for motor systems. The time frame considered is from 2010-2021, which corresponds to the period, from the [Regulation on ecodesign for electric motors \(EC\) No 640/2009](#) to the [Regulation on electric motors and variable speed drives \(EU\) 2019/1781](#) and its 2021 revision.

Table 9: Top-down savings calculated from electricity indicators in industry

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricity consumption of industry (TWh)	925,6	936,5	920,3	906,4	910,1	913,9	925,9	942,5	945,4	933,1	884,3	928,4
Industrial production index normalised to 2015)	97,84	100,46	97,68	96,68	97,86	100,00	101,80	105,26	106,86	107,26	100,04	108,34
Electricity savings related to electric motors (TWh)	0	9,7	2,7	5,8	11,0	22,5	26,0	37,4	45,9	57,1	43,5	67,6

Source: [ODYSSEE-MURE database](#)

Table 9 shows that the savings which have been built up to 2021 (avoiding 2020 as a very specific year due to Covid-19), are in the range of 68 TWh annual savings (5814 ktoe). This also includes autonomous savings. This is why top-down savings tend to be higher than savings calculated bottom-up from policy measures.

4. Noteworthy Country Observations

This section presents briefly in an exemplary manner several electric motor programmes for a selected number of countries. Details for each country and each programme are provided in **Error! Reference source not found.**

Austria

Related policy developments in the past, present, or (near) future

The most important policies/programmes to promote are subsidies in the field of energy efficiency investments, within the "Umweltförderung Inland". Here, motor replacement and certain motor optimisation measures can be subsidised.

In 2011/2012 the "Energy-efficient drives" programme subsidised the replacement of electric motors and the installation of frequency converters with a flat rate per kW. The programme was not continued.

Within the klimaaktiv programme audit guides for pumps, fans were published around 2010, including information on motor replacement and high efficient motors. For these audit guides trainings for consultants were and are still organized.

In December 2023 potential energy savings by the replacement of electric motors and other saving measures (as insulation of pipes, introduction of building automation systems, hydraulic optimisation of heating systems) in Austria were discussed, including a potential subsidy programme for these purposes.

Brief Evaluation

In principle, energy efficiency measures also in the electricity sector, where Austria has a high share of renewables, are promoted by the BMK (Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology).

Energy consultancy, energy auditing, awareness raising, and investment subsidies are in place, but, for all these instruments no specific motor replacement programme exists. One exception are the specific



motor replacement tips within the klimaaktiv pumps and fan system audit guides. Within this programme awards are given for measures in the optimisation of such systems.

France

White Certificates Scheme [Certificats d'Economies d'Energie – CEE]

The catalogue of the scheme includes several action types related to electric motors, including one about high efficiency motors (IE4 class) up to 1 MW. However, the way this action is counted does not differentiate whether this would be an early replacement or not. Larger motors can be eligible as a specific action, requiring an energy audit.

The scheme has been created by the national Energy Law adopted in 2005 and started officially in July 2006. It sets mandatory energy savings targets on energy suppliers. The energy suppliers can meet their target by acquiring white certificates, either with their own programmes or buying them on the market. The most common way to get certificates is to use the catalogue of the 200+ types of standardised actions (88% of the white certificates in 2018-2021). It is also possible to get certificates from specific actions reported with energy audits (3.6%), or by funding accompanying programmes selected by the ministry through calls for programmes on topics defined by the ministry (8.4%).

The scheme covers all end-use sectors, including the industry. Until 2019, the industrial sites covered by the EU ETS were not eligible. They can now be eligible under certain conditions. It should be noted that, even if the scheme is cross-cutting, it has aimed primarily to achieve energy savings in buildings (where it is possible for end-users to cumulate incentives from white certificates with public incentives). Nevertheless, the amount of white certificates from actions in industry has increased over time.

The parties that can apply for white certificates are the obligated parties (energy suppliers), delegated parties (organisations contracted by obligated parties to meet part or all of their energy savings target) and eligible parties (local authorities, social housing body and the national housing agency). End-users cannot apply for white certificates, however they can benefit from the support offered by the obligated, delegated or eligible parties. This support is most often a financial support (e.g. grant or soft loan). It can also be a tailored technical support, but this is rare as it is more difficult for the obligated parties to demonstrate that they had a material role in the implementation of the energy efficiency actions.

The standardised actions are defined with technical specifications (e.g. minimum efficiency requirements, capacity range, installation by a professional, applicable technical standard(s) to be met). These specifications also set the data to be reported for each action. The specifications' factsheets (in French) are given below as hyperlink on the catalogue's code of each action type.

List of standardised actions related to electric motors (as of July 2023), with their code in the catalogue:

Most of these action types are about industry:

- IND-UT-132: asynchronous motor of class IE4
- IND-UT-102: variable speed drive on asynchronous motor
- IND-UT-114: permanent magnet or reluctance synchronous motorised variable speed drive
- IND-UT-133: electronic control system for an electric motor with energy recovery
- IND-UT-136: motor-controlled systems

There are also two action types about services:

- BAT-EQ-123: permanent magnet or reluctance synchronous motorised variable speed drive
- BAT-TH-112: variable speed drive on asynchronous motor

In case of actions not covered by the catalogue, they can be submitted as specific actions. The submission file shall then include an energy audit, and the payback time shall not be less than 3 years. The methodology to document a specific action has been defined by ADEME (French agency for ecological transition).



Germany – multiple measures, see country report (annex III)

Several national programs support energy efficiency initiatives in Germany's industry, where notably the programme on "Federal Funding for Energy and Resource Efficiency in the Economy" supports both, components and systemic aspects related to motors:

- The "KfW Energy Efficiency Programme for Production Plants/Processes" is a German national program that provides low-interest loans to commercial enterprises for implementing energy efficiency measures in their production facilities and processes. The program is ongoing and is available for companies of any size and is open to companies and individual entrepreneurs in the commercial sector who are majority privately owned, as well as freelancers. The program requires all investment measures to achieve energy savings of at least 10 %
- The "Federal Funding for Energy and Resource Efficiency in the Economy" is another German national program that aims to increase energy efficiency in the industry. The program receives over 10,000 applications per year and consists of different modules. The purpose of module 1 is to support the replacement or acquisition of high-efficiency units for industrial and commercial applications on the company premises in cross-sectional technologies. The program is ongoing and has been successful in supporting smaller projects with a very high attractiveness for applicants. Module 4 (Energy- and resource-related optimisation of facilities and processes) complements with a systemic approach: Funding is provided for investment measures for the energy and resource-oriented optimisation of industrial and commercial facilities and processes that contribute to increasing energy or resource efficiency. The funding is open to all technologies and can also include the measures listed under modules 1.
- The "Energy-efficient and climate-friendly production processes" programme, which is designed to improve energy efficiency in production processes. It supports companies in investing in the most energy-efficient and environmentally friendly solutions in the design of their production processes.
- The "STEP up! - Utilizing electricity efficiency potentials" programme aims to increase the efficiency of electricity use by promoting the use of energy-efficient technologies and practices. It provides funding for projects that reduce energy consumption and greenhouse gas emissions by improving the energy efficiency¹⁰. The programme was running from 2016-2019.
- The "PIUS Advice and Invest" programme subsidises investment projects by SMEs which increase resource efficiency and reduce CO₂ emissions through process and/or organisational changes. SMEs in production, commerce and the service sector are supported with consulting in their efforts to cut their resource consumption and reduce emissions of harmful substances through 11.

According to "Regulation on Securing Energy Supply through Medium-Term Effective Measures (EnSimiMaV)" (Verordnung zur Sicherung der Energieversorgung über mittelfristig wirksame Maßnahmen) companies are required to promptly implement identified and economically feasible energy efficiency measures within 18 months. The feasibility is determined based on an economic viability assessment as outlined in DIN EN 17463 12.

Germany has further developed a unique policy instrument based on "[Learning Networks for Energy Efficiency](#)". This instrument consists in company networks including 10-15 companies, which set themselves in a moderated manner specific energy efficiency targets over several years. Details of this approach are described on the website of the network initiative, which now includes nearly 400 networks. In the 2022 monitoring report, results of 212 networks are reported which by then had finished the networking activity. The 2,191 companies participating in the 212 networks evaluated reported a total of 9,070 implemented energy efficiency measures. In 8,328 of these, the energy savings were quantifiable, while the remaining were mainly organizational measures, such as training courses and information campaigns. These 8,328 quantifiable energy-saving measures result in total annual savings of 6,743 GWh of final energy, 8,452 GWh of primary energy (only the non-renewable portion is considered) and 2,451 kt of CO₂. The 212 networks investigated achieved their average network target of 33.4 GWh/a, as reported in the monitoring, by 95% (previous year: 98%). At the measure level lighting (27%) were implemented most frequently. These are followed at a great distance by measures in the areas of process technology (15%), compressed air (7%), motors and drives (7%), heating and hot water (7%) and other measures (6%).



Of the measures implemented, 49% related to the replacement of existing technology, while 37% represented optimization. 76% of the measures related to electricity as an energy source and 17% to natural gas. The technology with the largest median savings per measure turned out to be cogeneration, followed by heat recovery/waste heat recovery, industry-specific processes and process heat. Across the measure categories the largest savings come from process technology, process heat, other measures, heat recovery/waste heat recovery, and industry-specific processes. This example shows that, despite the high share of motor and motor applications in industrial energy demand, they still represent a low share in savings, even in a highly specialized policy measure such as the Learning Networks for Energy Efficiency.

Greece

“Antonis Tritsis AT03” Programme.

Interventions and actions to improve energy management and use of renewable energy in water and wastewater management infrastructure.

Antonis Tritsis Programme is managed by the Ministry of Internal affairs and is aimed at municipal water and wastewater utilities. The total budget of the 12 in total foreseen actions amounts to 2.5 bn € (funding from National Resources and the European Investment Bank).

Action AT03 is the most relevant to the project as it involves replacing old pumps and inverters for more energy efficient operation and use of RES. More specifically in the context of AT03, it is planned to finance projects related to the following actions:

1. Interventions and actions to improve energy efficiency, energy saving in energy-intensive water and wastewater infrastructures such as replacement of equipment in pumping stations, boreholes, water and wastewater treatment facilities, buildings, etc. Replacement of existing pumps with new high energy efficiency ones. Installation of frequency converters (inverters).
2. Utilization of Renewable Energy Sources (RES) (PV on the roofs of buildings, in parking areas, on the roof of closed tanks, geothermal, etc.) and intelligent energy distribution-storage-consumption systems (the utilization of RES and the management of energy are aimed at energy autonomy).
3. Supply and installation of intelligent energy management systems in existing sewage and drinking water networks, and treatment facilities. Indicative actions are the installation of energy consumption meters in energy-intensive infrastructures/equipment and their correlation with quantitative and qualitative parameters. Installation of analogue water level sensors for water reservoirs, control-monitoring, and energy management systems facilities/infrastructure

The total budget for the AT03 Call for Proposals is 150 mln €.

There have been 139 proposals for funding exceeding the total budget by about 200 mln €. The budget of the selected 53 projects will amount to 145 mln €.

Action AT01 of the same programme is also linked to water and wastewater infrastructure and focuses solely on the aging pipework network. More specifically in the construction of new external networks and upgrading internal drinking water distribution networks through the replacement of aging pipelines, creating zones and loops.

Together the two programmes will deliver a significant upgrade to both electromechanical equipment (AT03) and pipe network (AT01) of local water companies and municipalities.

Netherlands

The Netherlands is and remains ambitious and objectively at the forefront of the energy transition, introducing advanced policy measures targeting EU-MORE related measures for (industry) companies.

An important (new) development within the Dutch legislative framework is the requirement (as of end of 2023) for large companies to analyse all motor driven systems larger than 15 kW. This happens as part of



the mandatory energy audit which is implemented nationally (refer to the 'onderzoeksplicht' and 'informatieplicht') and overlaps with the mandatory energy audits for large companies required by the EED Art.7/8 every 4 years.

This specific inclusion of motor driven systems in the mandatory energy audit is an important development that could be the first step towards accelerated uptake and implementation of specific policy measures targeted at the replacement of old- and inefficient electric motors.

In regard to this review, three measures were found that stipulate the replacement of electric motors for energy efficiency improvements: 1. the Energie-investeringsaftrek (EIA), 2. the Versnelde klimaatinvesteringen industrie (VEKI), and 3. the Milieu-investeringsaftrek (MIA) & Willekeurige afschrijving milieu-investeringen (VAMIL). Each identifying and targeting the replacement of electric motors in processes through various intervention types and are described in detail.

However, in each of the identified measures the replacement of electric motors is part of wider policy and technical interventions providing blanket EE improvements to companies or the industry sector.

The Dutch 'Energy List' provides detailed specification for eligible (technical) measures which, in relation to EU-MORE, includes IE3, IE4 and IE5 electric motors for use in (industry) company processes.

Portugal

The Energy Efficiency Promotion Plan (PPEC) consists of an incentive mechanism that aims to promote actions to improve efficiency in electricity consumption. To this end, suppliers, network operators and entities that promote and defend the interests of electricity consumers in Portugal propose measures (tangible and intangible) that go through a selection process managed by ERSE (Regulatory Entity). These actions are aimed at electricity consumers in the various market segments, such as Industry and Agriculture, Commerce and Services, and Residential. The selected actions are funded through a tariff surcharge included in the energy bill (Global Use of the System). The PPEC had its first edition in 2007 and it is now in its 7th edition.

Measures relating to electric motors were approved in the 4th edition (2011/2012), 5th edition (2013/2014) and 6th edition (2017/2018).

In the 6th edition, a measure to promote the installation of High Efficiency Motors (HEMs), within the 0,75kW to 400kW power range, in the manufacturing, agricultural and fisheries sectors as a replacement for low efficiency motors (motors of efficiency class below IE1) was approved. The objective was to replace these inefficient motors with IE3 or IE4 motors.

A financial incentive of 51,1% of the average new motor price (including installation costs) was given. The measure also foreseen a rapid assessment of the use profile and load of the motor to ensure a correct dimensioning of the replacement motor. The measure had a budget of 896 767€ for the replacement of 420 motors. The estimated electricity savings generated by the measure were of 115 GWh with a corresponding reduction of GHG of 43 thousand tCO₂eq.



5. Discussion

This section discusses main observations on electric motor-related policies, as there are:

- Mandatory standards for electric motors
- Subsidy-based policies for electric motors
- Non-subsidy-based policies
- Generic energy efficiency programmes for industry versus motor-specific policies
- Impacts of motor-related policies
- Missing aspects in electric motor-related policies

5.1 Mandatory standards for electric motors

Regulation on mandatory standards and labels for electric motors under eco-design and labelling policies²³ has been a central European instrument to address new motors. While new motors are not the focus of the EU-MORE project, standards and labels for motors provide the (minimum) potential for electricity savings, when old motors are replaced.

Efficiency requirements for low voltage motors are derived from the [Commission Regulation \(EU\) 2019/1781](#) and the amending [Regulation \(EU\) 2021/341](#) which extend the scope of energy efficient motors covering the output power range from 0.12 kW up to 1000 kW and setting for the first time energy efficiency requirements for the variable speed drives (VSD).

In the last two years, the standards were increasingly tightened further:

Step 1 (Starting 1 July 2021)

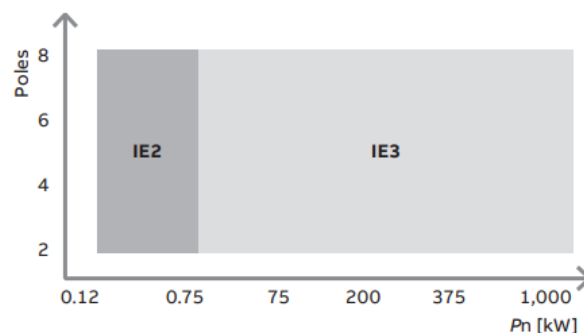


Figure 8: Regulation for electric motors under EU Eco-design requirements (since July 2021)

The first step in 2021 broadened the range of motors concerned. The coverage with standards concerns induction electric motors without brushes, commutators, slip rings or electrical connection to the rotor, rated for operation on a 50 Hz, 60 Hz or 50/60 Hz sinusoidal voltage, that:

- have 2, 4, 6 or 8 poles;
- have a rated voltage above 50 V and up to and including 1000 V;
- have a rated power output from 0.12 up to and including 1000 kW
- are rated on the basis of continuous duty operation (means capable of continuous operation at rated power with a temperature rise within the specified temperature class) and
- are rated for direct-on-line operation.

Three-phase motors with a rated output between 0.75kW and equal to or below 1000kW had to reach the IE3 level of motor efficiency standards by July 2021 (see Figure 8). The regulation also sets requirements

²³ <https://www.iea-4e.org/ems/news/ie4-motors-are-required-in-the-eu/>

on the efficiency of variable speed drives. Variable speed drives have two levels of efficiency (IE1 and IE2) and the regulation requires all drives in scope to reach the IE2 level.

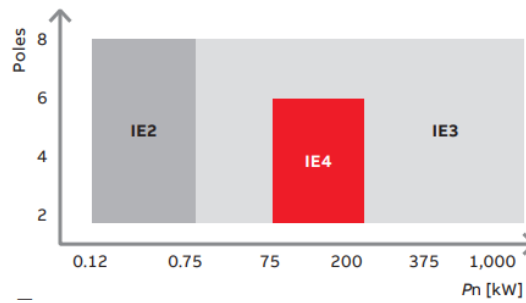


Figure 9: Regulation for electric motors under EU Eco-design requirements (since July 2023)

Step 2 (Starting 01.07.2023) (additions to Step 1)

2, 4 and 6 pole single speed motors from 75 kW up to 200 kW had to reach the IE4 efficiency class (Figure 9).

The Regulation also sets information requirements for electric motors and variable speed drives in scope. This includes the provision of energy efficiency values at different load points, enabling easier optimisation of energy use in motor systems.

The EU Commission estimated that under the former regulation more efficient motors were expected to bring 57 TWh of annual energy savings in the EU by 2020. Taking into account the overall effect of the revised regulation, the annual savings are expected to increase to 110 TWh (9500 ktoe) by 2030.

5.2 Subsidy-based policies for electric motors

The overwhelming number of measures discussed in Chapter 0 are related in a broad sense to subsidy-based policies. Taking all categories together, which in one way or another represent subsidies: financial measures and loans, as well as their combinations, fiscal measures and market-based instruments such as energy saving obligations (see Figure 3) 42 out of 61 (69%) are related to subsidy-based policies. This shows that energy efficiency policies related to electric motors are targeting largely the financial barriers. While these factors hold significance, obstacles in implementation, such as complex interactions with industrial processes, are impeding the adoption of cost-effective measures within the industry. The recent surge in electricity prices, driven by escalating gas prices, significantly influences wholesale electricity prices and has been particularly pronounced in 2022. Despite observing a decline in electricity prices in 2023, they still hover around an average that is roughly double the pre-Ukraine crisis levels. It remains uncertain whether they will swiftly return to those lower levels, as a potential resurgence in gas prices could lead to another increase in the near term. In the medium term, there are certainly factors at work which tend to decrease the prices (notably reforms in the marginal pricing of electricity and increasing penetration of renewables in the power mix). However there are also strong factors active leading to increases in electricity prices (such as increasing demand from heat pumps, electric cars, hydrogen production and direct electrification of process). This will lead to further strain on electricity prices.

Hence, it can be expected that the economics of motor-related measures is already becoming more interesting and will further improve. The non-economic barriers to motor-related measure thus will require additional focus.

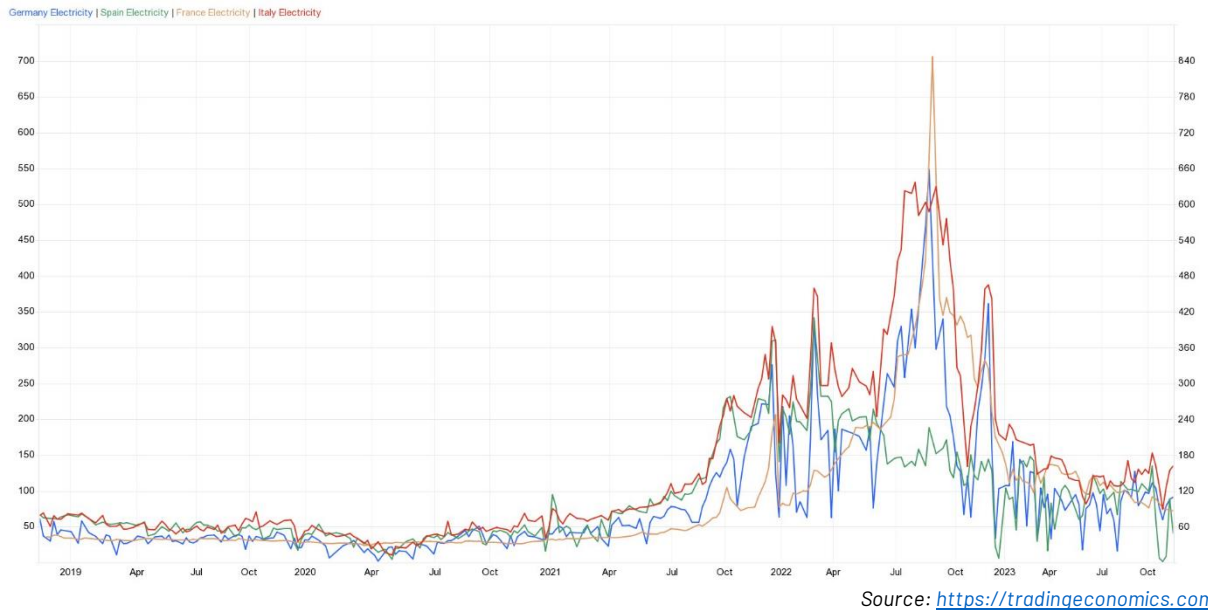


Figure 10: Whole sale electricity prices in four European countries Germany, France, Italy, Spain

5.3 Non-subsidy-based policies

Non-subsidy-based policies related to electric motors only represent one third of all policies. They are linked to:

- Mandatory standards
- Mandatory information (such as audits or motor labelling)
- Informational measures
- Learning Networks for Energy Efficiency

Barriers overcome by non-subsidy-based policies related to electric motors include informational and behavioral barriers to electric motor replacement. Mandatory information policies, such as energy audits obligations, are one example of such policies. These policies aim to provide information to consumers about the benefits of electric motors and to encourage them to replace their old, inefficient motors with newer, more efficient models. Learning Networks for Energy Efficiency is another example of a non-subsidy-based policy that aims to overcome informational barriers by providing training and support to businesses and individuals on how to improve energy efficiency.

The success of these measures in overcoming barriers to electric motor replacement varies depending on the specific policy and context. However, the effectiveness of mandatory information policies is less clear, as they may not be sufficient to overcome all of the barriers to electric motor replacement, such as upfront costs and lack of awareness about the benefits of electric motors.

5.4 Generic energy efficiency programmes for industry versus motor-specific policies

Frequently motor-specific policies are integrated into general industrial programmes on energy, as can be derived from the following examples and the in-depth analysis presented in **Error! Reference source not found.**

Example where electric motors are not specifically addressed in industrial energy efficiency programmes:



- The Learning Networks for Energy Efficiency in industry address all industrial technology equally. Correspondingly, low hanging fruits such as industrial lighting first attract the attention of the networks, while electric motors and their applications represent a correspondingly low share.

Examples where general programmes on energy efficiency in industry include motor-specific components.

- The “Federal Funding for Energy and Resource Efficiency in the Economy” programme in Germany aims to increase energy efficiency in the industry. The purpose of module 1 is to support the replacement or acquisition of high-efficiency units for industrial and commercial applications on the company premises in cross-sectional technologies.
- The Energy Efficiency Promotion Plan (PPEC) programme in Portugal, containing a measure to promote the installation of high efficiency motors (IE3 or IE4).

While there are arguments to consider policies and measures in the context of all industrial energy efficiency policies, there are **important arguments to advocate motor-specific measures which address all or many aspects of motor-specific barriers in industry in common** and in focus, given the fact that electric motors and their applications represent about 70% of industrial electricity demand in Europe.

5.5 Policy instruments promoting systems approaches to motor replacement

Quite a few of the investigated countries have developed specific policy instruments to address systems approaches to motor replacement. Examples include:

- The Netherlands: An important (new) development within the Dutch legislative framework is the requirement (as of end of 2023) for large companies to analyse all motor driven systems larger than 15 kW. This happens as part of the mandatory energy audit which is implemented nationally (refer to the ‘onderzoekplicht’ and ‘informatieplicht’) and overlaps with the mandatory energy audits for large companies required by the EED Art.7/8 every 4 years. This specific inclusion of motor driven systems in the mandatory energy audit is an important development that could be the first step towards accelerated uptake and implementation of specific policy measures targeted at the replacement of old- and inefficient electric motors.
- Germany: In the “Federal Funding for Energy and Resource Efficiency in the Economy”, which has different modules, the purpose of module 1 is to support the replacement or acquisition of high-efficiency units for industrial and commercial applications on the company premises in cross-sectional technologies. This module is component-oriented with a detailed list of technologies. Motor systems aspects are partly reflected in the detailed technology lists. Module 4 (Energy- and resource-related optimisation of facilities and processes) complements with a systemic approach: Funding is provided for investment measures for the energy and resource-oriented optimisation of industrial and commercial facilities and processes that contribute to increasing energy or resource efficiency. The funding is open to all technologies and can also include the measures listed under modules 1.

CEMEP addresses the systems perspective in their policy paper "[A system approach to maximise energy savings potential in electric drive systems](#)". Their key take-aways are:

- Only increasing the efficiency level of individual components (e.g. motor or VSD) does not generate significant energy savings.
- A system approach must be implemented to enable efficiency, when components become a system optimising the energy consumption of the application.
- Key measures should be mandated to start saving energy, such as using Life Cycle Cost assessment; expert cooperation & knowledge creation; and highlighting non-energy benefits (e.g. lower carbon footprint).

CEMEP points to the fact that in recent years standards were developed to assess the energy efficiency of components and systems, progressing from the individual component to the entire electric drive



system. Notably, this is the case of the Standard IEC 61800-9 Electric Drive System, which describes how to calculate the energy efficiency of a complete Electric Drive System. Based on the development of these Standards, CEMEP advocates policies addressing in particular the following organisational and technical measures (CEMEP 2023), which are best addressed in connection with audits on motor systems, notably:

- the use of Life Cycle Cost assessments to highlight the advantages of energy saving measures in motor systems.
- the creation of knowledge using IEC- and ISO-standards across the value chain to reduce the energy demand of electric drive systems.



6. Conclusion

The imperative need for EU member states to prioritize the introduction of policy measures targeting old and inefficient electric motors used in the industrial and service sectors cannot be overstated and becomes ever more apparent from this review with little to no policies found that are targeting motor replacement directly. Instead, blanket EE related measures cross cutting multiple sector are found to be the main measures addressing motor inefficiency related energy consumption. As per the introduction section, the electricity consumption of motors in the industrial sector remains a significant contributor to energy consumption and carbon emissions across the EU with over an estimated half of Europe's electricity consumption in the industry sector consumed by motors. Introduction of adequate measures to support their timely replacement therefore plays a pivotal role in driving the energy saving targets of the member states and, as emphasised by this review, remain under considered by all countries.

Aligning with the long-term goals set in the NECPs, EU member states are committed to achieving substantial reductions in greenhouse gas emissions by 2030, with the ambition to transition to a cleaner more efficient energy system. These reports outline the strategic roadmap towards the ambitious targets set by the EU, and under the EED, specifically relating to Articles 7/8 (and 11 audits), MS are obligated to implement policies that promote energy efficiency and the use of renewable energy sources to achieve the (annual) energy consumption targets set. However, what is apparent from the first revision of the NECPs and the underlying accompanying annual energy reports, is that many MS struggle to achieve the saving targets set.

Introducing policy measures which focus on, and promote the need for, early motor replacement the MS have a major, and still often untapped, opportunity to significantly contribute toward achieving the saving targets set. Furthermore, the introduction of focused policies can foster innovation and economic growth, by incentivizing the adoption of efficient technologies in parallel to motor replacements such as digitization of the motor system, introduction of variable speed drives (VSDs), energy class standards, improvement of recycling, and further development of a robust market for energy-efficient motors which is shown to be underappreciated.

Also economic benefits of early motor replacement should not be understated, as they align with reduced energy costs for industries, increased competitiveness in global markets, and job creation in the manufacturing and maintenance sectors which are all potential outcomes of adequate integration of motor replacement policies. Similarly, roll-out of supportive trainings raising the overall competence of motor operators and energy experts, often auditors, who lack the required knowledge for proper assessment of the motor system, and fails to recognise the inherent energy savings potential.

In essence, the adoption of policies targeting old and inefficient electric motors in industry represents an untapped and major opportunity for member states. Allowing them to address environmental concerns, stimulate economic growth, and bolster their energy security, all in alignment with the long-term targets laid out in their NECPs and the obligations stipulated in the EED. The time to act is now, and by doing so, EU member states can take a significant step towards a more sustainable and prosperous future for all, while fulfilling their energy saving obligations.

7. Annex I: Policy Review Collection Template

EU-MORE



EUropean MOtor
REnovation initiative

Collection Template

of past and existing policy options for the
acceleration of electric motor renovation

COUNTRY

Main Author(s) (Organization)



List of Acronyms

Acronym	Text
	Please include any acronyms used in this Collection Template



COUNTRY

General suggestions and recommendations filling in this template:

- Consider the [National Energy and Climate Plans \(NECP\)](#) as a good first starting point
- Have a look at the [ODYSSEE-MURE](#) database for a first policy overview before diving into the government websites
- Also consider the [IEA policy database](#)
- **Contact (national) policy experts for verification and additional inputs, rather than asking them to fill out the policy review for you.**
- **Use this activity as a good opportunity for general stakeholder outreach for EU-MORE, draw attention to the [website](#) and explore the option to discuss upcoming developments by creating a dedicated section on the [forum](#) (and sign up!)**

Introduction and description of the national policy framework and important related national programmes, measures and/or developments:

... add text here ...

Suggested format/structure:

- *Introduction to the national policy framework including the implementing authorities (name and typical responsibilities)*
- *Description of the general direction / course of action taken by the country (NECP)*
- *Overview of major national programmes related to Energy Efficiency*
- *Highlight EU-MORE related and/or relevant policy developments in the past, present, or expected in the (near) future.*
- *(If available) list the related National goals/targets set on Energy Efficiency improvements to which the related motor replacement measures aim to contribute*

Brief evaluation of the overall size and scope of national actions in relation to the replacement of electric motors and the EU-MORE project as a whole

... add text here ...

Would you say the countries actions in this field are:

- *Leading the pack as a frontrunner, with significantly large measures already implemented and/or under consideration that go beyond the typical standard*
- *Lagging, little to no action taken at all*
- *Industry standard, slow mover, why?*
- *Please specify (no need to be scientific, can be based on gut-feel personal judgement / perspective)*



Measure 1: [TITLE]

Overview	
Short Description	[Brief summary of the policy measure related to motor replacement](2-3 lines max)
Responsible Authority	[(national) authority responsible for implementation](text)
Status	[Ongoing / Proposed (definitive) / Proposed (early-stage) / Completed](pick one)
Issue Date	[Month, Year](date of announcement)
Start Date	[Month, Year](confirmed/expected)
Ending Date	[Month, Year](confirmed/expected)
Duration	[# Months](confirmed/expected)
Reference:	[Link to main resource](official government publication/announcement/website with information)

Main Description

A detailed description of the policy measure – including references to (if applicable) anchoring national law, EU directives, other schemes

... add text here ...

Include:

- *The (specific) scope of the targeted sector (Municipalities, SME's, Large Companies, certain industry sector, ...)*
- *Set conditions / requirements / criteria for participation in the scheme (company size, expected energy reduction, cost of intervention, return on investment years, funding percentages)*
- *a description of the eligible actions related to motor renovation.*
- *(Where possible) the specific type of motors addressed (like year of construction / Efficiency class IE1; IE2; IE3; IE4 or IE5 / power (kW) / # of operating hours per year)*



	Characteristics
Budget	[Total amount in EUR](total budgeted/actual amount in EUR) <ul style="list-style-type: none"> ○ Include any relevant details on the budget distribution. If possible, try to include budgets specific to motor renovation (like range of funding/budget available per beneficiary)
Financing of the measure	[How is the measure funded](i.e. through national funds, ESCOs, trade-in-schemes, tax incentive, other...)
Policy focusses	[Product / service](Indication if the policy support package targets/focuses on product ('physical') interventions or service ('soft') interventions)
Intervention Type	[short keyword that best captures the intervention](equipment upgrade, capacity building, awareness raising, mandatory replacement, ...)
Main Barriers Addressed	[Brief description of the main barriers addressed by the measure e.g. high initial cost, lack of information, general financial viability, return on investment, ease of regulation, emission reduction, waste reduction, ...]
Key Driver(s)	[what "forced" the implementation of the measure](a court ruling, a national law, EU Directive, other?)
Replicability	[high / medium / low](a simple personal 'gut feeling' assessment of the potential for replication or transfer to other countries; are there any specific local conditions)
EU Inclusion	[Yes/No, + short description](Included in NECP? EED? Other EU wide policy directives?)
Related Characteristics	[open text](feel free to include any additional thoughts on the Key Characteristics not captured in the above)

Impacts

A detailed description of the final (expected) results of the measure implementation and any achievements related to the measure implementation.

... add text here ...

	Impacts
Case level impact	[High (>20%) / Medium (5-20%) / Low (<5%) / Unknown](indicative value based on the expected total % reduction in energy consumption through measure introduction at the case level)
Policy level impact	[High (>0.5%) / Medium (0.1-0.5%) / Low (<0.1%)](indicative value based on the expected total % reduction in energy consumption through measure introduction at the industry/sector level)
Size	[Number of electric motors impacted by the action; where possible disaggregated by efficiency level, power range]
Energy	[Estimation of overall Energy / GHG savings through the measure](in MWh or tCO ₂) Where available specify the estimation specific to motors
Impact evaluation	[Short, bulleted list of the main (expected) results and/or key achievements of the measure implementation](see detailed impacts description section above)

(If available) Provide a description of the method used for calculating the final energy - / cost- savings achieved through the measure.

... add text here...

Lessons Learnt

Description of the lessons learnt and/or (initial) feedback gathered in response to the measure's implementation. Also include (if applicable) the main barriers found that hamper and/or the conditions that are necessary for the implementation of the measure.

... add text here...

This is a good opportunity to reach out and ask the national stakeholder or responsible authorities directly for their inputs, for example through a short interview with stakeholders asking them to provide their views on current or future specifications, opportunities, or limitations regarding policy development.

Typical barriers for implementation:

- *(National) monitoring platform needed.*
- *Involvement of too many stakeholders*
- *Legal, regulation, certification issues*
- *Too complex, too little benefits observed.*
- *General cost of implementation*
- *Timeline unrealistic*

	Lessons Learnt
Key takeaways	[List of key takeaways/learnings](summarized list)
Recommendations	[for the specific improvement of existing National and/or EU policies](please specify)
Linked measures	[list of affiliated measures](follow-up interventions, finalized, discontinued, or planned measures associated with the action)
Reference(s)	[weblink(s)](weblink for further reading e.g. reports, studies, publications, policy evaluations, ...)
Other	[Key associated contacts, organizations, ministries, responsible authorities]
Thoughts, comments, considerations ...	[Links to successful cases, case studies, success stories, further research, or any other relevant reports]

Measure 2: [TITLE]

Copy and paste section (1.1) and all subsections to include additional measures

Table 10: National Policy Measure Overview - COUNTRY

#	Measure Title	Short Description	Type of Measure	Start Year	End Year	Duration	Target Groups	Source link / Reference	Case Level Impact of the measure
1									
2									
3									
...									
...									



8. Annex II: Summary Table of Policy Measures

Country	Measure Title	Measure Acronym	Category	Sub-Category	Start Year	End Year	Target Group 1	Target Group 2	Reference	Case Level Impact	Policy Level Impact	Policy Focus	Replicability	EU Inclusion	NECP	EED Art. 7/8	Key Driver
Austria	Umweltförderung im Inland (UFI)	UFI	Financial - Subsidies		1993	-	Industry - All	Services	Link	High	High	Product	High	Yes	Yes		
Austria	OekoBusiness Wien/Vienna	OBVV	Information/Trainings	Financial - Subsidies	1998	Ongoing	Industry - All	Services	Link	High	High	Service	High	Yes	Yes		
Austria	Energy Audits	EA	Mandatory Information	2015	2019	Industry - Large Companies			Link	High	Both	High	Yes	Yes	Yes	EED	
Austria	Energy management systems in small and medium enterprises	EMS-SME	Financial - Subsidies		2018	2025	Industry - SMEs		Link	Low	Medium	Both	Medium	Yes	Yes		
Austria	klimaaktiv Energy Efficient Enterprises	kaEEE	Information/Trainings		2005	2030	Industry - All	Services	Link	High	High	Service	High	No	No		
Belgium	Tax deduction for energy saving investments by companies	TD-ESIC	Fiscal		1993	Ongoing	Industry - All		Link	Low	Medium	Product	High	Yes	Yes		
Belgium	Wallonia - Voluntary agreements with industry	VVAI	Voluntary Agreements		2003	Ongoing	Industry - All		Link	High	High	Product	High	Yes	Yes	Yes	EED
Belgium	Flanders - Voluntary agreements with industry	FVAI	Voluntary Agreements		2003	Ongoing	Industry - All		Link	High	High	Product	High	Yes	Yes	Yes	EED
Belgium	Brussels - Compulsory energy audits for large buildings and large companies	BEA-LBLC	Mandatory Information	2012	Ongoing	Industry - Large Companies	Buildings - All		Link	High	Medium	Product	High	Yes	Yes	Yes	
Bulgaria	Innovations and Competitiveness	IAC	Financial - Subsidies & Loans	Information/Trainings	2014	Ongoing	Industry - SMEs		Link	Medium	Medium	Product	High	Yes			
Bulgaria	Energy Efficiency and Renewable Sources Fund	EERF	Financial - Subsidies & Loans	Information/Trainings	2006	Ongoing	Industry - All	Municipalities	Link	Medium	Medium	Both	High	Yes	Yes		
Croatia	ENU-17: Increasing energy efficiency and use of RES in manufacturing industries	ENU-17	Financial - Subsidies		2017	2030	Industry - SMEs		NECP			Both	High	Yes	Yes		
Croatia	ENU-1: Energy efficiency obligation system for suppliers	ENU-1	Mandatory Standards		2019	2030	All Sectors		NECP		High	Both	High	Yes	Yes	Yes	
Croatia	Introduction of efficient electric motors	IEEM	Information/Trainings		2011	2016	Industry - All		NEEAP		High	Product	High	No	No	No	
Cyprus	Grant Scheme for conducting energy audits in SMEs	GSEA-SME	Financial - Subsidies		2019	Until end of budget	Industry - SMEs		Link	Low	Low	Service	High	Yes	Yes		
Cyprus	Business4Climate	B4C	Voluntary Agreements		2018	Unknown	Industry - SMEs		Link	Low	Low	Service	High	Yes	Yes		
Cyprus	Supporting scheme for promoting energy efficiency investments in Small and Medium Enterprises (SMEs)	SSEI-SME	Financial - Subsidies		2022	~2030	Industry - SMEs		Link	Low	Low	Both	High	Yes	Yes		
Czech Republic	Operational Program Technologies and Application for Competitiveness	OP TAC	Financial - Subsidies		2021	2027	Industry - All	Services	Link	Medium	High	Both	Medium	Yes			
Denmark	Mandatory energy audit in large enterprises	MEALE	Mandatory Information	2012	Ongoing	Industry - Large Companies			Link	High	Medium	Service	High	Yes	Yes	Yes	
Denmark	Renewable energy for production processes	REPP	Financial - Subsidies		2013	2021 (?)	Industry - All		Link	High	High	Product	High	Yes		Yes	EED
Denmark	Increase in energy tax rates on business as part of Green Tax Reform – phase 1	IETR-GTR1	Fiscal		2021	2030	Industry - All	Services	Link	High	High	Product	High	Yes	Yes		EED
Denmark	Competitive subsidy scheme related to private enterprises	CSSRPE	Financial - Subsidies		2021	2029	Industry - All	Services	Link	High	Medium	Product	High	Yes			EED
Estonia	Grant support for resource efficiency in the enterprises	GSREE	Financial - Subsidies		January 2017	Dec. 23	Industry - All		Link	High	High	Both	High	No	No	No	
Finland	Energy Efficiency Agreement for Industries	EAI	Voluntary Agreements		1997	2025	Industry - All		Link		High	Product	High	Yes	Yes	Yes	EED
France	White Certificates Scheme	WCS	Market-based Instruments	2006	Ongoing	Industry - All			Link	High	High	Product	High	Yes			
Germany	Federal Funding for Energy and Resource Efficiency in the Economy –Module 1	FFEREE M1	Financial - Subsidies		2019	2023	Industry - All	Municipalities	Link	High	High	Product	High	Yes	Yes	Yes	EED



Germany	Federal Funding for Energy and Resource Efficiency in the Economy – Module 4	FFEREE M4	Financial - Subsidies		2019	2023	Industry - All	Municipalities	Link	High	High	Product	High	Yes	Yes		EED
Germany	Federal Funding for Energy and Resource Efficiency in the Economy – Funding competition	FFEREE M-FC	Financial - Subsidies		2019	2023	Industry - All	Municipalities	Link	Medium	Medium	Product	High	Yes	Yes	Yes	EED
Germany	KfW Energy Efficiency Programme - Production Plants/Processes	KfW-EPPPP	Financial – Loans		2015	-	Industry - All		Link	High	Medium	Product	Medium	No			EED
Germany	Energy-efficient and climate-friendly production processes	ECP	Financial - Subsidies		2013	2017	Industry - All		Link	Medium		Both	High	No			
Germany	STEP up! - Utilizing electricity efficiency potentials	STEP	Financial - Subsidies		2016	2019	All Sectors		Link	Low	Low	Both	Medium	No			
Germany	PIUS Advice and Invest	PAI	Financial - Subsidies		2017	n/a	Industry - SMEs		Link	Medium		Service	Medium	Yes			
Greece	“Antonis Tritsis AT03”	AT-AT03	Financial - Subsidies		2020	2023	Buildings - Public		Link	High	High	Product	High	Yes			
Greece	“Green transition SMEs”	GT-SMEs	Financial - Subsidies		2023	-	Industry - SMEs		Link	High	High	Both	High	Yes			
Greece	“Energy efficiency obligation scheme”	EEOS	Mandatory Standards		2017	2030	Industry - Large Companies		Link	High		Both	High	Yes	Yes		EED
Hungary	Corporate income tax incentive to trigger energy efficiency Investments	CITITEE	Fiscal		2017; amended 2022	Ongoing	Industry - All		Link	Medium	Low	Product	High	Yes	Yes	Yes	EED
Hungary	Requirement for large energy consuming enterprises to install sub-metering devices	RLECEIS MD	Mandatory Standards	Mandatory Information	2020	Ongoing	Energy Intensive Industry		Link	Low	Low	Product	Medium	Yes			
Hungary	Operational Programmes for Environment and Energy Efficiency 2021-2027	OP EEE 2021-2027	Financial - Subsidies		2014	2027	All Sectors		Link	Medium	High	Both	Low	Yes			
Ireland	EXEED Certified Programme	ECP	Financial - Subsidies		2021	2023	All Sectors		Link	Medium	High	Product	High	Yes	Yes		
Ireland	Energy Efficiency Obligation Scheme (EEOS)	EEOS	Market-based Instruments	2021	2030	Energy Intensive Industry											
Italy	White certificates (PS)	WCPS	Market-based Instruments	2004	-	Industry - All		Link	Medium	Medium	Product	Medium	Yes	Yes			
Latvia	Efficient use of energy resources and transfer to RES in manufacturing industry	EU-EMI 2014-2020	Financial - Subsidies		2017	Dec. 2023	Industry - All		Link	High	High	Product	High	Yes	Yes	Yes	EED
Latvia	Improving energy efficiency and promoting the use of RES in industry	EU-EE-RES 2021-2027	Financial - Subsidies		Sept. 2022	December, 2029	Industry - All		Link	High	High	Product	High	Yes	Yes	Yes	
Latvia	Loans and green bonds to improve the energy efficiency of businesses	LGB-EEB	Financial – Loans		2018	-	Industry - All		Link		Medium	Product	Medium	Yes	Yes		
Lithuania	Increase energy efficiency in industrial enterprises (private sector)	IEE-IP	Financial - Subsidies		2022	2029	Industry - All		Link	Medium	High	Product	Low	No			
Lithuania	Agreements with energy companies on energy savings	ACES	Mandatory Standards	Voluntary Agreements	2017	-	Industry - Large Companies		Link	Low	Low	Both	Medium	Yes	Yes		Energy Efficiency Action Plan
Luxembourg	Voluntary Agreements (“Accord Volontaire”)	VA	Voluntary Agreements		1996	December, 2023	Industry - All		Link	Low	Low	Service	High	Yes	Yes		
Malta	Aid Investment Scheme for Businesses	AISB	Financial - Subsidies		2020	2023	Industry - All	Services	Link			Product	High	No	No		
Netherlands	Energie-investeringsaftrek (EIA)	EIA	Fiscal		1997	Ongoing	Industry - All	Services	Link	High	High	Product	High	Yes	Yes		
Netherlands	Versnelde klimaatinvesteringen industrie (VEKI)	VEKI	Financial - Subsidies		2019	Ongoing	Industry - All		Link	High	Medium	Product	High	Yes	Yes		
Netherlands	Milieu-investeringsaftrek (MIA) & Willekeurige afschrijving milieu-investeringen (VAMIL)	MIA-VAMIL	Fiscal		1991	Ongoing	Industry - All	Services	Link	High	Medium	Product	High	Yes	Yes	No	
Poland	System of White Certificates	SWC	Market-based Instruments	2013		All Sectors		Link	High	High	Product	High	Yes	Yes			
Portugal	SGCIE - Management System for Intensive Energy Consumers	SGCIE	Mandatory Information	April, 2008	Ongoing	Energy Intensive Industry		Link	High	High	Product	High	Yes	Yes			
Portugal	Plano de Promoção da Eficiência no Consumo de Energia (PPEC) / Energy Efficiency Promotion Plan	PPEC	Financial - Subsidies			All Sectors		Link	High	High	Both		Yes	Yes			
Portugal	Energy Efficiency Fund (EEF)	EEF	Financial - Subsidies			Industry - All		Link			Product	Medium					



Romania	EIB loans for energy efficiency projects	EB-EE	Financial – Loans		2020	Ongoing	Industry - SMEs		Link			Both	High				
Slovakia	Slovak Sustainable Energy Financing Facility (SLOVSEFF III)	SSEFF III	Financial - Subsidies & Loans	2014	2020	All Sectors			Link			Product	Low	Yes	Yes		
Slovenia	Financial incentive for increasing the efficiency and use of RES in industry (same for SMEs)	FIERI	Financial - Subsidies		2017	2030	Industry - SMEs		Link	Low	Low	Product		Yes	Yes	Yes	EED
Slovenia	Financial incentives for efficient electricity consumption	FIIEEC	Financial - Subsidies		2008	2030	Industry - All		Link	High	High	Product		Yes	Yes	Yes	EED
Slovenia	Energy efficiency obligation scheme	EEOS	Mandatory Standards		2010 (2015)	2030	All Sectors		Link	High	High	Both		Yes	Yes	Yes	
EEDSpain	Ecodesign requirements for energy-using products	ERP	Mandatory Standards		2007	Ongoing	All Sectors		Link	High	Medium	Product	High	Yes	Yes	No	
Sweden	PFE – Programme for energy efficiency	PFE	Voluntary Agreements		2004	2015	Industry - Energy Intensive Companies		Link	High	High	Product	High	No	No		
Sweden	Energikartläggningsscheckar (SEAP)	SEAP	Financial - Subsidies		2010	2014	Industry - SMEs		Link	Medium	Low	Product	High	No	No		National Law
Sweden	Energy Step	ES	Financial - Subsidies		2018	2020	Industry - Large Companies	Mining/Manufacturing	Link	Low	Low	Product	High				



