

Minimum Energy Performance Standards for motor systems: Global overview

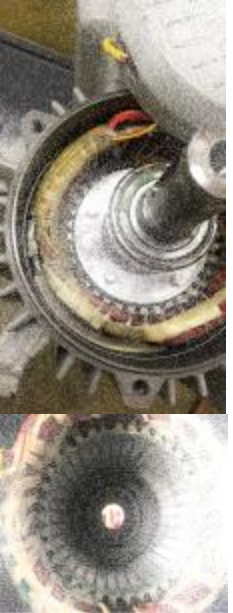
Motors Academy webinar #13

November 5 | 2024 15:00 – 16:00 CEST

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Introduction

IEA TCP 4E Electric Motor Systems Platform (EMSA)

Technology Collaboration Programme
by IEA



IEA TCP 4E Energy Efficient End-Use Equipment

- Energy efficient equipment
- 15 members (EMSA + CA, CN, FR, JP, KR, UK)

Electric Motor Systems Platform (EMSA)

- Raise awareness, share information, initiate collaborative projects and transfer experience *to support effective policy development for energy efficient electric motor systems*
 - International standards, testing, coordination
 - Digitalisation and demand flexibility in motor systems
 - Motor Systems Tool, expert pool
- 9 members (AU, AT, DK, EC, NL, NZ, SE, CH, US)



www.iea-4e.org/emsa

IEA TCP 4E Electric Motor Systems Platform (EMSA)

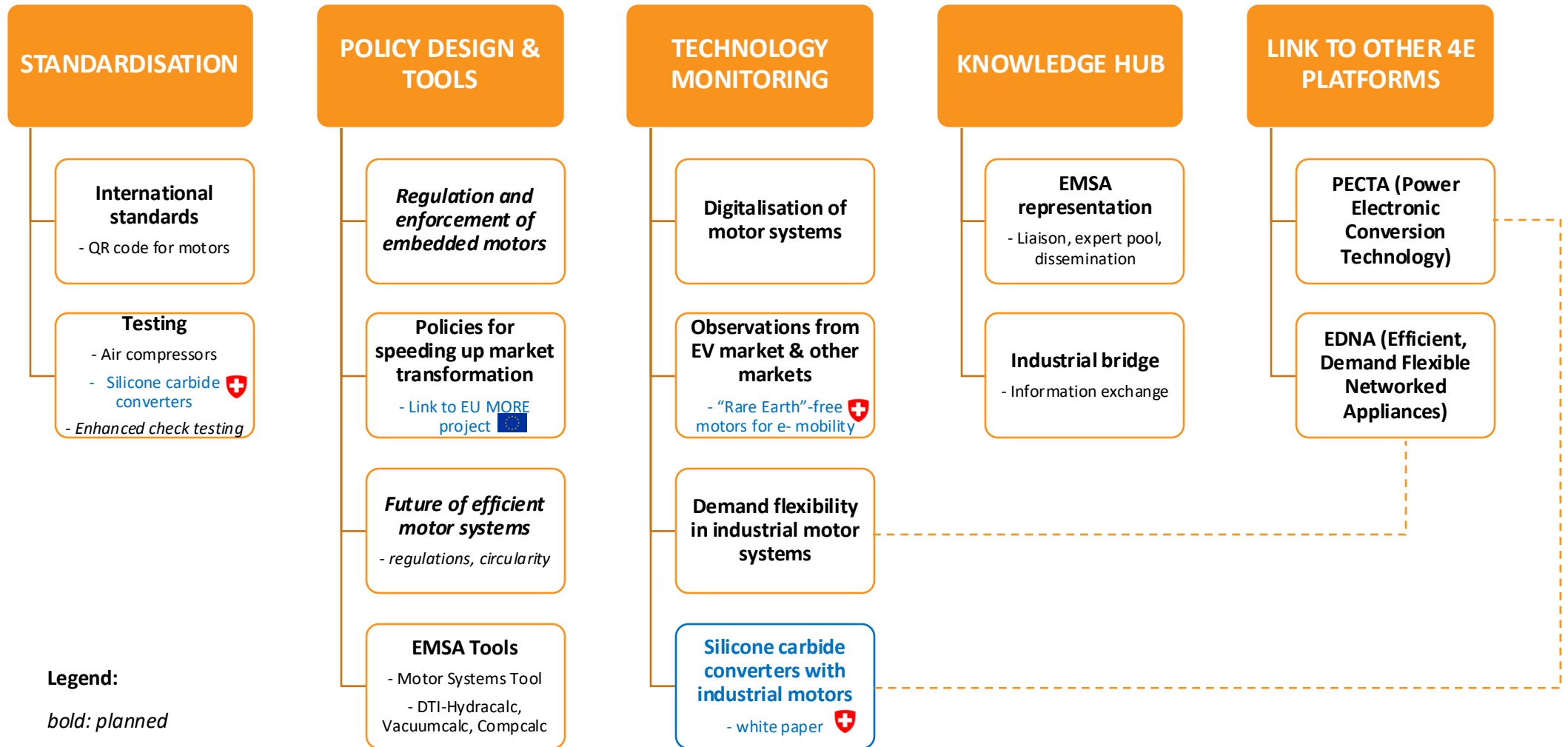
EMSA liaises with...



EMSA levels of impact

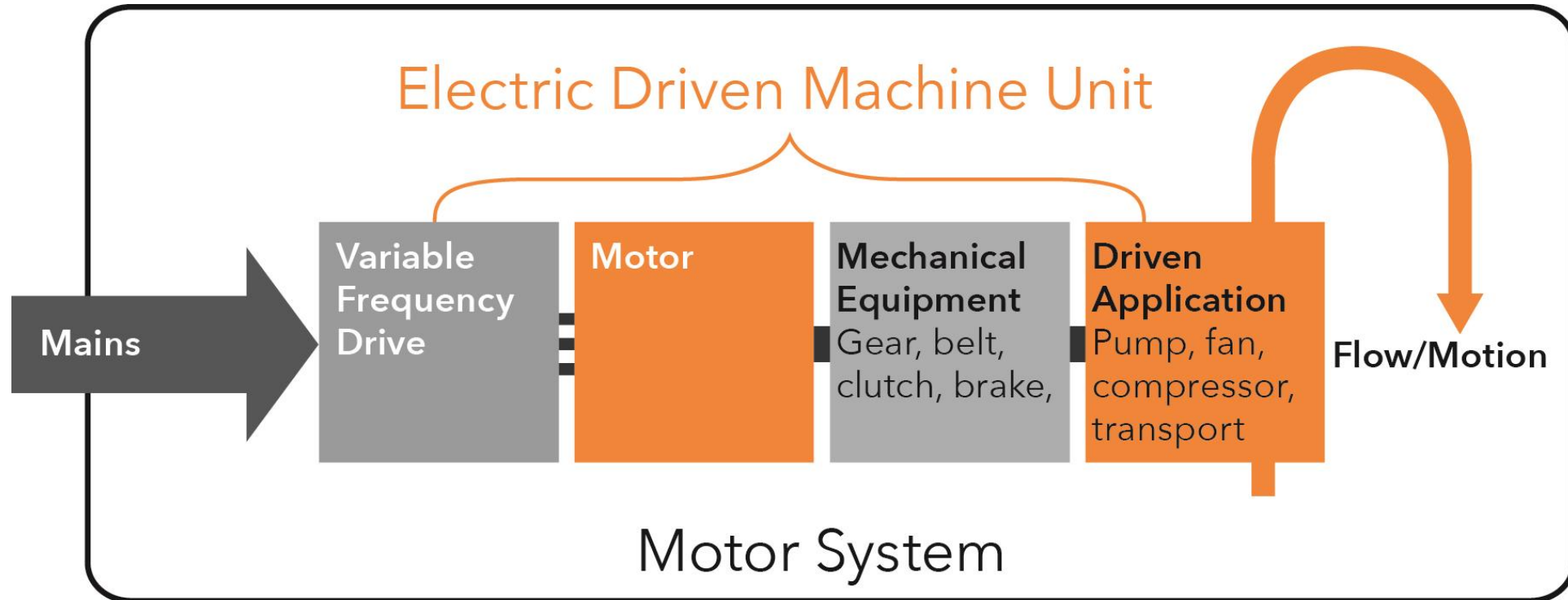


EMSA activities (2024 - 2029)



An electric motor system with different components is complex

Average savings potential on system level: 20 – 30%

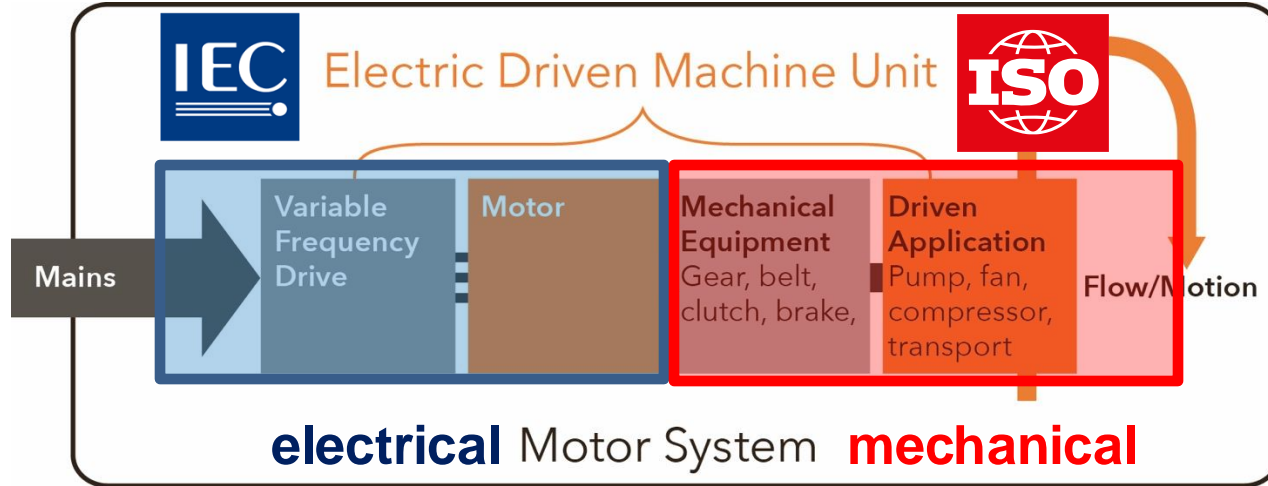


$$\eta_{\text{System}} = \eta_{\text{VFD}} * \eta_{\text{Motor}} * \eta_{\text{Gear}} * \eta_{\text{Belt}} * \eta_{\text{Driven application}}$$



International standards & Minimum Energy Performance Standards

Standards





JAG 22

Optimized Energy and Power Consumption of Electric Driven Machine Units

linked to TC 2, ISO/TC 115, ISO/TC 117, ISO/TC 118

Motor control		Motor	Mechanical equipment		Driven application			
IEC TC 121	IEC TC 22 SC 22G	IEC TC 2	ISO TC 41	ISO TC 60	ISO TC115	ISO TC 117	ISO TC 86	ISO TC 118
Switchgear & controlgear	Adjustable speed drive	Rotating machinery	Pulleys & belts	Gears	Pumps	Fans	Cooling-Compressors	Air-Compressors
1927	1934	1911	1947	1947	1964	1964	1957	1965

Standards and regulations

Component	Scope	Testing standards	Efficiency Classification standards
	 		
Motor			
Converter			
Pump			
Fan			
Air compressor			



Minimum Efficiency Performance Requirements
MEPS
MEPS
MEPS
MEPS
MEPS

Standards and regulations

Minimum Efficiency Performance Requirements Electric Motors, VSD, Pumps, Fans, Air compressors

Component	Scope	Testing Standard	Efficiency Classification Standard				Performance Requirement
			efficiency metric		P ^I	EP ^I	
Motor	3-phase induction motors (Low Voltage < 1'000 V)	IEC 60034-2-1 IEC 60034-2-3	IEC 60034-30-1 IEC TS 60034-30-2	IE, International Energy efficiency class	x		50+ countries (incl. EU)
Converter	Variable Speed Drive (VSD)	IEC 61800-9-2	IEC 61800-9-2	IE, International Energy efficiency class	x		EU
Pump	Rotodynamic water pump	ISO 9906	EU: EN 16480 EU: EN17038-1,-2,-3,-4 US: 10 CFR Part 431 /Y *) CN: GB19762	MEI, Minimum Efficiency Index EEI, Energy Efficiency Index PEI, Pump Efficiency Index EI, Efficiency Index	x	x	EU (**) EU (**) USA China
Fan	Industrial	ISO 5801 ISO 13350	ISO 13349 ISO 12759-1, -2 ISO 12759-3 ISO 12759-4 ISO 12759-5 ISO 12759-6	<i>Vocabulary and definitions</i> <i>General information; standard losses</i> FEG, Fan Efficiency Grade FMEG, Fan Motor Efficiency Grade JFMEG, Jet Fan Motor Eff. Grade FEI, Fan Efficiency Index	x	(x) x	China EU EU USA (***)
Air compressor	Compressor package	ISO 1217, Am. 1:2016	CN: GB 19513 US: 10 CFR Part 431 /T *)	Compressor efficiency grade Isentropic efficiency		x x	China USA

I) P = product; EP = extended product (motor, control, transmission, pump/fan/compressor)

II) MEPS = Minimum Energy Performance Standard (set as requirement by regulators)

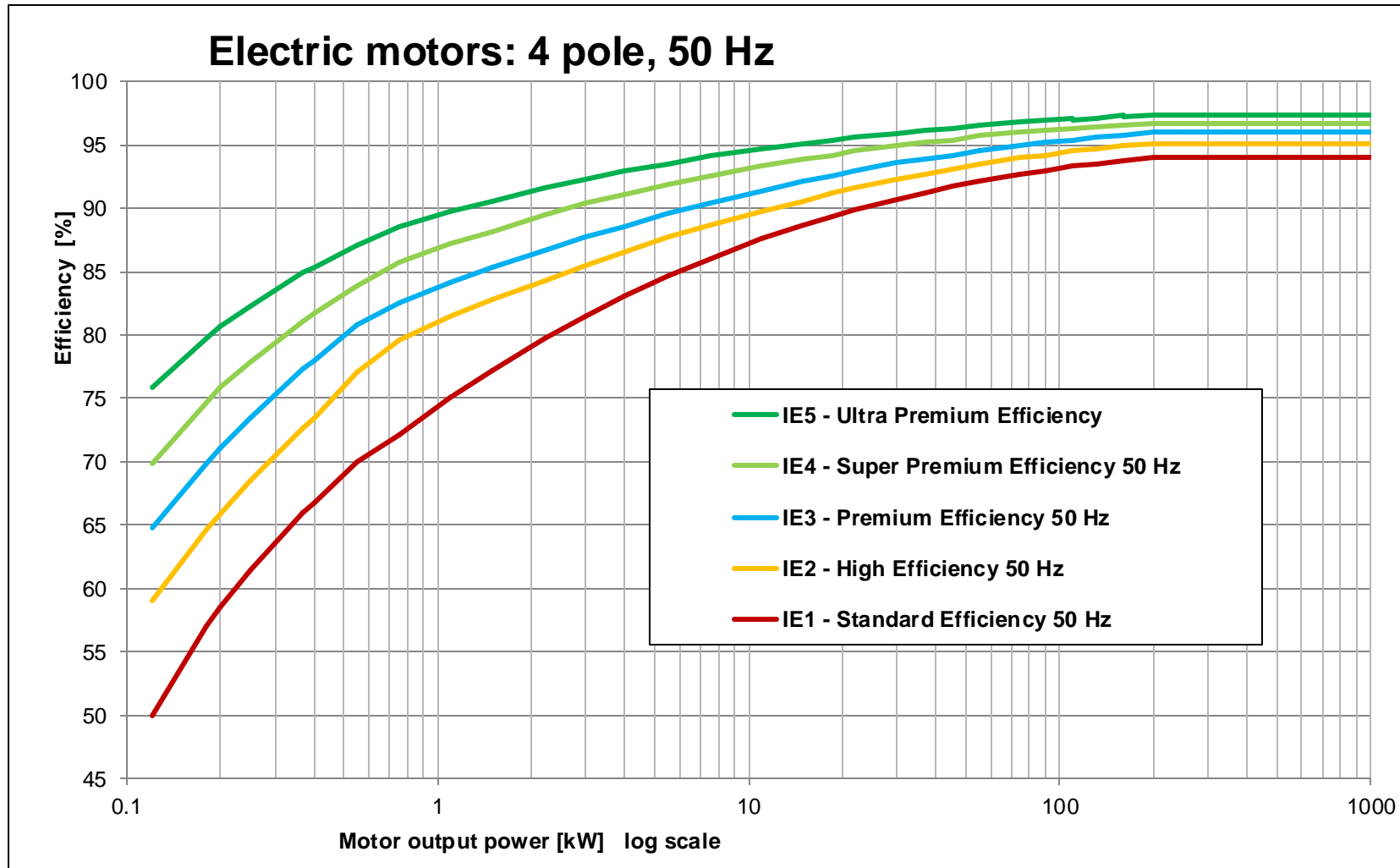
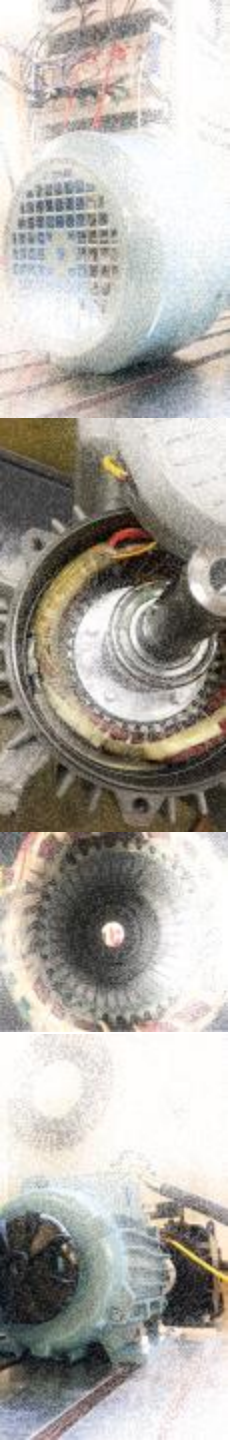
*) see Code of Federal Regulations (www.ecfr.gov) for test method, classification and minimum requirements

***) MEPS under revision

****) MEPS under development

Note: When available the related ISO or IEC standard is listed, otherwise the regional/national standard is listed.

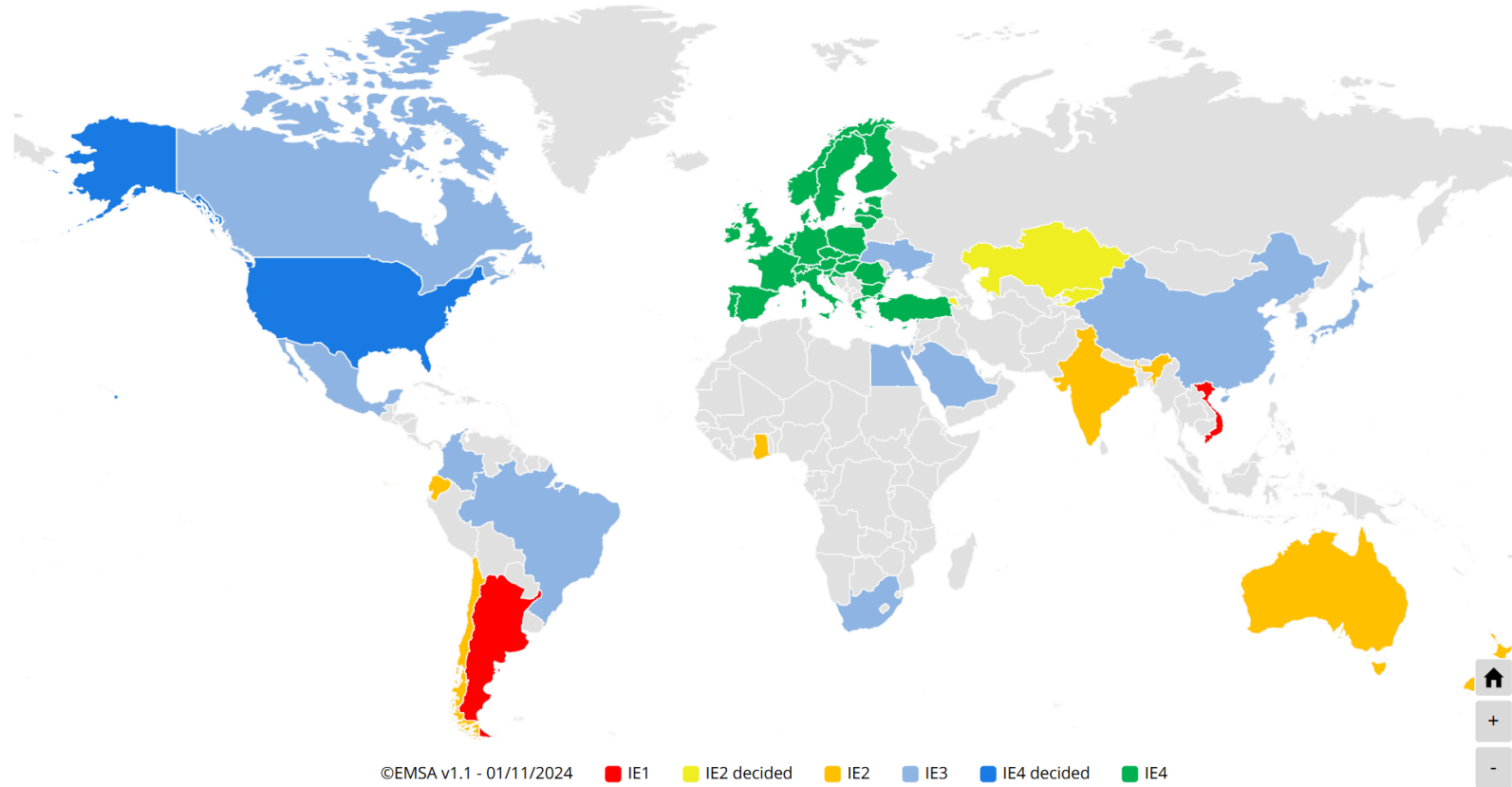
Efficient electric motors → IE-classification



Sources: IEC 60034-30-1; IEC TS 60034-30-2

Global overview of Minimum Energy Performance Standards (MEPS)

MEPS for electric motors



The colour reflects the highest requirement for electric motors in a country. The categories 'IE2 decided' and 'IE4 decided' mean a regulation to apply IE2 or IE4 respectively has been adopted and the requirement will be applicable from a future date.

Disclaimer: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

- Coming up on www.iea-4e.org/emsa: MEPS for pumps, fans, compressors

MEPS per region: looking back - status per Mid 2016

Efficiency classification		Minimum Energy Performance Standard (MEPS) [appr. status per Mid 2016]									
IEC 60034-30-1;2014		Mandatory MEPS II		0.12-0.75	0.75-7.5	7.5-75	75-150	150-200	200-375	375-563	563-1000
IE efficiency class ¹		Country / Region									
IE4											
IE3	Americas	Canada									
		Mexico									
		USA									
	Asia & Middle East	Israel									
		Japan									
		Taiwan									
		Saudia Arabia									
	Europe, Central	South Korea									
		EU 28 *)									
		Switzerland, Norway, Turkiye *)									
IE2	Americas	Brazil									
		Canada									
	Asia & Middle East	China									
		Israel									
	Australia & Oceania	South Korea									
		Australia									
	Europe, Central	New Zealand									
		EU 28 *)									
IE1	Americas	Switzerland, Norway, Turkiye *)									
		Chile									

I) Output power: 0.12 kW - 1000 kW, 50 and 60 Hz, line operated, 2-, 4-, 6- and 8-poles.

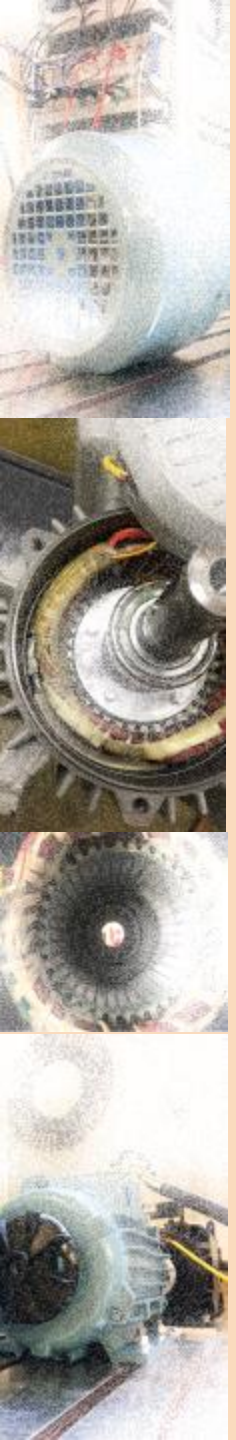
II) Testing standard IEC 60034-2-1

*) IE3 or IE2+VSD

Poll: How many countries have MEPS at IE3 for motors today?

- 11 – 15
- 16 – 20
- 21 – 25
- 26 - 30

(EU 27 counts as one)



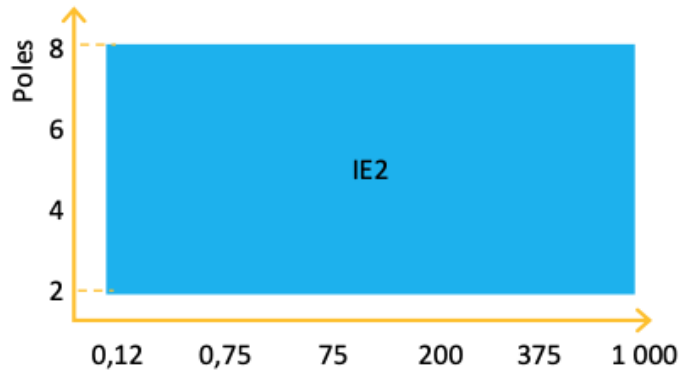
MEPS for motors per region, country

Efficiency classification	Minimum Energy Performance Standard (MEPS)		Range [kW]							
		Mandatory MEPS ^{II}	0.12-0.75	0.75-7.5	7.5-75	75-150	150-200	200-375	375-563	563-1000
IE efficiency class ^I	Country / Region									
IE4	Americas	USA, per 06.2027								
	Europe, Central	EU 27								
		UK, Switzerland, Norway, Türkiye								
IE3	Africa	Egypt								
		South Africa								
	Americas	Brazil								
		Canada								
		Colombia								
		Mexico								
		USA								
		USA								
	Asia & Middle East	USA, per 06.2027								
		China								
		Israel								
		Japan								
		Saudi Arabia								
		Singapore								
		South Korea								
	Europe, Central	Taiwan								
		EU 27								
UK, Switzerland, Norway, Türkiye										
Ukraine										
IE2	Africa	Ghana								
		Chile								
	Americas	Colombia								
		Ecuador								
		Armenia, KAZ, KGZ per 09.25								
	Asia & Middle East	India								
		Israel								
	Australia & Oceania	Australia								
New Zealand										
Europe, Central	EU 27, UK, CH, NO, TR									
	Americas	Argentina								
IE1	Asia & Middle East	Vietnam								

I) Output power: 0.12 kW - 1000 kW, 50 and 60 Hz, line operated, 2-, 4-, 6- and 8-poles. II) Testing standard IEC 60034-2-1

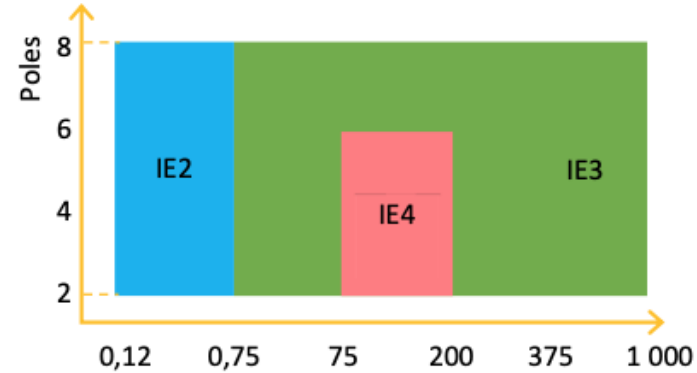
*) VSD: IE2 efficiency class, IEC 61800-9-2 (0.12-1'000 kW). **) IE3 or IE2+VSD

EU: MEPS for motors and VSDs – some details



Motors rated for operation on 50 Hz, 60 Hz or 50/60 Hz supplies:

- 1-phase motors
- Ex eb motors for explosive atmospheres

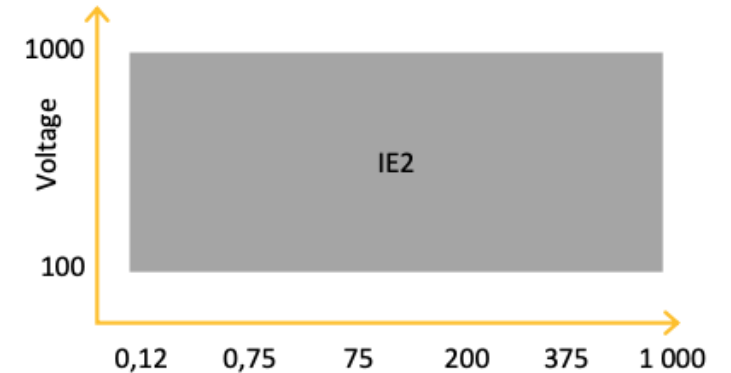


3-phase induction motors

- 2-, 4-, 6-, 8-poles
- 50, 60 Hz or 50/60 Hz
- Rated for continuous duty
- motors for explosive atmospheres Ex ec, Ex tb, Ex tc, Ex db, Ex db eb, Ex dc
- brake motors, incl. Totally Enclosed Air Over (TEAO) motors

Note: IE4 mandatory for 2-, 4- and 6-poles single speed motors which are not brake motors, Ex eb motors for explosive atmospheres or other explosion-protected motors

Information requirements at part load/speed for motors and VSDs

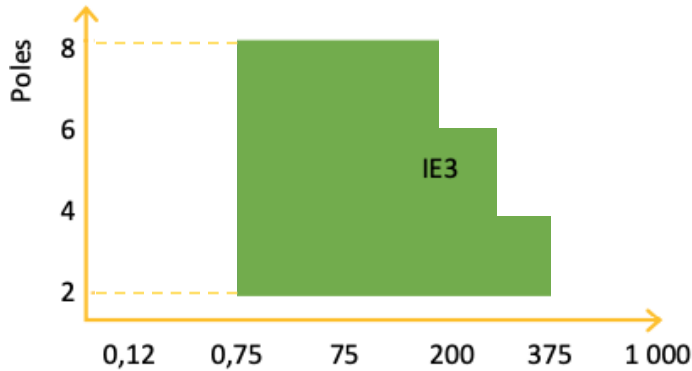


3-phase variable speed drives
from $0,12 \text{ kW} \leq P_n \leq 1000 \text{ kW}$

Major exemptions:

- Regenerative drives (active front end, AFE)
- Low-harmonic drives (THD < 10%)
- Multiple AC-output drives
- 1-phase drives

US: MEPS for motors – some details



IE3/NEMA Premium

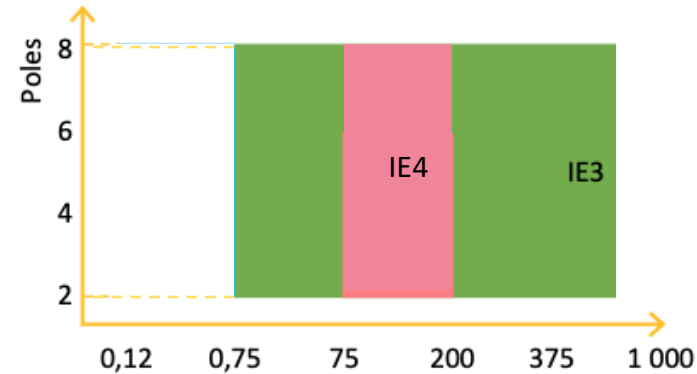
3-phase induction motors

- 2-, 4-poles 0.75 – 375 kW
- 6-poles 0.75 – 260 kW
- 8-poles 0.75 – 185 kW
- excluded: air-over/sp, inverter only air-over, liquid cooled, submersible [..]

Fire Pump Electric Motors: IE2, 0.75-373 kW

Polyphase Small Electric Motors: 0.18 – 2.2 kW: appr. IE3

Capacitor-Start Induction-Run and Capacitor-Start Capacitor-Run Small Electric Motors: 0.18 – 2.2 kW: appr. IE2/IE3



2023 direct final rule, *compliance starts June 1st 2027*

IE4/NEMA Super Premium: 75 – 186 kW

IE3/NEMA Premium: 0.75 – 75, 186 – 559 kW

3-phase induction motors

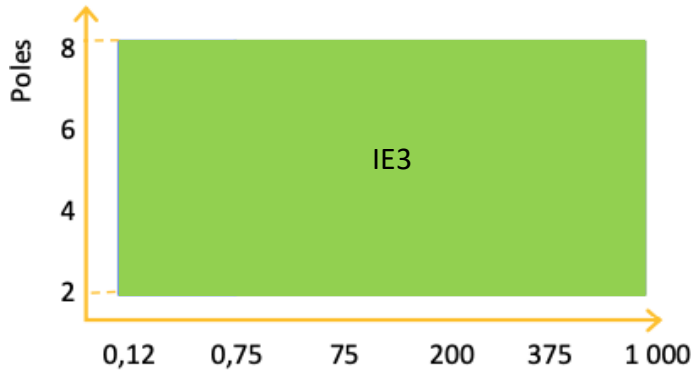
- continuous duty
- 60-hertz; 600 volts or less;
- 2-, 4-, 6-, or 8-pole configuration,
- excluded: inverter only air-over, liquid cooled, submersible [..]

Fire Pump Electric Motors: IE2, 0.75 - 373 kW

Air-Over Electric Motors: IE3/IE3+, 0.75 – 186 kW

Dedicated-purpose pool pump motors: 0.5 – 5 HP per Sept. 2027/2029: must be eq. with VSD; < 0.5 HP: min. efficiency of 69% at full load

China: MEPS for motors – some details



per 21 June 2021

3-phase induction motors

- 2-, 4-, 6-, 8-poles
- Rated for continuous duty

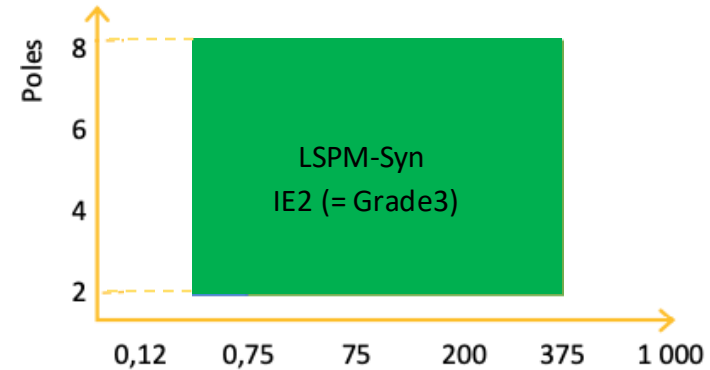
Excluded: All non-S1 motors, Converter motors, Non-ventilated motors, Special motors for specific machine requirements

Single-phase motors:

- capacitance starting asynchronous motors (0.12 – 3.7 kW) and capacitance running asynchronous motors (0.12 - 2.2 kW) *
- double capacitance asynchronous motors (0.25 - 3.7 kW) **, capacitance running motors and brushless DC motors for air conditioner fans (0.01 - 1.1 kW)

*) different classification from IEC 60034-30-1

**) classification equivalent to IE-classes from IEC 60034-30-1



per 1 July 2020

Permanent magnet synchronous motors

- LSPM-Syn: Line-start three-phase permanent magnet synchronous motors: IE2/Grade 3 to 1* (**0.55-375 kW**),
- PM-Syn VFDdriven: variable frequency driven permanent magnet synchronous motors: Grade 3 to 1** (**0.55-90 kW**)
- Permanent magnet synchronous motors for elevators: Grade 3 to 1** (**0.55-110 kW**)

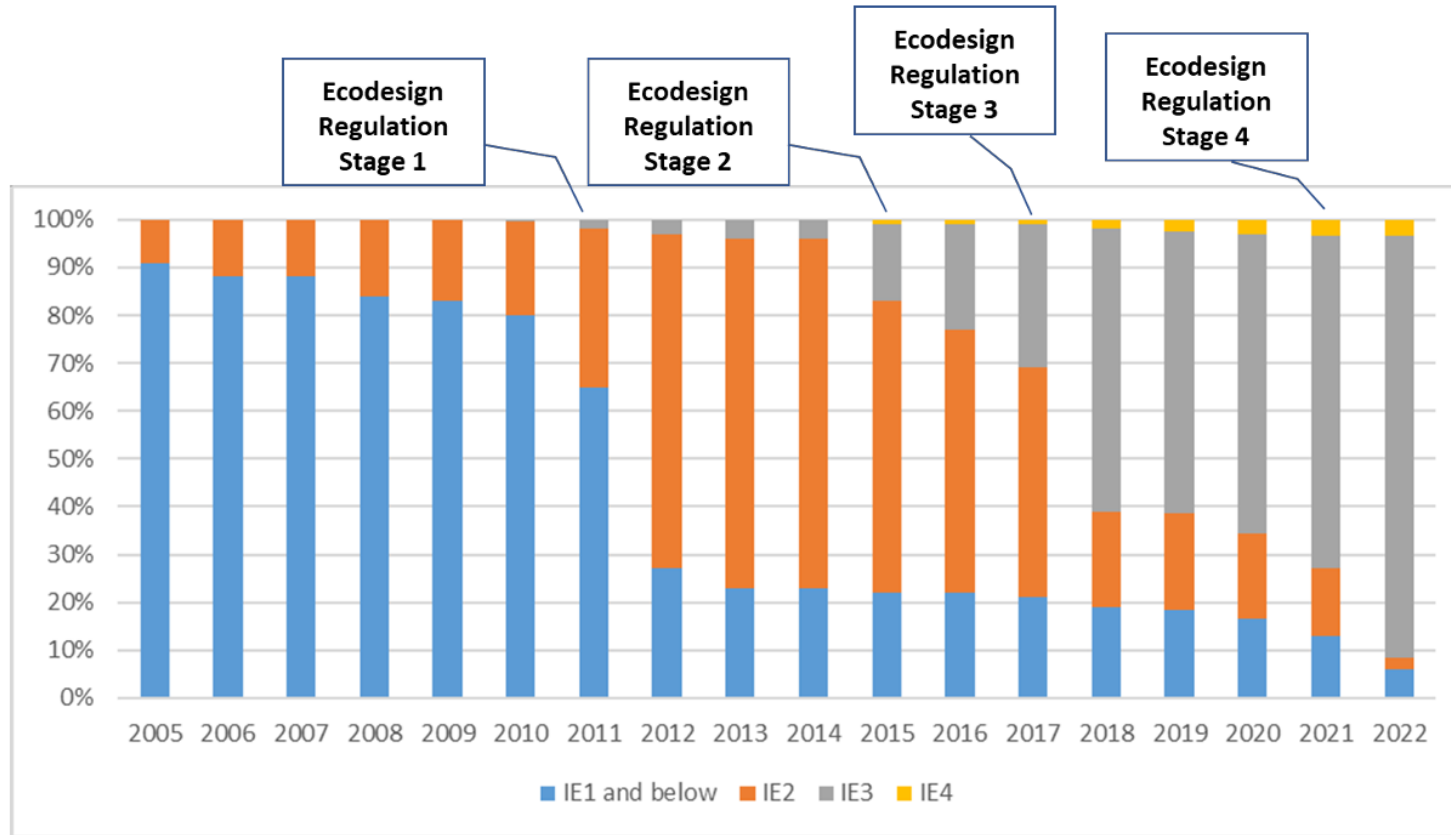
Note:

Grade 1-3: *) small differences compared to IEC TS 60034-30-2;

**) own values, different compared to IEC TS 60034-30-2

Market change – by MEPS (motors)

The sales evolution by efficiency class in the EU-27 is shown in Figure 4.



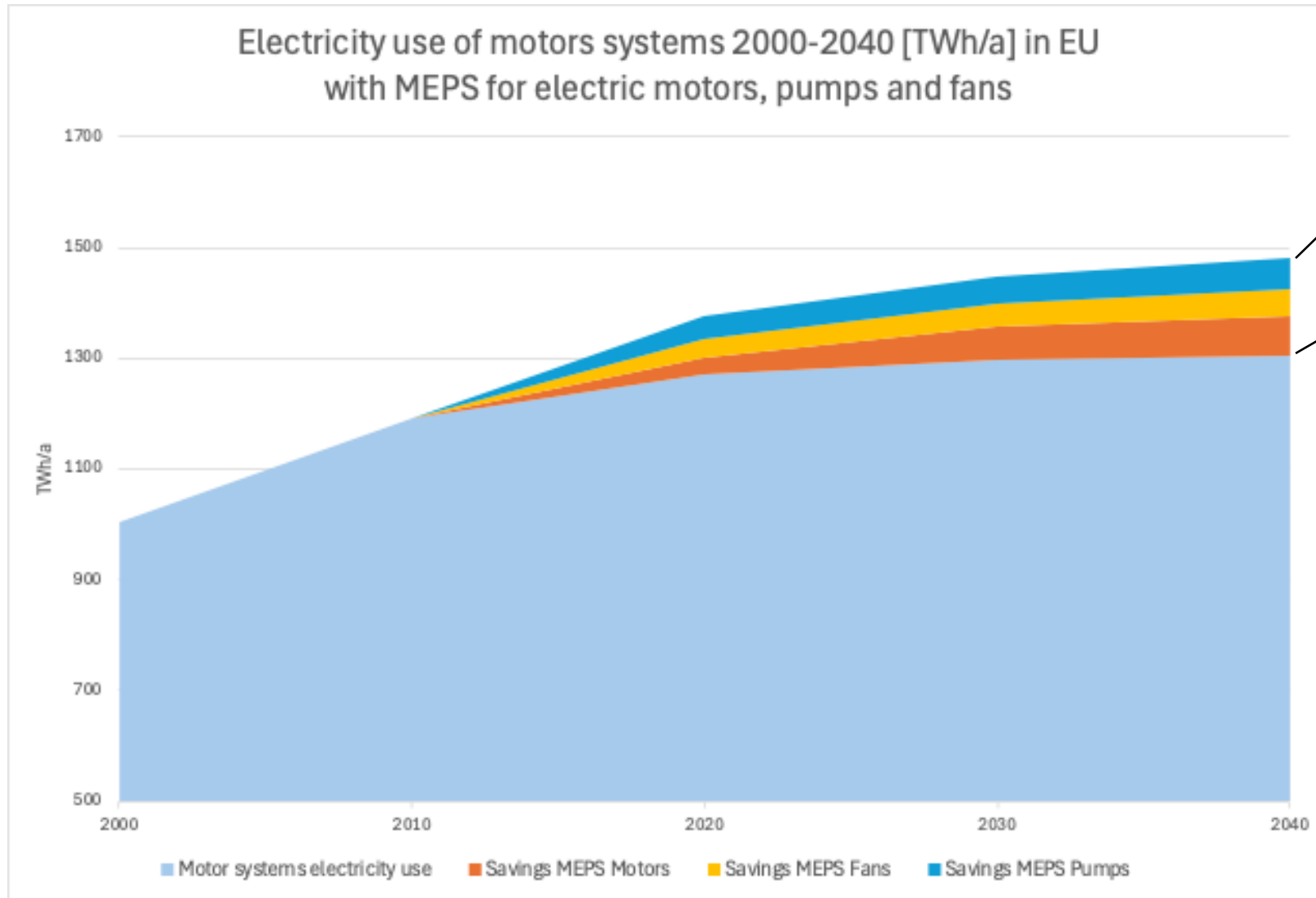
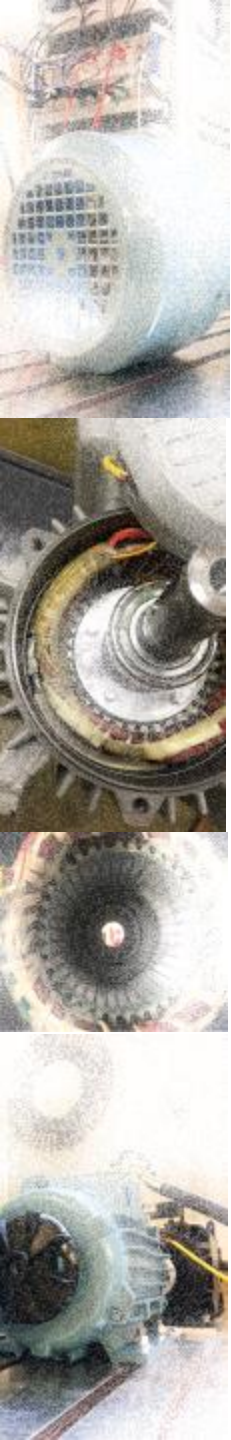
Ecodesign regulation stages:

1. 0.75 kW – 375 kW: IE2
2. 7.5 kW – 375 kW: IE3 or IE2+VSD
3. 0.75 kW – 375 kW: IE3 or IE2+VSD
4. 0.75 kW – 1 000 kW: IE3
5. 0.12 kW – 0.75 kW: IE2
75 kW – 200 kW: IE4

Figure 4 - Motors sold by efficiency class (IE-code), 2005-2022 (CEMEP data)

Source: EU-MORE: D2.1 European Electric Motor Market Assessment, 2024

Savings – example EU MEPS motors, fans, pumps



Electricity use with Business-As-Usual: no MEPS

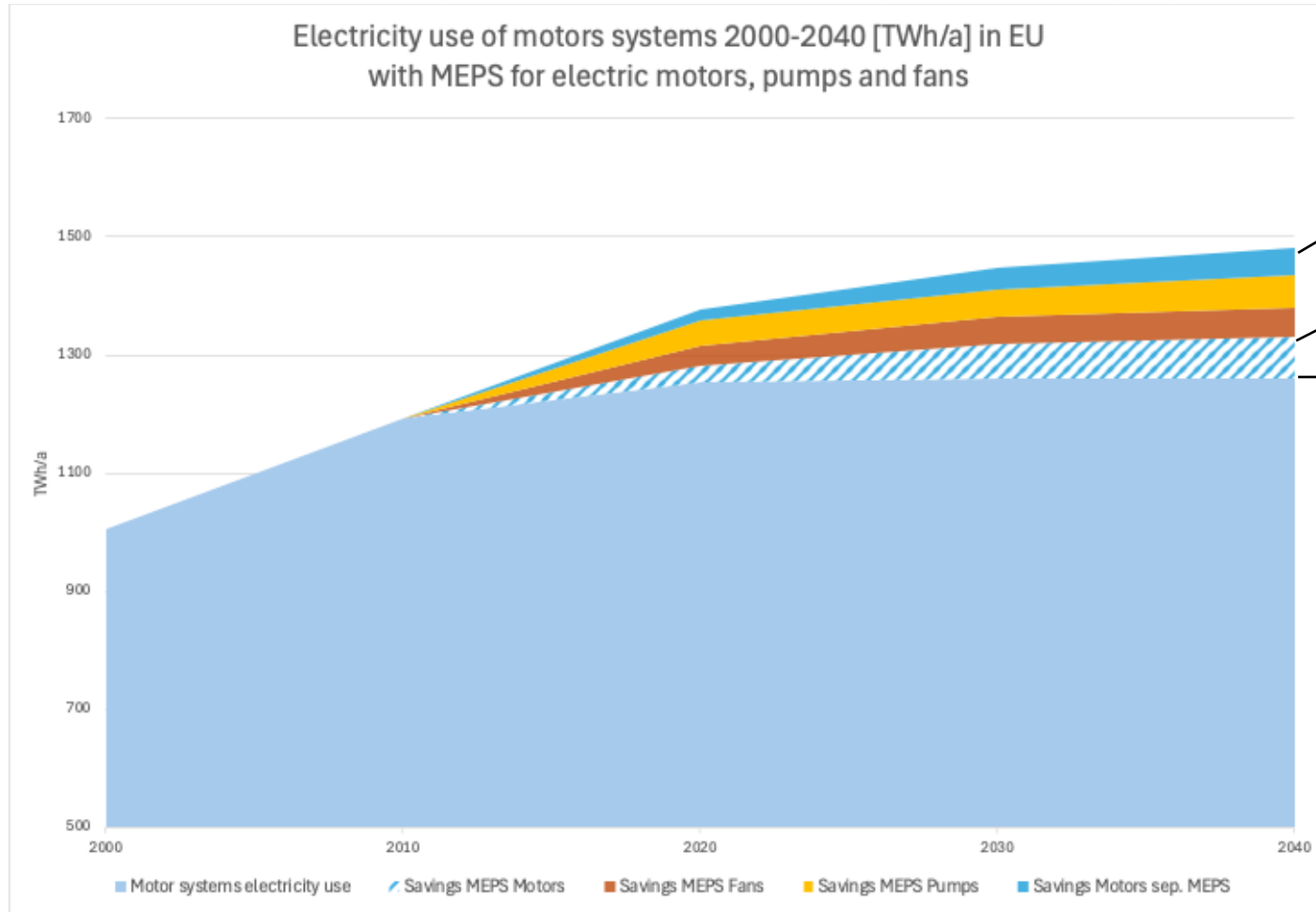
Electricity use with MEPS for motors, fans and pumps

Savings shown are **net savings** (excl. double counting through other regulations).

Source: Ecodesign Impact Accounting – Overview Report 2023

Savings – example EU MEPS motors, fans, pumps (2)

Savings by **efficient motors** including **savings through MEPS for other products** e.g. non-residential ventilation units & refrigeration units, air cooling and heating, space and water heating



Electricity use with Business-As-Usual: no MEPS

Electricity use with MEPS for motors, fans and pumps

Electricity use with MEPS for motors, fans and pumps AND **other products** e.g. ventilation units and more

Savings shown are **net savings** (excl. double counting through other regulations).

Source: Ecodesign Impact Accounting – Overview Report 2023

Fans - industrial



MEPS in place in EU and China



China GB 19761: 2020

Fans i.e.

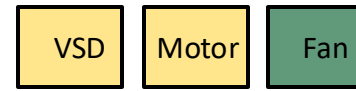
- general-purpose centrifugal fans,
- general-purpose axial flow fans,
- centrifugal induced draft fans for industrial boilers,
- centrifugal fans for boiler of power station,
- axial flow fans for power station,
- centrifugal fans for HVAC, and
- forward multi-blade centrifugal Fans.

Not applicable to duct fans for air conditioning [..]

Fan efficiencies classified in 3 Grades

Metric: FEG, Fan Efficiency Grade + FMEG

Based on peak efficiency, impeller efficiency for centrifugal and axial fans, and overall (combination of fan and drive) efficiency for forward-curved fans with external rotors



EU 2024/1834

Five fan types i.e.

- axial fans,
 - centrifugal fans,
 - cross flow fans,
 - mixed flow fans and
 - jet fans
- Power range: 125 W – 500 kW
 - Efficiency grade N specific for each fan type ranging from N50 to N67 (Best Efficiency Point)
 - Information requirements for Partial Load, for three performance curves at different speeds.

Metrics

- FMEG, Fan Motor Efficiency Grade
- JFMEG, Jet Fan Motor Efficiency Grade



US 10 CFR/Part 431/J/App. A&B

[Test method; no minimum requirements adopted]

Fans and blowers other than air circulating fans i.e.

- centrifugal housed fan;
- radial housed fan;
- centrifugal inline fan;
- centrifugal unhooded fan;
- centrifugal power roof ventilator exhaust fan;
- centrifugal power roof ventilator supply fan;
- axial inline fan; axial panel fan; or axial power roof ventilator fan.

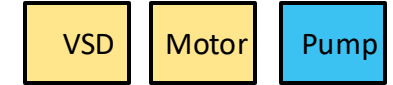
- 0.89 kW (el.power) – 112,5 kW [airpower]

Metric: FEI, Fan Efficiency Index

Every Duty Point as specified by manufacturer

Pumps – clean water

MEPS in place in EU, China and USA



China GB 19762-2007

Pump types:

- single-stage single-suction,
- single-stage double-suction and
- multi-stage centrifugal pumps for fresh water

Tables with minimum efficiencies (EI) per pump type

Other pump types regulated:

- waste submersible motor-pumps (GB 32031-201)
- petrochemical centrifugal pumps (GB 32284-2015)

EU 547/2012 (under rev.)

Clean water pump types i.e.

- End suction own bearing (ESOB), End suction close coupled (ESCC), End suction close coupled inline (ESCCI)
- Vertical multistage (MS-V), Horizontal multistage (MS-H), Submersible multistage (MSS) and
- [Booster sets (BS)]

Minimum Efficiency Index (MEI) 0.4

Best Efficiency Point (BEP); 75%; 110%
 ≤ 150 kW shaft power

Under development - *additionally*

- For water pump units: for ESOB, ESCC and ESCCI end suction units up to 45 kW shaft power an Energy Efficiency Index (EEI) of not more than 0.62, and
- for booster sets an EEI of not more than 0.5

US 10 CFR/Part 431/Y

Clean water pumps

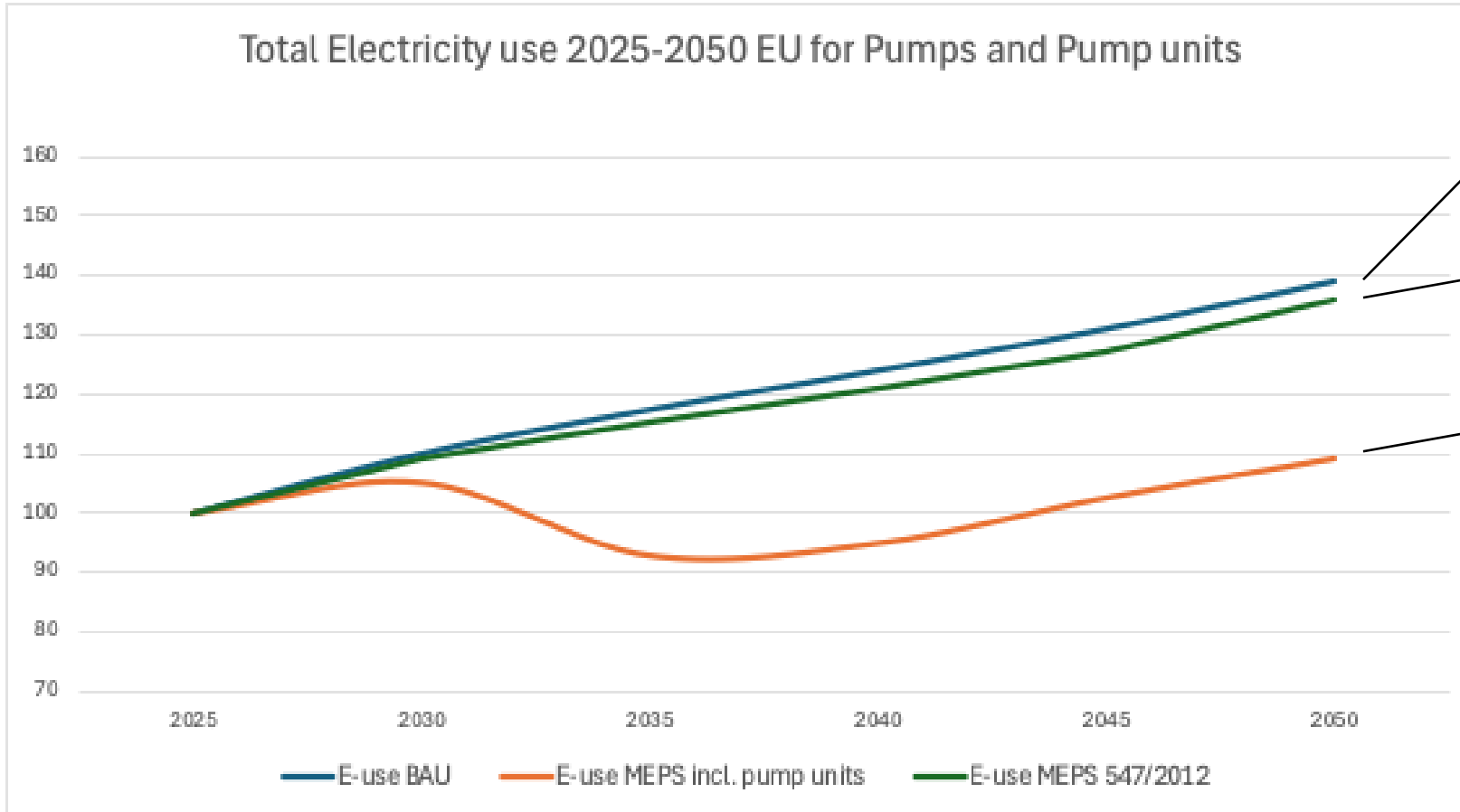
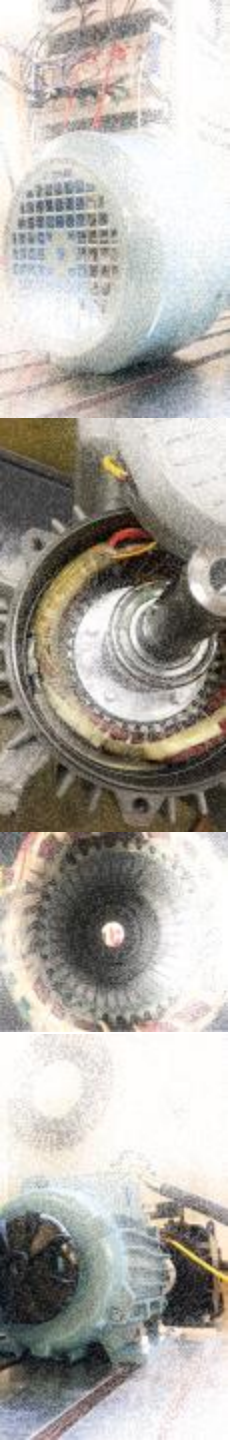
- End suction close-coupled (ESCC),
- End suction frame mounted/own bearings (ESFM);
- In-line (IL);
- Radially split, multi-stage, vertical, in-line casing diffuser (RSV); and
- Submersible turbine (ST) pumps.
- Radially-split, multi-stage, horizontal, end-suction diffuser casing (RSHES);
- Radially-split, multi-stage, horizontal, in-line diffuser casing (RSHIL);
- Small vertical in-line (SVIL); Vertical Turbine (VT).

-> Bare pump, Pump with motor, Pump with motor and VSD

-> PEI (pump efficiency index) for Constant load and Variable load

Pool pumps, Circulators

Pumps – clean water, example Savings EU

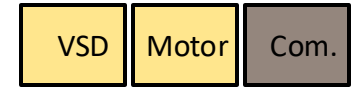
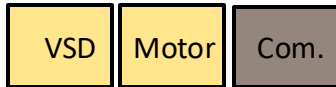


- Electricity use Business-As-Usual
- Electricity use with MEPS pump only EC 547/2012
- Electricity use incl. savings with regulated pump units (MEPS are under rev.)

Source: Ecodesign Impact Accounting – Overview Report 2023

Air compressors

MEPS in place in China and USA



China GB 19153 – 2019

Oil-injected / lubricated rotary air compressors:

- Fixed speed: Oil injected rotary air compressors; for general use; with the drive motor power of 1.5 kW - 630 kW and the discharge pressure of 2.5 - 14 bar
- Variable speed: Variable speed oil injected rotary air compressors for general use with the drive motor power of 2.2 kW - 315 kW and the discharge pressure of 2.5 - 14 bar;
- Reciprocating piston air compressors for general use with the drive motor power of 0.75 kW - 75 kW
- Oil-free reciprocating piston air compressors with the drive motor power of 0.55 kW - 22 kW and the discharge pressure of 4 - 14 bar
- Direct drive portable reciprocating piston air compressors .
- Specific input power (kW/(m³/min), for fixed and variable speed

EU (no regulation)

Rotary standard air compressor packages with a maximum volume flow rate between 5 to 1280 l/s when supplying air at discharge pressure(s) equal to or higher than 7 bar(a) and not exceeding 15 bar(a).

'Low pressure' application range was defined as compressors with an absolute discharge pressure of approximately 1.1 to 5 bar(a)

The 'oil free' application range covers the same range in discharge pressure as 'standard air': discharge pressure between 7-15 bar(a)

US 10 CFR/Part 431/T

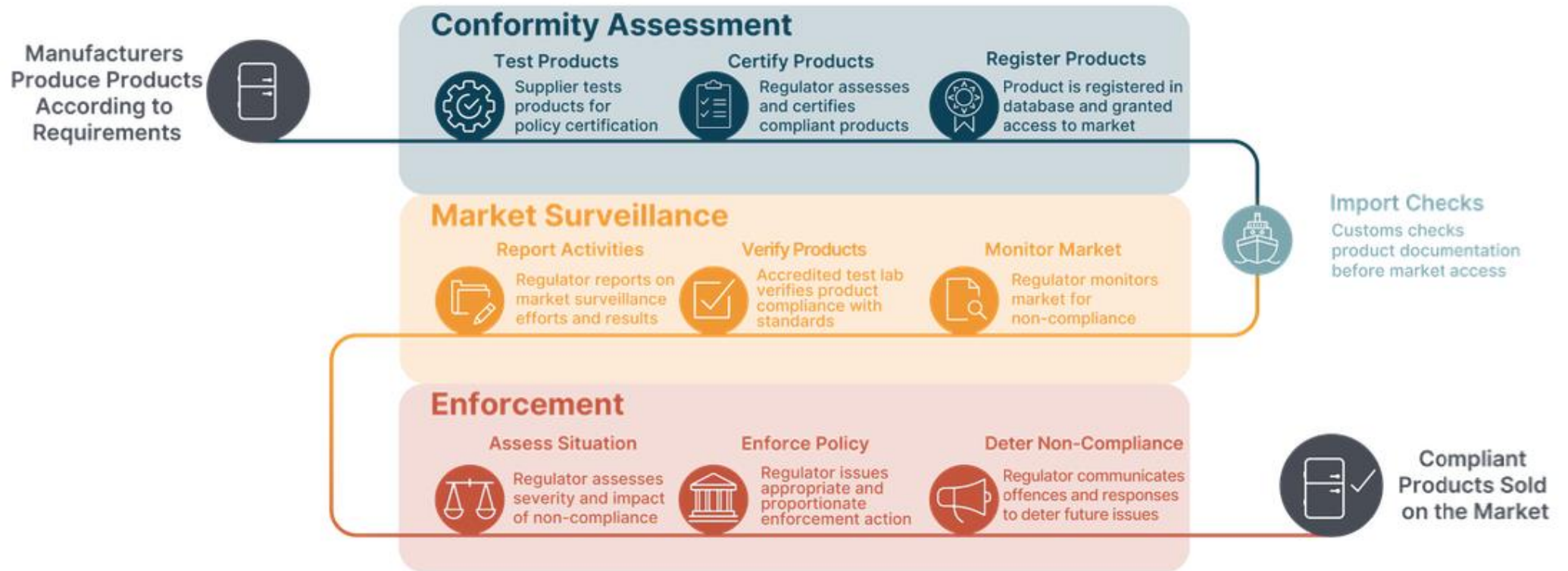
Rotary, lubricated compressor

- air- or liquid-cooled,
- fixed- or variable-speed;
- have a full-load operating pressure of 75-200 psig (5.2 – 13.8 bar);
- 10-200 hp [7.5-150 kW] compressor motor nominal horsepower, or 35-1,250 full-load actual volume flow rate (cfm).
- Minimum package isentropic efficiency
- d –factor (percentage loss reduction): -15 and -10 for air-cooled/var.speed

Monitoring, Verification and Enforcement (MVE)

MVE scheme fits the national legal framework; differences per region, country

Involves all stakeholders: manufacturers, regulators, market surveillance authorities and end users



Source: Clasp.ngo



MEPS: developments

New aspects: circularity

Ecodesign for Sustainable Products Regulation (ESPR)

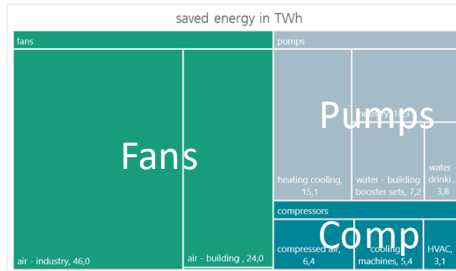


- Entered into force: 18 July 2024
- Goal: more environmentally sustainable & circular products
- Replaces the current Ecodesign directive (EU) 2009/125 covering energy-related products (“ErPs”)
- Wide range of requirements, including:
 - **energy efficiency** and **resource efficiency**
 - product **durability, reusability**, upgradability and **reparability**
 - presence of substances that inhibit **circularity**
 - **recycled content, remanufacturing** and **recycling**
 - carbon and environmental footprints
 - **information requirements**, including through a **Digital Product Passport**
- Review of the MEPS for electric motors and Variable Speed Drives (EU) 2019/1781 under the new ESPR framework

Variable Speed Drives – capturing the savings from controls

Saving potential with Variable Speed Drives (VSDs) in the European market *

- Total: 121,5 TWh/a (appr. 9.5% of e-use motor systems, 2021)



NEMA Power Index **

- Means to compare the relative energy savings of motors (both fixed and variable speed) to a standard baseline motor.
- The focus must shift from increasing efficiency of a component to reducing power used
- Ongoing work on developing testing paths by equipment type (for example, pumps)

Potential policy approaches *

1. Make VSDs mandatory with all newly sold electric motors above a certain size
2. System must reach a minimum efficiency in different load points (based on an energy efficiency index)
3. Information requirement: OEM to declare the energy costs of the assembled system

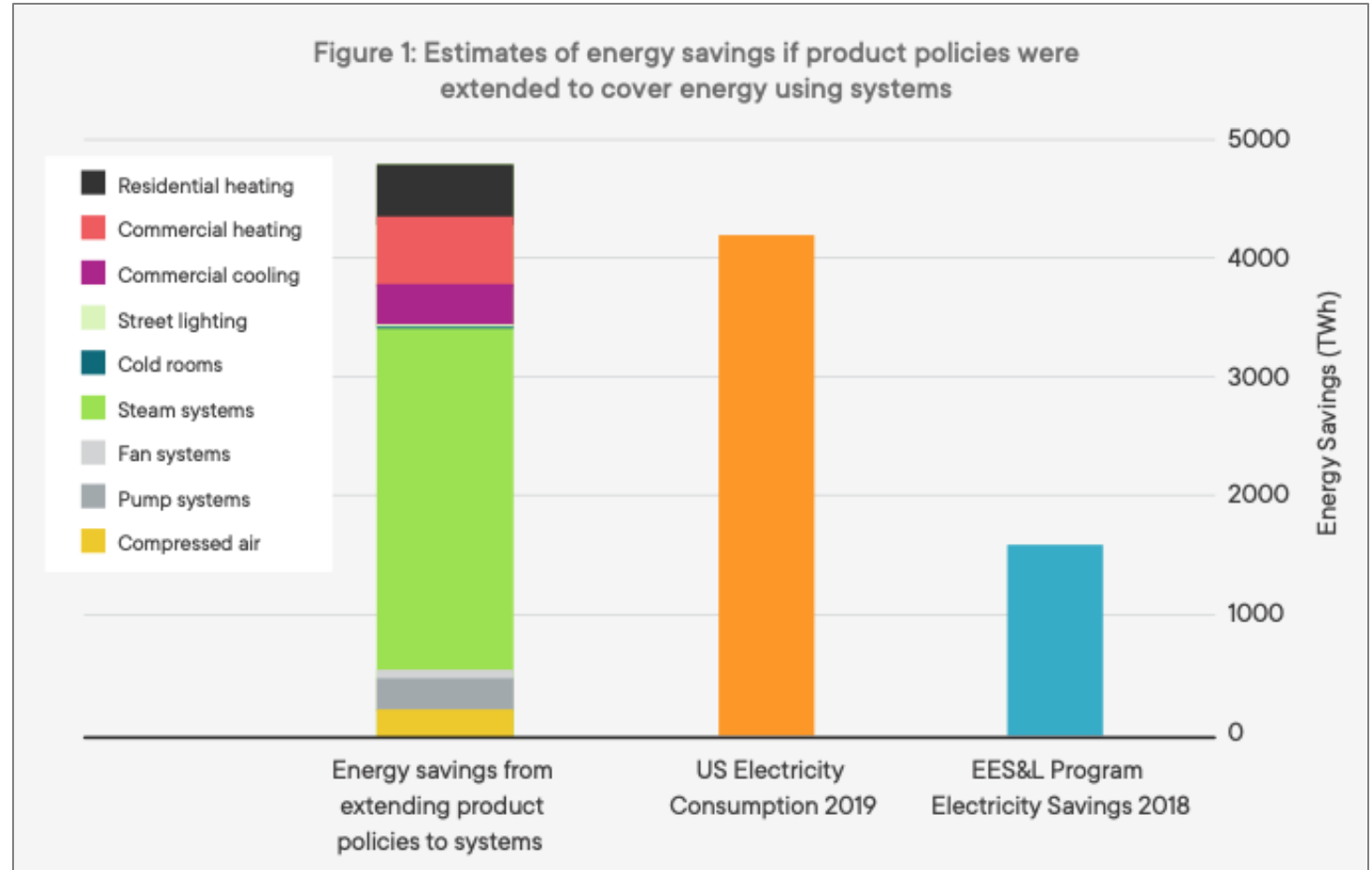
* Source: Schröder, A. e.a.: Study on the energy-saving potential of electric motors with variable-speed drives in the European Union, Fraunhofer Institute for Chemical Technology ICT, 2023. Commissioned by: CEMEP

** Source: Tim Albers, Lily Baldewicz: Overview of the NEMA MG 10011, Power Index Calculation Procedure—Standard Rating Methodology for Motors, Power Drive Systems, and Complete Drive Modules, EEMODS 2024

From product to systems – regulatory needs

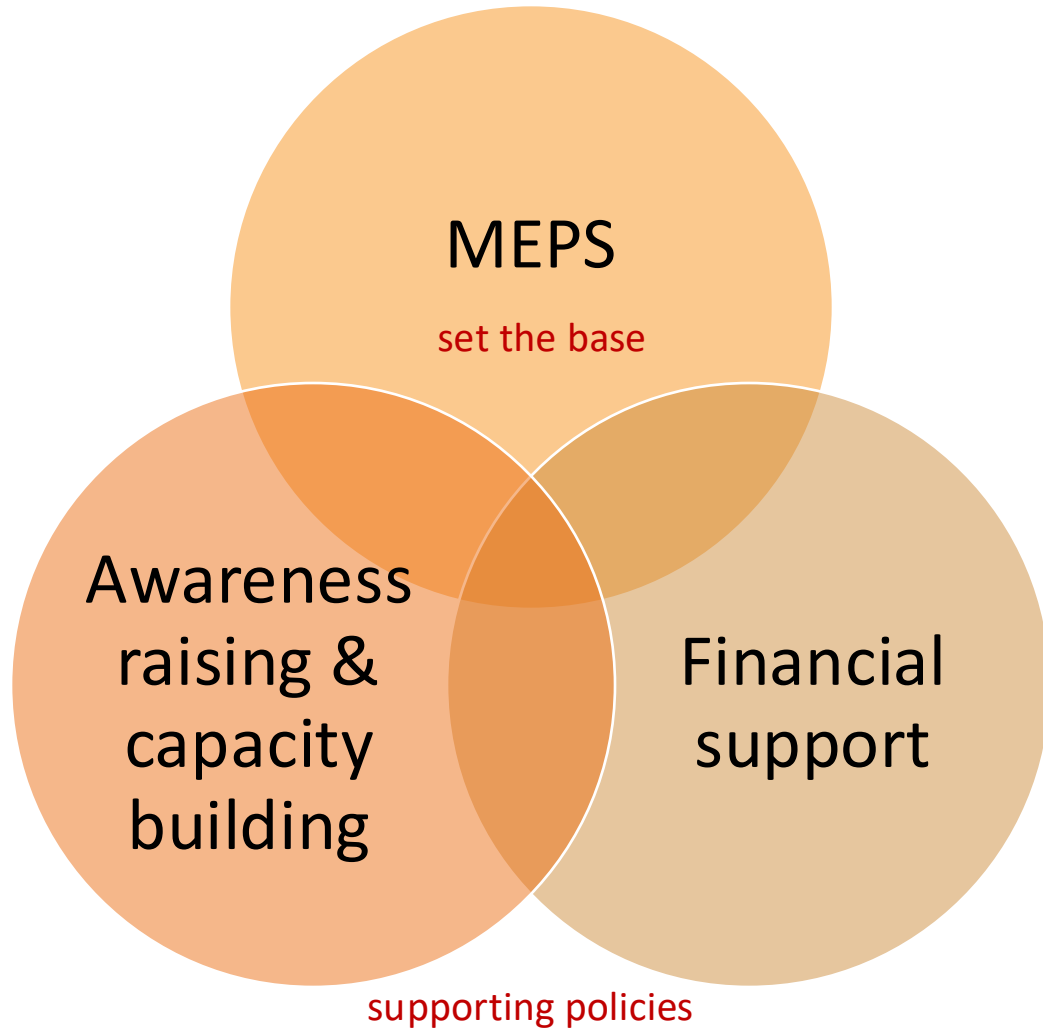
Energy efficiency regulations for systems need at least

1. The scope which identifies those products or systems that are included and excluded
2. The addressees of the regulation
3. The energy efficiency metric(s) and requirements
4. The performance assessment methods including testing or alternatives.



Source: IEA 4E Progressing Energy Efficiency Policies for Systems, 2022

Policy toolkit



Motor stock

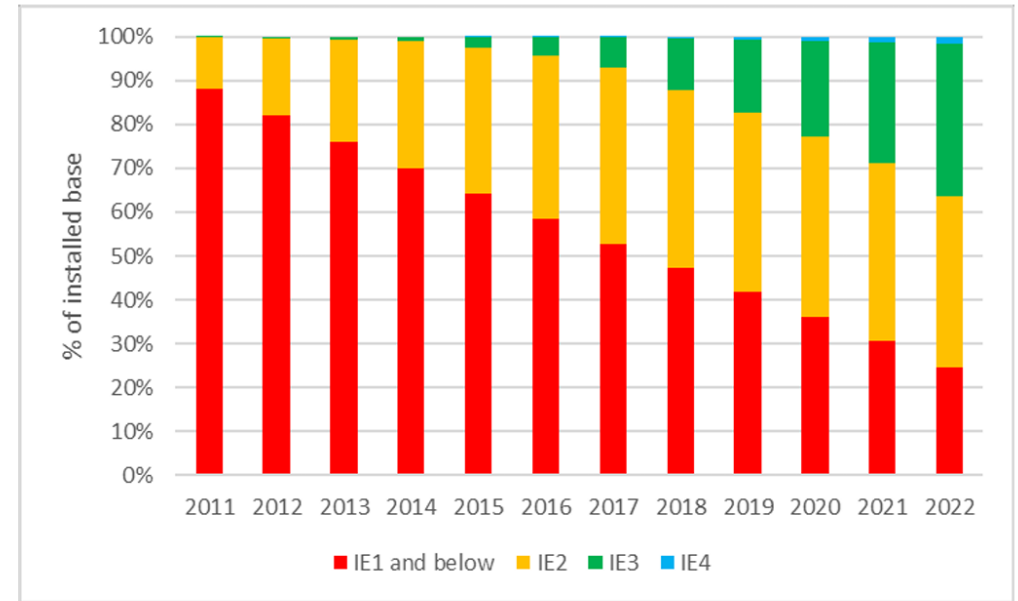
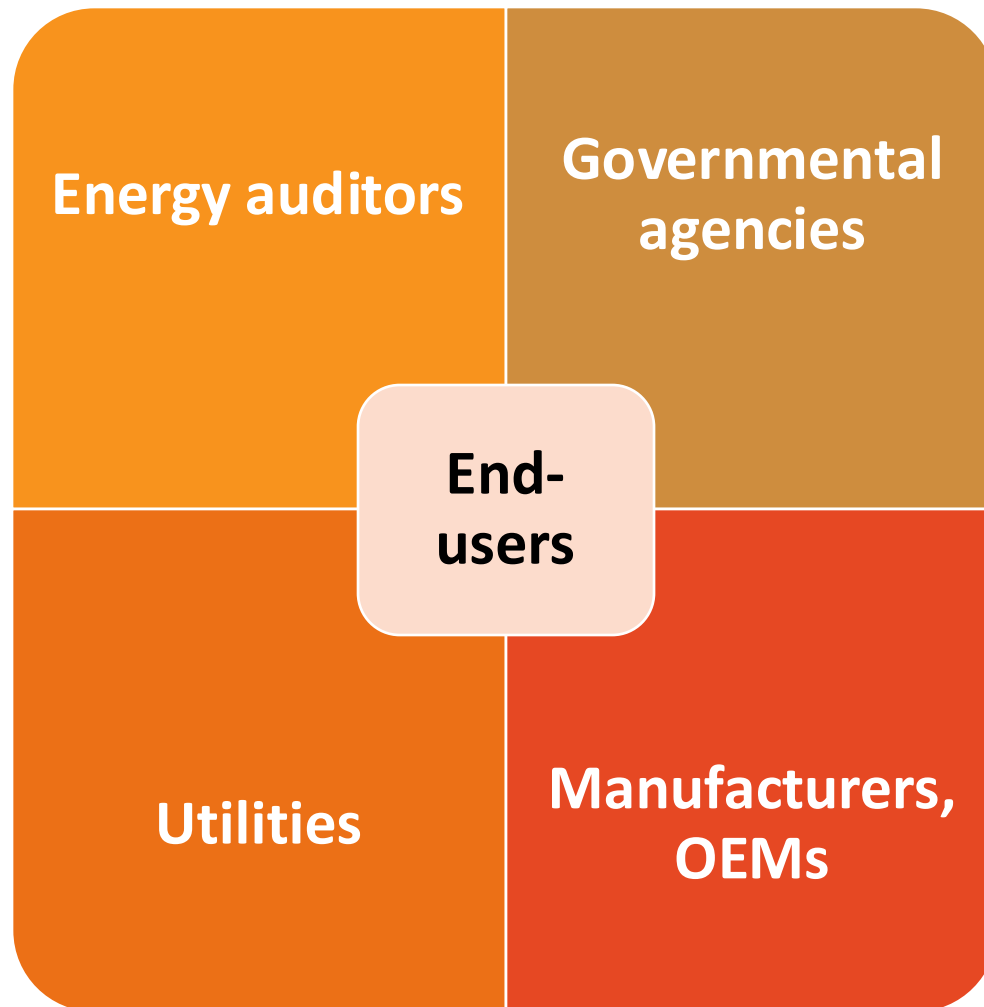


Figure 5 – EU-27 motor installed base by efficiency class.

Source: EU-MORE: D2.1 European Electric Motor Market Assessment, 2024

Awareness raising & capacity building



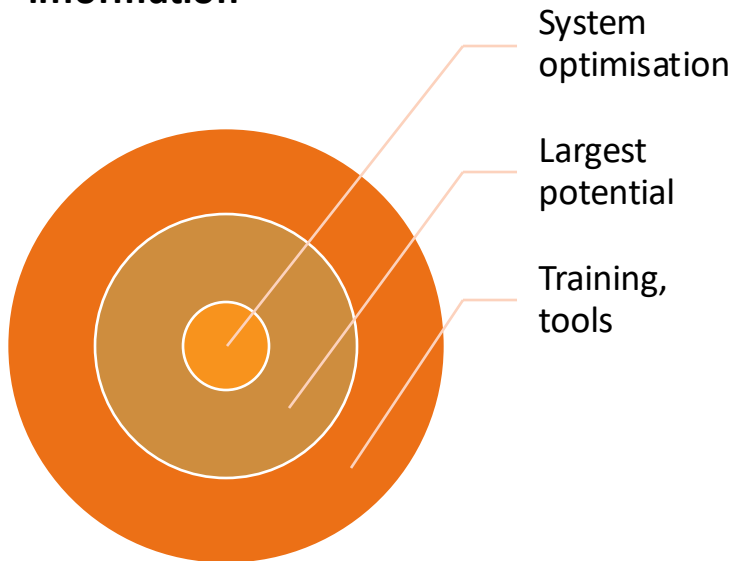
1. Raise awareness among end-users:
 - a. Energy consumption (digitalisation)
 - b. Saving potentials
 - c. Life cycle costs
 - d. Multiple benefits
2. Energy audits often fail to identify motor systems. Qualified (+certified) auditors needed to spot potentials & accompany measures.
3. Governmental agencies: build up capacities for enforcement.
4. Utilities to include motor systems in their energy saving programmes.
5. Manufacturers & OEMs to successfully educate clients and sell more efficient solutions.

• www.iea-4e.org/emsa/our-work/digitalisation

Financial support

Goal should be...:

1. Target **system optimisation**
 - not only one component
 - not only low hanging fruits
2. Focus on **largest potential**:
old, big, oversized machines
3. Be accompanied by dedicated training, tools,
information

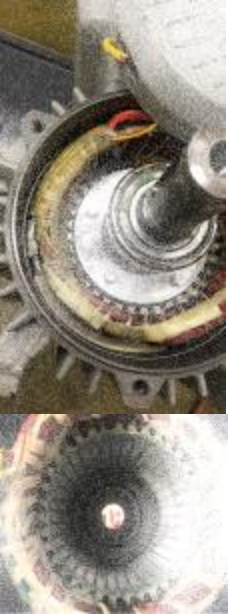


• Key factors of a successful subsidy programme:

- Contact to programme participants
- Awareness within target group
- Easy participation
- Tangible subsidy
- Qualification of involved consultants

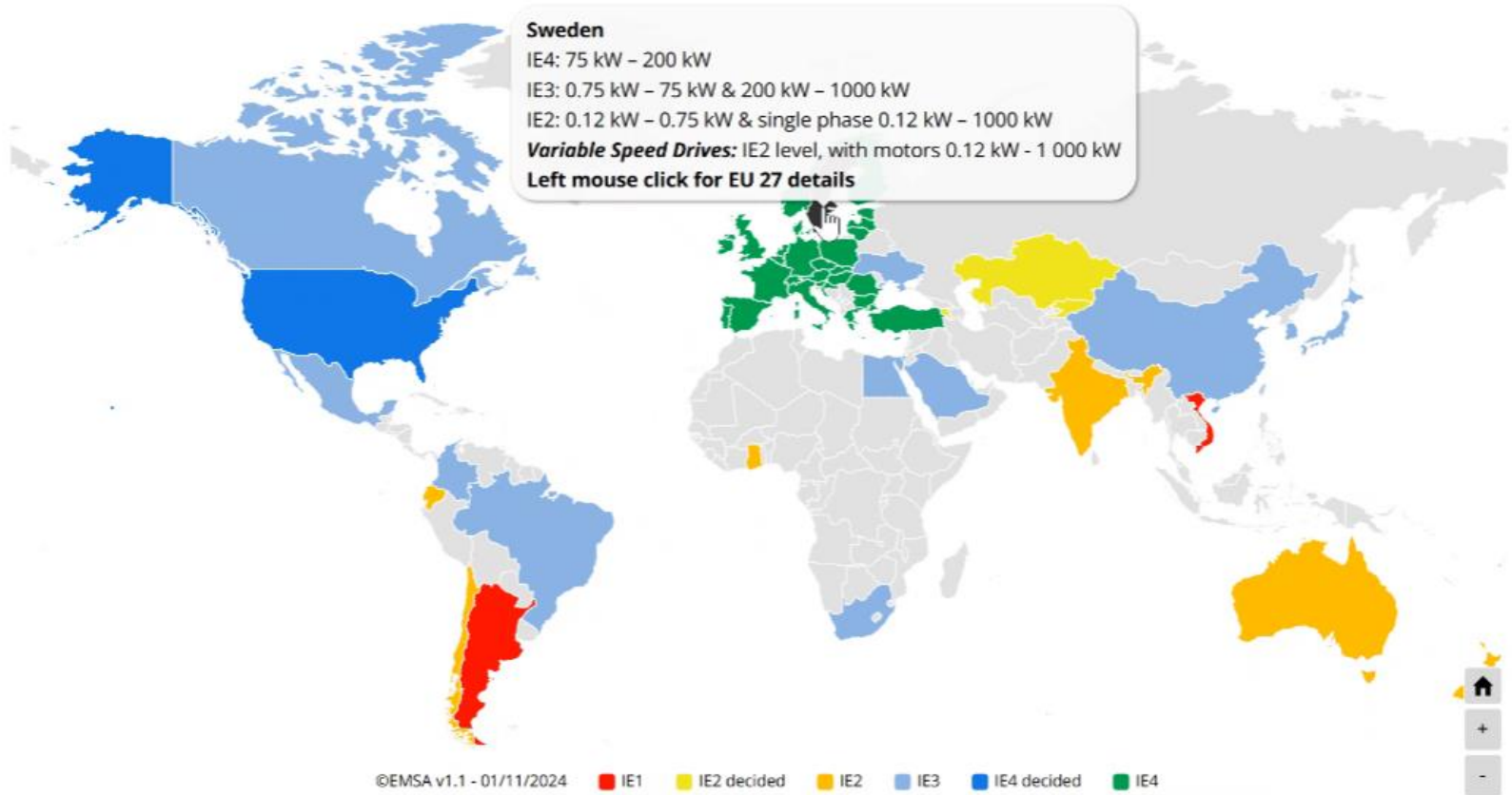
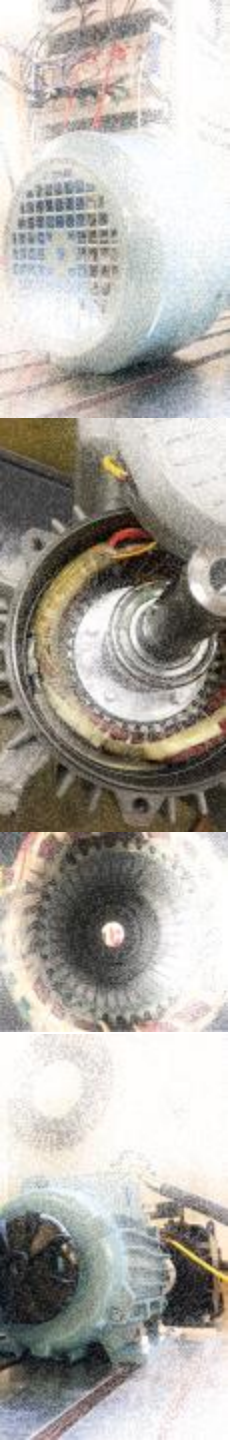
• More on success factors of financial incentive programmes: [Motors Academy webinar 12](#)*

*based on Hammer, S., Siegrist, G., Iten, R., Werle, R., Brunner, C. U.: [Vorstudie Förderprogramm effizienter elektrischer Antriebssysteme in Unternehmen](#), Swiss Federal Office of Energy, 2023.



Sources

EMSA website



The colour reflects the highest requirement for electric motors in a country. The categories 'IE2 decided' and 'IE4 decided' mean a regulation to apply IE2 or IE4 respectively has been adopted and the requirement will be applicable from a future date.

Disclaimer: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

EMSA website: standards

Current Global Motor Energy Efficiency Standards

EMSA offers an overview of current international standards for electric motors and Variable Speed Drives, as well as for pumps, fans and air compressors.

MOTORS

PUMPS - FANS - AIR COMPRESSORS

International Standards

International Standards for Motors







International Standards for Pumps, Fans, Air Compressors

Testing



Digitalisation

EMSA Tools

Technology & Capacity Building

Scope	Testing	Efficiency classification	Guidance
 Motor	IEC 60034-2-1 IEC 60034-2-2	IEC 60034-30-1 IEC 60034-30-3	IEC TS 60034-31 IEC Guide 118
  Motor driven by a VSD	IEC 60034-2-3	IEC TS 60034-30-2	
 VSD	IEC 61800-9-2		
  Motor+VSD	IEC 61800-9-1		

STANDARD	PUBLISHED	TITLE	
IEC 60034-1 edition 14.0	2022	Rating and performance	PREVIEW BUY
IEC 60034-2-1 edition 3.0	2024	Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)	PREVIEW BUY
IEC 60034-2-2 edition 2.0	2024	Specific methods for determining separate losses of large machines from tests – Supplement to IEC 60034-2-1	PREVIEW BUY
IEC 60034-2-3 edition 2.0	2024	Specific test methods for determining losses and efficiency of converter-fed AC motors	PREVIEW BUY

 = Motor  = Variable Speed Drive

www.iea-4e.org/emsa

U4E Policy Guide and Model Regulation Guidelines on Electric Motor Systems

U4E Policy Guide Electric Motor Systems

- Single-stop reference source for Emerging Markets and Developing Economies policymakers
- U4E Integrated Policy Approach, differentiated for the New Equipment Market and the Installed Base
- Overview of resources, tools and best practices globally

U4E Model Regulation Guidelines Electric Motor Systems

- Provides templates for MEPS regulations for Motors, VSDs, Fans, Pumps, Compressors
- Structured *as building blocks* that may be combined based on the market structure and practices in each individual country or region.

See www.united4efficiency.org





Appliance & Equipment Policy Tracker

Use the dropdown menus to customize appliance and/or policy type.

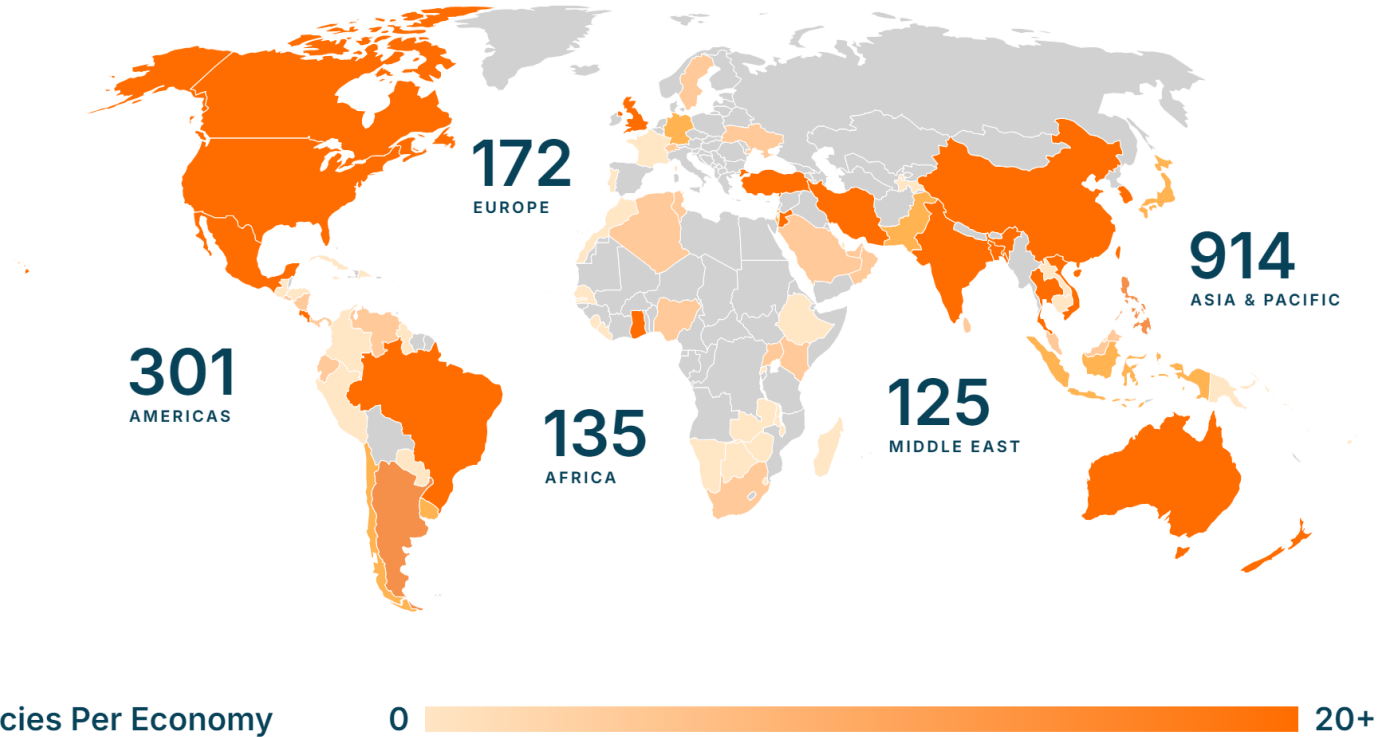
Select Product Category ▼

Select Policy Instrument ▼

[← Back to the CPRC](#)

1647 Policies

All Appliance & Equipment Policies



Conclusions & key takeaways

Present

- Standards serve as building blocks for regulations
- Motor system: coordination & alignment of standards dedicated to parts of the system
- MEPS for motors evolve and expand in
 - scope
 - stringency
 - coverage worldwide
- MEPS for motors
 - getting close to reaching their maximum
- MEPS for pumps, fans, air compressors
 - in a few regions only
 - evolve from component to the unit

Future

- How to harvest 'system savings'
- MEPS
 - Metrics: efficiency; power
 - Enlarge the system boundary
 - Weighing benefits/burdens
- Other type of regulations
 - addressing new and installed base
- Effective supporting policies
 - Awareness raising & capacity building
 - Financial support

Let's keep in touch!

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News

IE4: a minimum requirement for electric motors in the European Union and the USA

Motors with a rated output between 75 kW and 200 kW must meet the IE4 efficiency class in the European Union since 1 July 2023. From 1 June 2027, motors in the USA between 100 HP (75 kW) and 250 HP (186 kW) are required to meet IE4 as well. With these regulatory requirements the EU and the USA are the first jurisdictions in the world to require IE4 for certain electric motors, in a similar size range.



See the sections below with more details on the EU and US regulations concerning motor systems.

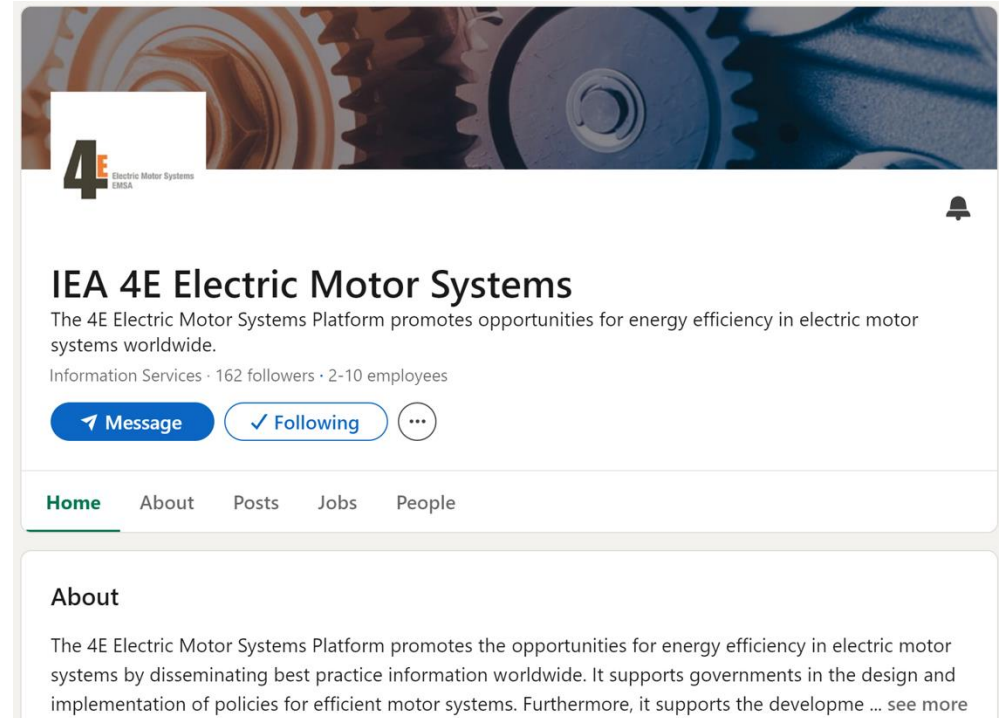
European Commission regulatory update

- **Motors & Variable Speed Drives** (EC 2019/1781): from 1 July 2023, **motors** with a rated output **between 75 kW and 200 kW must meet** the requirements of efficiency class **IE4** (or better). A review of the regulation was due in 2023 but delayed in view of competing priorities. It is expected to kick off in the course of 2024.
- **Circulators** (EC 641/2009): Impact Assessment paused due to competing priorities, to be resumed in due time with a view to a possible adoption by the end of 2026.
- **Pumps** (EC 547/2012): Impact Assessment received positive opinion and will be revised with a view to address the comments received. Further steps expected in 2024 with possible adoption in 2025.
- **Fans** (EC 327/2011): The final text of the review has been approved by the Regulatory committee in January 2024. Adoption and publication are expected by mid-2024, after scrutiny by EU Parliament and Council.
- **Air Compressors**: no new requirements are foreseen in near future.



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