



# What to Know About the Department of Energy's Latest Motor Rules



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## An overview of the new DOE rules for motors and understanding their implications.



In an ongoing effort to reduce energy consumption, greenhouse gas emissions and energy costs, the U.S. Department of Energy (DOE) is implementing three new motor efficiency and test rules and proposing one additional rule that broadly impact motors from .25 horsepower (hp) to 750 hp.

Those who do not live and breathe DOE regulations as part of their daily jobs may find it challenging to understand the nuances of the DOE's new electric motor rules and which of their motors are covered in each category.

This guide provides a high-level summary of each of the new rules, as well as their implementation dates, so users are aware of what lies ahead and can begin planning now for the changes.



### Updated Test Rule for Electric Motors

Following a six-month extension to the original implementation date (as requested by motor manufacturers), the DOE's updated test rule for electric motors took effect in October 2023.

Key changes include:

- **Motor nameplates must now list only the voltage at which a motor meets the listed efficiency** - Formerly, motor nameplates often listed a spread of voltages at which a motor can run. For example, a 230 volt (V) motor's nameplate might previously have listed a voltage spread of 208 V to 230 V.

With this new rule, the DOE seeks to ensure that motors achieve the efficiency level designated on the nameplate at each voltage rating listed on the nameplate. While a 230 V motor may continue to operate when the voltage drops to 208, the motor must work harder, reducing its efficiency. The certified efficiency, therefore, is only achieved at 230 V.

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If a motor is not currently covered by any efficiency standard and therefore does not list an efficiency on the motor nameplate, then a spread voltage can continue to be listed until such time as an efficiency standard applies to that motor.

This rule applies only to a listed voltage on a nameplate. The DOE continues to permit manufacturers to include voltage range information in their catalogs and other literature.

- **The updated test rule covers a broader range of motors** – The former test rule regulated only three-phase motors ranging from 1 to 500 hp. The updated test rule covers both single- and three-phase motors from .25 hp to 750 hp. For the first time, the test rule also includes a test procedure for both the open and enclosed air-over electric motors commonly used for fans and blowers.

Keep in mind that not every motor is required to meet a designated efficiency standard. With this test rule, the DOE requires manufacturers that are voluntarily listing the efficiency of these motors on the nameplates to certify the motor meets the stated value. Certification is accomplished through the same verification process required of motors whose efficiency is regulated and must be certified.

- **Synchronous and inverter-only motors** – While synchronous and inverter-only motors are not yet impacted by the efficiency standards, work is ongoing by the National Electrical Manufacturer Association (NEMA) and energy advocacy groups to create test methods, labeling requirements and other standards for these motors that satisfy the test rule’s efficiency labeling requirements.

<b>Electric Motor Category</b>	<b>Delay in Enforcement</b>	<b>Enforcement commencement date</b>
208 Volt Removal	None	14-Oct-23
Electric motors greater than 500 and up to 750 hp	12 months	14-Oct-24
Air-over electric motors other than air-over ESEMs	24 months	14-Oct-25
Inverter-only and synchronous electric motors	36 months	14-Oct-26
Expanded scope electric motors (“ESEMs”), including air-over ESEMs (“AO-ESEMs”)	36 months	14-Oct-26

## Medium Electric Motor Rule

The DOE’s updated medium electric motor (MEM) rule expands the types and sizes of motors that must comply with NEMA Premium and Super Premium efficiency standards, which formerly affected only 1 hp to 500 hp three-phase motors.

Implemented by the DOE as a direct final rule in June 2023, the updated MEM rule was created based on recommendations from the Motor Coalition, a group consisting of NEMA and a consortium of utility, energy efficiency and environmental organizations. When it takes effect in June 2027, new requirements for motors that must comply with MEM rule standards include:

- **100 hp to 250 hp motors** – A majority of 100 hp to 250 hp motors will be required to meet NEMA Super Premium Efficiency (similar to IE4) standards. The new efficiency values are slightly different for open drip proof (ODP) motors. Some NEMA ODP motors match IE4 values, but others are slightly lower because their frame sizes are smaller than the totally enclosed fan cooled (TEFC), which are the basis of the IEC IE4 values. The NEMA Super Premium table to be published later this spring (and which matches the DOE-published values) lists the TEFC IE4 values.

HP	Number of Poles							
	2		4		6		8	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
100	95.0	94.5	96.2	96.2	95.8	95.8	94.5	95.0
125	95.4	94.5	96.2	96.2	95.8	95.8	95.0	95.0
150	95.4	94.5	96.2	96.2	96.2	95.8	95.0	95.0
200	95.8	95.4	96.5	96.2	96.2	95.8	95.4	95.0
250	96.2	95.4	96.5	96.2	96.2	96.2	95.4	95.4

- **1 hp to 250 hp air-over electric motors** – Air-over motors that are built in a standard NEMA frame size will have to meet NEMA Premium efficiency standards from 1 hp to 75 hp and Super Premium standards from 100 hp to 250 hp. Motors above 250 hp are not covered at this time. Air-over motors from 1 hp to 20 hp that are down-framed from standard NEMA size will be required to meet the same efficiency as current fire pump motors, which is equivalent to NEMA Energy Efficient levels.

HP	Number of Poles							
	2		4		6		8	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
100	95.0	94.5	96.2	96.2	95.8	95.8	94.5	95.0
125	95.4	94.5	96.2	96.2	95.8	95.8	95.0	95.0
150	95.4	94.5	96.2	96.2	96.2	95.8	95.0	95.0
200	95.8	95.4	96.5	96.2	96.2	95.8	95.4	95.0
250	96.2	95.4	96.5	96.2	96.2	96.2	95.4	95.4

HP (kilowatt equivalent)	2 Pole (maximum NEMA Frame Diameter)		4 Pole (maximum NEMA Frame Diameter)		6 Pole (maximum NEMA Frame Diameter)		8 Pole (maximum NEMA Frame Diameter)	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
1/.75	74 (48)	--	82.5 (48)	82.5 (48)	80 (48)	80 (48)	74 (140)	74 (140)
1.5/1.1	82.5 (48)	82.5 (48)	84 (48)	84 (48)	85.5 (140)	84 (140)	77 (140)	75.5 (140)
2/1.5	84 (48)	84 (48)	84 (48)	84 (48)	86.5 (140)	85.5 (140)	82.5 (180)	85.5 (180)
3/2.2	85.5 (140)	84 (48)	87.5 (140)	86.5 (140)	87.5 (180)	86.5 (180)	84 (180)	86.5 (180)
5/3.7	87.5 (140)	85.5 (140)	87.5 (140)	87.5 (140)	87.5 (180)	87.5 (180)	85.5 (210)	87.5 (210)
7.5/5.5	88.5 (180)	87.5 (140)	89.5 (180)	88.5 (180)	89.5 (210)	88.5 (210)	85.5 (210)	88.5 (210)
10/7.5	89.5 (180)	88.5 (180)	89.5 (180)	89.5 (180)	89.5 (210)	90.2 (210)	--	--
15/11	90.2 (210)	89.5 (180)	91 (210)	91 (210)	--	--	--	--
20/15	90.2 (210)	90.2 (210)	91 (210)	91 (210)	--	--	--	--

- **500 hp to 750 hp motors** – These previously unregulated motors will be required to meet NEMA Premium Efficiency standards.

## Notice of Proposed Rule for Expanded Scope Electric Motors

In November 2023, the DOE issued a notice of a proposed rule (NOPR) that aims to prescribe energy conservation standards for expanded scope electric motors (ESEM)—a subset of motors used in various commercial and industrial equipment. The primary motors covered by this rule are single-phase and three-phase motors rated .25 hp to 3 hp.

Like the MEM rule, the proposed ESEM rule is based, in large part, on recommendations made to the DOE by the Motor Coalition. One major difference is that the Motor coalition recommended not covering air over motors, but the DOE decided to include air over in the ESEM proposal. The comment period for this rule has ended, and the proposed implementation date for the new rule is January 2029. A final rule has not been published by the DOE as of May 2024, but expectations are that a rule will be published in calendar year 2024.

Important takeaways from this proposed rule:

- **It expands upon and overlays the small motor rule enacted by the DOE in 2015** – The original fractional motor rule, which covered .25 hp to 3 hp motors, was written in a way that limited the DOE from expanding its scope. The proposed new rule modifies the MEM rule described above, expanding it to include single-phase and other smaller motors. This overlap with the small motor rule makes some components of this new ESEM rule confusing. In general, almost all induction single-speed motors over .25 hp will be covered by a motor efficiency rule once this rule is implemented.
- **The proposed rule covers motors not currently required to comply with DOE efficiency standards** – These include both open and totally enclosed fractional hp motors as well as air-over motors. The following tables apply to both non-air-over as well as air-over motors.

HP	Average Full Load Efficiency				Average Full Load Efficiency			
	Polyphase				Polyphase			
	Open				Enclosed			
	2-Pole	4-Pole	6-Pole	8-Pole	2-Pole	4-Pole	6-Pole	8-Pole
0.25	65.6	69.5	67.5	62.0	66.0	68.0	66.0	62.0
0.33	69.5	73.4	71.4	64.0	70.0	72.0	70.0	64.0
0.5	73.4	78.2	75.3	66.0	72.0	75.5	72.0	66.0
0.75	76.8	81.1	81.7	70.0	75.5	77.0	74.0	70.0
1	77.0	83.5	82.5	75.5	75.5	77.0	74.0	75.5
1.5	84.0	86.5	83.8	77.0	84.0	82.5	87.5	78.5
2	85.5	86.5	--	86.5	85.5	85.5	88.5	84.0
3	85.5	86.9	--	87.5	86.5	86.5	89.5	85.5



	Average Full Load Efficiency				Average Full Load Efficiency			
	Capacitor-start capacitor-run; capacitor start induction-run; & split phase				Capacitor-start capacitor-run; capacitor start induction-run; & split phase			
	Open				Enclosed			
HP	2-Pole	4-Pole	6-Pole	8-Pole	2-Pole	4-Pole	6-Pole	8-Pole
0.25	59.5	59.5	57.5	--	59.5	59.5	57.5	--
0.33	64.0	64.0	62.0	50.5	64.0	64.0	62.0	50.5
0.5	68.0	69.2	68.0	52.5	68.0	67.4	68.0	52.5
0.75	76.2	81.8	80.2	72.0	75.5	75.5	75.5	72.0
1	80.4	82.6	81.1	74.0	77.0	80.0	77.0	74.0
1.5	81.5	83.8	--	--	81.5	81.5	80.0	--
2	82.9	84.5	--	--	82.5	82.5	--	--
3	84.1	--	--	--	84.0	--	--	--

	Average Full Load Efficiency				Average Full Load Efficiency			
	Permanents split capacitor & shaded pole				Permanents split capacitor & shaded pole			
	Open				Enclosed			
HP	2-Pole	4-Pole	6-Pole	8-Pole	2-Pole	4-Pole	6-Pole	8-Pole
0.25	63.9	66.1	60.2	52.5	60.9	64.1	59.2	52.5
0.33	66.9	69.7	65.0	56.6	63.9	67.7	64.0	56.6
0.5	68.8	70.1	66.8	57.1	65.8	68.1	65.8	57.1
0.75	70.5	74.8	73.1	62.8	67.5	72.8	72.1	62.8
1	74.3	77.1	77.3	65.7	71.3	75.1	76.3	65.7
1.5	79.9	82.1	80.5	72.2	76.9	80.1	79.5	72.2
2	81.0	82.9	81.4	73.3	78.0	80.9	80.4	73.3
3	82.4	84.0	82.5	74.9	79.4	82.0	81.5	74.9

- **Some, but not all, motor technologies are covered by this proposed rule** - While single-speed permanent split capacitor (PSC) motors will be required to comply with the proposed rule, multispeed and synchronous motors will not. That includes electronically commutated motors (ECM) and brushless DC motors that are starting to gain traction as an energy-efficient alternative to PSC motors. To be clear, multi-tap PSC motors are considered multi-speed and are not included. Other types of single-phase motors included are induction start-capacitor run, capacitor start-capacitor run, split phase and shaded pole. Fractional hp three-phase motors are broadly covered as well.
- **The proposed rule's January 2029 implementation date coincides with the date that new heating, ventilation and air conditioning (HVAC) and other manufacturing equipment rules are set to take effect** - The DOE is coordinating rule implementation so manufacturers can redesign their HVAC equipment and motors once to comply with all pending regulatory changes.

- **Input from the Motor Coalition validated the technical and economic feasibility of the proposed changes** – The proposed design efficiencies have already been tested and implemented on a small scale in equipment now available on the market. While the proposed changes will require the redesign of many motor models, the Motor Coalition found the necessary efficiencies can mostly be achieved with current manufacturing technologies and frame sizes. With literally tens of thousands of active custom models being utilized in the United States, the mechanical and electrical characteristics of each design must be resolved at the unique model level to fit the requirements of the OEM or end-use application.

## DOE Energy Conservation standards for Dedicated Purpose Pool Pump Replacement Motors

Motor Total Horsepower (THP)	Performance Standard (Full Load Efficiency)	Design Requirement: Speed Capacity	Compliance Date
THP < 0.50	69%	None	September 29, 2025
1.15 ≤THP≤5.0*		Variable Speed	September 29, 2025
0.50 ≤THP≤1.15*		Variable Speed	September 29, 2025

\* Polyphase (three phase) motors are exempt from this rule as they are regulated by the DOE Small Motor Rule. Under the small motor rule, motors rated over 40 C ambient, are NOT regulated. The standard catalog motors, open-dripproof, catalog series EH prefix, are rated 50 C ambient, therefore, not regulated.

Manufacturers must comply with the new regulations by manufacturing only compliant products beginning on the compliance dates noted above. Any product in your inventory or your distributor’s inventory purchased before the compliance date will be sellable to the market.

### How These Changes Impact Operations

OEMs and end users seeking a more detailed understanding of how these changing rules will impact their motor fleet should consult with their motor manufacturer’s representative. The sooner users understand the implications of the rules, the better prepared they can be for the changes that are already here and those that are coming in the years ahead.



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