



Small Motors Regulations Update



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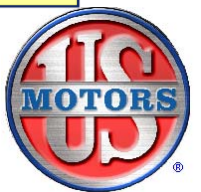


NEMA Motor Efficiency Strategy

The energy strategy of the MG section has been and continues to be based on cooperation with regulatory bodies to assure rational and meaningful improvements in standards and laws that impact electric motors. The MG Section strives to understand global energy opportunities and create products, standards, incentives and regulations optimizing our products as energy savings solutions for our customers.



NEMA MG Members are Energy Solution Providers



Integral Motors Standards and Regulation

Efficiency Elements	1992	1997	2001	2005	2007	2008	2011
Covered product	Existing NEMA Standard	Implement	Unchanged	Unchanged FEMP	Unchanged FEMP	Unchanged FEMP	Expanded and FEMP
Efficiency levels Standards	Existing NEMA Standard	Implement	NEMA Premium	NEMA Premium	NEMA Premium 50	NEMA Premium	NEMA Premium
Test Method	Existing IEEE/CSA Standards	Implement	Unchanged	Unchanged	Unchanged	Unchanged	Unchanged
Lab required	New DOE Energy Code	Implement	Unchanged	Unchanged	Unchanged	Unchanged	Unchanged
Compliance enforce	New DOE Energy Code	Implement	Unchanged	Unchanged	Unchanged	Unchanged	Unchanged
Timing & Regulations	New DOE Energy Code	Implement	Voluntary	Voluntary	Voluntary	Voluntary	Regulation
Revisions Regulations	New DOE Energy Code			FEMP Added	EISA Passed	Rule Making	Revisions Implement



What is a Small Motor?

Nidec
All for dreams

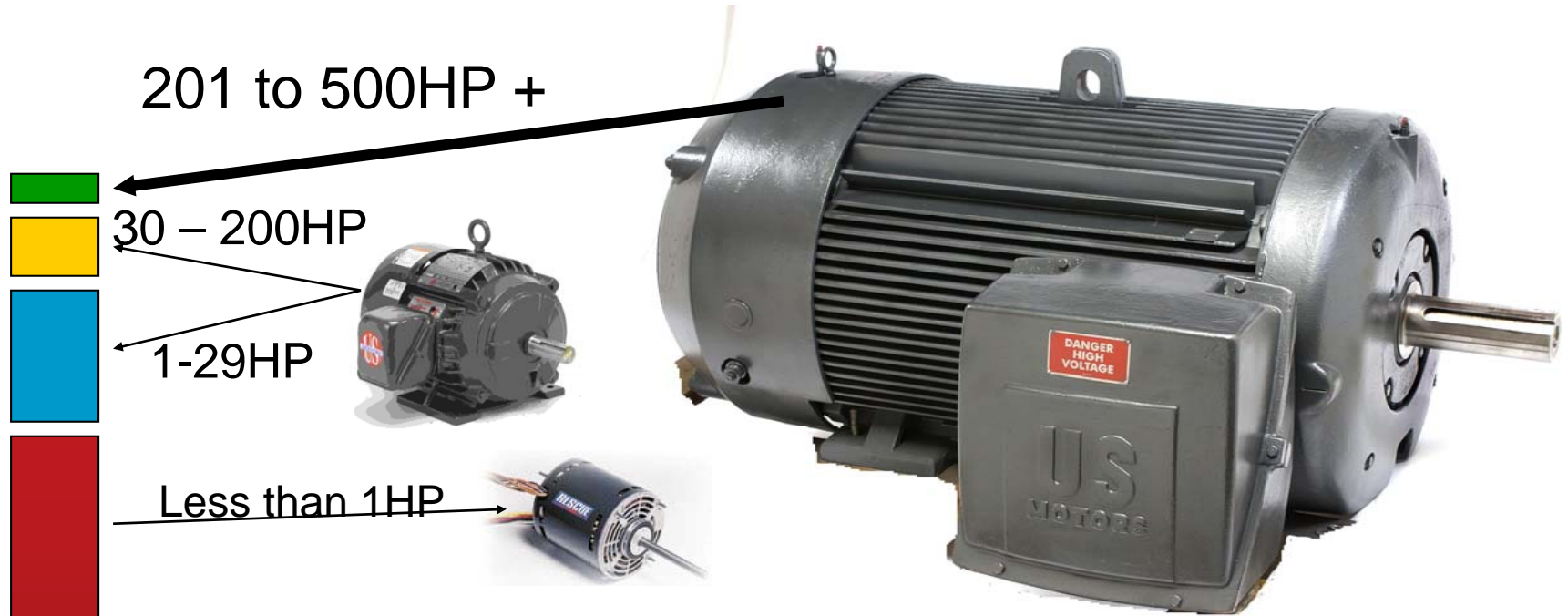




Small motors are engineered to meet specific application requirements
Typical performance standards used to define integral horsepower motors are not used to define small motors
Customers specify torque, temperature, Amps, duty cycle
Motors become partial components along with unique mechanical configurations



Motor Categories Units Sold



Machinery manufacturer
may also build motors
NEMA Standards seldom used



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NEMA Regulatory Definition of a Small Motor

General Purpose

Per MG1-1987

- 1.) General purpose alternating current
 - a.) Open construction
 - b.) Continuous duty
 - c.) Service factor in accordance with MG1-12.47
 - d.) Class A insulation system with temperature rise as specified in MG1-12.42 modified to include Class B, F, and H insulation systems and temperature rises
 - e.) Single phase: Breakdown torque per MG1-12.32, Locked rotor torque per MG1-12.32.2, Locked rotor current per MG1-12.43. This limits the types to capacitor start induction run and capacitor start capacitor run. Polyphase: Breakdown Torque per MG1-12.37.
 - f.) For use under usual service conditions without restriction to a particular application or type of application.
- 2.) Single speed induction
- 3.) NEMA 2-digit frame sizes modified to include metric equivalents.



HAC Applications

May be covered by system regulations

Industrial products Open
built to an OEM standard

General
Purpose
Open

TEFC build to OEM
specification or
industry standard

US Small Motor Market Estimated
6 million units per year

Polyphase/Cap Start Cap Run/ Cap Start Induction Run

These are very rough numbers meant for relationships only

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Typical Small Motor Applications

- Residential compressors
- Exhaust fans
- HAC
 - Both air and liquid moving
- Door openers
- Conveyors
- Swimming pool pumps
- Jetted tubs
- Food processing
- General Machinery

Average hours of operation
Less than 1000 per year

Source NEMA statistical

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How DOE created small motor rule

- Test one motor that does not meet the EPACK definition of a small motor
 - Ignored some points of definitions in statutes while picking others to re-define covered product
- Use of a consultant software design program that was not correlated to actual motor test results
- Extrapolate efficiency from a single test example to three speeds, eight power levels and three motor types
- Leaves definition of a small motor vague
- Creates confusion and enforcement issues



Summary Of Small Motor Rule

- Product covered
 - ¼ through 3 HP
 - 2/4/6 pole
 - 42 through 56 frame
 - Polyphase
 - Cap start cap run
 - Cap start induction run
- General purpose
 - Without final definition
- Implementation in five years
- Result ---NEMA has filed a lawsuit



TABLE II.1—PROPOSED STANDARD LEVELS FOR POLYPHASE SMALL ELECTRIC MOTORS

Motor output power	Six poles	Four poles	Two poles
0.25 Hp/0.18 kW	77.4	72.7	69.8
0.33 Hp/0.25 kW	79.1	75.6	73.7
0.5 Hp/0.37 kW	81.1	80.1	78.0
0.75 Hp/0.55 kW	84.0	83.5	81.6
1 Hp/0.75 kW	84.2	85.2	83.6
1.5 Hp/1.1 kW	85.2	87.1	86.6
2 Hp/1.5 kW	89.2	88.0	88.2
≥3 Hp/2.2 kW	90.8	90.0	90.5

* Standard levels are expressed in terms of full-load efficiency.

** These efficiencies corresponded to NOPR Trial Standard Level 5 for polyphase motors.

TABLE II.2—PROPOSED STANDARD LEVELS FOR CAPACITOR-START INDUCTION-RUN SMALL ELECTRIC MOTORS

Motor output power	Six poles	Four poles	Two poles
0.25 Hp/0.18 kW	65.4	69.8	71.4
0.33 Hp/0.25 kW	70.7	72.8	74.2
0.5 Hp/0.37 kW	77.0	77.0	78.3
0.75 Hp/0.55 kW	81.0	80.9	78.1
1 Hp/0.75 kW	84.1	82.8	80.0
1.5 Hp/1.1 kW	87.7	85.5	82.2
2 Hp/1.5 kW	89.8	86.5	85.0
≥3 Hp/2.2 kW	92.2	88.9	85.6

* Standard levels are expressed in terms of full-load efficiency.

** These efficiencies corresponded to NOPR Trial Standard Level 7 for capacitor-start motors.

TABLE II.3—PROPOSED STANDARD LEVELS FOR CAPACITOR-START CAPACITOR-RUN SMALL ELECTRIC MOTORS

Motor output power	Six poles	Four poles	Two poles
0.25 Hp/0.18 kW	63.9	68.3	70.0
0.33 Hp/0.25 kW	69.2	71.6	72.9
0.5 Hp/0.37 kW	75.8	76.0	75.1
0.75 Hp/0.55 kW	79.9	80.3	77.0
1 Hp/0.75 kW	83.2	82.0	79.0
1.5 Hp/1.1 kW	87.0	84.9	81.4
2 Hp/1.5 kW	89.1	86.1	84.2
≥3 Hp/2.2 kW	91.7	88.5	84.9

* Standard levels are expressed in terms of full-load efficiency.

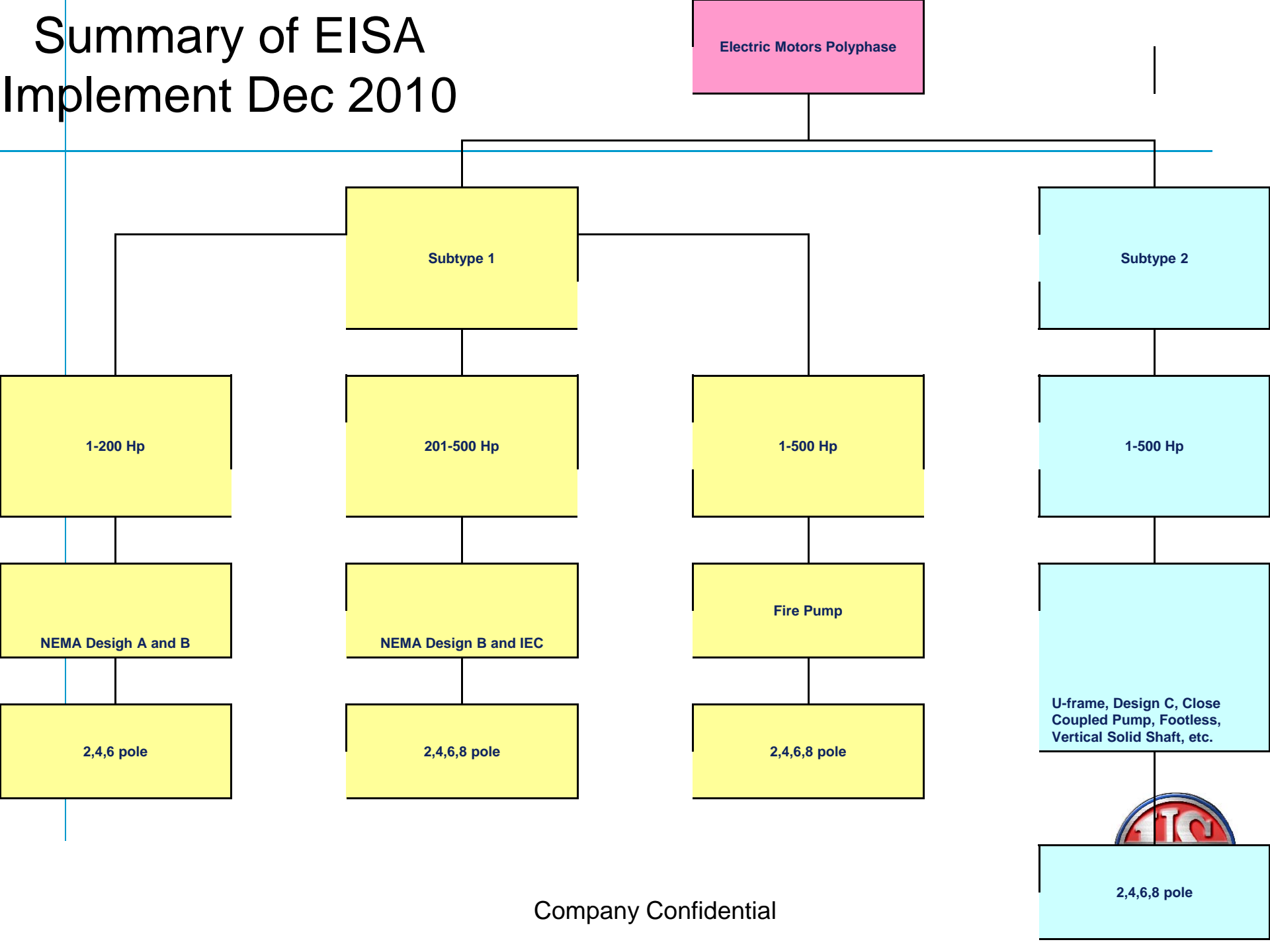
** These efficiencies corresponded to NOPR Trial Standard Level 7 for capacitor-start motors.

How Should MEPS work ?

- Regulators and industry must agree to use existing performance standards
- Covered product needs to be clearly defined using industry accepted standards recognized by motor users and OEMs
- Testing must utilize current industry best practice
 - Multiple accredited labs must be include both manufacturer and third party
- Labeling should be clear to user while remaining adoptable to high volume global products and logistics
 - Catalog data is as critical as actual product labeling
- Manufacturers compliance certification and identification should be included



Summary of EISA Implement Dec 2010



Electric Motors Polyphase

Subtype 1

Subtype 2

1-200 Hp

201-500 Hp

1-500 Hp

1-500 Hp

NEMA Design A and B

NEMA Design B and IEC

Fire Pump

U-frame, Design C, Close Coupled Pump, Footless, Vertical Solid Shaft, etc.

2,4,6 pole

2,4,6,8 pole

2,4,6,8 pole

2,4,6,8 pole

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Under discussion future 1-500 HP US Regulations

- Expanded product scope to include
 - Definite and special purpose
 - Type 2 motors
 - Proposed by a stakeholder coalition including NEMA, ACEEE, NRDC, Earthjustice, NWEA and ASaP
- Increased levels of efficiency evaluation and impact
DOE
- Enforcement improvements to level the market playing field
 - Monitor
 - Verify
 - Enforce

