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KYLE PITSOR
Vice President, Government Relations

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Submitted Online: https://www.regulations.gov
Or Via Email: MotorsCCE2014CE0019@ee.doe.gov

Ms. Ashley Armstrong
US Department of Energy
Buildings Technologies Program
Mail Stop EE-5B
1000 Independence Ave, SW
Washington, DC 20585-0121

NEMA Comments on Energy Conservation Program: Certification, Compliance, Labeling, and Enforcement for Electric Motors and Small Electric Motors

Docket Number: EERE-2014-BT-CE-0019
RIN: 1904-AD25

Dear Ms. Armstrong,

As the leading trade association representing the manufacturers of electrical and medical imaging equipment, the National Electrical Manufacturers Association (NEMA) provides the attached comments on the Department of Energy's Notice of Proposed Rulemaking for Certification, Compliance, Labeling, and Enforcement requirements for Electric Motors and Small Electric Motors. These comments are submitted on behalf of NEMA Motor and Generator Section member companies.

NEMA, founded in 1926 and headquartered in Arlington, Virginia, represents nearly 400 electrical and medical imaging manufacturers. Our combined industries account for more than 350,000 American jobs and more than 6,500 facilities across the U.S. Domestic production exceeds $117 billion per year.

NEMA notes with disappointment the DOE's refusal to extend the comment period as requested by several stakeholders. The years spent by the DOE preparing this NOPR are not fairly balanced by the few weeks given to interpret, analyze and comment on it. The far-reaching implications of the proposed regulatory changes could not be adequately understood and assessed during the limited comment period. NEMA is submitting these comments with the caveat that some portions are noted as unfinished, and we will submit improved, more complete comments in the coming weeks. We expect the department will address all our comments fairly and without prejudice.

Please find our detailed comments attached. Our Member companies count on your careful consideration and we look forward to an outcome that meets their expectations.
If you have any questions on these comments, please contact Alex Boesenberg of NEMA at 703-841-3268 or alex.boesenberg@nema.org.

Sincerely,

Kyle Pitsor

Kyle Pitsor
Vice President, Government Relations

NEMA Comments on Energy Conservation Program: Certification, Compliance, Labeling, and Enforcement for Electric Motors and Small Electric Motors

General Comments:

1. Our most significant concern with the NOPR is that the proposed changes to the certification calculations found in 10 CFR 429.63 and 429.64, i.e. instituting the use of a Lower Control Limit, is in fact an amendment to the energy conservation standards for electric motors and small electric motors, because it would result in product designs that meet current energy conservation standards to fail under the proposed rule. It is statutorily inappropriate to amend the energy conservation standards for electric motors and small electric motors through an enforcement rule, because it bypasses the Energy Policy and Conservation Act's process for amending those standards in 42 U.S.C. §6295(p).[1] That the proposed rule would amend the energy conservation standards for electric motors and small electric motors is established by the fact that the proposed "Lower Control Limit" explicitly revises the current energy conservation standards that rely on long-recognized nominal full-load efficiency tolerances that are part of the standards, but also by the fact that manufacturers would have to modify or redesign many of their motors *just as they would have to do following the amendment of any energy conservation standard by DOE.* The economic impacts to manufacturers (and their customers) which will in fact ensue from the proposed rule will not be trivial, and a complete rulemaking under Section 6295(p) is required to assess technical feasibility and economic justification if the DOE insists on proceeding with the use of an LCL approach instead of the global practice of nominal efficiency tolerances. In conclusion: The present sampling plan for certification should not be revised by this rulemaking. We provide additional detail in Appendix A, and are ready and willing to further this discussion with DOE via ex parte communications as needed.

2. The common understanding of the term "Original Equipment Manufacturer (OEM)" among members of the public, including the motor industry and its customers, is that this term refers to the manufacturer (including assembler) of a larger device that incorporates components that may include, but are not limited to, electric motors and small electric motors. The proposed revisions to 10 CFR 431.17 and 431.447 would deem the producer of a complete motor as the "OEM". Such a change would sow confusion in the public. We suggest DOE use a different term such as Original Component Manufacturer (OCM) or Original Motor Manufacturer (OMM) in this context and define it appropriately. In our comments below we refer to an OEM in the preceding context/practice, NOT as the DOE has termed it.

3. The amount of testing required to be performed and the follow-on administrative actions associated with this NOPR will take far longer than the proposed 180 day implementation. If the DOE does not significantly revise what it has proposed, the Secretary must exercise his discretion to allow a 3-year implementation. We offer additional information in our comments to item 1 below.

4. According to our notes, during the ex parte meeting[2] between NEMA and DOE on July 1st, DOE staff stated that when motors that had been exported are imported back into the U.S. the importer (manufacturer) would need to re-certify them with DOE. We would suggest that DOE consider that motors coming back into the U.S. from Canada or Mexico be exempted from this

[1] Applied to industrial and commercial equipment under 42 U.S.C. §6316(a).

[2] https://www.regulations.gov/document?D=EERE-2014-BT-CE-0019-0006

requirement if they are currently registered with DOE as certified motors and bear the original manufacturer's nameplate and CC/MIN number. This will reduce burden on parties involved without any increased risk of non-compliance.

5. Because of the significant potential impact of the NOPR, and our anticipation that the DOE will noticeably adjust the proposed regulatory text as a result of stakeholder comments, we insist that the DOE issue a SNOPR with subsequent public comment opportunity.

6. Not stated in the NOPR are any anticipated impacts of this rule will have on the DOE's rulemaking for Import Data Collection. NEMA requests DOE provide specific examples of how this NOPR will improve the enforcement of non-compliant motor products within the U.S. and through importation into the U.S., whether these motors are introduced in commerce as embedded components or as standalone products. If this NOPR will not improve importation enforcement, we are concerned that the effect will be to further burden U.S. manufacturers with respect to foreign competition.

7. NEMA is concerned about the content of 10 CFR 431 once the certification, compliance and enforcements are remove and placed in 10 CFR 429. NEMA requests the DOE issue a working draft of each section with the SNOPR mentioned in item 5 for public review and comment, rather than the piecemeal edit notations given in the NOPR. (We did not have time to generate and verify such a document internally before the comment deadline.)

8. We call the DOE's attention to several comments and concerns about AEDM development and validation, both in our response to Item 8 and in Appendix B.

9. While NEMA appreciates the DOE's attempts to align and harmonize requirements for Electric Motors and Small Electric Motors we are significantly concerned that there is little benefit to conducting any rulemakings which pertain to Small Electric Motors because the bulk of this market is currently exempt from standards. Current statutory language exempts small motors which are embedded in a larger covered product[3] as do the DOE's proposed text changes to 10 CFR 431.446 (NOPR page 41410). This statute has the effect of discouraging U.S.-made (i.e. compliant and more expensive as evidenced in rulemaking analysis[4]) motors from being sourced for the myriad products and appliances that incorporate motors. Due to the limited comment period given this NOPR, we are unable to deliver detailed arguments at this time. NEMA is preparing further submissions on this topic in which we believe the DOE has the authority to extend future Small Electric Motor rulemakings to the gamut of special purpose design types, and save significant amounts of energy nationwide. If the DOE does not agree with NEMA on this point, we would submit that further rulemakings for Small Electric Motors represent undue burden and wasted resources/savings.

NEMA Response to Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

[3] "§431.446 Small electric motors energy conservation standards and their effective dates.
(a) Each small electric motor manufactured (alone or as a component of another piece of non-covered equipment) after March 9, 2015, or in the case of a small electric motor which requires listing or certification by a nationally recognized safety testing laboratory, after March 9, 2017, shall have an average full load efficiency of not less than the following:"

[4] https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=7

1. DOE requests comments on its proposal to replace compliance certification (CC) numbers with a Manufacturer Identification Number (MIN) system. In particular, DOE requests comment on the following items:

NEMA Comment: NEMA sees no value in changing from the existing CC marking to the proposed MIN. Every manufacturer has just finished registration of their electric motor products with DOE for the June 1, 2016 reporting deadline. They should register their small electric motors in a similar manner and use the same CC number for identification. Creating a new system adds unnecessary and expensive burden that is unrecoverable from our customers.

a. The amount of time needed for manufacturers to transition to MINs.

NEMA Comment: Three years is required. This reflects the amount of time necessary to retest and redesign products, followed by the amount of time needed to revise and apply nameplates and associated media. To accomplish these things within the normal product development and revision cycle, so as to minimize burden, three years is needed. We are gathering additional information on this subject for later submittal.

b. Any additional costs due to the proposal to replace CC numbers with a MIN system.

NEMA Comment: There is no value added in moving to MIN, thus the cost is unjustified. By our estimates, this change could require up to 10 man years to first change nameplates (1. 5MY) as well as all marketing materials and brochures, web media, etc. (8.5MY). A three year rollout of literature would be needed to allow for routine updates to include new terminology. A faster rollout would require bringing on staff just for this purpose.

c. Whether the OEM–brand relationship is confidential business information and whether a list of MINs and associated OEMs and brands should be posted on DOE's CCMS web site. If the OEM–brand relationship is confidential business information, whether the brand-MIN combination should be published.

NEMA Comment: OEM-brand relationship and should be public information, though multiple CC numbers should be allowed as necessary to allow for private labeling and other business needs, as long as they are registered. In other words, continue the current practice regarding CC. We remind the DOE of general comment #2 above about the use of the term "OEM".

a. Whether the OEM–brand relationship is held in confidence by the OEM and importer, whether the OEM–brand relationship is available in public sources, whether disclosure of the information is likely to cause substantial harm to the competitive position of the OEM or importer, and the nature of that harm.

NEMA Comment: There are some cases where a device supplier might not want to disclose the source of their motors and in these cases or similar the OEM should be able to apply for their own CC number. We remind the DOE of general comment #2 above about the use of the term "OEM".

b. As DOE is proposing that a MIN may not be transferred to another entity, how much time would be required to transition a MIN on a nameplate to a new MIN in the event that an OEM was acquired by another company.

NEMA Comment: As we note above in item b., as much as 3 years might be needed to update nameplates, AFTER the merger or acquisition is fully permitted and approved by the Department of Justice and other entities. In other cases, the merger is done with the intention of maintaining the

brand name and CC numbers, etc., and as such NO changes are intended or desired with respect to CCE and the new owner may want to continue the use of the CC number, especially if it means no nameplate/media changes or other added costs. We remind the DOE of general comment #2 above about the use of the term "OEM".

2. In this proposal, DOE proposing to define the term "independent" at 10 CFR 431.12 and 431.442 and applying these requirements to the laboratories used by manufacturers for determining the efficiency of their basic modes. As part of this proposal, DOE is revising the requirements currently located in Section 431.18, which require that testing laboratories be accredited by NIST/NVLAP laboratory, accredited by a laboratory accreditation program having a mutual recognition program with NIST/NVLAP, or a laboratory accredited by an organization classified by DOE as an accreditation body. DOE seeks comment regarding whether DOE should also require that independent labs be accredited and what accreditations such laboratories should have.

NEMA Comment: Most if not all manufacturer labs are certified to ISO / IEC 17025-2005 on a semi-annual basis by NIST/NVLAP (a member of ILAC) which is an internationally recognized accreditation body and the same one that certifies the labs of other "independent" facilities. Proposing that a 3rd party lab review another NVLAP lab's results is redundant and adds burden, time delays and costs, while delivering no additional value. The past interpretations of "independent" have been sufficient and the NVLAP program in particular, being Government-run, has not shown any evidence of being insufficient.

An alternative to NVLAP/ISO accreditation is the IECEE GMEE (Global Motor Energy Efficiency) program as per OD 2057[5]. We propose DOE recognize this program as an equivalent alternative certification program to these new 10 CFR 429 requirements.

It is the opinion of NEMA members that those labs not affiliated with manufacturers in any way today all have testing facilities that are very limited with respect to testable horsepower range. Furthermore, since most of these independent labs use the same accreditation path as the labs at motor manufacturers, there really isn't a difference in testing other than the immediate oversight.

Additionally, NEMA questions the "independence" of a lab if they perform consulting services for manufacturers, helping them redesign motors or improving their AEDM in order for them to be certified by their facility, while at the same time may in the future perform these certification services for manufacturers while doing enforcement testing for DOE. It is better to keep these services apart, and given the limited ability and selection of outside motor testing labs, it again makes sense to continue manufacturers to use their own NVLAP labs to certify.

NVLAP requires manufacturer labs demonstrate "independence" from undue influence. We assert this is sufficient to satisfy the statutory requirement.

3. DOE anticipates that manufacturers using certification programs will have their certification programs act as third-party representatives; however, DOE seeks comment regarding whether DOE should accept certification reports directly from manufacturers that use certification programs to fulfill the certification testing requirements.

[5] http://www.iecee.org/about/gmee/

NEMA Comment: The accredited lab of a motor manufacturer should be able to submit certification data directly to DOE as they have done since 1997. This will speed up the ability to update portfolio files and reduce costly follow-up services from the certifiers.

4. DOE requests comment as to whether DOE should require the certification report to include a certificate of conformity or whether DOE should only require the certification report to identify the certification program used (with a certificate of conformity available from the certification program upon request by DOE).

NEMA Comment: NEMA perceives no value added in moving to annual relisting for products which have not changed. The intent in this proposal seems to make Motor requirements similar to other industries that already have annual reporting; however there is no evidenced benefit to instituting this practice for motors.

5. DOE requests comment on its proposal for electric motors manufacturers to test and certify compliance with energy conservation standards by either: (1) testing the electric motor using a recognized testing program (under § 429.74 of the proposal); (2) testing the electric motor at a testing laboratory other than a recognized testing program and then have a certification program that is nationally recognized in the United States (under § 429.73 of the proposal) certify the efficiency of the electric motor; or (3) using an alternative efficiency determination method ("AEDM," discussed in Section III.E.) and then have a third-party certification program that is nationally recognized in the United States (under § 429.73 of the proposal) certify the efficiency of the electric motor.

NEMA Comment: We remind the DOE of the NIST handbooks developed by NEMA/NIST at the request of DOE, most notably HB150-10-2013, which represents significant investment on the part of industry and the Government (NIST). This work should not be negated by a sidelining of the NVLAP program.

With respect to the specific items in the above query from DOE:
(1) This practice is already an option today. We have no reason to object to it as an option.

(2) When EPCA created the motor rules that went into effect in October 1997, it was DOE who suggested manufacturers certify their test labs by NIST/NVLAP. Accordingly, manufacturers have made significant investments over the years to establish and maintain modern and accurate labs for testing, research and development. NEMA member labs exceed the ability of any of the so-called "independent" labs both in accuracy and ability to test a wide range of motors and drives. This proposal - 5(2) - is not an improvement on the NVLAP program today. Third party review and "certification" will only add time and cost, but not deliver any greater rigor than the review process of NVLAP already affords.

(3) Continuous testing of motors is required to maintain the accuracy of AEDM programs. As more models are tested, the program accuracy is refined for varying configurations.
NEMA appreciates the ability to certify efficiency by means of testing and/or AEDM and we remind the DOE that we already obtain certification of our AEDMs from the DOE, arguably satisfying a 3rd party review requirement.

6. As discussed in Section III.C.2, DOE is proposing to make explicit that a certification program must conduct ongoing verification testing. DOE requests comment regarding whether DOE should more require specific sampling provisions for use in verification testing by certification programs, and, if so, what those sampling requirements should be.

NEMA Comment: Any DOE certification program must contain a robust compliance aspect, regardless of how the DOE incorporates our comments above regarding independence of testing and certification. Not only should DOE review the data submitted by manufacturers and any certifiers, but DOE should randomly select motors from commerce for inspection to verify nameplate data and performance in an accredited lab on an 18 month cycle not to exceed once per year per manufacturer. .

7. DOE requests comment on its proposal to retain a minimum sample size of 5 units for basic models rated by testing at an independent laboratory unless fewer than five individual units of a basic model are manufactured over a period of 180 days.

NEMA Comment: We disagree with the DOE's proposed interpretation of "independent" as noted above. There is no evidenced need to change the current 10 CFR 431 requirement and its interpretation.
With respect to sampling plans, we are still developing comments on this issue.

8. DOE requests comment on its proposal to retain the requirement that at least five units of each basic model must be tested to validate an AEDM.

NEMA Comment: We note that the current regulation does not simply require testing five units of each basic model; it is to test at least five units of five basic models for AEDM validation testing. However, we agree the existing requirement/practice should be continued.

With respect to AEDM development we note that the proposed changes to 429.70 with respect to sample size and minimum number of basic models to be tested for validation of an AEDM are in conflict with respect to small electric motors. Several portions of the proposed text on NOPR pages 41403 and 41404 indicate that five basic models must be tested and evaluated, but then other sentences proposed in the same clause contradict this.

For example: on page 41404 left hand column stating "(3)… (C) No two basic models may have the same frame number series; and".

The problem lies in that there are only three frame sizes for small electric motors today.
Current regulatory text allows for greater flexibility in small electric motor basic model selection to allow for more than three basic models.

Proposal: Maintain the current wording appearing in 431.445 (5) (c) (1) (i) with respect to small electric motor basic model selection.

With respect to other proposals in the NOPR which address the validation of an AEDM, we call the DOE's attention to Appendix B of these comments.

9. DOE requests comment on its proposal to adopt a sampling plan for electric motors similar to those used for other consumer products and commercial equipment. Additionally, DOE

requests comment on its proposal to use the formulas from 10 CFR 431.17(b)(2)(i) and 10 CFR 431.17(b)(2)(ii) and add them to 10 CFR 429.138 to verify representations used for labeling.

NEMA Comment: We disagree with any minimum sample sizes larger than 5.

We again call the DOE's attention to our detailed comments in Appendix A.

10. DOE requests comment on its proposal to make the general certification report requirements at 10 CFR 429.12(b)[6] applicable to electric motors and require additional specific reporting requirements including detailed in Section III.C.3 of this notice.

NEMA Comment: We do not perceive any value in the added regulatory burden of annual filing when products have not experienced any changes. This proposal represents incremental regulatory burden and zero incremental benefit to anyone.

NEMA believes that each manufacturer should be tasked with submitting a certificate of conformity along with the updated files for their product portfolio only when there is a change in the basic model design or due to a regulatory change in efficiency level. We have no preference as to when the submission date is scheduled. Splitting small electric motors and electric motors is acceptable until such time when the rules may be merged.

11. DOE requests comment on its proposal that small electric motor manufacturers follow the same efficiency testing and certification procedures as electric motors manufacturers. Unlike with electric motors (see 42 U.S.C. 6316(c)), the statute does not require manufacturers of small electric motors to certify that a motor meets the applicable standard through an independent testing or certification program nationally recognized in the United States. Therefore, DOE requests stakeholders suggest other frameworks for certification testing of small electric motors if the stakeholder opposes DOE's proposal for consistency.

NEMA Comment: We agree that certification requirements for small electric motors are necessary to clearly identify a pathway and means for enforcement. As noted, we disagree with annual reporting requirements. We propose that the current practice of self-certification be maintained for small electric motors, as well as for Electric Motors as we indicate in our comments to Item 2.

12. DOE requests comment on the sampling provisions proposed for small electric motors discussed in detail in Section III.D.2.

NEMA Comment: We refer the DOE to our detailed comments in Appendix A and B regarding sampling.

13. DOE requests comment on its proposal requiring specific reporting requirements for small electric motors detailed in Section III.D.3.

[6] http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=10:3.0.1.4.17#se10.3.429_112

NEMA Comment: If the CCE language as proposed in the NOPR is changed in view of NEMA's comments, then one year should be sufficient for small motor reporting. If the DOE stands by its proposals to change nameplates, change testing requirements and associated other changes, then the three years noted in our comments to item 1.a. apply. We refer to the DOE to our more detailed comments to item 19 and Appendix A below concerning the proposed term "represented full load efficiency". The DOE should abandon use of this term.

14. DOE proposes to add periodic verification testing as a criteria to be a nationally recognized certification program. DOE requests comment regarding whether, in light of the changes to the petition criteria, the currently recognized certification programs should renew their petitions and DOE should conduct a new review once this rulemaking is finalized.

NEMA Comment: By making this statement, the DOE appears to be asserting that there are no nationally recognized certification programs. We disagree. ISO is an internationally recognized standards development organization (SDO) and ISO 17025 has established a robust certification program that requires re-certification every two years, and the DOE should recognize it. The DOE has offered no evidence that verification testing is needed, and given our position that NVLAP labs be permitted to conduct testing for certification purposes there is no need for verification testing since NVLAP labs are already reviewed routinely. We agree with recognition review by the DOE of recognized test labs. NVLAP also currently reviews participating labs every two years. This should be continued in accordance with NIST HB150-10-2013.

15. DOE requests comment regarding whether model number, basic model number, or some other type of design information should be required on the nameplate to permit DOE and customers to tie a certification of compliance to a particular unit being distributed in commerce.

NEMA Comment: Existing nameplate requirements are adequate. While variations in presentation may exist between manufacturers, all necessary data is included on existing nameplates and certifiers and customers have been using them successfully for years. This proposal falls into the category of change for the sake of change or a solution in search of a problem.

16. DOE requests comment on time required to transition to new nameplate requirements. Specifically, whether manufacturers could make the proposed changes within six month of publication of a final rule or whether the nameplate changes should be required on all electric motors manufactured on or after June 1, 2016, when compliance with amended standards is required.

NEMA Comment: NEMA sees no value in changing from the existing CC marking to the proposed MIN identification.

To answer the DOE's question: As we note in our comments to item 1.a), three years is more realistic, especially in view of the DOE's proposal to include additional information beyond what is provided today. Testing may be required to gain this information in a manner that conforms to DOE's newly proposed certification requirements, followed by database updates, changes to physical nameplates and finally, updates to catalog and other media resources. It is not possible to preforms necessary testing within six months, much less the administrative and nameplate changes. We understand the six month requirement is based on statutory reference, and if the DOE intends to steadfastly refuse three years for implementation, then we insist the DOE is obligated to not add any testing or

representational requirements that cannot be readily met within the 180 day time frame. By this logic, a strict statutory six month window therefore obliges that DOE require NO changes to nameplate information.

17. DOE requests comment regarding whether small electric motors currently, always, bear a "nameplate" or whether other forms of labeling should be permitted. DOE also requests comment regarding whether DOE should require some sort of model, basic model, or other design-specific information to be displayed on the nameplate.

NEMA Comment: Today small electric motors do not always have nameplates. They *should* have nameplates, in accordance with NEMA MG-1, to enable visual identification of basic model number and product class, facilitate visual verification of compliance, efficiency, and other important information.

18. DOE requests comments regarding whether the formula currently in 10 CFR 431.445 should be retained for evaluation of representations.

NEMA Comment: We refer the DOE to our detailed discussion of this issue in Appendix A, and offer the following conclusion that DOE should revert to the existing practice in 10 CFR 431.17 (5 and 15 levels)

19. DOE proposes that only the lowest efficiency (when tested and rated for multiple voltages) be placed on the nameplate of an electric motor.

NEMA Comment: On most three phase electric motors sold in the U.S., it makes no difference as to efficiency on 230/460 volt motors if they are 9-lead motors with 2:1 voltage ratios (e.g. they are 2Y/1Y winding connections). Some markets, particularly Europe, often apply 6 lead windings (e.g. 1Delta/1Wye) on smaller motors that are not equivalent between 2:1 voltages.
On single phase capacitor run motors, today DOE allows the manufacturer to select the voltage for compliance. When the capacitor is only connected on half the winding (high voltage connection), the efficiency is lower. To require that the connection for the lowest efficiency be compliant will force these motors to be redesigned, resulting in more active material and possibly larger frame sizes, creating further product utility problems.

Manufacturers may be driven by OEM customers to design single voltage motors to mitigate product costs if DOE changes to lowest efficiency marked on nameplate. This doubles the number of SKUs required in the portfolio, increasing manufacturer burden. Additionally, if single voltage motors were designed, the model for 230V would be required to have additional run capacitance adding to the motor cost and size.

These time and cost impacts must be analyzed for technical and financial feasibility if the DOE insists on maintaining this approach.

With respect to efficiency marking on nameplates we stress that DOE should abandon the term "Represented Full load Efficiency" proposed in the NOPR. As our detailed comments in Appendix A prove, the practice of "Nominal efficiency" is statistically sufficient and is well established globally. It is current practice to indicate "Nominal efficiency" or "Nom. Eff.", consistent with paragraph 12.58.2 of NEMA MG1-2009, on nameplates. The term "NEMA Nominal Efficiency" or "NEMA Nom. Eff." was

introduced March 16, 1977 in the NEMA suggested standard for future design. These terms have been included on nameplates since the terms were included in a NEMA standard on January 17, 1980 and this practice has been sufficient in the passing decades of application.

In comparison, the DOE offers inadequate justification to change this practice and to adopt a non-standard term that no one understands, whereas “NEMA Nominal” is well understood throughout the United States and North America.

NEMA urges DOE to abandon the term “Represented Full load Efficiency” and maintain the use of “NEMA Nominal Efficiency”.

a. DOE requests comment on whether there should be some indication of which rated voltage is the lower efficiency voltage corresponding to the rated efficiency.

NEMA Comment: We disagree with this practice, per our comments above, and therefore have no further comment.

b. As certification reports will indicate the corresponding voltage, DOE is accepting comment on whether the additional information would provide sufficient benefit to purchasers to warrant the additional cost.

NEMA Comment: There is insufficient space on nameplates for a litany of information, nor are motors generally purchased by methods that allow physical inspection of the nameplates or other “comparison shopping” techniques. Electric motors are most often bought on spec from catalogs. The DOE appears to be confusing motors with consumer products or commercial products which are typically bought from warehouses or large inventory stores. Existing nameplate information is sufficient for real-world needs.

c. DOE requests comment regarding whether, for each rated voltage, the manufacturer should also put a corresponding efficiency on the nameplate and the associated costs of such a requirement.

NEMA Comment: As noted above, space on nameplates is physically limited, and motors are not generally purchased by methods that allow physical inspection of the nameplates or other “comparison shopping” techniques. Electric motors are most often bought on spec from catalogs. The DOE appears to be confusing motors with consumer products or commercial products which are typically bought from warehouses or large inventory stores.

DOE should accept a single nominal voltage for three phase motors and allow manufacturers to choose the voltage which they select for compliance on single phase motors.

With respect to motors marked as 208-230/460 volts in the rated voltage, we believe that that designation should comply with NEMA performance and rated efficiency at each voltage number marked; i.e. 208, 230 and 460 volts.

When the motor is rated at 230/460 volts only, there is a NEMA tolerance that the motor is suitable for operation at the marked voltages +/- 10%, but it will have compliant efficiency at 230 and 460 volts. As such, the motor is “Suitable for use at 208V” as it is in the =10% band but does not have rated efficiency when not at rated voltage. This is a common, established practice that should be allowed to continue.

d. DOE also requests comment on whether small electric motors will include multiple rated voltages on its nameplate and if DOE should adopt similar provisions for small electric motors.

NEMA Comment: We refer to our comments on item c. above. The challenge of available space on a nameplate is more critical on a small electric motor. It follows the DOE's NOPR proposals are even more mis-applied with respect to small electric motors. As we comment above in several places, nameplates should not change at all, if possible. We remind the DOE that many small motors entering commerce as embedded components have no nameplates at all. The requirement that they have nameplates is in itself a significant cost addition.

20. DOE requests comment on the change in validation testing requirements for small electric motors described in Section III.D.

NEMA Comment: We refer the DOE to Appendix A and B of these comments on this subject.

21. DOE seeks comment on the impacts of the any additional cost of testing on small manufacturers imposed by this proposal. DOE also seeks comment on its reasoning specified in Section IV.B that the proposed changes would not have a significant impact on a substantial number of small entities.

NEMA Comment: We do not have immediate information on impacts to small entities. Should our further comment development discussions yield any further information we will include it with our follow-on comments.

Additional Comments:

1. In the NOPR page 41410, DOE proposes to revise 431.446 to read "… under 42 U.S.C. 6302(a) or covered equipment under 42 U.S.C. 6311…..
   Clause 6302(a) of 42 U.S. Code does not mention any products and so this reference is confusing. It could be that DOE intended to cite 42 U.S.C. 6292 which lists several covered consumer products.

Appendix A

Comparison of "Represented Full Load Efficiency" versus "NEMA Nominal Efficiency"

NEMA would like to comment on DOE's proposal to revise the criteria for certifying that basic models for electric motors and small electric motors comply with the represented full-load efficiency. The present criteria for electric motors appear in 10 CFR 431.17(b)(2) and require that:

- the average full-load efficiency of the sampled units for a basic model not be less than an efficiency that is equivalent to a 5% increase in losses compared to the losses associated with the represented nominal full-load efficiency

- the lowest full-load efficiency of the sampled units not be less than an efficiency that is equivalent to a 15% increase in losses compared to the losses associated with the represented nominal full-load efficiency

For small electric motors the present criteria appear in 10 CFR 431.445(c)(3) and include a requirement equivalent to that for electric motors for the average full-load efficiency of the sampled units but include no requirement for the lowest full-load efficiency of the sampled units.

The newly proposed criteria for electric motors in the June 24, 2016 NOPR would appear in 10 CFR 429.63(b)(1) and for small electric motors appear in 10 CFR 429.64(b)(1) and both sets of criteria require that the represented full-load efficiency be less than or equal to the lower of the mean full-load efficiency of the sampled units or the lower 97.5 percent confidence limit (LCL) of the true mean divided by 0.95.

NEMA's understanding is that DOE's motivation for amending the energy conservation standards and removing the 5% margin on losses that presently exists in 10 CFR Parts 431.17(b)(2) and 431.445(c)(3) is based upon the following arguments advanced in the NOPR:

1) The interpretation that the definition of Nominal full-load efficiency presently in 10 CFR 431.12 mandates that the "average full-load efficiency of a population of motors of the same design" (equivalently, the "actual population mean" or the "true mean efficiency") be equal to or greater than the represented full-load efficiency.
2) The belief stated in section III.C.3 of the June 24, 2016 NOPR that the "Part 429 requirements ensure the tests of each basic model, whether for determining the model's efficiency or for the substantiation (i.e., initial validation) of an AEDM, are based on a sample of units that is large enough to account for reasonable manufacturing variability among individual units of the basic model or variability in the test methodology such that the test results for the overall sample will be reasonably representative of the efficiency of the whole population of production units of that basic model".
3) The concern expressed in section III.C.3 of the June 24, 2016 NOPR that "current provisions give rise to too high a risk that a manufacturer may state a nominal efficiency for a basic model that is greater than the actual population mean for that model".

NEMA acknowledges the interpretation stated in item 1) above assuming that the term "population" is understood to consist of "all the small electric motors (or electric motors) produced for the basic

model" as DOE states in section III.D.2 of the June 24, 2016 NOPR. NEMA will point out, however, that the definition of Nominal full-load efficiency in 10 CFR 431.12 only applies to electric motors and not to small electric motors.

NEMA strongly disagrees with the belief stated in item 2) above and with the concern stated in item 3) above.

Furthermore, NEMA concludes that this June 24, 2016 CCE NOPR is, in effect, *a Minimum Energy Efficiency Standards Rulemaking*. The present certification criteria in 10 CFR 431.17(b)(2) and 10 CFR 431.445(c)(3) accommodate the unavoidable reality that any sampled set of units from a normally distributed population with non-zero standard deviation for efficiency will have a non-zero probability that the mean efficiency of the sampled units is lower than the true mean efficiency of the population and for the standard deviations for efficiency and the practical sample sizes that are applicable for electric motors and small electric motors this probability is significantly large as is demonstrated later in this comment. The removal of the present 5% margin for mean full-load efficiency of the sampled units that is proposed in this CCE NOPR ignores this unavoidable reality and requires overdesign/redesign of equipment to ensure successful compliance in practical application. Existing NIST studies, as well as NEMA Round Robin and IEC Round Robin testing, show that the accuracy of inter-lab testing has a standard deviation from one to two NEMA nominal efficiency bands. This means that to satisfy the newly proposed certification criteria, manufacturers will have to increase the true mean efficiency of each basic model to a value well above the regulated value to be reasonably assured of meeting the certification criteria proposed in the NOPR. Whether through tighter material controls, redesign, or other construction methods, the NOPR will result in negative financial and other resource impacts to all manufacturers, even those who are committed today to be well within compliance requirements. To avoid this, NEMA recommends that the criteria for certifying that basic models for electric motors and small electric motors comply with the energy conservation standards should remain unchanged from what they presently are in 10 CFR Part 431.17(b)(2) and 10 CFR 431.445(c)(3) and should not reflect what is proposed in the NOPR for 10 CFR 429.63(b)(1) and 10 CFR 429.64(b)(1). In other words, the present 5% margin in losses for the average full-load efficiency of the sample of both electric motors and small electric motors should remain in the future regulations and the present 15% margin in losses for the lowest full-load efficiency in the sample of electric motors should remain in the future regulations. The present 15% margin in losses for the lowest full-load efficiency in the sample that NEMA is recommending to be retained in the future regulations is a more strenuous requirement for the lowest full-load efficiency in the sample than what is proposed in the June 24, 2016 CCE NOPR; in fact, the CCE NOPR proposes no limit for the lowest full-load efficiency in the sample. NEMA's conclusion and recommendation is supported by the following two items:

1. Recognition that the newly proposed lower 97.5 percent confidence limit (LCL) of the true mean divided by 0.95 likely will not come into play for any imaginable real world scenario. NEMA's calculations indicate that this value will only be lower than the mean of the sample when the standard deviation for efficiency is unrealistically high as is illustrated by the following examples:

Mean of the sample	# of samples	Lowest standard deviation for 97.5% LCL / 0.95 to be <= mean of the sample	# of NEMA MG1 Table 12-10 nominal eff bands this standard deviation corresponds to

95%	5	3.85%	7
95%	15	8.6%	12
95%	20	10.5%	14
88.5%	5	3.6%	3.5
88.5%	10	6.2%	5
88.5%	15	8%	6.5

Since standard deviations of much more than approximately 1.5 or 2 nominal efficiency bands would put basic models at risk of not complying with the presently allowable lowest full-load efficiency in the sample (X_{min}), this means that for any imaginable real world scenario the mean full-load efficiency of the sampled units is lower than the 97.5 percent LCL of the true mean divided by 0.95 and the represented full-load efficiency is required by the newly proposed regulations to be equal to or less than this mean full-load efficiency of the sampled units.

2. Simulations of certification tests performed by a computer program that NEMA developed. For these simulations the computer program randomly selected efficiency values from a normal distribution with a user defined true mean efficiency (actual population mean) and a user defined standard deviation for efficiency that had been converted from units of percent efficiency to units of nominal efficiency bands and for which one standard deviation was defined to be the distance between the nominal efficiency mandated by the energy conservation standards for a particular rating and the next higher nominal efficiency. The number of randomly selected efficiency values for each simulated certification test ranged from one (corresponding to a sampling of one unit) to twenty-one (corresponding to a sampling of twenty-one units). Each certification test for a given sampling size was simulated 1000 times in order to minimize anomalies stemming from the randomness of the efficiency selection. Plots produced by the computer program appear in Figures 1 through 4 below and Figures 5 through 8 in Appendix A. Figures 1, 2, 5, and 6 depict cases for which the true mean efficiency was equal to or greater than the nominal efficiency mandated by the energy conservation standards and the certification test criteria were those newly proposed in the June 24, 2016 NOPR. These are cases for which the true mean efficiency of the basic model met or exceeded the applicable energy conservation standard yet the Figures clearly show that with the newly proposed certification test criteria there is a significant probability for these cases of failing the certification test. NEMA believes Figures 1, 2, 5, and 6 clearly illustrate that random sampling of up to twenty-one units from a normally distributed population with a true mean efficiency that is compliant with the energy conservation standards and with a typically encountered value for standard deviation results in a high enough uncertainty for the mean efficiency value of the sample that the following belief stated by DOE in section III.C.3 of the June 24. 2016 NOPR is false: “Part 429 requirements ensure the tests of each basic model, whether for determining the model’s efficiency or for the substantiation (i.e., initial validation) of an AEDM, are based on a sample of units that is large enough to account for reasonable manufacturing variability among individual units of the basic model or variability in the test methodology such that the test results for the overall sample will be reasonably representative of the efficiency of the whole population of production units of that basic model”. The remaining figures depict cases for which the true mean efficiency was equal to (Figure 3) or less than (Figures 4, 7, and 8) the nominal efficiency mandated by the energy conservation standards and the certification test criteria were those that presently appear in 10 CFR 431.17(b)(2) and 431.445(c)(3). Figures 4, 7, and 8 represent cases for which the true mean efficiency of the basic model by a small amount did not meet the applicable energy conservation standard and these Figures clearly show that there is a significant probability for these cases of failing the present certification test. Figure 3 represents a case for which the

true mean efficiency of the basic model met the applicable energy conservation standards and yet, for standard deviations of one to two NEMA bands that NIST studies and NEMA Round Robin and IEC Round Robin have shown to be typical for inter-lab testing accuracy, there is still a significant probability of failing the present certification test. NEMA believes Figures 3, 4, 7, and 8 clearly illustrate that in order to be reasonably assured of complying with the present certification test criteria, a basic model needs to have a true mean efficiency that is not less than or not equal to the nominal efficiency mandated by the energy conservation standards but, instead, is greater than the nominal efficiency mandated by the energy conservation standards. This means there is little opportunity for the scenario described in Section III.C.3 of the June 24, 2016 NOPR of a manufacturer stating a nominal efficiency for a basic model that is greater than the actual population mean for that model and still being reasonably assured of being compliant with the requirements that presently exist for the certification test in 10 CFR Part 431.17(b)(2) and 10 CFR 431.445(c)(3). Comparing Figure 1 to Figure 4 and comparing Figure 2 to Figure 3 reveals that, with the newly proposed certification test criteria, the probability of failing the certification test with a given value of true mean efficiency is approximately the same as it is for the case where the true mean efficiency is one-half of a nominal efficiency band lower and the present certification test criteria are used. NEMA believes this demonstrates that this June 24, 2016 CCE NOPR is, in effect, a Minimum Energy Efficiency Standards Rulemaking.

As can be seen from Figure 1 below that was produced by the computer program, regardless of the sampling size and regardless of the standard deviation, approximately 50% of the 1000 simulated certification tests using the newly proposed criteria were failed when the true mean efficiency (actual population mean) was exactly equal to the 89.5% efficiency mandated by the energy conservation standards for a 5HP, 4 pole, enclosed electric motor. One may be under the impression that if the probability of failure for a given number of samples such as 5 is 50% and if the probability of failure for the next larger amount of samples (6) is also 50% then the combined probability of failing with 5 samples and then failing again when an additional sample is added to bring the total to 6 would be the substantially smaller value of 50% * 50% = 25%. This is not true, however. The combined probability of failure in both cases would only be substantially reduced in this manner if the 6 samples in the second sample set consisted entirely of motors that were not in the first sample set of 5 motors. This is not how the certification test works, however. Instead, 5 of the 6 motors in the second sample set would be in common with the 5 motors in the first sample set. This logic in conjunction with Figure 1 clearly demonstrates that a certification can easily be failed under the proposed new regulations even if the true mean efficiency is equal to the efficiency mandated by the energy conservation standards and is equal to the represented efficiency.

Figure 1: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency exactly equal to the 89.5% efficiency mandated by the energy conservation standards when the newly proposed certification test criteria were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:

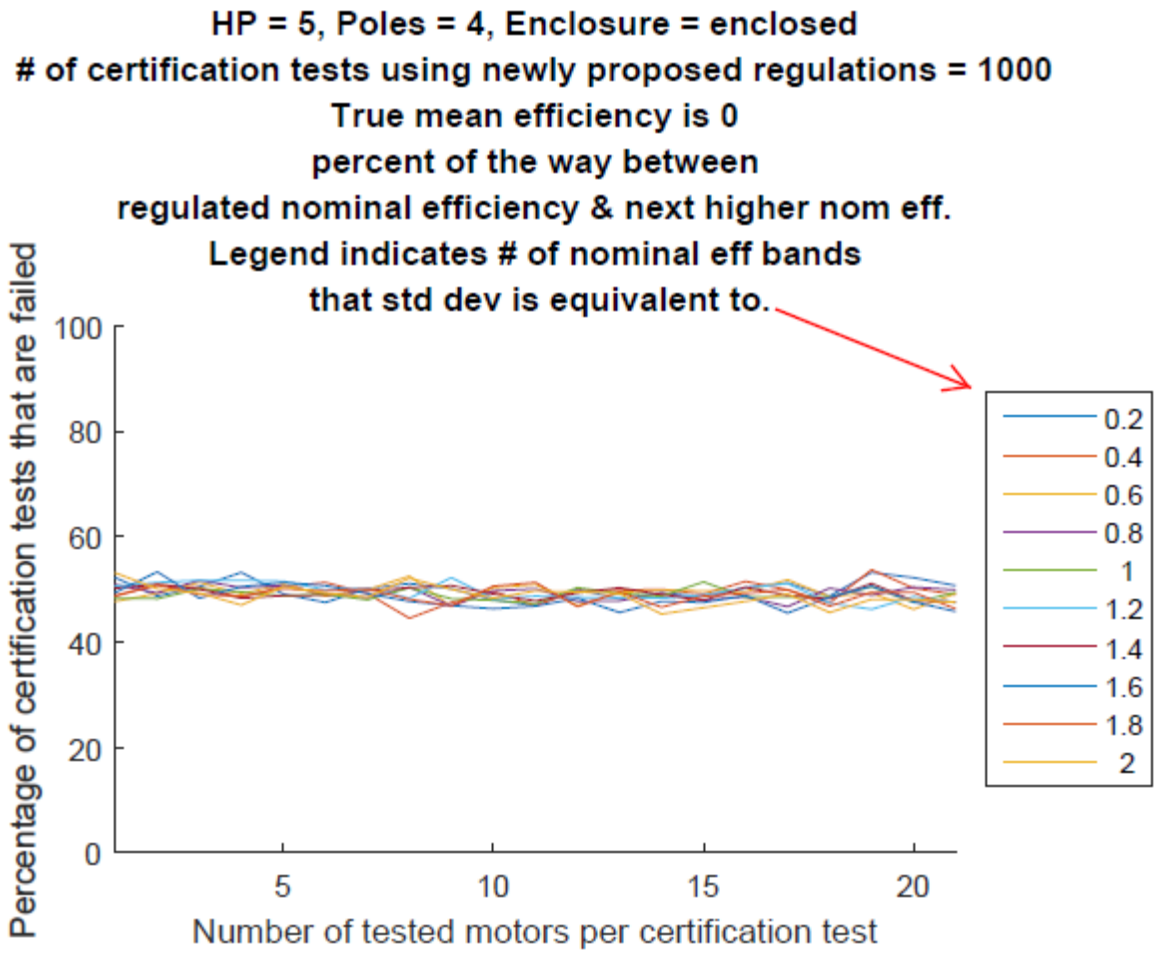


Figure 2 shows the simulation results using the newly proposed certification test criteria when the true mean efficiency for this same motor rating was 50% of the way between the efficiency of 89.5% mandated by the energy conservation standards and the next higher nominal efficiency of 90.2%. It can be seen that even for this case where the true mean efficiency was half a band higher than the mandated efficiency, for a sampling size of 5 units there is still a significant probability of failing the newly proposed certification test when the standard deviation for efficiency falls within the quite realistic range of 0.8 to 2 nominal efficiency bands. Note that NIST studies of multiple NVLAP accredited test laboratories, as well as NEMA Round Robin and IEC Round Robin testing, show that the accuracy of inter-lab testing has a standard deviation of one to two nominal efficiency bands; this doesn't include the additional standard deviation due to manufacturing variations. If the sampling size is increased to 10 or more units, the probability of failure decreases but is still significant unless the standard deviation is held at or below a level of approximately 1 nominal efficiency bands.

Figure 2: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency 50% of the way between the 89.5% efficiency mandated by the energy conservation standards and the next higher nominal efficiency of 90.2% when the newly proposed certification test criteria were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the

energy conservation standards for that particular rating and the next higher nominal efficiency:

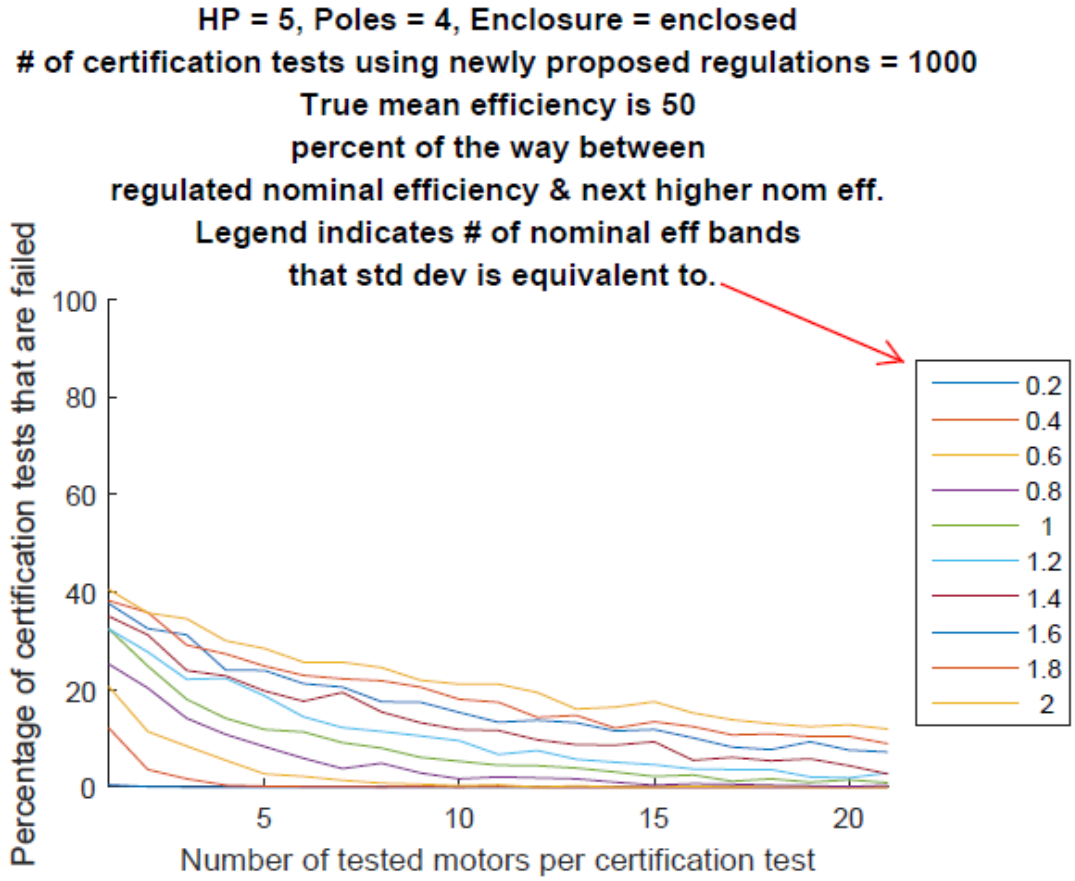


Figure 3 shows the simulation results using the certification test criteria presently in 10 CFR 431.17(b)(2) and 431.445(c)(3) when the true mean efficiency for this same motor rating was exactly equal to the 89.5% efficiency mandated by the energy conservation standards. Figure 3 represents a case for which the true mean efficiency of the basic model met the applicable energy conservation standards and yet, for standard deviations of one to two NEMA bands that NIST studies and NEMA Round Robin and IEC Round Robin have shown to be typical for inter-lab testing accuracy, there is still a significant probability of failing the present certification test. The present certification test criteria allow the average full-load efficiency of the sample to be no lower than the efficiency associated with a 5% increase in losses compared to the regulated nominal efficiency value. A 5% increase in losses is approximately equivalent to one half of a nominal efficiency band. The case depicted by Figure 3, therefore, is very similar to the case depicted in Figure 2 in that the true mean efficiency is approximately one half of a nominal efficiency band above the minimum average full-load efficiency of the sample allowed by the certification test criteria. One would therefore expect Figures 3 and 2 to look very similar and it can be seen that, indeed, they are. The differences between the two Figures are primarily due to the fact that Figure 3 depicts a case where the true mean efficiency is higher than the minimum allowed average full-load efficiency of the sample by approximately one half of a nominal efficiency band while Figure 2 depicts a case where it is higher by exactly one half of a nominal efficiency band. The remainder of the differences is of a random nature due to the fact that the computer program randomly selects the sampled efficiencies from a normal distribution. By comparing Figures 2 and 3 it can be seen that the newly proposed certification test criteria in the June

24, 2016 NOPR effectively force manufacturers to increase the true mean efficiency for each of their basic models by approximately one half of a nominal efficiency band in order to have the same probability of passing the certification test that exists today.

Figure 3: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency exactly equal to the 89.5% efficiency mandated by the energy conservation standards when the certification test criteria presently in 10 CFR 431-17(b)(2) and 431.445(c)(3) were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:

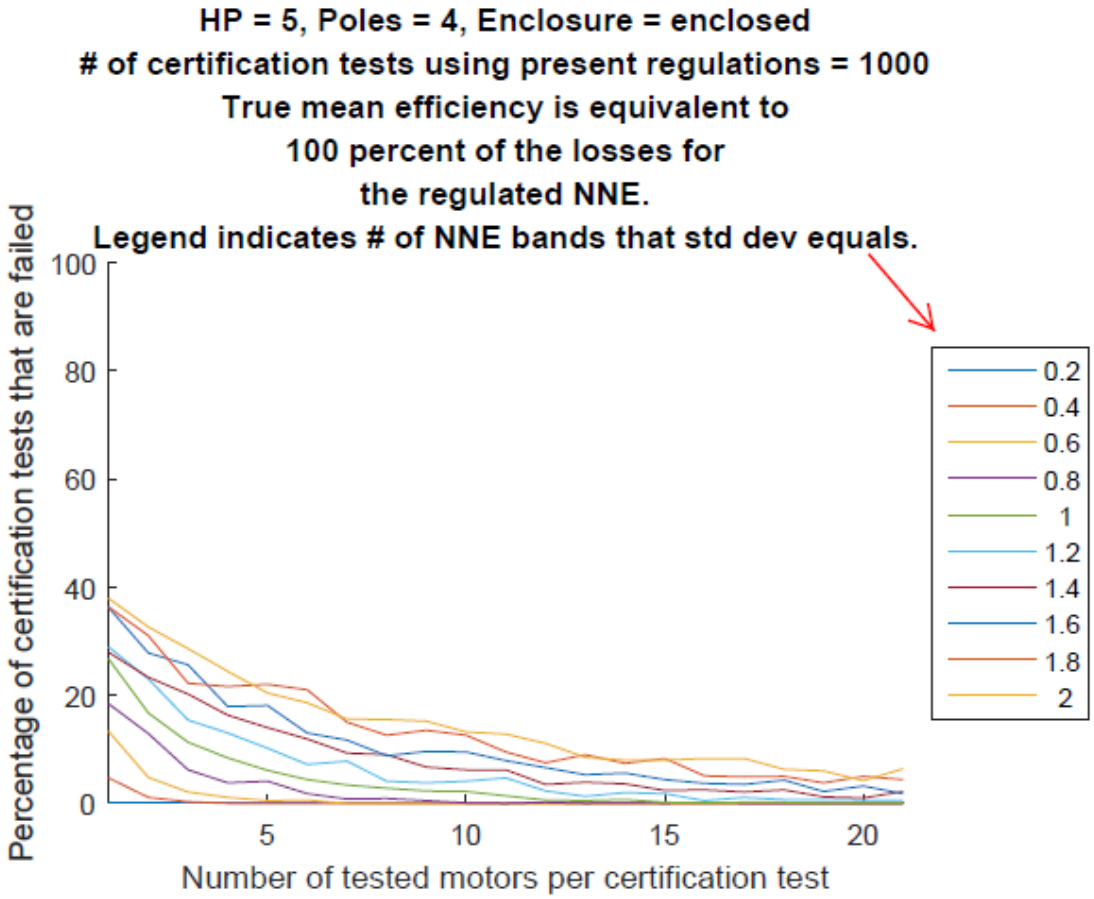
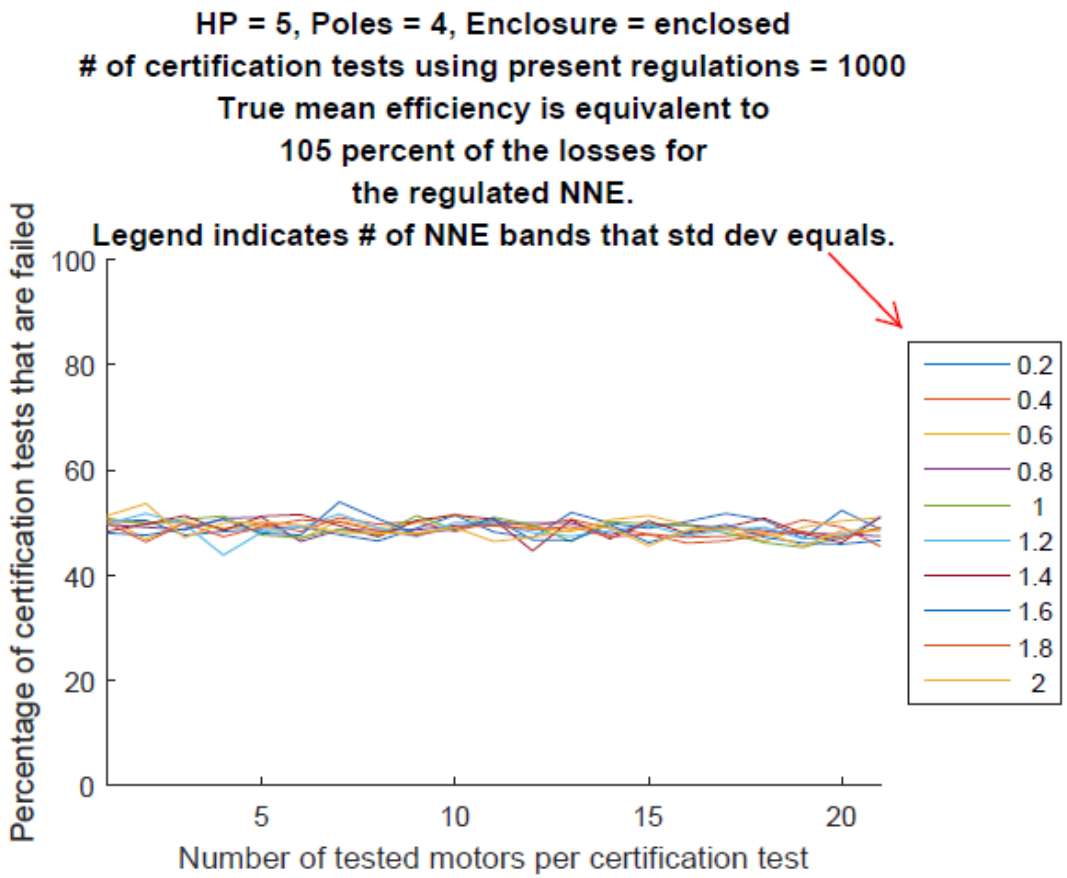


Figure 4 shows the simulation results using the certification test criteria presently in 10 CFR 431.17(b)(2) and 431.445(c)(3) when the true mean efficiency for this same motor rating was lower than the 89.5% efficiency mandated by the energy conservation standards by an amount equivalent to a 5% increase in losses (approximately one half of a nominal efficiency band). This means that the true mean efficiency was exactly equal to the minimum value allowed by the present certification test criteria for the average full-load efficiency of the sample. This case, therefore, is very similar to the case depicted in Figure 1 for which the true mean efficiency was exactly equal to the minimum value allowed by the newly proposed certification test criteria for the average full-load efficiency of the sample. One would therefore expect Figures 4 and 1 to look very similar and it can be seen that,

indeed, they are. It can be seen from both of these Figures that if a basic model has a true mean efficiency that is exactly equal to the minimum value allowed by the certification test criteria for the average full-load efficiency of the sample then there is approximately a 50% chance of failing the certification test regardless of whether 5 motors are sampled, 21 motors are sampled, or any number of motors in between those two extremes are sampled. By comparing Figures 1 and 4 it can be seen that the newly proposed certification test criteria in the June 24, 2016 NOPR effectively force manufacturers to increase the true mean efficiency for each of their basic models by approximately one half of a nominal efficiency band in order to have the same probability of passing the certification test that exists today.

Figure 4: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency equivalent to losses 5% higher than those for the 89.5% efficiency mandated by the energy conservation standards when the certification test criteria presently in 10 CFR 431-17(b)(2) and 431.445(c)(3) were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:



Additional simulations of certification tests for the same motor rating

Figure 5 shows the simulation results using the newly proposed certification test criteria when the true mean efficiency for this same motor rating was 20% of the way between the efficiency of 89.5% mandated by the energy conservation standards and the next higher nominal efficiency of 90.2%. It can be seen that even for this case where the true mean efficiency was significantly higher than the mandated efficiency, for a sampling size of 5 units there is still a significant probability of failing the newly proposed certification test unless the standard deviation for efficiency is equal to the extremely low value of 0.2 nominal efficiency bands. If the sampling size is increased to 10 or more units, the probability of failure decreases but is still significant unless the standard deviation is held at or below the very low level of 0.4 nominal efficiency bands.

Figure 5: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor with a true mean efficiency 20% of the way between the 89.5% efficiency mandated by the energy conservation standards and the next higher nominal efficiency of 90.2% when the newly proposed certification test criteria were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:

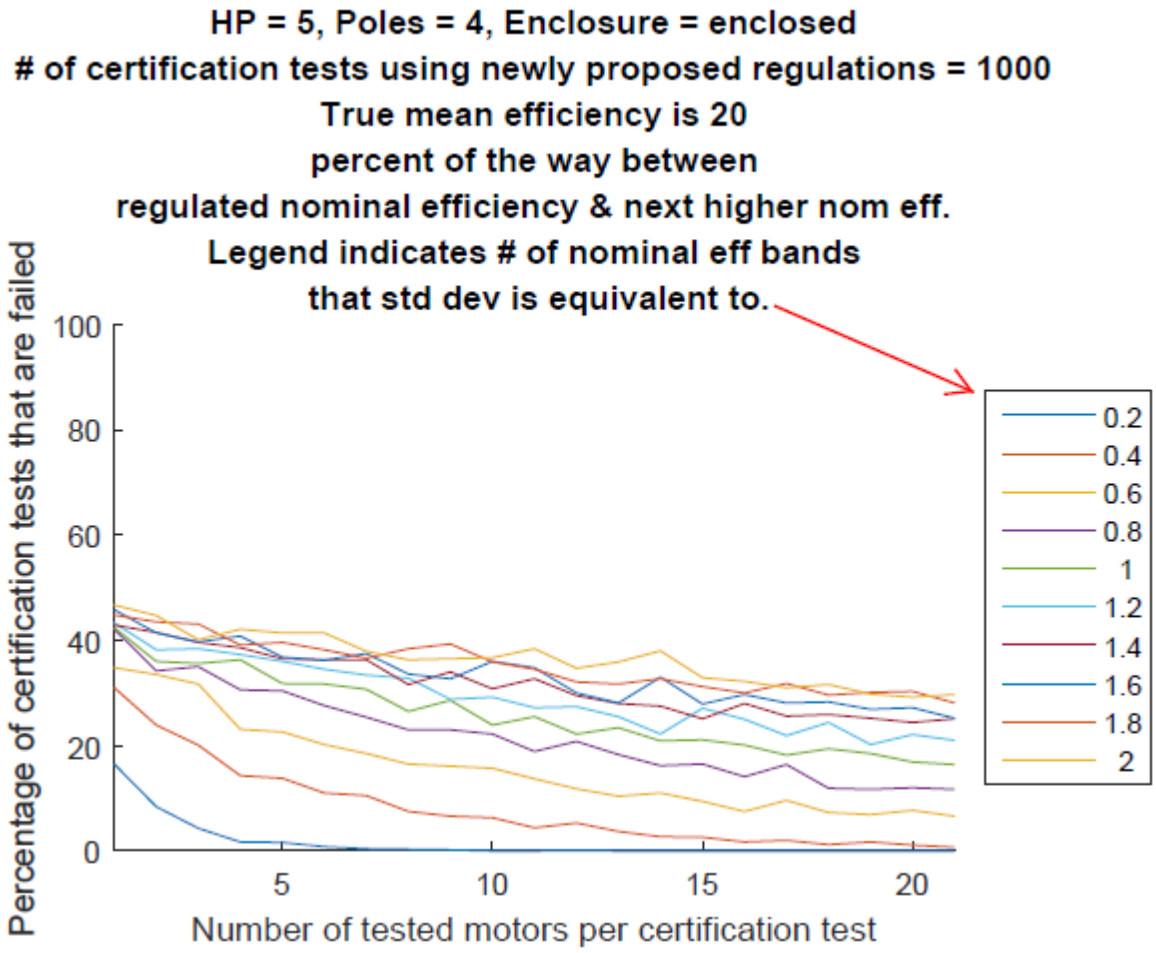
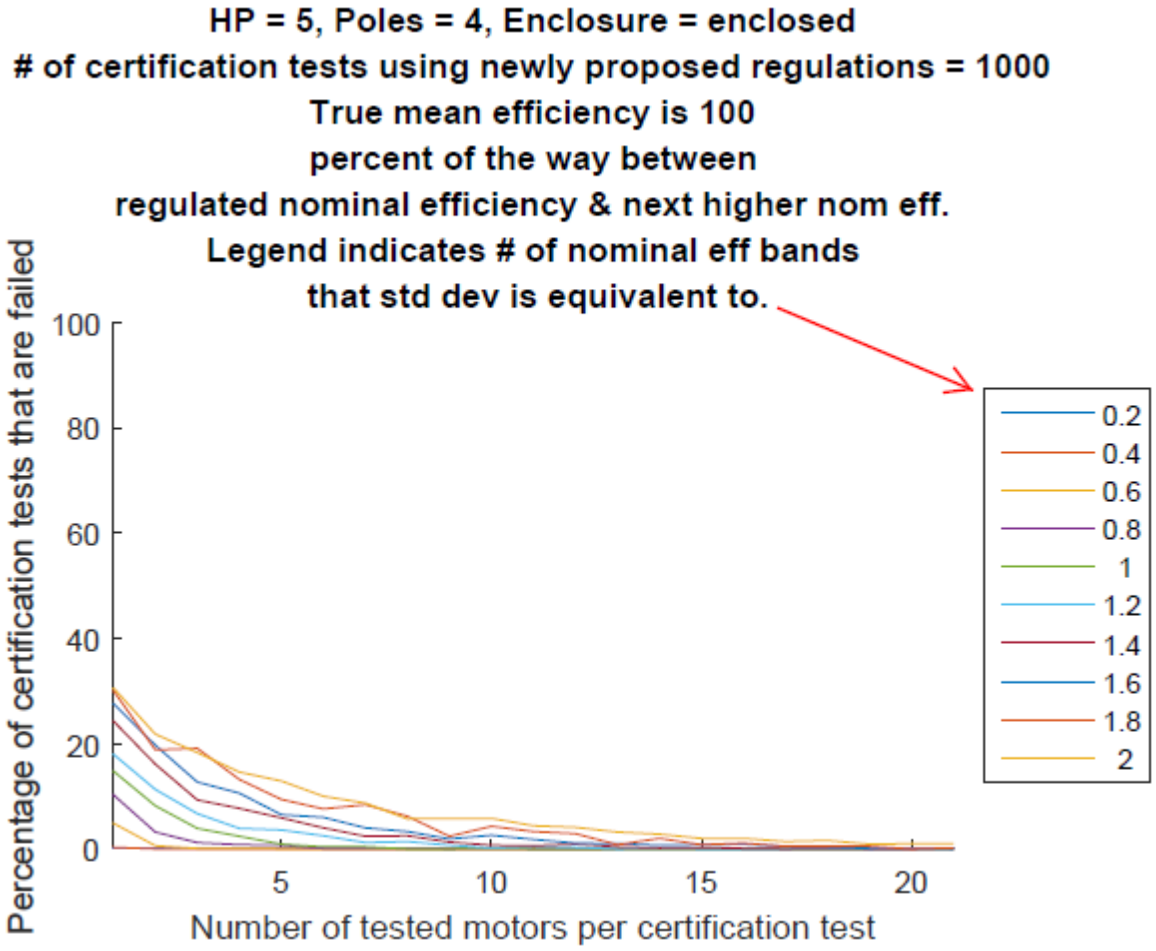


Figure 6 shows the simulation results using the newly proposed certification test criteria when the true mean efficiency for this same motor rating was exactly equal to 90.2%, a full band above the 89.5% value mandated by the energy conservation standards. It can be seen that, even for this case, for a sampling size of 5 units there is still a significant possibility of failing the newly proposed certification test when the standard deviation for efficiency falls within the quite realistic range of 1.4 to 2 nominal efficiency bands. If the sampling size is increased to approximately 10 units the probability of failure for this true mean efficiency becomes very low unless the standard deviation is approximately 1.8 nominal efficiency bands or higher but recall that such a value for standard deviation is quite possible and also keep in mind that a sampling of 10 units could potentially place a large burden on manufacturers for low volume ratings, particularly large ratings approaching 500 horsepower.

Figure 6: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency one full band above the 89.5% efficiency mandated by the energy conservation standards when the newly proposed certification test criteria were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:



Figures 7 and 8 show the simulation results using the certification test criteria presently in 10 CFR 431.17(b)(2) and 431.445(c)(3) when the true mean efficiency for this same motor rating was lower than the 89.5% efficiency mandated by the energy conservation standards by an amount equivalent to a 1% increase in losses and a 3% increase in losses respectively. It can be seen from both of these Figures that if a basic model has a true mean efficiency that is slightly lower than the efficiency mandated by the energy conservation standards then there is a significant probability of failing the certification test that is presently defined in 10 CFR 431.17(b)(2) and 431.445(c)(3).

Figure 7: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency equivalent to losses 1% higher than those for the 89.5% efficiency mandated by the energy conservation standards when the certification test criteria presently in 10 CFR 431-17(b)(2) and 431.445(c)(3) were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:

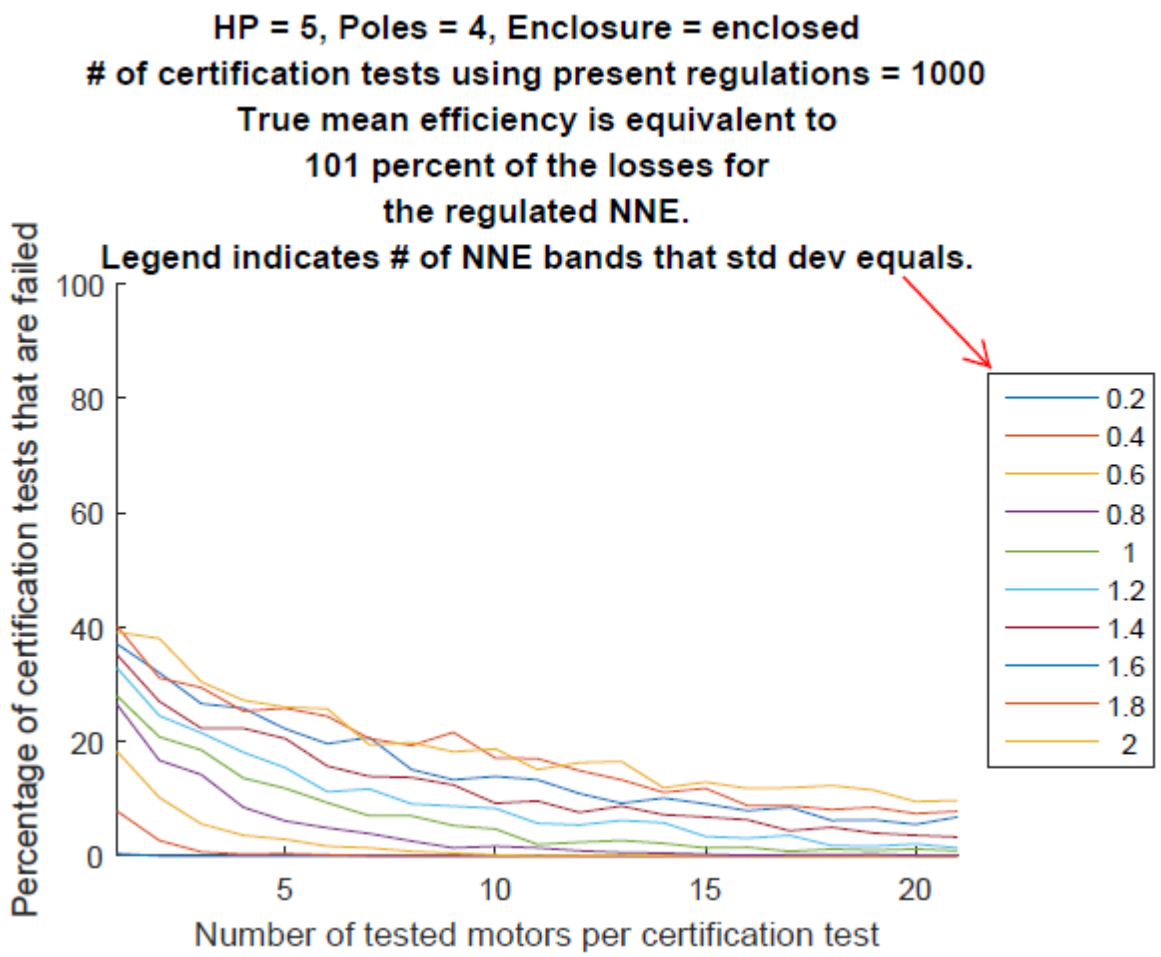
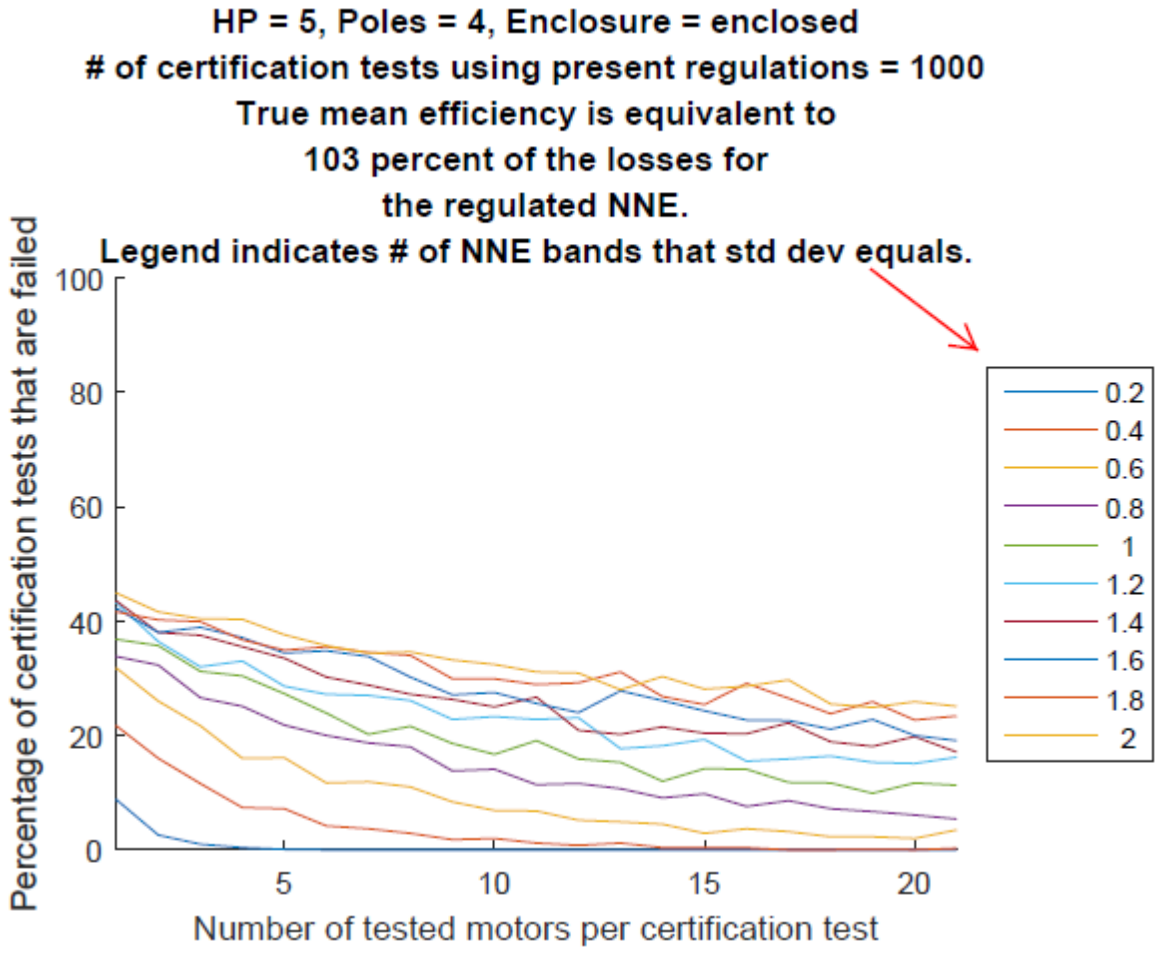


Figure 8: Percentage of 1000 simulated certification tests per sampling size and per value of standard deviation that were failed for a 5 HP, 4 pole, enclosed electric motor design with a true mean efficiency equivalent to losses 3% higher than those for the 89.5% efficiency mandated by the energy conservation standards when the certification test criteria presently

in 10 CFR 431-17(b)(2) and 431.445(c)(3) were used. Note that standard deviation has been converted from units of percent efficiency to units of nominal efficiency bands and one standard deviation has been defined to be the distance between the nominal efficiency mandated by the energy conservation standards for that particular rating and the next higher nominal efficiency:



Appendix B
Allowable Tolerances During AEDM Validation

NEMA would like to comment on DOE's proposal in the June 24, 2016 NOPR to change the allowable tolerance that is applied when substantiating (validating) an AEDM. The present allowable tolerance appears in 10 CFR 431.17(a)(3) and is plus or minus ten percent of the measured mean total power loss determined from the testing of the sampled units for each basic model that is used to substantiate the AEDM. The NOPR proposes to move the requirements for this allowable tolerance to 10 CFR 429.70(h)(2) and to change this allowable tolerance such that for each basic model used to validate the AEDM the average full-load efficiency predicted by the AEDM must not be more than five percent greater than the measured average full-load efficiency determined from the testing of the sampled units for that basic model.

The phrase "not be more than five percent greater than the measured average full-load efficiency" can be interpreted in either of the following two ways:

1. Not be more than the sum of 5% and the measured average full-load efficiency determined from the testing expressed as a percentage: in other words if the average full-load efficiency determined from the testing was 89.5% then the average full-load efficiency predicted by the AEDM must not be more than 5% + 89.5% = 94.5%.
2. Not be more than 1.05 multiplied by the measured average full-load efficiency determined from the testing expressed as a percentage: in other words if the average full-load efficiency determined from the testing was 89.5% then the average full-load efficiency predicted by the AEDM must not be more than 1.05 * 89.5% = 93.975%.

In all situations the first interpretation would allow for a higher allowable value for the average full-load efficiency predicted by the AEDM. NEMA would like clarification as to which of the two interpretations is the one intended by DOE. NEMA does not take issue with either of these interpretations although it is not clear to NEMA why DOE is proposing to move from the present tolerance of plus or minus ten percent of the measured mean total power loss to a tolerance of plus five percent of the measured average full-load efficiency. What NEMA would take issue with is if DOE actually intended a tolerance of five percent of the measured mean total power loss. NEMA believes that a tolerance of five percent of the measured mean total power loss determined from the testing of the sampled units for each basic model is too small. This belief stems from the following fact that NEMA points out in Appendix A: the measured mean total power loss of a sampled set of units from a normally distributed population has a significant probability of being more than 5% different than the true mean total power loss of the population. This can be seen from Figures 2 and 3 in that Appendix. For the computer simulations depicted in Figure 3, the approximate percentage rate of occurrence for the measured mean total power loss of the sampled units being more than 5% higher than the true mean total power loss of the population was as follows for these sets of conditions:

Number of Sampled units	Standard deviation for efficiency in units of bands of nominal efficiency	Approximate % rate of occurrence for the measured mean total power loss of the sampled units being more than 5% higher than the true mean total power loss of the population
5	2	24
10	2	16
20	2	5
5	1.4	15
10	1.4	7

20	1.4	1
5	1	5
10	1	2
20	1	0

Since NIST studies of multiple NVLAP accredited test laboratories, as well as NEMA Round Robin and IEC Round Robin testing, show that accuracy of inter-lab testing has a standard deviation from one to two nominal efficiency bands it is clear that when additional standard deviation due to manufacturing variations is accounted for as well, there is a significant probability of the measured mean total power loss of the sampled units being more than 5% higher than the true mean total power loss of the population. This means that even if an AEDM perfectly modelled the true mean total power loss of the population for a basic model there would be a significant probability that the measured mean total power loss of the sampled units for that basic model would be more than 5% greater than the AEDM predicted value. Of course, in general, the AEDM cannot perfectly model a basic model so this probability increases even further. In light of this, it is clear that an allowable tolerance on AEDM predictions of five percent of the measured mean total power loss is too small.

Conclusion: NEMA believes that the present tolerance of plus or minus ten percent of the measured mean total power loss that is specified in 10 CFR 431.17(a)(3) is appropriate.

Alternatively, NEMA also finds acceptable the tolerance of plus five percent of the measured average full-load efficiency that is proposed by the NOPR to be incorporated into 10 CFR 429.70(h)(2).