ENERGY STAR® for Electric Motors
Draft Specification 1.0
6 April 2001

Money Isn't All You're Saving

The following is the *first draft* specification for ENERGY STAR labeled integral horsepower electric motors. In accordance with the requirements of ENERGY STAR, a product must meet all of the identified criteria if it is to be qualified as ENERGY STAR by its manufacturer.

1) Definitions: Below is a brief description of terms used in the ENERGY STAR specification for integral horsepower electric motors.

   a) Electric Motor: A commercially available machine that converts energy from electricity into mechanical energy.
   b) EPAct: Energy Policy Act of 1992 that set minimum performance standards for certain types of electric motors.
   c) National Electrical Manufacturers Association (NEMA): Trade association that represents the majority of motor manufacturers.
   d) Horsepower (hp): A unit of power equal in the United States to 745.7 watts.

2) Qualifying Products: To qualify for the label, electric motors must meet all of the following:

   a) NEMA Design A and B
   b) Polyphase
   c) Single speed
   d) 1 hp to 500 hp (µ 1 hp & [500 hp)
   e) Low or medium voltage
   f) Squirrel cage induction motor
   g) Totally enclosed fan-cooled (TEFC)
   h) four pole (1,800 rpm synchronous speed)

EPA Comments: At this time, EPA intends to address only 1,800 RPM motors and is excluding all other motor speeds. If an agreement is reached on an initial motor label specification, EPA will work with stakeholders to discuss expanding the scope of coverage to include 1,200 and 3,600 TEFC motors.

It is EPA's policy to encourage a systems approach to maximize energy savings. Therefore, since original equipment manufacturers purchase the bulk of open drip proof (ODP) motors, EPA does not feel it is appropriate to label ODP motors at this time since they are sold as a component of larger systems. In addition, EPA feels that at this time it needs to learn more about special and definite purpose motors before it can include them in a specification.

3) Energy-Efficiency Specifications for Qualifying Products: For a motor to qualify for the ENERGY STAR label, it must first meet the corresponding minimum performance requirements of the Energy Policy Act of 1992 and NEMA specifications. In addition, the motor must meet or exceed the efficiency levels listed in table 1 at both 100 percent and 75 percent load.

EPA Comments: Manufacturers have the option of voluntarily working with EPA to develop 75 percent load efficiency values that they would be willing to certify as accurate within the same variations as the full load value. When completed, the motor would only need to attain the efficiency value at 75 percent load.

Table 1: Draft Criteria for ENERGY STAR qualified electric motors (Version 1.0)

Motor Size (hp)	ENERGY STAR Efficiency Level
1	85.5%
1.5	86.5%
2	86.5%
3	89.5%
5	90.2%
7.5	91.7%
10	91.7%
15	92.4%
20	93.0%
25	93.6%
30	93.6%
40	94.5%
50	94.5%
60	95.0%
75	95.4%
100	95.4%
125	95.4%
150	95.8%
200	96.2%
250	96.2%
300	96.2%
350	96.2%
400	96.2%
450	96.2%
500	96.2%

Note: At present, EPA is only considering the discrete size levels above. If at a later date a manufacturer develops a different size motor within the listed size range, EPA will discuss the potential for additional size categories at that time.

EPA Comment (qualifying motor example): Assume a manufacturer has four 10 hp motors that are potentially qualifying products. Table 2 lists the efficiencies for the four motors.

Table 2: Qualifying Motor Example Efficiency Levels

Motor Number	Full Load Efficiency	75% Load Efficiency	Qualify for ENERGY STAR Label?
Motor 1	92.4	91.9	Yes
Motor 2	91.7	92.1	Yes
Motor 3	91.7	90.3	No
Motor 4	90.2	91.9	Potentially

Both motors 1 and 2 qualify as ENERGY STAR since both the 100 percent and 75 percent efficiency values exceed the proposed label value of 91.7 (see table 1). Motor 3 does not qualify, even though the 100 percent efficiency value meets the required level, because the 75 percent load efficiency does not. As listed, motor 4 does not qualify for the ENERGY STAR label. The manufacturer has the option of voluntarily working with EPA to qualify the motor based on the 75 percent load efficiency value. If the manufacturer performs testing or develops a model that demonstrates that the 75 percent load efficiency meet or exceeds the 91.7 nominal efficiency, the motor could qualify on that basis regardless of the full-load nameplate efficiency.

4) Test Procedure: For the purposes of ENERGY STAR, the motor must meet the qualifying nameplate efficiency. Nameplate full-load efficiency values are to be determined using the IEEE standard 112, test method B, or alternate efficiency estimations allowable under EPAct and by NEMA.

It is not EPA's intention to require extensive additional motor testing to determine a motors part load specification. ENERGY STAR will use a self-certification process for manufacturers to determine and provide part load data. Manufacturers have two testing options to satisfy the part-load efficiency requirement.

Option 1) Manufacturers may use statistically valid test results that demonstrate 75 percent load efficiency values are equal to or greater than qualifying levels.

EPA Comment: An example of sufficient test data follows: 3 of 5 times during the IEEE standard 112, test method B procedure the 75 percent load efficiency is greater than or equal to the label specified efficiency value and the average of all 5 values is greater than the specified label efficiency value.

Option 2) Manufacturers may use a computer model to project the efficiency of 75 percent load for the specific motor in question. If the model used to accurately predict the 100 percent load efficiency also predicts a 75 percent load efficiency that is greater than or equal to the specified label efficiency, the motor will qualify for the ENERGY STAR label.

EPA Comment: EPA will work with manufacturers to develop a consistent manner to develop reasonable estimations of part-load efficiency values.

EPA Comments: ENERGY STAR identifies top energy performers. As such, not all manufacturers products will meet the ENERGY STAR specification and qualify to carry the ENERGY STAR label. As this is still a draft specification, EPA encourages manufacturers to submit data for inclusion in this analysis. Based upon any additional data, the efficiency numbers could be adjusted upward or downward to accommodate a determined percentage of products that are deemed "most efficient."

The efficiency levels are consistent with proposed Consortium for Energy Efficiency (CEE) full load levels except at the 5 and 40 hp levels. From the data EPA has reviewed, both of these are proposed one NEMA band higher to capture an appropriate segment of the market.

It is EPA's belief that it is a common industry practice to oversize motors and that part-load efficiency best represents operational efficiency. However, EPA intends to use the full load efficiency value for the time being so as to not place costly additional requirements on manufacturers. This draft specification includes both the accepted 100 percent load and manufacturers estimated 75 percent load values so as to incorporate the importance of part-load operation. EPA believes full-load efficiency is often a good indication of part-load performance, but believes it is important for consumers to have some assurance of part-load performance. This rationale is why EPA provides the option to manufacturers to voluntarily work with EPA to develop 75 percent load efficiency estimations that are as accurate as full-load values. If this occurs, EPA may only require 75 percent load efficiency data to determine qualifying products.

3) Other Information: The *final* version of the ENERGY STAR electric motor specification will be provided in the standard ENERGY STAR Partnership Agreement format. The full Partnership Agreement will include product specifications and other pertinent information including the following.

- Buyer Information: In keeping with the spirit of ENERGY STAR, the Partner will be expected to ensure that consumers have a quick and easy method of determining which of its products are ENERGY STAR qualified. To achieve this goal, EPA recommends that the Partner place the ENERGY STAR logo on all qualified product models. Partners will be required to place the ENERGY STAR logo on product packaging, and product-related materials such as brochures, manuals, advertisements, and Web sites. Further, to educate consumers about energy efficiency and its benefits, the Partner will be asked to provide customers one or more of the following: a description of ENERGY STAR, a discussion of the energy-saving characteristics of the product, a description of the environmental benefits that result from the energy saved by the product, and/or a description of the potential energy-bill savings of the product. The Partner may determine the best manner to disseminate this information.

- Additional Efficiency Information: Since the largest source of energy savings are in systems improvements, EPA feels it is important for manufacturers to discuss system approaches to energy savings in literature relating to ENERGY STAR labeled motors. This will include, but is not limited to DOE's Motors Best Practices. In addition, manufacturers will be asked to list nominal test efficiencies at 100 percent and 75 percent load as well as full-load speed in motor catalogs.

- Effective Date: The date that manufacturers may begin to qualify products as ENERGY STAR will be defined as the *effective date* of the Partnership Agreement. EPA currently suggests an effective date of June 1, 2001; however, this date is still subject to discussion with industry. Manufacturers that sign a Partnership Agreement with EPA will have one year from the date of

signing to qualify at least one product that meets the final ENERGY STAR specification for electric motors.

- Future Specification Revisions: EPA reserves the right to change the Partnership Agreement requirements should technological and/or market changes affect its usefulness to consumers, industry, or the environment. Revisions to the performance specifications will be determined through industry discussions.

- Use of the ENERGY STAR Logo: The ENERGY STAR logo may only be used on products that meet the final specification. Manufacturers who become partners in the program, by signing a Partnership Agreement, must first determine that their products qualify under the final specification before using the logo on their products.

- Other Information Requirements: Manufacturers who become partners are asked to provide EPA with information about their ENERGY STAR qualifying products including model names and numbers. This information will be posted on the ENERGY STAR Web site and provided to those who request qualifying product information for motors. In addition, manufacturers are asked to supply basic shipment data in the form of total units shipped and percentage of that total which is ENERGY STAR qualifying. This data will be closely held and will be released only in aggregate form to help evaluate the success of ENERGY STAR. Any information submitted will be masked to protect the confidentiality of the partner. EPA will also require that partners provide information to the Motor Master database and include 100 percent, 75 percent, and 50 percent load efficiency values and full load motor speed.

EPA Comments: In order to focus EPA/industry discussions on the most crucial elements of the program (i.e., the definitions and specifications), EPA has provided this brief draft specification as opposed to a complete Partnership Agreement. As noted above, the product specification, effective date, and the duration of the Partnership Agreement will be discussed with industry. As always, EPA welcomes comments or alternative proposals from industry. EPA deems industry feedback crucial to the successful development of ENERGY STAR.