

Appliance Standards Awareness Project  
American Council for an Energy-Efficient Economy  
Natural Resources Defense Council  
New York State Energy Research and Development Authority

June 20, 2022

Mr. Jeremy Dommu  
U.S. Department of Energy  
Office of Energy Efficiency and Renewable Energy  
Building Technologies Office, EE-5B  
1000 Independence Avenue SW  
Washington, DC 20585

**RE: Docket Number EERE-2022-BT-TP-0019: Test Procedures for Compressors**

Dear Mr. Dommu:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), Natural Resources Defense Council (NRDC), and the New York State Energy Research and Development Authority (NYSERDA) on the request for information (RFI) for test procedures for compressors. 87 Fed. Reg. 27025 (May 6, 2022). We appreciate the opportunity to provide input to the Department.

In the RFI, DOE seeks comment on the scope of the air compressors test procedure as well as whether existing testing requirements accurately measure energy usage. We encourage DOE to consider expanding the test procedure scope to include reciprocating compressors, centrifugal compressors, compressors greater than 200 hp, lubricant-free compressors, and compressors with brushed motors. We also encourage DOE to consider two changes to fixed speed compressor test load points that may improve representativeness. Potential opportunities for scope expansion and modification of compressor testing load points are discussed in more detail below.

**We encourage DOE to consider expanding the scope of the test procedure to include additional air compressor types.** The current air compressors test procedure applies to lubricated rotary air compressors that are driven by three-phase brushless electric motors, have a full-load operating pressure of 75-200 psig and full-load volume flow rates between 35 and 1250 CFM, are between 10 and 200 hp, and are not designed and tested to American Petroleum Institute Standard 619 requirements.<sup>1</sup> However, there are additional categories of air compressors excluded from the current DOE test procedure that represent a significant portion of the market. In some cases, these currently uncovered air compressors may serve as unregulated substitutes for currently covered rotary compressors. Expanding the scope of the test procedure to additional air compressor types will ensure that purchasers have access to consistent information about compressor efficiency.

In evaluating potential additional categories of air compressors, we encourage DOE to consider the following air compressor types:

---

<sup>1</sup>87 Fed. Reg. 27027.

Reciprocating compressors: While DOE ultimately did not adopt standards for reciprocating air compressors as part of the previous standards rulemaking, the Department estimated potential energy savings of 2.2 quads.<sup>2</sup> In the previous final rule, DOE concluded that establishing a test procedure for reciprocating compressors was not warranted in the absence of existing or proposed energy conservation standards.<sup>3</sup> Given the significant potential energy savings, we strongly encourage DOE to include reciprocating compressors within the scope of the test procedure. Including them within the test procedure scope would give DOE the option to pursue future energy conservation standards and could provide valuable information to drive efficiency programs.

Centrifugal compressors: Centrifugal compressors are dynamic compressors that compress air by transferring kinetic energy to the air rather than by reducing its volume via mechanical displacement. In the previous test procedure NOPR, DOE stated that dynamic compressors accounted for less than 1% of the compressor market.<sup>4</sup> However, the recent AMO motors report showed that the energy usage of all industrial compressors was nearly 64 TWh, and centrifugal compressor energy usage represented about one-sixth of this total.<sup>5</sup> This suggests energy usage from centrifugal compressors is significant. The ISO test procedure for dynamic compressors, ISO 5389, could serve as the basis for a DOE test procedure for centrifugal compressors.

Compressors greater than 200 hp: In the previous test procedure NOPR, DOE proposed to include compressors up to 500 hp within the test procedure scope. However, in the final rule DOE limited the scope to 200 hp. In prior comments, the California Investor-Owned Utilities (CA IOUs),<sup>6</sup> Atlas Copco,<sup>7</sup> and the Edison Electric Institute<sup>8</sup> expressed support for coverage of compressors greater than 500 hp. DOE's rationale for limiting the scope to 200 hp was that test burden for large (e.g., 200+ hp) rotary compressor manufacturers would create an unfair advantage for non-regulated competing equipment such as centrifugal compressors.<sup>9</sup> However, we believe inclusion of centrifugal compressors in scope, as described above, would mitigate this concern.

Lubricant-free compressors: As part of the prior test procedure NOPR, DOE did not propose to limit scope based on lubrication. However, stakeholders expressed concern that other compressor types outside the proposed scope such as dynamic compressors or scroll compressors would be viable substitutes for lubricant-free rotary compressors. In the final rule, DOE agreed that inclusion of lubricant-free rotary compressors could create a risk for unregulated product substitutions and excluded them from the scope of the test procedure. However, we encourage DOE to address the risk of unregulated product substitutions by expanding scope to include these other compressor types, rather than by explicitly excluding lubricant-free compressors.

Compressors with brushed motors: The scope of the DOE test procedure includes only compressors utilizing brushless motors. While DOE previously suggested that brushed motors in air compressors represent a small portion of the market, the Department noted in the previous NOPR that

---

<sup>2</sup>EERE-2013-BT-STD-0040-0037, pp. 8-28,29; 10-15. [www.regulations.gov/document/EERE-2013-BT-STD-0040-0037](http://www.regulations.gov/document/EERE-2013-BT-STD-0040-0037)

<sup>3</sup>82 Fed. Reg. 1059 (January 4, 2017).

<sup>4</sup>81 Fed. Reg. 27228 (May 5, 2016).

<sup>5</sup>P. Rao et al. U.S. Industrial and Commercial Motor System Market Assessment Report, 2021, pp. 38-39. [escholarship.org/uc/item/42f631k3](http://escholarship.org/uc/item/42f631k3)

<sup>6</sup>EERE-2014-BT-TP-0054-0012, p. 4. [www.regulations.gov/comment/EERE-2014-BT-TP-0054-0012](http://www.regulations.gov/comment/EERE-2014-BT-TP-0054-0012)

<sup>7</sup>EERE-2014-BT-TP-0054-0009, p. 11. [www.regulations.gov/comment/EERE-2014-BT-TP-0054-0009](http://www.regulations.gov/comment/EERE-2014-BT-TP-0054-0009)

<sup>8</sup>EERE-2013-BT-STD-0040-0012, p. 3. [www.regulations.gov/comment/EERE-2013-BT-STD-0040-0012](http://www.regulations.gov/comment/EERE-2013-BT-STD-0040-0012)

<sup>9</sup>82 Fed. Reg. 1061,1062 (January 4, 2017).

compressors with brushed motors could be considered as part of a future rulemaking.<sup>10</sup> We are concerned that manufacturers could consider substituting brushless motors with less efficient brushed motors to avoid compressor regulations.

**We encourage DOE to consider requiring fixed speed compressors with variable air flow controls to be tested at part-load.** Fixed speed compressors sold with variable air flow controls, such as “variable displacement” or “inlet modulation,” can provide the utility of variable-speed compressors. Thus, we believe that these compressors with variable air flow controls should be tested in a comparable fashion to variable-speed compressors (i.e., at 40%, 70% and 100% of full load). Part-load testing of fixed-speed compressors with air flow controls would facilitate comparison of part-load efficiency between fixed-speed and variable-speed compressors and allow purchasers to select the most efficient compressor for a given application.

**We encourage DOE to explore how no load power measurements could be incorporated into the test procedure.** For example, fixed speed air compressors are tested and evaluated only at full load. However, fixed speed compressors often include controls such as “start/stop” or “load/unload.” Testing and evaluating fixed speed compressors at both fully loaded and fully unloaded (i.e., zero flow) conditions would be more representative of typical usage. We understand that the CAGI Performance Verification Program already specifies testing at a fully unloaded test point. In the 2017 test procedure final rule, DOE mentioned that the Department may explore no load power measurement in a future rulemaking.<sup>11</sup>

Thank you for considering these comments.

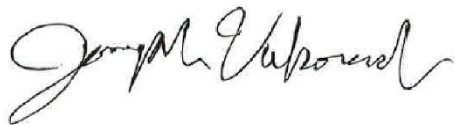
Sincerely,



Jeremy Dunklin, PhD  
Technical Advocacy Associate  
Appliance Standards Awareness Project



Michael Waite, Ph.D., P.E.  
Senior Manager, Buildings Program  
American Council for an Energy-Efficient Economy



Joe Vukovich  
Energy Efficiency Advocate  
Natural Resources Defense Council



Chris Corcoran  
Team Lead – Codes, Products, & Standards  
New York State Energy Research and Development  
Authority (NYSERDA)

---

<sup>10</sup>81 Fed. Reg. 27229 (May 5, 2016).

<sup>11</sup>82 Fed. Reg. 1070 (January 4, 2017).