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

June 10, 2022

Mr. Jeremy Dommu
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-2J
1000 Independence Avenue SW
Washington, DC 20585

RE: Docket Number EERE-2020-BT-TP-0032: Test Procedures for Commercial and Industrial Pumps

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 notice of proposed rulemaking (NOPR) for test procedures for commercial and industrial pumps. 87 Fed. Reg. 21268 (April 11, 2022). We appreciate the opportunity to provide input to the Department.

We support DOE's proposal to include additional pump types described below within the scope of the pumps test procedure. Expanding the test procedure scope to these additional pump types, which are often interchangeable with currently covered pumps, will ensure that purchasers have access to consistent information regarding pump efficiency. We also support DOE's proposal to permit use of a calculation-based method for pumps sold with efficient inverter-only (e.g., synchronous) motors, which could potentially encourage greater market adoption of these efficient motors in pump applications. However, we encourage DOE to expand the test procedure scope to include pumps greater than 200 hp. We also encourage DOE to further consider coverage for both cantilever and line shaft pumps. Finally, we encourage DOE to investigate ways to accelerate adoption of variable speed drives (VSDs) in non-clean water applications.

We support DOE's proposal to expand coverage to additional clean water pump types. Currently, the pumps test procedure covers five categories of clean water pumps: end-suction close-coupled (ESCC), end-suction frame mounted (ESFM), in-line (IL), radially-split vertical (RSV), and submersible turbine (ST) pumps. We support DOE's proposal to add the following pump categories to the test procedure scope:

> Small vertical inline (SVIL) pumps: SVILs are identical to currently covered IL pumps except they are defined as having a shaft input power less than 1 hp. Inclusion of SVILs within the commercial and industrial pumps test procedure scope is consistent with the Circulator Pump Working Group recommendations.[1] SVILs are generally more similar to covered commercial and industrial pumps than circulator pumps. We understand that the market share of SVILs in HVAC applications is

[1]EERE-2016-BT-STD-0004-0058, pp. 1-2. www.regulations.gov/document/EERE-2016-BT-STD-0004-0058

increasing, and that lack of coverage may cause market confusion as some SVIL pumps may be in the same pump family as currently covered IL pumps.[2] DOE is proposing to include SVILs within scope, including those less than 0.25 hp and with twin-head configurations.

Between-bearing (BB) pumps: BB pumps, such as one-/two-stage axially-split double suction (BB1) pumps, are available below 200 hp and in some cases are marketed for clean water applications such as chilled water systems.[3] DOE states in the NOPR that certain clean water BB pumps could be interchangeable with currently covered pumps.[4]

Vertical turbine (VT) pumps: The current DOE test procedure covers ST pumps, also referred to as VS0 pumps, but excludes similar VT pump types such as VS1 and VS2 pumps. VT pumps may be utilized in similar applications to currently covered ST pumps such as irrigation or in cooling towers. Furthermore, DOE discusses in the NOPR that VT pumps and ST pumps from the same manufacturer may even share identical assemblies.[5]

Radially-split, multi-stage horizontal (RSH) pumps: The current DOE test procedure includes radially-split, multi-stage, vertical, in-line casing diffuser (RSV) pumps, but excludes RSH pumps. DOE discusses in the NOPR that both RSH and RSV pumps are multistage pumps used primarily in heating, cooling, and pressure boosting applications, and lack of coverage for RSH pumps could represent a loophole.[6] DOE is proposing to include both in-line and end-suction (e.g., OH1J, OH7J, OH13J) configurations.

End-suction pumps similar to ESFM and ESCC pumps: The current DOE test procedure covers both close-coupled and mechanically-coupled end-suction pumps. Generally, a close-coupled pump (i.e., ESCC) is distinguishable in that the pump impeller and motor share the same shaft. In contrast, mechanically-coupled pumps (i.e., ESFMs) have separate, mechanically attached shafts. However, there are some end-suction pumps on the market that do not clearly fall into either of these categories. Thus, DOE is proposing to modify the definitions of ESFM and ESCC pumps to ensure they are inclusive of all end-suction pumps.

ST pumps with bowl diameters greater than 6 Inches: The current DOE test procedure covers ST pumps with a bowl diameter of 6 inches or less. However, this may create confusion wherein some models within a pump family are regulated while others are not.[7] We understand ST pumps with larger bowl diameters are often used in municipal water and agricultural irrigation applications. Furthermore, the proposed scope expansion to VT pumps does not include a bowl diameter limitation, and DOE notes in the NOPR that ST and VT pumps can be used in overlapping applications. Thus, DOE is proposing to remove the bowl diameter limitation for ST pumps.

1,200 rpm pumps: The current DOE test procedure applies only to pumps with motors designed to operate at 2,880-4,320 rpm (e.g., a 2-pole induction motor) or 1,440-2,160 rpm (e.g., a 4-pole induction motor). In the NOPR, DOE discusses that pumps operating at 960-1440 rpm (e.g., a 6-pole

[2]EERE-2020-BT-TP-0032-0021, pp. 6-7. www.regulations.gov/comment/EERE-2020-BT-TP-0032-0021
[3]www.xylem.com/siteassets/brand/bell-amp-gossett/resources/brochure/b-320a-series-e-hsc-brochure.pdf
[4]87 Fed. Reg. 21276, 21277.
[5]87 Fed. Reg. 21277.
[6]87 Fed. Reg. 21278.
[7]franklinengineered.com/products/submersible-motors-turbines/submersible-turbines/5-9-sts-series-submersible-turbine-pumps/9-sts-series-submersible-turbine-pumps/

induction motor) are often part of the same families of currently covered pumps.[8] We understand 6-pole pumps can compete in similar applications as 4-pole pumps.

Overall, we support DOE's scope expansion to cover SVIL pumps, BB pumps, VT pumps, RSH pumps in both in-line and end-suction configurations, additional end-suction pumps, ST pumps with larger bowl diameters, and 1,200 rpm pumps. Each of these additional pump types can be tested using the existing test procedure. Coverage of these additional pump categories will provide purchasers with consistent information regarding pump efficiency and help mitigate inefficient pump substitutions that may undermine energy savings.

We support DOE's proposal to permit use of a calculation-based method for pumps sold with inverter-only motors. While the current pump test procedure contains a calculation method for determining pump input power, this option is available only for pumps with motors covered within DOE's electric motors regulations or with submersible motors (via an exception). The calculation-based method reduces test burden by allowing manufacturers to test a sample of bare pumps and use that data along with motor nameplate efficiency values to rate multiple pump configurations. Inverter-only (e.g., synchronous) motors are highly efficient, particularly in variable-load applications; however, per the current DOE test procedure, pumps sold with these efficient but currently unregulated motors must be physically tested via a wire-to-water test.[9] Thus, we support DOE's proposal to include a calculation-based method for rating pumps with inverter-only motors, which may reduce testing burden and help facilitate adoption of pumps utilizing these highly efficient motors.

We encourage DOE to expand the test procedure scope to include pumps greater than 200 hp. The current DOE test procedure excludes pumps greater than 200 hp. The 2021 AMO motors report showed that pumps, inclusive of all pump sizes, represent the second-highest share (21%) of total industrial motor electricity consumption at over 115 TWh/yr.[10] Further, 201-500 hp motors, inclusive of pump-driven applications, was the single highest motor size group in industrial electricity consumption at nearly 95 TWh/yr.[11] While the fraction of pump energy usage in the 201-500 hp motor range was not reported, we understand that pumps larger than 200 hp are used in clean water applications. Thus, energy usage from large currently unregulated pumps could be significant. We note that the current calculation methods[12] as well as DOE's proposal to allow alternative efficiency determination methods (AEDMs) in lieu of physical testing would help mitigate any potential concerns regarding test burden. Therefore, we encourage DOE to include pumps greater than 200 hp within the scope of the pumps test procedure.

We encourage DOE to further consider coverage for cantilever and line shaft pumps. Both line shaft (VS4) pumps and cantilever (VS5) pumps are types of vertical discharge sump pumps wherein the discharge column is separate from the shaft column. In comments on the test procedure request for information (RFI), Grundfos stated that cantilever and line-shaft pumps have designs that are similar to

[8] 87 Fed. Reg. 21279.
[9] The recent motor test procedure NOPR proposes an expanded scope to include synchronous and inverter-only motors. 86 Fed. Reg. 71710.
[10] P. Rao et al. U.S. Industrial and Commercial Motor System Market Assessment Report, 2021, pp. 38-39. escholarship.org/uc/item/42f631k3
[11] *Ibid*, pp. 56-58.
[12] DOE's current motor regulations specify a 500 hp upper limit. Thus, the calculation method could be used for covered motors up to 500 hp. The recent motors test procedure NOPR proposed expanding scope to 750 hp.

ESFM and ESCC pumps and that some are marketed for clean water pumping.[13] For example, some line shaft pumps are marketed for use in cooling towers.[14] Thus, we encourage DOE to further consider including these additional pump types in the test procedure scope.

We continue to encourage the Department to investigate how the test procedure could accelerate the adoption of VSDs in non-clean water applications. Non-clean water pumps, such as wastewater or chemical process pumps, are not currently covered by the DOE test procedure. Pumps in the chemical and wastewater sectors are estimated to use more than 27 and 17 TWh/yr of electricity, respectively.[15] While the NOPR states that DOE considered expanding the scope to cover these non-clean water pumps,[16] the Department did not ultimately propose to do so. The current DOE test procedure captures the energy-savings benefits of VSDs, and the PEI metric can serve as a tool for utility programs to incentivize currently covered clean water pumps sold with variable-speed drives.

A 2020 Northwest Energy Efficiency Alliance (NEEA) pump study showed that VSDs provided average energy savings of 23% and 43% for constant- and variable-load pumping applications, respectively.[17] While this study focused on clean water pumps, the large, demonstrated energy savings across both constant- and variable-load applications suggest VSDs would provide significant savings in non-clean water applications. For example, we understand that wastewater flows vary significantly over time and that typical wastewater pumps often operate with cyclic on-off cycles.[18] Due to the cubic relationship between pump speed and power, a variable-speed pump operating for a longer period at lower speeds can provide significant energy savings relative to a single-speed pump that cycles on and off. Thus, we encourage DOE to consider how the test procedure could help facilitate greater market adoption of wastewater and chemical process pumps sold with variable-speed drives.

Thank you for considering these comments.

Sincerely,

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[13] EERE-2020-BT-TP-0032-0017, p. 3. www.regulations.gov/document/EERE-2020-BT-TP-0032-0017

[14] www.xylem.com/siteassets/brand/bell-amp-gossett/resources/brochure/b-710a-lineshaft-and-submersible-turbine-pumps.pdf

[15] P. Rao et al. U.S. Industrial and Commercial Motor System Market Assessment Report, 2021, pp. 38-39. escholarship.org/uc/item/42f631k3

[16] 87 Fed. Reg. 21274.

[17] E20-313, Power Drive Systems: Energy Savings and Non-Energy Benefits in Constant & Variable Load Applications. neea.org/resources/power-drive-systems-energy-savings-and-non-energy-benefits-in-constant-variable-load-applications

[18] www.xylem.com/siteassets/brand/flygt/flygt-resources/flygt-resources/variable-speed-wastewater-pumping-1894.pdf

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