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[6450-01-P]

**DEPARTMENT OF ENERGY**

**Office of Energy Efficiency and Renewable Energy**

[Case No. CAC-051]

**Notice of Petition for Waiver of Johnson Controls, Inc. (JCI) from the Department of Energy  
Central Air Conditioners and Heat Pumps Test Procedure, and Granting of Interim Waiver**

**AGENCY:** Office of Energy Efficiency and Renewable Energy, Department of Energy.

**ACTION:** Notice of petition for waiver, notice of grant an interim waiver, and request for comment.

**SUMMARY:** This notice announces receipt of and publishes a petition for waiver from JCI seeking an exemption from specified portions of the U.S. Department of Energy (DOE) test procedure for determining the efficiency of central air conditioners (CAC) and heat pumps (HP) under Title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix M and 10 CFR Part 429.16. According to JCI, testing its CAC and HP basic models that use variable-speed, oil-injected scroll compressors (VSS systems) with only a 20-hour break-in period produces results unrepresentative of their true energy consumption characteristics, and would provide materially inaccurate comparative data. JCI requests that in lieu of the 20-hour break-in limit, it be permitted to test its VSS systems with a 72-hour break-in period. This notice also grants JCI an interim waiver from the DOE CAC and HP test procedure for its specified basic models, subject to use of the alternative test procedure as set forth in this notice. DOE solicits comments, data, and information concerning JCI's petition and its suggested alternate test procedure.

**DATES:** DOE will accept comments, data, and information with respect to the JCI Petition until [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** You may submit comments, identified by case number “CAC-051” and Docket number “EERE-2017-BT-WAV-0037,” by any of the following methods:

- Federal eRulemaking Portal: <http://www.regulations.gov>. Follow the instructions for submitting comments.
- E-mail: JohnsonControlsCAC051waiver@ee.doe.gov Include the case number [Case No. CAC-051] in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.
- Postal Mail: Ms. Lucy Debutts, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, Petition for Waiver Case No. CAC-051, 1000 Independence Avenue, SW., Washington, DC 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
- Hand Delivery/Courier: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L’Enfant Plaza, SW., 6<sup>th</sup> Floor, Washington, DC, 20024. Telephone: (202)-287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

The docket Web page can be found at <http://www.regulations.gov/docket?D=EERE-2017-BT-WAV-0037>. The docket Web page will contain simple instruction on how to access all documents, including public comments, in the docket.

Docket: The docket, which includes Federal Register notices, comments, and other supporting documents/materials, is available for review at [www.regulations.gov](http://www.regulations.gov). All documents in the docket are listed in the [www.regulations.gov](http://www.regulations.gov) index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

**FOR FURTHER INFORMATION CONTACT:** Ms. Lucy Debutts, U.S. Department of Energy, Building Technologies Program, Mail Stop EE-2J, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 287-1604. E-mail: [AS\\_Waiver\\_Requests@ee.doe.gov](mailto:AS_Waiver_Requests@ee.doe.gov).

Mr. Pete Cochran, U.S. Department of Energy, Office of the General Counsel, Mail Stop GC-33, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585-0103. Telephone: (202) 586-9496. E-mail: [peter.cochran@hq.doe.gov](mailto:peter.cochran@hq.doe.gov).

## **SUPPLEMENTARY INFORMATION:**

### **I. Background and Authority**

Title III, Part B<sup>1</sup> of the Energy Policy and Conservation Act of 1975 (EPCA), Public Law 94-163 (42 U.S.C. 6291-6309, as codified) established the Energy Conservation Program for Consumer Products Other Than Automobiles, which includes central air conditioners and heat pumps.<sup>2</sup> Part B includes definitions, test procedures, labeling provisions, energy conservation standards, and the authority to require information and reports from manufacturers. Further, Part B requires the Secretary of Energy to prescribe test procedures that are reasonably designed to produce results that measure energy efficiency, energy use, or estimated operating costs during a

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<sup>1</sup> For editorial reasons, upon codification in the U.S. Code, Part B was redesignated as Part A.

<sup>2</sup> All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015 (EEIA), Public Law 114-11 (April 30, 2015).

representative average-use cycle, and that are not unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) The test procedure for central air conditioners and heat pumps is contained in 10 CFR part 430, subpart B, appendix M (referred to in this notice as “appendix M”) and 10 CFR Part 429.16.

DOE’s regulations set forth at 10 CFR 430.27 contain provisions that allow a person to seek a waiver from the test procedure requirements for a particular basic model of a covered product when the petitioner’s basic model for which the petition for waiver was submitted contains one or more design characteristics that either (1) prevent testing according to the prescribed test procedure, or (2) cause the prescribed test procedures to evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. 10 CFR 430.27(a)(1). A petitioner must include in its petition any alternate test procedures known to the petitioner to evaluate the basic model in a manner representative of its energy consumption. 10 CFR 430.27(b)(1)(iii).

DOE may grant a waiver subject to conditions, including adherence to alternate test procedures. 10 CFR 430.27(f)(2). As soon as practicable after the granting of any waiver, DOE will publish in the Federal Register a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. As soon thereafter as practicable, DOE will publish in the Federal Register a final rule. 10 CFR 430.27(l).

The waiver process also allows DOE to grant an interim waiver if it appears likely that the petition for waiver will be granted and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the petition for waiver. 10 CFR 430.27(e)(2). Within one year of issuance of an interim waiver, DOE will either: (i) publish in the Federal Register a determination on the petition for waiver; or (ii) publish in the

Federal Register a new or amended test procedure that addresses the issues presented in the waiver. 10 CFR 430.27(h)(1). When DOE amends the test procedure to address the issues presented in a waiver, the waiver will automatically terminate on the date on which use of that test procedure is required to demonstrate compliance. 10 CFR 430.27(h)(2).

## **II. JCI's Petition for Waiver of Test Procedure and Application for Interim Waiver**

On May 17, 2017, JCI filed a petition for waiver and an application for interim waiver from the applicable CAC and HP test procedure set forth in 10 CFR part 430, subpart B, appendix M and 10 CFR part 429.16. On June 2, 2017, JCI supplemented its petition with additional information. According to JCI, testing its CAC and HP basic models that use variable-speed, oil-injected scroll compressors (VSS systems) with only a 20-hour break-in period produces results unrepresentative of their true energy consumption characteristics, and would provide materially inaccurate comparative data. JCI requests that in lieu of the 20-hour break-in limit, it be permitted to test its VSS systems with a 72-hour break-in period. Consequently, JCI seeks to use an alternate test procedure to test and rate specific CAC and HP basic models, which increases the break-in time limit stipulated in section 3.1.7 of Appendix M to 10 CFR Part 430, Subpart B.

JCI also requests an interim waiver from the existing DOE test procedure. An interim waiver may be granted if it appears likely that the petition for waiver will be granted, and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination of the petition for waiver. See 10 CFR 430.27(e)(2).

DOE has reviewed the test data provided by JCI and agrees that it demonstrates that the specified VSS system models that are the subject of the waiver have compressors that may require more than the 20 hours of break-in time allowed by the DOE test procedure. The oil injected into the oil-injected scroll compressors increases the coverage of the viscous oil layer between mating

surfaces of the scroll. This is presumably its purpose, i.e., to provide additional sealing in the gaps of the mating surfaces to improve compressor volumetric efficiency (relationship between displacement rate and volume flow rate of refrigerant drawn into the compressor). By enhancing this oil layer, the direct contact between irregularities in the surfaces may also be reduced, which would slow the wearing process that smooths out these irregularities, which is the break-in process. For this reason, oil injected compressors are expected to require additional break-in time.

DOE understands that absent an interim waiver, JCI's products cannot be tested and rated for energy consumption on a basis representative of their true energy consumption characteristics. DOE has reviewed the alternate procedure suggested by JCI and concludes that it will allow for the accurate measurement of the energy use of these CAC and HP basic models based on the information and data supplied by JCI.

Consequently, DOE has determined that JCI's petition for waiver will likely be granted. Furthermore, DOE has determined that it is desirable for public policy reasons to grant JCI immediate relief pending a determination of the petition for waiver.

### **III. Summary of Grant of an Interim Waiver**

For the reasons stated above, DOE has granted JCI's application for interim waiver from testing for its specified CAC and HP basic models. The substance of DOE's Interim Waiver Order is summarized below.

JCI is required to use the alternate test procedures set forth in this notice to test and rate certain CAC and HP basic models that use certain variable-speed, oil-injected scroll compressors (VSS systems). Specifically, this requirement applies to JCI CAC and HP basic models that (1) have a VSS system that use one of the compressor models JCI specified to DOE on June 2, 2017

with a request for confidential treatment and (2) include the following outdoor unit models in combinations, listed by brand name:

Brand →	York	Coleman	Luxaire	Fraser-Johnston	Champion
Air Conditioners	YXV24B21	AC21B2421	AL21B2421	AL21B2421	AL21B2421
	YXV36B21	AC21B3621	AL21B3621	AL21B3621	AL21B3621
	YXV48B21	AC21B4821	AL21B4821	AL21B4821	AL21B4821
	YXV60B21	AC21B6021	AL21B6021	AL21B6021	AL21B6021
Heat Pumps	YZV24B21	HC20B2421	HL20B2421	HL20B2421	HL20B2421
	YZV36B21	HC20B3621	HL20B3621	HL20B3621	HL20B3621
	YZV48B21	HC20B4821	HL20B4821	HL20B4821	HL20B4821
	YZV60B21	HC20B6021	HL20B6021	HL20B6021	HL20B6021

JCI is permitted to make representations about the energy use of these basic models for compliance, marketing, or other purposes only to the extent that such products have been tested in accordance with the provisions set forth in the alternate test procedure and such representations fairly disclose the results of such testing in accordance with 10 CFR 429.16.

DOE makes decisions on waivers and interim waivers for only those basic models specifically set out in the petition, and in this case only those models that use the specified compressors, not future models that may be manufactured by the petitioner. JCI may request that DOE extend the scope of a waiver or an interim waiver to include additional basic models employing the same technology as the basic model(s) set forth in the original petition consistent with 10 CFR 430.27(g). In addition, DOE notes that granting of an interim waiver or waiver does not release a petitioner from the certification requirements set forth at 10 CFR part 429. See also 10 CFR 430.27(a) and (i).

The interim waiver shall remain in effect consistent with the provisions of 10 CFR 430.27(h) and (l). Furthermore, this interim waiver is conditioned upon the presumed validity of statements, representations, and documents provided by the petitioner. DOE may rescind or modify a waiver or interim waiver at any time upon a determination that the factual basis



underlying the petition for waiver or interim waiver is incorrect, or upon a determination that the results from the alternate test procedure are unrepresentative of the basic model's true energy consumption characteristics. See 10 CFR 430.27(k).

#### **IV. Alternate Test Procedure**

EPCA requires that manufacturers use DOE test procedures to make representations about the energy consumption and energy consumption costs of products covered by the statute. (42 U.S.C. 6293(c)) Consistent representations are important for manufacturers to use in making representations about the energy efficiency of their products and to demonstrate compliance with applicable DOE energy conservation standards. Pursuant to its regulations applicable to waivers and interim waivers from applicable test procedures at 10 CFR 430.27, DOE will consider setting an alternate test procedure for JCI in a subsequent Decision and Order.

In its petition, JCI proposes that the basic models listed in the petition be tested according to the test procedure for residential CAC and HP prescribed by DOE at 10 CFR Part 430, Subpart B, Appendix M, except that the 20-hour break-in period maximum in section 3.1.7 of appendix M be replaced with a 72-hour maximum. With JCI's proposed alternative test procedure, this section of the test procedure reads as follows:

##### **3.1.7 Test Sequence**

Manufacturers may optionally operate the equipment under test for a "break-in" period, not to exceed 72 hours, prior to conducting the test method specified in this section. A manufacturer who elects to use this optional compressor break-in period in its certification testing should record this information (including the duration) in the test data underlying the certified ratings that are required to be maintained under 10 CFR 429.71. When testing a ducted unit (except if a heating-only heat pump), conduct the A or A<sub>2</sub> Test first to establish the cooling full-load air volume rate.

For ducted heat pumps where the heating and cooling full-load air volume rates are different, make the first heating mode test one that requires the heating full-load air volume rate. For ducted heating-only heat pumps, conduct the H1 or H1<sub>2</sub> Test first to establish the heating full-load air volume rate. When conducting a cyclic test, always conduct it immediately after the steady-state test that requires the same test conditions. For variable-speed systems, the first test using the cooling minimum air volume rate should precede the E<sub>v</sub> Test, and the first test using the heating minimum air volume rate must precede the H2<sub>v</sub> Test. The test laboratory makes all other decisions on the test sequence.

## **V. Summary and Request for Comments**

Through this notice, DOE announces receipt of JCI's petition for waiver from the DOE test procedure for certain CAC and HP basic models and grants JCI an interim waiver from the test procedure for the specified basic models that use variable- speed, oil-injected scroll compressors (VSS systems). DOE is publishing JCI's petition for waiver in its entirety, pursuant to 10 CFR 439.27(b)(1)(iv). The petition contains no confidential information. The petition includes a suggested alternate test procedure, as specified in section IV of this notice, to determine the energy consumption of JCI's specified CAC and HP models. DOE may consider including this alternate procedure in a subsequent Decision and Order.

DOE solicits comments from interested parties on all aspects of the petition, including the suggested alternate test procedure. More specifically, DOE is seeking test data and additional

information on the performance on CAC and HP basic models with VSS compressors as well as the VSS compressor performance information as a function of time. Pursuant to 10 CFR 430.27(d), any person submitting written comments to DOE must also send a copy of such comments to the petitioner. The contact information for the petitioner is Steve Tice, UPG Vice-President, Engineering, Unitary Products, Johnson Controls, Inc., 3110 N. Mead St., Wichita, KS 67219. All comment submissions must include the agency name and Case Number CAC-051 for this proceeding. Submit electronic comments in WordPerfect, Microsoft Word, Portable Document Format (PDF), or text (American Standard Code for Information Interchange (ASCII)) file format and avoid the use of special characters or any form of encryption. Wherever possible, include the electronic signature of the author. DOE does not accept telefacsimiles (faxes).

Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit two copies to DOE: one copy of the document marked "confidential" with all of the information believed to be confidential included, and one copy of the document marked "non-confidential" with all of the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Issued in Washington, DC, on September 13, 2017.

A handwritten signature in black ink, appearing to read 'KB Hogan', is written over a horizontal line.

Kathleen B. Hogan, Ph.D.  
Deputy Assistant Secretary for Energy Efficiency  
Energy Efficiency and Renewable Energy

Johnson Controls, Inc.  
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Tel 316-239-2925 Fax 316-832-6598

May 17, 2017

VIA E-MAIL: AS\_Waiver\_Requests@ee.doe.gov

Ashley Armstrong  
Building Technologies Program  
Office of Energy Efficiency and Renewable Energy  
U.S. Department of Energy  
Mailstop EE-5B  
1000 Independence Avenue, SW  
Washington, DC 20585-0121

**RE: Petition for Waiver and Interim Waiver of 20 Hour Break-In Period Limit for Certain JCI Central Air Conditioners and Heat Pumps with Variable Speed Compressors**

Dear Ms. Armstrong:

Pursuant to 10 C.F.R. § 430.27, Johnson Controls, Inc. (JCI) respectfully submits this petition for waiver, and request for interim waiver,<sup>1</sup> of the requirement in Section 3.1.7 of the test procedure for central air conditioners (CAC) and heat pumps (HP) found at Appendix M to Subpart B of 10 C.F.R. Part 430 that limits an optional compressor “break-in” period to a maximum of 20 hours before testing under Appendix M (the “20 Hour Break-In Limit”).<sup>2</sup> Specifically, JCI seeks waiver of the 20 Hour Break-In Limit for its central air conditioner and heat pumps with variable speed systems that use oil-injected scroll compressors (VSS systems), because testing these systems with only a 20-hour break-in period produces results unrepresentative of their true energy consumption characteristics, and would provide materially inaccurate comparative data.<sup>3</sup> As explained below, JCI requests that in lieu of the 20 Hour Break-In Limit, it be permitted to test its VSS systems with a 72-hour break-in period.

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<sup>1</sup> This petition for waiver and request for interim waiver is a substitute for that originally submitted by Johnson Controls, Inc. on May 2, 2017 on the same break-in period issue.

<sup>2</sup> Section 3.1.7 of Appendix M to Subpart B of 10 C.F.R. Part 430.

<sup>3</sup> 10 C.F.R. § 430.27(a)(1).

## **I. Johnson Controls, Inc.**

Johnson Controls, Inc. is a diversified equipment and technology company with its operational headquarters in Milwaukee, Wisconsin and approximately 140,000 employees located around the globe. Our employees provide intelligent buildings, energy efficient solutions and integrated infrastructure to optimize energy efficiency and to create the smart buildings and communities of the future. Through its Unitary Product Group division, JCI manufactures and sells central air conditioner and heat pump systems for residential use, including high efficiency variable speed systems. These products are manufactured in the United States, in Wichita, Kansas.

## **II. Background**

A “break-in” period contemplates the running of equipment for a period of time before beginning of an efficiency test.<sup>4</sup> DOE has found that a “break-in period is particularly important for scroll compressors, which may be less efficient when first started and may require time to warm up to achieve optimal performance. Once the compressor is broken in, the performance should be more representative of the actual field performance.”<sup>5</sup> Break-in allows “mating” parts to wear against each other, which results in reduced friction and leakage. Until this initial wear has occurred, the moving parts in the compressor generate greater friction when they contact each other, which decreases efficiency, and the seals between chambers that compress or expand the refrigerant may have greater leakage between the chambers, which reduces efficiency. Oil injection technology improves system efficiency, but the oil in the scroll elements prolongs the time required for this initial wear, which is needed to achieve nominal efficiency.

Section 3.1.7 of Appendix M to 10 C.F.R. Part 430, Subpart B provides that “[m]anufacturers may optionally operate the equipment under test for a „break-in“ period, not to exceed 20 hours,” provided that the manufacturer reports the break-in period used in any certification to DOE.<sup>6</sup>

## **III. Basic Models for Which Waiver Is Requested**

JCI requests a waiver from the 20 Hour Break-In Limit for its split-system CAC and HP basic models that use variable speed scroll compressors with an oil-injection system. Specifically, JCI requests waiver for all basic models that include the following outdoor unit models in combinations, listed by brand name:

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<sup>4</sup> Energy Conservation Standards and Test Procedures for Commercial Heating, Air-Conditioning, and Water-Heating Equipment, Proposed Rule, 77 FR 2355, 2374 (Jan. 17, 2012).

<sup>5</sup> *Id.*

<sup>6</sup> Section 3.1.7 of Appendix M to Subpart B of 10 C.F.R. Part 430 (as revised by DOE in the June 2016 Final Rule).

	York	Coleman	Luxaire	Fraser-Johnston	Champion
AC	YXV24B21	AC21B2421	AL21B2421	AL21B2421	AL21B2421
	YXV36B21	AC21B3621	AL21B3621	AL21B3621	AL21B3621
	YXV48B21	AC21B4821	AL21B4821	AL21B4821	AL21B4821
	YXV60B21	AC21B6021	AL21B6021	AL21B6021	AL21B6021
HP	YZV24B21	HC20B2421	HL20B2421	HL20B2421	HL20B2421
	YZV36B21	HC20B3621	HL20B3621	HL20B3621	HL20B3621
	YZV48B21	HC20B4821	HL20B4821	HL20B4821	HL20B4821
	YZV60B21	HC20B6021	HL20B6021	HL20B6021	HL20B6021

The variable speed scroll compressors used in these systems are optimized for high-efficiency residential air conditioner and heat pump systems in the 2-ton to 5-ton range.

#### IV. Grounds for Test Procedure Waiver

DOE's regulations provide for granting of a test procedure waiver where testing of a basic model under the prescribed test procedures would "evaluate the basic model in a manner so unrepresentative of its true energy . . . consumption characteristics as to provide materially inaccurate comparative data."<sup>7</sup> JCI seeks a waiver from the 20 Hour Break-In Limit for its VSS systems because limiting the optional break-in period to 20 hours results in testing that provides materially inaccurate data unrepresentative of the true energy efficiency characteristics of these systems.

JCI's VSS systems require significantly more than 20 hours of break-in to reach design efficiency, which is the level of efficiency that is representative of system performance over the lifetime of the VSS system, and would be more appropriately tested with a break-in period of 72 hours. DOE established the 20 hour Break-in Limit to reduce test variability,<sup>8</sup> but because variable speed compressors with oil injection do not completely wear in within 20 hours, performance variability for VSS systems actually increases when break-in is limited to 20 hours. As explained below, JCI conducted testing demonstrating that a 20-hour break-in period does not allow for sufficient break-in for its VSS systems to reach representative efficiency, but that a 72-hour break-in period does.

JCI conducted baseline VSS system performance tests under Appendix M after 20 hours of break-in – the maximum currently permitted under Appendix M.<sup>9</sup> JCI then ran the same performance tests on the same units after longer break-in periods, of 44, 68, and 92 hours. JCI's testing shows that for the tested products, measured efficiency increased significantly with break-in periods longer than 20 hours. As is shown in the following sections, the Ev, B1, and F1 tests show substantial gains in efficiency with longer break-in periods.

Table 1 below shows testing data for a 3-ton air conditioning unit with a variable speed scroll compressor with oil injection tested after 20 hours of break-in. The unit was started at A2

<sup>7</sup> 10 C.F.R. § 430.27(a)(1).

<sup>8</sup> Final Rule at 1445 ("[T]he establishment of the 20-hour limit is to maintain test repeatability among labs regardless of who conducts the test.")

<sup>9</sup> These test results are representative of the break-in characteristics of all models for which JCI seeks waiver here

conditions and instrumentation was verified before starting the A2 test with 20 hours of accumulated compressor run time. Completion of the A2 test was followed by the B2, B1, Ev, and F1 tests.

JCI then operated the test system for an additional 24 hours, for a total compressor run time of 44 hours, to determine if an increased break-in period improved performance. The results in Table 1 show the calculated SEER improved by 0.77 with this additional 24 hour period of break in. The most substantial gain was found in the EV, B1 and F1 tests.

**I. Table 1: 3-ton AC System Testing, with 20 Hour Break-In and 44 Hour Break-In**

Calorimeter 20 Hr Break-In Compressor							Increased Break-In Run ~ 24 Hours						
Test	ID Capacity	Watts	EER	CFM	Static	ID Watts	Test	ID Capacity	Watts	EER	CFM	Static	ID Watts
A2	35719	2597.1	13.75	1160	0.24	199.5	A2	35751	2545.7	14.04	1159	0.23	190.3
B2	38054	2243.1	16.96	1162	0.24	198.4	B2	37779	2213.8	17.07	1156	0.24	191.6
Ev	19235	1074.4	17.90	708	0.16	71.6	Ev	19187	1032.3	18.59	707	0.15	67.5
B1	10287	544.6	18.89	428	0.26	55.4	B1	10276	547.3	18.78	420	0.20	46.2
F1	11112	348.4	31.89	420	0.24	51.6	F1	11156	324.8	34.34	428	0.22	49.3
		SEER	19.30						SEER	20.07			

JCI then operated the test system for two more 24-hour break-in periods and collected system performance data after each break-in period. A second system was also installed into a psychrometric test cell and tested after the same intervals of compressor run time. As shown in Table 2, the performance data from both samples shows improvement after the first two additional 24-hour break-in periods, tapering off in the third 24-hour break-in period. With an additional 48 hours of break-in, there is an average of 7.5% improvement in SEER across both tests. Sample 1 improved from a SEER of 19.30 to 20.46 and sample 2 improved from a SEER of 18.97 to 20.70. This average gain of more than 1.0 SEER is significant in the current marketplace.

**II. Table 2: 3-ton AC System Performance with Increasing Break-in Periods**

Sample 1					Sample 2				
Test	20 Hr	44 Hr	68 Hr	92 Hr	Test	20 Hr	44 Hr	68 Hr	92 Hr
A2	13.75	14.04	13.98	14.03	A2	13.14	13.73	13.83	13.88
B2	16.96	17.07	17.13	17.22	B2	16.21	16.91	16.91	17.08
Ev	17.90	18.59	19.04	20.16	Ev	17.52	19.01	19.32	19.34
B1	18.89	18.78	20.52	22.73	B1	17.75	22.10	21.45	21.58
F1	31.89	34.34	34.86	36.06	F1	32.92	37.77	35.92	35.83
SEER	19.30	20.07	20.46	21.41	SEER	18.97	20.59	20.70	20.73

Additional unit sizes were tested using the same procedure as described above. As shown in Tables 3 and 4 below, results from those additional tests show the same pattern – increased efficiency with longer break-in periods beyond 20 hours.

**III. Table 3: 4-ton AC System Performance with Increasing Break-in Periods**

Sample 1					Sample 2				
Test	20 Hr	44 Hr	68 Hr	92 Hr	Test	20 Hr	44 Hr	68 Hr	92 Hr
A2	13.03	13.35	13.42	13.47	A2	13.31	13.60	13.26	13.52
B2	15.93	16.21	16.43	16.45	B2	16.39	16.65	16.54	16.96
Ev	18.60	19.08	19.11	19.30	Ev	19.55	18.91	19.32	19.81
B1	19.96	21.04	21.50	21.28	B1	21.41	19.43	20.30	21.90
F1	36.87	37.63	38.56	36.95	F1	35.50	37.16	36.06	38.52
SEER	20.07	20.54	20.67	20.67	SEER	20.76	20.46	20.64	21.29

**Table 4: 5-ton AC System Performance with Increasing Break-in Periods**

Sample 1					Sample 2				
Test	20 Hr	44 Hr	68 Hr	92 Hr	Test	20 Hr	44 Hr	68 Hr	92 Hr
A2	13.12	13.18	13.20	13.27	A2	13.03	13.24	13.23	13.23
B2	16.05	16.08	16.18	16.30	B2	15.81	16.04	15.90	16.24
Ev	19.23	19.51	19.68	19.65	Ev	19.07	19.48	19.49	19.95
B1	22.15	23.20	23.80	24.02	B1	22.19	23.12	23.05	23.96
F1	36.94	38.00	38.28	37.45	F1	35.55	37.50	37.96	38.93
SEER	20.67	21.05	21.22	21.18	SEER	20.45	20.98	21.02	21.52

In evaluating this test data, JCI determined that the increase in system efficiency and reduced test variability that occurs with the lengthier break-in periods was principally due to a reduction in required compressor power during the test. Figures 5 and 6 show the decrease in compressor watts compared to the 20-hour baseline compressor for 3-ton and 5-ton AC systems. For both systems, results show a consistent reduction in watts consumed as the break-in time of the compressor is increased. This is most significant at the Ev, B1 and F1 test conditions.

#### **IV. Figure 5: Decrease in Compressor Watts (3 Ton AC) with**

#### **3 Additional 24-hour Break-In Periods, Relative to 20-hour Break-In Baseline**

See the following website for figure 5: <https://www.regulations.gov/docket?D=EERE-2017-BT-WAV-0037>

#### **Figure 6: Decrease in Compressor Watts (5 Ton AC) with**

#### **3 Additional 24-hour Break-In Periods, Relative to 20-hour Break-In Baseline**

See the following website for figure 6: <https://www.regulations.gov/docket?D=EERE-2017-BT-WAV-0037>



These test results show that a VSS system is not fully broken in at 20 hours, and that rating such a system with only 20-hour break-in period can understate a system's SEER rating performance by 1 to 2 SEER (or approximately 5% to 10%). Because the 20 Hour Break-In Limit does not allow sufficient time for full break-in of VSS systems, the efficiency rating of a VSS system measured under Appendix M falls below the actual efficiency level at which the system will operate for the great majority of its time in service. JCI is thus unable to represent, on the basis of Appendix M testing, the full efficiency at which its VSS systems will operate. To achieve a particular efficiency rating under the Appendix M test method, JCI is forced to overdesign its VSS systems to meet an even higher target efficiency rating after full break-in. In short, the 20 Hour Break-In Limit in Appendix M results in the underrating of JCI's VCC systems, and thus produces materially inaccurate data about the efficiency of VSS systems for comparison purposes, leaving homeowners without the information needed to objectively evaluate the benefits of such systems.

This underrating under Appendix M for JCI's VSS systems has significant consequences in the marketplace. Because of underrating due to the 20 Hour Break-In Limit, the full efficiency advantage of JCI's VSS systems will not be apparent versus lower-efficiency full stage compressor products, for which the 20 Hour Break-In Limit does not bias results. Consumers for whom central air conditioner measured efficiency is an important factor will be misled about the merits of VSS systems on the basis of measured efficiency under Appendix M. Although the JCI models at issue are very efficient, and perform well above the applicable minimum efficiency standards, accurate ratings for high efficiency products such as these are important for purposes of, for instance, determining eligibility for Energy Star, utility rebates, tax credits, and green building recognition.

## **I. Alternative Test Procedures**

DOE's Appendix M test procedure, as currently promulgated but with the option of an extended, 72-hour break-in period, constitutes the appropriate alternate test procedure that will evaluate the performance of JCI's VSS systems in a manner representative of its energy characteristics. Therefore, JCI proposes to test the basic models for which it seeks waiver by applying the entirety of Appendix M to 10 CFR Part 430, Subpart B, with a single modification to Section 3.1.7, as shown below:

### **3.1.7 Test Sequence**

Manufacturers may optionally operate the equipment under test for a "break-in" period, not to exceed ~~20~~72 hours, prior to conducting the test method specified in this section. A manufacturer who elects to use this optional compressor break-in period in its certification testing should record this information (including the duration) in the test data underlying the certified ratings that are required to be maintained under 10 CFR 429.71. When testing a ducted unit (except if a heating-only heat pump), conduct the A or A<sub>2</sub> Test first to establish the cooling full-load air volume rate. For ducted heat pumps where the heating and cooling full-load air volume rates are different, make the first heating mode test one that requires the heating full-load air volume rate. For ducted heating-only heat pumps, conduct the H1 or H<sub>12</sub> Test first to establish the heating full-load air volume rate. When conducting a cyclic test, always conduct it immediately after the steady-state test that requires the same test conditions. For variable-speed systems, the first test using the cooling minimum air volume rate should precede the E<sub>v</sub> Test, and the first test using the heating minimum air volume rate must precede the H<sub>2v</sub> Test. The test laboratory makes

all other decisions on the test sequence.

Thus, the only change would be to modify the maximum length of the optional break-in period for JCI's VSS systems. As required by Appendix M, JCI would report the break-in period used in its product compliance certifications.

## **II. Similar Products**

JCI is aware of the following manufacturers of residential central air conditioners and heat pumps that offer VSS systems using scroll compressors with oil injection: Carrier Corporation, Daikin Industries, Goodman Manufacturing Co. LP, Lennox International Inc., Nortek Global HVAC, Rheem Sales Company, and Trane.

## **III. Petition for Interim Waiver**

Pursuant to 10 CFR § 430.27, JCI also requests an interim waiver of the 20 Hour Break-In Limit for the JCI VSS systems. DOE will grant an interim waiver if it appears likely that the petition for waiver will be granted and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the petition for waiver.<sup>10</sup> Interim relief is important to ensure that JCI can make materially accurate representations about the energy efficiency of its VSS systems in its certifications to DOE and marketing materials while DOE is considering the merits of JCI's petition for waiver.

Likely Success of the Petition for Waiver. For the reasons outlined above, JCI believes that there are strong arguments for granting the petition for waiver on the merits. Specifically,

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<sup>10</sup> 10 C.F.R. § 430.27(e)(2).

JCI testing of its VSS systems shows that a 72-hour break-in period produces test results that are more representative of the actual product efficiencies at which the VSS systems will operate over the lifetime of the product than those results obtained under the current 20 hour break-in period limit.

Competitive Disadvantage. If JCI must continue to comply with the 20 Hour Break-In Limit for its VSS systems, these systems will be disadvantaged in the market relative to other types central air conditioners and heat pumps for which a break-in period of 20 hours or less produces results representative of actual operating efficiency. As shown above, the impact of the 20 Hour Break-In Limit on ratings is significant – it can reduce ratings by 1 to 2 SEER. The effects of such depressed ratings in the market can be significant.

Public Policy Reasons to Grant Interim Waiver. Without an interim waiver, consumers will continue to be exposed to materially inaccurate information about the energy consumption characteristics of JCI's VSS systems. This inaccurate information harms consumers (especially those seeking to evaluate very high efficiency CAC/HP products) and distorts markets. Further, underrating high efficiency products is inconsistent with the policy objectives of EPCA.

For all of these reasons, the Department should grant an interim waiver while it considers the petition for waiver set out above.

#### **IV. Conclusion**

For the reasons stated above, JCI respectfully requests that DOE grant this petition for waiver of the 20 Hour Break-In Limit with respect to its VSS systems. JCI further requests DOE to grant its request for an interim waiver while its petition for waiver is under consideration.

If you have any questions or would like to discuss this request, please contact me at (316) 832-6393, Chris Ware at (414) 524-5443, or Doug Smith of Van Ness Feldman, LLP at (202) 298-1902. We greatly appreciate your attention to this matter.

Sincerely,

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Cc: Johanna Jochum, Office of the General Counsel