ICC-SRCC
SOLAR RATING & CERTIFICATION CORPORATION

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June 22, 2023

U.S. Environmental Protection Agency
Office of Air and Radiation
ENERGY STAR HVAC Program
1200 Pennsylvania Ave NW
Washington, DC 20460

Via E-Mail Attachment

Re: Comments of the International Code Council and Solar Rating & Certification Corporation on the ENERGY STAR® Residential Boilers Discussion Guide

The International Code Council and Solar Rating & Certification Corporation are pleased to submit the attached response to the ENERGY STAR Residential Boilers Discussion Guide, issued by the U.S. Environmental Protection Agency on June 5, 2023. The Solar Rating & Certification Corporation (ICC-SRCC™) is a subsidiary of the International Code Council (ICC) and a program of the ICC Evaluation Service.

The comments offered address specific questions posed in the Discussion Guide and as further outlined in the associated webinar conducted on June 21, 2023.

Thank you for the opportunity to address this important topic. If you have any questions concerning our recommendations, please do not hesitate to contact us.

Sincerely,

Shawn Martin

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The International Code Council (ICC) is a not-for-profit organization, driven by the engagement of its 64,000 members, that is dedicated to helping communities and the building industry provide safe, resilient, and sustainable construction through the development and implementation of model codes (I-Codes) and standards used in design, construction, and compliance processes. Most U.S. states and communities, federal agencies, and many global markets choose the I-Codes to set the standards for regulating construction and major renovations, plumbing and sanitation, fire prevention, and energy conservation in the built environment.

The Solar Rating & Certification Corporation (ICC-SRCC or SRCC) is an ISO/IEC 17065-accredited third-party certification body and standard developer, addressing the certification and performance rating of solar heating and cooling products. ICC-SRCC's OG-100 and OG-300 certifications and performance ratings are accepted throughout North America. ICC-SRCC's well-known ANSI standards are specified by dozens of incentive programs, regulations, and laws at the local, state, and federal levels, and are referenced within building codes. ICC-SRCC also operates listing programs that assist code enforcement professionals to determine whether solar heating and cooling products comply with applicable codes and standards.

SRCC has a long history within the solar industry and was formed to benefit consumers by providing standardized third-party thermal performance ratings along with minimum safety and durability assessments. It was founded in 1980 through the efforts of industry associations and a national consortium of U.S. state energy offices and regulatory bodies. In November 2014, SRCC became part of the International Code Council Family of Companies and is now a program of the ICC Evaluation Service (ICC-ES).

We appreciate the opportunity to submit comments to the U.S. Environmental Protection Agency regarding the ENERGY STAR Residential Boilers Discussion Guide and the questions posed there. ICC and ICC-SRCC are pleased to provide the following comments in response to the specific questions posed:

Question 5: EPA is interested in additional information about dual fuel boilers particularly market, cost, and performance information.

The question regarding dual fuel boilers appears to be based on the premise that these are the only two fuel sources for air-water heat pump equipment. ICC encourages a technology-agnostic approach that allows the greatest opportunity for innovation. **Therefore, we recommend that the specification accommodate all potential energy sources for air-to-water heat pumps.** This includes solar thermal energy, which can be used to reduce fossil fuel consumption. Air-to-water heat pump technologies incorporating solar thermal collectors to enhance evaporator performance are already available in international markets and are recently becoming available within the U.S. as well. These products are often known as solar-assisted or thermodynamic heat pumps. Many thermodynamic air-water heat pumps have the added benefit of an outdoor evaporator/solar thermal collector component that operates without the need for a fan, reducing noise and parasitic energy consumption.

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Onsite renewable energy sources should be accommodated within the specification and considered on an equal basis with both natural gas and electricity. Should equipment capable of operating entirely using onsite renewable energy sources become available, it should be eligible for certification if it can meet the same testing requirements. Equipment capable of utilizing more than one fuel not only provides the potential for greater efficiency, it also introduces additional resiliency in the event of energy supply interruptions.

Examples of solar-assisted air-to-water heat pumps currently on the market include:

1. SAHP, Ltd., Unit 10 Oak Farm, Tolleshunt Major, Essex, CM9 8LS https://sahp.info/ Distributed in the U.S. by New England Solar Hot Water, https://www.neshw.com/residential/sahp/

2. Arctic Heat Pumps, 835 Kapelus Dr. West St Paul, MB R4A 5A4, Canada
https://www.arcticheatpumps.com/heat-pump-with-solar.html

3. VINDSOL, Shed No. A.70, KSSIDC, Bommasandra Industrial Area, Bangalore, India – 560099
https://vindsol.in/all-in-one-thermodynamics-solar-heat-pump/

4. ENERGIE, Zona Industrial de Laúndos, Lote 48 4570-311 Laúndos, Póvoa de Varzim, Portugal
https://energie.pt/en/products/thermodynamic-solar/

Question 6: As the evaporators are likely to be located outdoors, what range of outside air conditions are most representative to determine overall performance?

Air-water heat pump performance varies with ambient air temperature and relative humidity at the evaporator. As a result, the performance of these units differs with geographic location, season, and time of day. A single performance rating representing a "typical" U.S. location will result in local performance values that vary greatly. Consumers have come to understand that air source heat pump performance varies by local climate conditions. However, recent advances in heat pump technologies have resulted in systems that can function effectively at far lower ambient air temperatures than previous technologies. Some consumers are not aware of these advances and may incorrectly assume that the technology is not appropriate for their location. **Therefore, we recommend that the ENERGY STAR specification provide several regional performance values addressing appropriate climate zones within the U.S.**

This approach also coordinates with the location-specific requirements in model energy codes such as the *International Energy Conservation Code* (IECC) and ANSI/ASHRAE/IES Standard 90.1 (Standard 90.1). Both utilize climate zones defined in the ANSI/ASHRAE 169 standard, Climatic Data for Building Design Standards. Energy conservation provisions for many building systems and components are linked to the climate zone associated with the installation. Establishment of performance ratings linked to the Standard 169 climate zones will allow for ready use in coordination with energy codes used nationally.

Specific representative locations can be designated in each climate zone, and Typical Meteorological Year (TMY) climate data published in the National Renewable Energy Laboratory's National Solar

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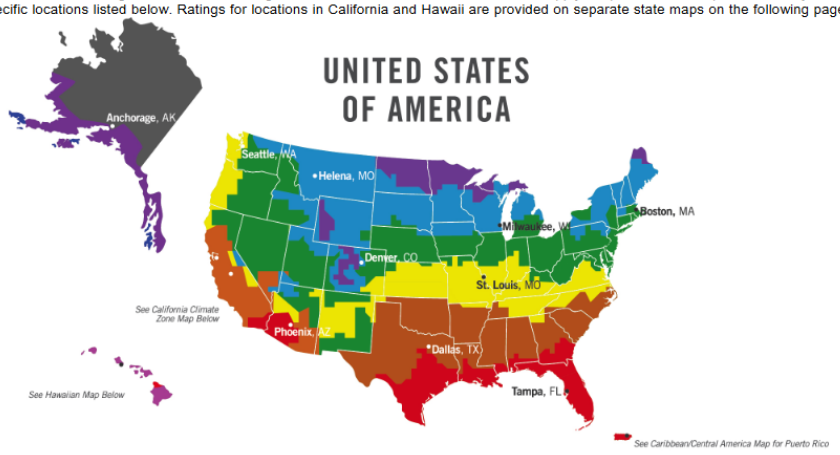
Radiation Database (NSRDB) can be utilized to determine the annual energy consumption and savings compared with incumbent boiler technologies. This approach is also comparable to that used by energy modeling software packages such as EnergyPlus, eQuest, DOE-2, and SAM.

This regional performance rating approach has been employed for decades in the solar thermal industry through the ICC-SRCC OG-300 ratings program. An example, with each climate zone and representative locations, is provided below. More information on the OG-300 certification program and performance ratings is available on the SRCC website at https://solar-rating.org/programs/og-300-program/

OG-300 LOCAL ANNUAL SOLAR WATER HEATING SYSTEM PERFORMANCE

System performance at several geographic locations in the United States corresponding to climate zones as established in ASHRAE 169 is provided below. Ratings are determined using weather data, solar irradiance and water supply temperature over a period of one year for the specific locations listed below. Ratings for locations in California and Hawaii are provided on separate state maps on the following pages.



USA			
Location	Climate Zone (ASHRAE 169)	Solar Fraction (SF_A)	Annual Energy Savings (kWh)
AK - Anchorage	7	0.37	1980
AZ - Phoenix	2B	0.84	2990
CO - Denver	5B	0.73	3360
FL - Tampa	2A	0.80	2750
GA - Atlanta	3A	0.70	2860
MA - Boston	5A	0.59	2690
MO - St Louis	4A	0.63	2750
MT - Helena	6B	0.57	2840
TX - Dallas-Fort Worth	3A	0.74	2820
WA - Seattle	4C	0.50	2300
WI - Milwaukee	6A	0.55	2660

Question 10: Are there additional considerations for the test method for air-to-water heat pumps?

ENERGY STAR should consider international testing and performance rating programs for air-source heat pumps and coordinate with them where practicable. The ENERGY STAR program should benchmark air-to-water heat pump specifications, standards, test methods, and certification programs in other comparable international markets in addition to those promulgated in the U.S. by AHRI. Doing so would not only allow U.S. regulations to coordinate with international programs but would also promote trade. One example is the Microgeneration Certification Scheme (MCS) for Air Source Heat Pumps in the United Kingdom. Certification is conducted to *MCS 007, Product Certification Scheme Requirements: Heat Pumps*. More information on the MCS can be found at https://qms.easy-mcs.com/mcs/mcs-technologies/air-source-heat-pumps.html. Another example is the Heat Pump

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KEYMARK program operated by European Committee for Standardisation (CEN) in the European Union. The program utilizes the EN 14825 and EN 16147 standards and establishes standardized performance ratings that are utilized throughout the EU. More information on Heat Pump KEYMARK can be found at https://keymark.eu/en/products/heatpumps/heat-pumps.

The EPA should consider the global warming potential of refrigerants used in air-source heat pumps in any resulting specification. Air-water heat pumps have the potential to significantly reduce energy consumption for the purpose of heating using hydronic systems. However, this impact can be undermined by the inadvertent release of high global warming potential (GWP) refrigerants commonly used in these systems.

The refrigerants commonly used in current heat pumps such as R32, R134, R410a, and R417a have extremely high GWP values of 675, 1430, 2090, and 2346 respectively. Wide-scale deployment of heat pumps will invariably lead to a higher volume of refrigerant emissions, offsetting some carbon reductions resulting from their increased energy efficiency. While the volume of those emissions can be reduced through effective product design and installer and servicer practices and training, they can never be entirely eliminated.

We believe that the ENERGY STAR specification should prioritize the use of lower GWP refrigerants that also exhibit low levels of toxicity and flammability. It should also promote best practices in the design, installation, and servicing of these systems to limit release of GWP refrigerants. Requirements regarding refrigerants can be found in Sections 1102.2 and 1103 of the *2021 International Mechanical Code* (IMC).

Thank you for the opportunity to provide comments. If you have any questions concerning these comments, please do not hesitate to contact Shawn Martin, Vice President of Technical Services, at smartin@solar-rating.org or 888-422-7233 x 7736.

REFERENCES

1. MCS 007, Product Certification Scheme Requirements: Heat Pumps, Issue 6.0
2. European KEYMARK Scheme for Heat Pumps, Rev 12, CEN-CENELEC
3. EN 14825, Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling, commercial and process cooling - Testing and rating at part load conditions and calculation of seasonal performance, 2022
4. EN 16147, Heat pumps with electrically driven compressors. Testing, performance rating and requirements for marking of domestic hot water units, 2017
5. 2021 International Mechanical Code (IMC), ICC
6. 2021 International Energy Conservation Code (IECC), ICC