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July 12, 2024

California Air Resources Board
1001 I Street
Sacramento, California 95814

Re: Rheem Manufacturing Company Comments to CARB Zero-Emission Space and Water Heater Standards

Rheem Manufacturing Company (Rheem) appreciates the opportunity to comment on the California Air Resources Board (CARB) development of zero-emission space and water heating standards.

Rheem is an industry leader in total heating, cooling, refrigeration, and water heating solutions, headquartered in Atlanta, Georgia and with a manufacturing facility in Oxnard, California. Rheem also has U.S. based manufacturing facilities in Alabama, Arkansas, Connecticut, and North Carolina and distribution facilities throughout the U.S., Canada and around the world. Rheem is committed to a clean energy future and continues to bring to market products that advance the goals of emissions reduction at an affordable price to the homeowner, working cooperatively with environmental agencies and regulators.

General Comments

Rheem is a strong proponent of building decarbonization and values the efforts of CARB to drive improved environmental outcomes through emission standards for space and water heating equipment. In March 2022 Rheem commented on CARB's 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy) and the agency's strategies to reduce emissions that contribute to ground-level ozone necessary to meet federal air quality standards.¹ CARB's proposed control measures to achieve the State SIP Strategy include a series of policies, affecting wide swaths of the California economy. Rheem wishes to reiterate comments made in 2022 to the State SIP Strategy now that CARB is proposing concepts to limit emissions from space and water heating equipment for residential and commercial buildings:

Prioritize zero emission appliance standards in the new construction residential segment in a timeframe that provides the sales channel (OEMs, Distributors, and Contractors), adequate time for product availability and planning, with consideration of economic feasibility for California consumers.

¹ [https://www.arb.ca.gov/lispub/comm2/bccomdisp.php?listname=draft2022statesip-
ws&comment_num=18&virt_num=18](https://www.arb.ca.gov/lispub/comm2/bccomdisp.php?listname=draft2022statesip-
ws&comment_num=18&virt_num=18) (accessed June 24, 2024)



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Provide additional compliance pathways that include consumer options such as high-efficiency condensing water and space heaters and dual-fuel heating systems, for retrofit in the existing residential and commercial building stock;

Program design flexibility recognizing continued gas use in limited and legacy applications;

Use future zero emission appliance standards to harmonize emission regulations from the separate air districts regulating NOx emissions from space and water heating;

Condition implementation of zero emission appliance standards to installation benchmarks from incentive programs targeted to heat pump technologies and labor force training;

Support in-state manufacturing of efficient gas and electric building system technologies through maintenance of gas infrastructure to serve industrial and manufacturing segments

Rheem Comments Draft Zero-GHG Regulatory Proposal: Refined Concept B

Rheem, in general, supports harmonization and avoidance of a regulatory patchwork that imposes higher costs on manufacturers, channel partners and, most importantly, Californians bearing the costs of replacing space and water heating equipment. In promulgating a regulation, CARB must consider that among Air Quality Management Districts, key differences exist on product scope, compliance reporting, incentive programs for low-and-moderate income residents, and exemptions from difficult installations and high-temperature and -altitude applications. Rheem has summarized the existing zero emission regulations along with our recommendations in a table the Appendix.

CARB seeks input on a regulatory framework to stagger the compliance dates of space and water heating equipment based on equipment type, capacity, size of equipment, and technological feasibility.

Rheem generally supports staggered compliance dates based on technical feasibility, equipment type and capacity/size limits as detailed in regulatory proposal C (refined concept B). However, full alignment with the South Coast Air Quality Management District's (SCAQMD) Rules 1111 (proposed), 1121 (proposed), and 1146.2 (final) as well as Bay Area Air Quality Management District's (BAAQMD) Rules 4 and 6 of Regulation 9 (final) is not practical given the variations in these rules and lacks consideration for the broader statewide market (and climate zone) impacts. Rheem notes that the SCAQMD Rule 1146.2 underwent an extensive development process which took stakeholder feedback on technological feasibility and market impacts into account, while the BAAQMD Rules 9-4 and 9-6 deferred the in-depth technological feasibility

evaluation for an implementation working group to conduct. SCAQMD Rules 1111 and 1121 are currently undergoing further technological feasibility assessment and review of new and existing equipment replacement impacts for that market segment.

Rheem recommends alignment of the residential storage (≤ 75 kBtu/h) and instantaneous (≤ 200 kBtu/h) water heater compliance dates, which are currently proposed as 2027 and 2029, respectively. Storage water heaters for many applications can be replaced with instantaneous water heaters, so any difference in compliance date could result in a shift to a gas-fired instantaneous water heaters instead of a zero-NO_x technology. Rheem notes the recently amended US Department of Energy's (DOE) energy conservation standards for consumer (residential) water heaters² has a compliance date of May 6, 2029. These amended standards set minimum efficiency levels that will require heat pump technology for all electric storage water heaters with >35 gallons of stored water. Considering the national impact of this standard and market transition to heat pump water heaters, CARB should seek to align compliance dates to minimize market disruption. Therefore, Rheem recommends a January 1, 2030, compliance date for residential water heaters.

Rheem recommends alignment of the >75 to ≤ 400 kBtu/h storage water heater compliance dates with the residential compliance dates (January 1, 2030, as recommended by Rheem). This range includes commercial water heaters that are often used in residential applications (defined by DOE as residential-duty commercial water heaters). Rheem notes that the recently amended DOE energy conservation standards for commercial water heaters³ has a compliance date of October 6, 2026. This rulemaking did not address electric water heaters but did set standards for gas-fired water heaters that are only achievable with condensing or heat pump technology. Condensing technology is inherently ultra-low NO_x, so there will be a statewide reduction in NO_x starting in 2026.

Rheem agrees that a proposed statewide standard should not "limit use or repair of existing space and water heaters." By contrast, the SCAQMD Rule 1146.2 places limits on existing equipment lifetimes leading to mandatory replacement dates for certain types of space and water heating equipment. Rheem notes that statewide enforcement of a unit age standard like SCAQMD Rule 1146.2 would be very difficult to implement and is not recommended for statewide adoption.

The Appendix table summarizes the existing and proposed zero emissions rules along with Rheem's initial recommendation for statewide adoption by equipment category.

² DOE consumer water heater energy conservation standard docket: <https://www.regulations.gov/docket/EERE-2017-BT-STD-0019>.

³ DOE commercial water heater energy conservation standard docket: <https://www.regulations.gov/docket/EERE-2021-BT-STD-0027>.

Manufactured Housing: What are reasonable compliance dates for equipment certified for manufactured housing?

Rheem notes that separate consideration for manufactured housing (mobile home) is provided for by the SCAQMD Rules 1111 and 1121 and BAAQMD Rule 9-6. A “mobile home water heater” is a storage water heater with ≤ 75 kBtu/h, however, some instantaneous water heaters are installed in manufactured housing as replacements to storage units or directly from the manufactured housing manufacturer.

Rheem recommends an aligned manufactured housing compliance date for all residential water heaters (storage and instantaneous). This date could coincide with an aligned non-manufactured housing compliance date (Rheem recommended 1/1/2030), however, extra time to develop lower cost zero-NOx technologies may be needed.

Rural and/or Under - Resourced Areas: What are the special considerations of regulating space and water heaters in rural and under-resourced areas?

Rheem notes that most propane equipment is utilized in rural areas and that most air districts exempt propane from their emissions regulations. Rheem recommends CARB exempt propane equipment as this fuel source is not prevalent in densely populated areas where the cost of switching from natural gas to propane gas may be more than the cost to electrify and in rural areas the utility infrastructure may not be present to allow for electrification.

“Dual-Fuel” Systems: What data or references can identify the fraction of heat pumps sold in California that are installed alongside other heating sources, such as gas furnaces? How often are these used to meet heating needs?

As California transitions to a 100 percent carbon-free electric grid, Rheem supports pathways for use of dual-fuel/flex-fuel space and water heating equipment. The renewable energy generation types being added to the California grid (*e.g.*, wind and solar) are intermittent and cannot be fully relied upon to deliver energy when needed. Energy storage is one solution, but systems that can switch between electricity and gas can also help to reduce electrical demand while ensuring the consumer experience isn't affected.

Rheem notes that there are fully packaged products that use natural gas and electricity to directly condition a space or heat water. However, most dual-fuel solutions applied at a system level (*i.e.*, pairing a furnace and heat pump or a boiler and hydronic heat pump). Rheem's sister company in Europe, Intergas, produces an air-to-water heat pump for residential space heating⁴ which can

⁴ Intergas Extend Hydronic Heat Pump: <https://www.intergasheating.co.uk/homeowner/products/xtend-monobloc/>

reduce gas consumption up to 82.5% when paired with a combi-boiler (a product that can space and water heat at the same time). Combi-boilers are a common technology used for space and water heating in Europe. A similar hydronic heat pump⁵ has also been introduced by IBC Boiler. In addition to significantly reducing natural gas usage, dual-fuel systems that prioritize electric operation allow for cost-effective electric technologies to be installed (e.g., two heat pumps or a very large heat pump would be significantly more expensive than a single heat pump with gas). Further, an evaluation⁶ of a dual-fuel space heater done by Oak Ridge National Laboratory (ORNL) shows significant reduction in both utility cost and CO₂ emissions.

Rheem recommends CARB adopt a low usage exemption which would allow installation of units that can demonstrate low gas usage. SCAQMD's Rule 1146.2 section (k)(3) allows for already installed Type 2 natural gas-fired units to remain installed (exempt from unit age mandatory replacements) if the unit operator can demonstrate low usage and if the burner complies with the existing ultra-low NO_x emission limits. Rheem also recommends CARB provide for climate zone specific exemptions for cold-climate applications. Rheem can provide additional details to quantify low usage exemptions needed for certain climate zones and specific product categories.

Additional technologies: Are there other technology types that should be included in the modeling? If so, please share data on usage, performance, and costs.

Rheem notes that commercial heat pump water heating is a nascent technology option that is changing rapidly. New solutions are actively being developed for hard to electrify commercial applications. Unfortunately, overly prescriptive standards and energy codes are being developed which limit innovation for cost-effective high efficiency technologies. SCAQMD considered the extra time needed to electrify commercial application and Rheem recommends CARB does the same.

Demand response is another technology that should be considered in the CARB analysis. Oregon and Washington have existing requirements for demand response and there is a growing fleet of water heaters and utility programs within California that are receiving incentive money. The CEC has an ongoing effort to add and update "Flexible Demand Appliance Standards" to Title 20 of the CCR. Timing and specific development requirements to comply with such new standards is unknown and could significantly impact product availability.

Rheem notes that with the passage of the American Innovation and Manufacturing (AIM) Act of 2020 and the ratification of the Kigali Amendment to the Montreal Protocol, hydrofluorocarbons

⁵ IBC Boiler HPX Series: <https://www.ibcboiler.com/consumer/products/hpx-series/>

⁶ Li, Z., Gluesenkamp, K., Shen, B., Munk, J., Zandi, H., Cheekatamarla, P., and Kowalski, S. 2022. "Seamlessly Fuel Flexible Heat Pump with Optimal Model-based Control Strategies to Reduce Peak Demand, Utility Cost and CO₂ Emission," Web link: <https://www.osti.gov/servlets/purl/1885311>.



(HFCs) are being phased out of the supply chain and being banned for certain sectors. HFCs are used as refrigerants in air-conditioners and heat pumps used for space conditioning as well as heat pump water heaters. Sector based limits have been established for space conditioning products by the US Environmental Protections Agency (EPA) and the CARB, but not heat pump water heaters. Given current low market adoption of heat pump water heaters and their ability to significantly reduce electricity demand (compared to electric resistance), shift load (as a thermal battery), and directly replace gas water heaters, Rheem does not support an aggressive water heater sector refrigerant limit. The benefits of an installed heat pump water heater far outweigh the costs of leaked refrigerant. Rheem notes that residential heat pump water heaters are all factory sealed, have very low leakage rates, and use significantly less refrigerant than space conditioning products.

In conclusion, Rheem remains committed to partnering with the State of California and CARB to successfully implement an effective and durable regulatory framework that reduces building energy emissions, promotes economic equity, and provides certainty to manufacturers and channel partners.

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Rheem Manufacturing Company





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Appendix: Summary of Emissions Regulations and Rheem's Recommendations

Zero-NOx Emissions Standard Compliance Dates

Equipment Type	Input Rate, kBtu/h	South Coast	Bay Area	CARB	Recommended Earliest Date
Storage Water Heater	≤75	New Construction: 1/1/2026 Replacement: 1/1/2027	1/1/2027	1/1/2027	1/1/2030
	≤75 (MH)	New Construction: 1/1/2026 Replacement: 1/1/2030	N/A (<40 ng/J)	Comment requested	1/1/2030
	>75 to ≤400	New Construction: 1/1/2026 Replacement: 1/1/2029	1/1/2031	1/1/2029	1/1/2030
	>400 to ≤1,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 2,000 therm/yr	1/1/2031	1/1/2031	1/1/2031
	>1,000 to ≤2,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 3,000 therm/yr	1/1/2031	1/1/2031	1/1/2031
Instantaneous Water Heater	≤200	New Construction: 1/1/2026 Replacement: 1/1/2029	1/1/2031	1/1/2029	1/1/2030
	≤200 (MH)	New Construction: 1/1/2026 Replacement: 1/1/2033	N/A	Comment requested	1/1/2030
	>200 to ≤400	New Construction: 1/1/2028 Replacement: 1/1/2031	1/1/2031	1/1/2031	1/1/2031
	>400 to ≤1,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 2,000 therm/yr	1/1/2031	1/1/2031	1/1/2031
	>1,000 to ≤2,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 3,000 therm/yr	1/1/2031	1/1/2031	1/1/2031
Pool Heater	≤400	New Construction: 1/1/2028 Replacement: 1/1/2031	N/A	1/1/2031	1/1/2031
	>400 to ≤1,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 2,000 therm/yr	N/A (<14 ng/J)	1/1/2031	1/1/2031
	>1,000 to ≤2,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 3,000 therm/yr	N/A (<14 ng/J)	1/1/2031	1/1/2031
Boiler	≤400	New Construction: 1/1/2026 Replacement: 1/1/2029	1/1/2031	1/1/2029	1/1/2029
	>400 to ≤1,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 2,000 therm/yr	1/1/2031	1/1/2031	1/1/2031



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Equipment Type	Input Rate, kBtu/h	South Coast	Bay Area	CARB	Recommended Earliest Date
	>1,000 to ≤2,000	New Construction: 1/1/2028 Replacement: 1/1/2031 LUE: 3,000 therm/yr	1/1/2031	<i>1/1/2031</i>	<i>1/1/2031</i>
High Temperature Unit (Boiler, Water Heater)	≤400	New Construction: 1/1/2029 Replacement: 1/1/2033	1/1/2031	<i>1/1/2033</i>	<i>1/1/2033</i>
	>400 to ≤1,000	New Construction: 1/1/2029 Replacement: 1/1/2033 LUE: 2,000 therm/yr	1/1/2031	<i>1/1/2033</i>	<i>1/1/2033</i>
	>1,000 to ≤2,000	New Construction: 1/1/2029 Replacement: 1/1/2033 LUE: 3,000 therm/yr	1/1/2031	<i>1/1/2033</i>	<i>1/1/2033</i>
Central Furnace	≤175	<i>New Construction: 1/1/2026</i> <i>Replacement: 1/1/2028</i>	1/1/2029	<i>1/1/2029</i>	<i>1/1/2029</i>
	≤175 (MH)	<i>New Construction: 1/1/2026</i> <i>Replacement: 1/1/2028</i>	N/A	<i>Comment requested</i>	<i>1/1/2029</i>
	>175 to ≤2,000	<i>New Construction: 1/1/2026</i> <i>Replacement: 1/1/2030</i>	1/1/2029	<i>1/1/2029</i>	<i>1/1/2030</i>
Other Furnaces	All	<i>New Construction: 1/1/2026</i> <i>Replacement: 1/1/2028</i>	1/1/2029	<i>1/1/2029</i>	<i>1/1/2029</i>

Italicized = Proposed

Highlighted Cells = different from CARB proposal

MH = Manufactured Housing (Mobile Home)

LUE = Low Usage Exemption, South Coast allows units installed prior to 6/7/2024 to be exempt from Unit Age (mandatory) replacements if the consumer can demonstrate that the unit uses a low amount of energy (2,000

Therms/yr for units with a rated input capacity >400 to ≤1,000 kBtu/h and 3,000 Therms/yr for units with a rated input capacity >1,000 to ≤2,000 kBtu/h).

