



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-015-15

MEMORANDUM

TO: Air Quality Board
THROUGH: Bryce C. Bird, Executive Secretary
FROM: Joel Karmazyn, Environmental Scientist
DATE: April 21, 2015
SUBJECT: PROPOSE FOR PUBLIC COMMENT: New Rule R307-230. NO_x Emission Limits for Natural Gas-Fired Water Heaters.

The state implementation plan (SIP) modeling indicates that future nitrogen oxides (NO_x) reductions will be necessary to help attain the PM_{2.5} standard. The largest contribution of NO_x from area sources come from combustion of natural gas.

The 2014 area source inventory shows that commercial, institutional and residential combustion of natural gas accounts for 5,479 tons per year of NO_x.

2014 Area Source Category	Combustion, Natural Gas, Commercial & Institutional	Combustion, Natural Gas, Residential	Total All Anthropogenic Area Sources
County	NO _x	NO _x	NO _x
Box Elder	146	51	
Cache	175	113	
Davis	364	314	
Salt Lake	810	1263	
Tooele	234	50	
Utah	869	451	
Weber	371	268	
TOTAL (tons per year)	2969	2510	9365

Reasonable Available Control Technology (RACT) Analysis

NO_x-emitting area sources include natural gas-fired furnaces, boilers, and water heaters. The South Coast Air Quality Management District (SCAQMD) has taken the leadership role in working with the heating industry to develop ultra-low NO_x burners and has recently completed testing of ultra-low NO_x furnaces and boilers rated at 14 ng/Joule of NO_x and are in the process of rulemaking for these appliances. We will follow these developments for future rulemaking in Utah.

Water heater technology is further along. Ultra-low NO_x water heaters are required by SCAQMD and the Bay Area Air Quality Management District (BAAQMD). The BAAQMD Regulation 9 Rule 6 requires the lowest available NO_x burners for water heaters, and it draws its requirements from the SCAQMD product testing. The SCAQMD has a certification process for approved water heaters and has certified many water heaters at the ultra-low NO_x level of 10 ng/Joule.

A limited number and type of SCAQMD certified residential water heaters are currently available in Utah through online purchases from several major box stores. The costs of these limited units are currently comparable to conventional units. Plumbing supply houses are not stocking SCAQMD certified appliances because there is no demand for them. We currently do not have supply and cost information for commercially sized SCAQMD certified water heaters. Staff has requested supply and cost information for both residential and commercial SCAQMD certified water heaters from the major commercial and residential builders, the major box stores, and plumbing supply houses located in Utah. We will also be asking for this information during the public comment period.

The Air-Conditioning, Heating, and Refrigeration Institute (ACHRI) has been actively engaged with the California initiative to bring forth commercially available ultra-low NO_x appliances. Mr. Frank Stanonik, chief technical advisor at the ACHRI, was consulted regarding the supply chain of ultra-low NO_x appliances. Mr. Stanonik concurred with our assessment that the industry could meet market demand in Utah if given two years to re-align their market distribution.

Rulemaking Proposal

Envision Utah petitioned the Air Quality Board on February 4, 2015, to propose for public comment rulemaking to require ultra-low NO_x water heaters based on limits established by the BAAQMD.

Envision Utah is proposing the lowest available NO_x burners for most residentially sized water heaters at 10 ng/Joule. Larger commercial units will have a higher NO_x limit of 14 ng/Joule. Mobile homes and smaller pool/spa heaters will have the highest limit of 40 ng/Joule.

<u>Category</u>	<u>Limit (ng/Joule)</u>
Water heater up to 75,000 BTU/hr, excluding those Installed in mobile homes	10
Water heater 75,001-2,000,000 BTU/hr	14
Any tank with power assist	10
Mobile home water heater	40
Pool/spa heater 400,001-2,000,000 BTU/hr	40
Pool/spa heater less than 400,000 BTU/hr	14

Labeling and Recordkeeping

Our peers at SCAQMD and BAAQMD have recommended labeling requirements on the appliance shipping box and the appliance itself to assure that the correct appliances would be installed in accordance with the proposed implementation schedule.

Implementation Schedule

Reducing NO_x year round will also play a role in controlling ozone. Therefore, the proposal is for a state-wide rule, with implementation first within the PM_{2.5} nonattainment area, followed by outlying counties on the following schedule:

<u>Location</u>	<u>Rule Implementation Date</u>
Box Elder, Cache, Davis, Salt Lake, Tooele, Utah, and Weber Counties	January 1, 2017
Washington, Duchesne, and Uintah Counties	January 1, 2018
Remaining portions of Utah	January 1, 2019

Stakeholder Support

On October 15, 2013, Governor Gary Herbert announced the formation of the Clean Air Action Team (CAAT). The CAAT includes representatives from health care, business, nonprofit organizations, government, academia, transportation, and other community representatives. This independent team works to provide a set of broadly supported recommendations to improve our air quality. The CAAT has reviewed modeling and inventory data associated with this proposal and has concluded that this proposal will have substantial air quality benefits statewide. Consequently, the CAAT supports this proposal.

SIP Credit

Manufacturers have been required to comply with the Department of Energy’s conservation standards for water heaters, ultimately leading to the current NO_x value of 40 ng/Joule, with the exception of mobile homes, which are higher. Mobile home water heaters may be as high as 110 ng/Joule. Even though the NO_x reduction from mobile home water heaters will be significant, the numbers of mobile homes are too low to quantify. The same holds true for the pool and spa heaters.

Future reductions are calculated from the 40 ng/Joule base NO_x value (SCAQMD and BAAQMD applied the same credits for their rules):

- Residential: 40 to 10 ng/Joule = 75% reduction
- Commercial: 40 to 14 ng/Joule = 65% reduction

Residential appliance apportionment: Each home has at least one furnace and one water heater. Many homes in Utah have a gas fireplace. Assumed apportionment: 45% furnace, 45% water heater and 10% fireplace.

$$\text{Residential Reduction for Water Heater: } (75\%)/2.22 = 33.8\% = \text{Control Efficiency}$$

Commercial appliance apportionment: One furnace and one water heater

Commercial Reduction for Water Heater: $(75\%)/2 = 37.5\% = \text{Control Efficiency}$

Rule effectiveness is 100% because national manufacturers will be held to the standards.

Rule penetration is based on an average water heater equipment life (normal lifetime is 10-13 years) when exposed to the natural hard water in the Wasatch Front - seven years. Seven years is consistent with most manufacturers' warranties, and this shorter timeline may also help account for the mobile home and pool and spa heater reductions that are not being quantified. The seven year rule penetration translates to a 4.8% inventory reduction for the residential area source for seven years and a 5.4% inventory reduction for commercial and institutional area source for seven years.

Staff Recommendation: Staff recommends the Board propose new rule R307-230, NO_x Emissions Limits for Natural Gas-Fired Water Heaters, for public comment.

1 **R307. Environmental Quality, Air Quality.**

2 **R307-230. NO_x Emission Limits for Natural Gas-Fired Water Heaters.**

3
4 **R307-230-1. Purpose.**

5 The purpose of R307-230 is to reduce emissions of nitrogen
6 oxides (NO_x) from natural gas-fired water heaters.

7
8 **R307-230-2. Applicability.**

9 R307-230 applies to the sale and installation of natural
10 gas-fired water heaters on the implementation schedule as
11 outlined in Table 1:

12
13 Table 1
14 Statewide Implementation Schedule of R307-230

16 Location	16 Rule Implementation Date
18 Box Elder, Cache, Davis, Salt Lake, 19 Tooele, Utah, and Weber Counties	January 1, 2017
21 Washington, Duchesne, and Uintah Counties	January 1, 2018
23 Remaining portions of Utah	January 1, 2019

24
25 **R307-230-3. Exemptions.**

26 The requirements of R307-230 shall not apply to:

- 27 (1) units using a fuel other than natural gas;
28 (2) units used in recreational vehicles; and
29 (3) units manufactured in Utah for shipment and use outside
30 of Utah.

31
32 **R307-230-4. Definitions.**

33 The following additional definitions apply to R307-370:

34 "Heat output" means the enthalpy of the working fluid
35 output of the unit.

36 "Heat input" means the heat of combustion released by fuels
37 burned in a unit based on the higher heating value of fuel. This
38 does not include the enthalpy of incoming combustion air.

39 "Recreational vehicle" means a motor home, travel trailer,
40 truck camper, or camping trailer, with or without motive power,
41 designed for human habitation for recreational, emergency, or
42 other occupancy.

43 "Natural gas-fired water heater" means a device that heats
44 water by the combustion of natural gas to a thermostatically-
45 controlled temperature not exceeding 210°F (99°C) for use external
46 to the vessel at pressures not exceeding 160 psig.

47

1 **R307-230-5. Standards**

2 (1) Beginning on the rule implementation date specified in
 3 Table 1 for each area of the state, no person shall sell or
 4 install any natural gas-fired water heater with an emission rate
 5 exceeding the limit in Table 2. The NO_x limits are expressed in
 6 nanograms of nitrogen oxides (calculated as NO₂) per Joule of
 7 heat output.

8

9

TABLE 2

10 NO_x Emission Rate for Natural Gas-Fired Water Heaters

11

12 Category	13 Limits(ng/Joule)
14 Water heater up to 75,000 BTU/hr, 15 excluding those installed in mobile homes	10
16 Water heater 75,001-2,000,000 BTU/hr	14
17 Any tank with power assist	10
18 Mobile home water heater	40
19 Pool/spa heater less than 400,000 BTU/hr	40
20 Pool/spa heater 400,001-2,000,000 BTU/hr	14

21

22 (2) The water heater manufacturer shall display the model
 23 number and the NO_x emission rate of a water heater complying with
 24 this rule on the shipping carton and on the permanent rating
 25 plate of each unit.

26

27 **KEY: Water heaters, natural gas, NO_x, air quality**

28 **Date of Enactment or Last Substantive Amendment: 2015**

29 **Authorizing, and Implemented or Interpreted Law: 19-2-101; 19-**
 30 **2-104**