Building Electrification Technical Supplement for the 1997 Annual PM2.5 NAAQS

Introduction

As part of the disapproval of the San Joaquin Valley 12 ug/m3 annual PM2.5 SIP, EPA stated that the SIP did not have enough documentation that Best Available Control Measure (BACM) was in place for space and water heaters since many localities are adopting requirements for buildings to go all-electric. As part of CARB's submittal for the 15 ug/m3 to support approval of this SIP by EPA, EPA conveyed that this topic would need to be addressed.

District Analysis

Many residential appliances, such as water heaters and furnaces, use natural gas or liquefied petroleum gas (fossil fuel) as a fuel source. These appliances have the potential to emit oxides of nitrogen (NOx) during combustion. While emissions from buildings represent a small component of total PM2.5 and precursor emissions, water and space heaters comprise a large portion of total building-related emissions. The District, in partnership with the South Coast Air Quality Management District (AQMD), has long enforced the most stringent requirements for water and space heaters in the nation, enforced through District Rules 4902 (Residential Water Heaters)[1], 4308 (Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/HR to Less Than 2.0 MMBtu/HR)[2], and 4905 (Natural Gas-Fired, Fan-Type Central Furnaces)[3], to reduce emissions from these source categories. The District currently requires the most stringent measures feasible to implement in the Valley for residential water heaters and furnaces. Along with South Coast AQMD, the District currently requires the most stringent NOx limit of 10 ng/J and 14 ng/J from water and space heaters, respectively. Electrification of water heaters and furnaces use technology currently beyond reasonably available control measure (RACM) and BACM requirements, and feasibility and cost issues have previously prevented widespread electrification around the nation, particularly with respect to lower income households given the significantly higher cost associated with electrical infrastructure and device costs.

In addition to regulatory requirements, the District is also reducing emissions through the District's Fireplace & Woodstove Change-Out incentive program. The program offers a substantial incentive to purchase and install cleaner space heating appliances. Since the Fireplace & Woodstove Change-Out Program's inception, the program has helped replace over 21,000 wood burning appliances with natural gas inserts, stoves, and fireplaces. Through recent changes to the program providing the greatest levels

[1] SJVAPCD. *Rule 4902 Residential Water Heaters.* March 19, 2009. Retrieved from: https://www.valleyair.org/rules/currntrules/r4902.pdf

[2] SJVAPCD. *Rule 4308 Boilers, Steam Generators, and Process Heaters - 0.075 MMBtu/hr to less than 2.0 MMBtu/hr.* November 14, 2013. Retrieved from: https://www.valleyair.org/rules/currntrules/03-4308_CleanRule.pdf

[3] SJVAPCD. *Rule 4905 Natural Gas-Fired, Fan-Type Central Furnaces.* December 16, 2021. Retrieved from: https://www.valleyair.org/rules/currntrules/r4905_03.pdf

of incentives for electric heat pump devices, residents have installed 21 electric space heating and cooling heat pumps in Valley homes. Under this program, residents are provided incentive funding up to $5,000 to install an electric heat pump. Additionally, with the recent enactment of the Inflation Reduction Act, income-qualified residents will now be able to take advantage of new funding aimed at retrofitting homes with upgraded electrical capacity and heat pumps.

CARB has established the goal of reducing greenhouse gas (GHG) and criteria pollutants through reducing fossil fuel consumption from building appliances. The *2022 State SIP Strategy for State Implementation Plan* states (*2022 State SIP Strategy*) states CARB's goal of implementing a statewide zero-emission standard by 2030.[4] CARB reiterated this goal in their *Final 2022 Scoping Plan for Achieving Carbon Neutrality* (*2022 Scoping Plan*), outlining CARB's goal of reducing emissions from both residential and commercial buildings.[5] The *2022 Scoping Plan* also stated CARB's goal of requiring a zero-emission standard for all new space and water heaters by 2030 for new or existing residential and commercial buildings. Upon fulfilling these commitments, the State expects to experience significant air quality and public health benefits. The District continues to support CARB in the development and implementation of this measure, as it will result in direct air quality and public health benefits for the Valley.

Other air districts around the State are considering strategies that are similar to that adopted by CARB under the *2022 Scoping Plan* and *2022 State SIP Strategy*. For example, on March 15, 2023, the Bay Area Air Quality Management District (BAAQMD) adopted requirements for residential and commercial space heating appliances starting with phasing out gas water heaters in 2027. Similarly, South Coast AQMD has committed to adopt the zero emission standard developed by CARB for new space and water heaters in new constructions and equipment replacement by 2030 in their *2022 Air Quality Management Plan*, in addition to low-NOx and incentive-based strategies.[6] Given the similar timing of these measures, there will be limited if any additional benefit beyond those provided under CARB's measure, and no additional reductions in the 2023 timeframe.

Additionally, as of January 2023, sixty-four cities and five counties in California have adopted local ordinances requiring varying degrees of building electrification requirements (none in the Valley). Notably, the socioeconomic profiles of these cities and counties are vastly different from those found within the District. Based on 2020

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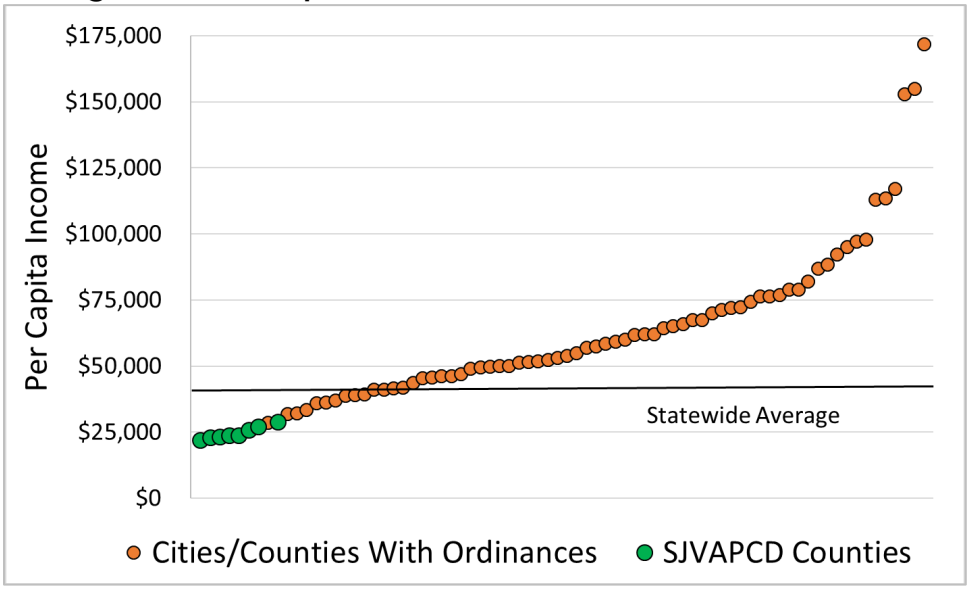
[4] CARB. *2022 State Strategy for the State Implementation Plan*, pp. 101-103. September 22, 2022. Retrieved from: https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf
[5] CARB. *Final 2022 Scoping Plan for Achieving Carbon Neutrality*. November 16, 2022. Retrieved from: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf
[6] SCAQMD. *2022 Air Quality Management Plan*. December 2, 2022. Retrieved from: http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/final-2022-aqmp.pdf?sfvrsn=10

Census data, the per capita income for each District resident averaged $24,708 while cities with building electrification ordinances averaged a per capita income of $60,969.

Figure 1: Per Capita Income (in 2020 dollars), 2016-2020



The District currently requires the most stringent measures feasible to implement in the Valley for residential and commercial water heaters, boilers, and furnaces. In an effort to identify potential emission reduction opportunities, the District's *2022 Plan for the 2015 8-Hour Ozone Standard* (*2022 Ozone* Plan) includes a further study commitment to evaluate current and upcoming work from CARB and other agencies related to reducing emissions from residential and commercial combustion sources, and evaluate the feasibility of implementing zero emission or low-NOx requirements for these sources in the Valley. Through this effort, the District will also evaluate opportunities to advocate for funding under the Inflation Reduction Act, Bipartisan Infrastructure Law, and other funding sources, which are prioritizing funding opportunities for electrification of appliances to reduce greenhouse gas emissions. The District will continue to closely track regulations being developed by CARB, South Coast AQMD, BAAQMD, and others. Additionally, although the District currently implements the most stringent measures feasible, the District remains committed to pursuing electrification opportunities where feasible, taking into consideration equitable and feasible strategies.

CARB Analysis

As part of the approved 2022 State SIP Strategy, CARB committed to developing a statewide zero-emission space and water heater regulation to be brought to CARB for consideration in 2025 and implementation in 2030. The primary goal of this measure is to reduce emissions from new residential and commercial space and water heaters sold in California. CARB would set an emission standard for space and water heaters to go into effect in 2030. Through meaningful engagement, CARB would adopt a statewide zero-emission standard which would have criteria pollutant benefits as a key

result along with GHG reductions. Beginning in 2030, 100 percent of sales of new space heaters and water heaters would need to comply with the emission standard.

The public process to undertake a rulemaking of this scope, would be at least two years so it would be impossible to have a rule in place by 2023, let alone new compliant units in place in time for emissions reductions in 2023. Manufacturers need time to ramp up production of zero-emission technologies to meet the expected demand. For example, despite the fact that appliance saturation studies in California show residential electric use for space heating has quadrupled over the last 10 years, manufacturing and deployment would need to continue to accelerate to meet the demand under a new zero-emission space and water heater standard.[7] Further, CARB would need to design any such standard in collaboration with energy regulators (U.S. Department of Energy and California Energy Commission), and building code regulators (California Building Standards Commission, California Department of Housing and Community Development, and California Energy Commission), and with air districts, ensure it was consistent with all State and local efforts, and would work carefully with communities to consider any housing cost or affordability impacts, recognizing that reducing emissions from space and water heaters can generate health benefits and cost-savings with properly designed standards.

CARB understands that this measure needs to be part of a suite of equity-promoting and complementary building decarbonization policies deeply informed by public process that include scaling back natural gas infrastructure, expanding construction of zero-emission buildings, and building a sustainable market by increasing affordability and accessibility through expanding incentive programs, ensuring utility rates are supportive of electrification, developing the workforce, and increasing consumer education. As part of the public process for equity promoting building decarbonization, CARB is reviewing and considering reports like Building Energy, Energy and Power (BEEP) Coalition's *Community Priorities for Equitable Building Decarbonization* Equitable.[8] Community engagement will be a critical aspect of the entire public process. CARB needs to engage with community-based organizations and other key stakeholders to incorporate equitable considerations for low-income and environmental justice communities where feasible.

Finally, the attached 2022 Scoping Plan Appendix F includes additional information on building decarbonization feasibility – technical feasibility, costs and costs savings, and consumer acceptance, adoption, and awareness and readiness factors that impact feasibility such as adequate funding for incentive programs, building-level electrical

[7] Opinion Dynamics, *California Heat Pump Residential Market Characterization and Baseline Study*, Figure 18. May 17, 2022. Retrieved from: https://www.calmac.org/publications/OD-CPUC-Heat-Pump-Market-Study-Report-5-17-2022.pdf

[8] Building Energy, Equity and Power Coalition, *Community Priorities for Equitable Building Decarbonization.* March 1, 2022. Retrieved from: https://ww2.arb.ca.gov/sites/default/files/2022-03/BEEP%20Letter%20and%20Report_Equitable%20Decarb%20March%202022.pdf

panel capacity, and energy rate affordability – in order to identify barriers and opportunities to help accelerate the decarbonization of new and existing buildings.[9]

Conclusion

While the District and CARB support the deployment of a building decarbonization measure by 2030, there are limited to no potential reductions available as a BACM by the 2023 attainment timeframe beyond those currently available under local, State, and federal regulations and programs. Additionally, given the potential significant impacts to low-income residents, careful equity considerations must be taken into account as new measures are developed. It is not feasible to adopt and implement an equitable statewide zero-emission space and water heater regulation to be effective in the Valley starting in 2023 considering the necessary public engagement needed with communities and stakeholders, and timeline needed for manufacturers to ramp up production of zero-emission technologies to meet the expected demand. Nor, would a statewide zero-emission space and water heater regulation be considered BACM in 2023.

[9] CARB. *Final 2022 Scoping Plan for Achieving Carbon Neutrality*, *Appendix F: Building Decarbonization,* pp. 5-23. November 16, 2022. Retrieved from: https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-f-building-decarbonization.pdf