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Field testing of gas space and water heating appliances efficiency

There is a lack of data on the real-world efficiency and emissions of natural gas furnaces and water heaters. When comparing emissions between electric heat pump appliances and gas alternatives, comparisons often use field efficiencies for heat pumps and rated efficiencies for natural gas appliances. For example, a heat pump water heater (HPWH) may have an energy factor of 3.5, and an annual coefficient of performance (representing field efficiency) of 2.7. A typical gas storage water heater may have a 0.6 energy factor rating, but the annual coefficient of performance might be closer to 0.5. Unfortunately, there is no data to allow the use of the annual coefficient of performance for gas appliances.

Natural gas appliances also perform less efficiently in the field than in lab testing, due to factors such as burners that get clogged by dust or rust, scale and sediment buildup in heat exchangers, less efficient operation when cycling, i.e. responding to multiple short water draws vs. a single large draw, etc. Assessing the efficiency and emissions of natural gas appliances at different stages of their life and in representative field conditions would better support California's air pollution and decarbonization policies, such as SB 32 and AB 3232 if it becomes law, and would maximize pollution and greenhouse gas reductions benefits for Californians.