From: KEN GARBER <kengarber@prodigy.net>
Sent: Thursday, July 28, 2022 12:08 PM
To: Planning <Planning@a2gov.org>
Subject: Heat pump versus gas utility costs

To the Planning Commission:

At the commission's July 19 discussion of the Village rezoning and site plan, the question of higher renter utility bills resulting from building electrification came up. It's true that heating buildings with air source heat pumps, as opposed to gas furnaces, is more expensive, because electricity is costlier than gas per Btu consumed. But the actual difference needs quantification. Tim Loughrin of Robertson Brothers told you this at the meeting: "When we talk about our renters, when they see their first year utility bill being 150 percent to 200 percent of what it is across the street, we're going to lose them." (See discussion at 53:17 of the Youtube meeting video.)

That 150-200 percent figure is incorrect. To estimate the actual utility cost differential, I offer the following analysis.

Heat consumption per household. According to the U.S. Energy Information Administration (EIA), Michigan's total residential energy consumption in 2020 was 770.5 trillion Btu. The state had 3,980,408 households (census bureau figure). So average energy consumption per household was 193,573,120 Btu. According to the EIA, space heating accounts for 55% of household energy consumption in Michigan. So total annual energy consumption for space heating per household is 106,965,210 Btu, or approximately 1070 therms. (One therm = 100,000 Btu.)

Gas expense per household. The average annual household space heating requirement of 1070 therms is equivalent to 1031.8 CCF (hundred cubic feet) natural gas per household. (One CCF of gas equals 103,700 Btu, or 1.037 therms.) DTE's residential rate for gas in July, 2022 is $0.85659 per CCF. So each Michigan household, on average, spends $883.85 a year, plus another $168 in fixed monthly charges (customer charge, IRM, other surcharges), for a total of $1051.85 a year for space heating using natural gas.

Heat pump electric expense per household. Modern heat pumps have a heating seasonal performance factor (HSPF) of 10 Btu/watt-hour. A 10 HSPF heat pump will thus produce 10,000 Btu/kWh, or 0.1 therm/kWh. At the average annual space heating energy demand of 1070 therms, that comes to 10,600 kWh per year electric demand per household. At DTE's current rate of $0.15952 per kWh, that's $1,690 a year. Adding in the approximately $10 a month in fixed charges brings total cost to $1,810 a year for space heating.

Note: an HSPF of 10 is equivalent to a heat pump COP (coefficient of performance) of 2.93. COP is the ratio of heat output to energy input, which falls as the temperature drops. Modern heat pumps rate at 3.8 COP at 47 degrees, and 2.0 COP at 5 degrees, so a winter average of 2.93 is a reasonable assumption.

Conclusion. The additional $758 a year in space heating charges for a heat pump will result in a heating bill that's 72 percent higher than with gas. (Not the 150-200 percent cited by Mr. Loughrin.) That's significant, but is unlikely to give other properties a competitive advantage. Averaged over a full year, the heat pump will add only about $63 a month to the typical renter utility bill. And this doesn't take into the lower cost of air conditioning, since a ductless system is more efficient and cheaper than an air conditioner that blows cold air through ducts. So the utility cost difference will be even smaller.

Recommendation. The difference of $758 (or 4,752 kWh) could be fully eliminated with a 2.7 kW per unit solar array, assuming an average 20% solar capacity factor over the course of a given year. That's about nine solar panels per unit. A tighter building envelope than currently planned would also help.

Respectfully,
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