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Roger Davenport - Re Item 5 Local Ordinance Applications

Additional submitted attachment is included below.

I support adoption of the reach codes being considered under this Agenda item.

But beyond that, I urge the CEC to build off this local leadership and take electrification further by setting an all-electric baseline for new construction in the 2022 building code. I also would ask the CEC to consider actions to retrofit the existing housing stock to reduce natural gas usage.

I am particularly concerned about the continued use of natural gas and propane water heaters in residential buildings. Not only do they pose an explosion/fire hazard in case of earthquake, they are more expensive and produce more emissions than electric heat pump water heaters (HPWH). If we eliminated new installations of gas water heaters and encouraged retrofit of HPWH, we could reduce the gas usage and the associated local emissions in those homes affected by about 50% compared to the average California household. If the HPWH is combined with solar PV, we could reduce the overall emissions attributable to water heating to zero in those homes.

Let me relate my personal experience – I am a solar research engineer, and I know solar and water heating technologies. About a year ago, we retrofitted a HPWH at our home. Over the past year, I measured an average of 0.55 kWh (monthly std. dev. of 0.07kWh) of electrical usage per (adult) person per day for our hot water system. This amount of electricity could be provided by less than 110W of solar PV, at a cost of only $330 (at $3/Watt, very conservative given the current cost of PV). So, assuming a 20-year life of the PV array (again very conservative) **the operational cost to provide ALL the hot water for a person is only about $1.40 per month**, **with zero emissions!** Heat pump water heaters represent a quantum leap beyond other traditional technologies, and solar prices are amazingly low (making solar electricity much cheaper than retail utility rates), and this situation should be exploited!

I have done the calculations to compare HPWH with other sources, and found:

1. Even if all the electricity to run it came from a natural gas power plant, a HPWH results in about half the overall emissions of a gas water heater
2. Retrofitting a HPWH (excluding extraordinary costs like possibly needing a new service entry) pays back against a gas water heater replacement in less than two years.
3. Retrofitting a HPWH in place of an existing electric water heater pays back in about six months.
4. The payback of a HPWH is improved with solar PV since PV produces electricity for about ½-1/3 the retail cost of SDG&E electricity
5. No solar water heating system can compete with a HPWH combined with about 500W of PV to provide all its energy needs. The cost of typical solar water heating systems is $6000-$10,000, and at that they only to provide 50-70% of the water heating energy over the year. A HPWH can be installed for far less money and will result in 100% reduction of natural gas or propane use for water heating. It really isn't even close.

So, my recommendations are as follows:

1. Require HPWH in all new construction houses. Preferably, require enough "extra" PV to cover their entire energy use, as well. This will be the most economic and least-emissions approach.
2. Provide incentives to all existing gas water heater owners in the State of California to convert those gas water heaters to HPWH.
    a. I believe the most effective approach would be to provide a cash incentive to do the wiring necessary to install a HPWH. No one ever wants to take out an operating water heater, and it's always urgent to replace it when it finally fails. By pre-installing

the wiring, a HPWH can be installed immediately when the gas water heater goes out.

b. Since the economics of a HPWH are so much better than a gas (or standard electric) water heater, the homeowner should have sufficient incentive to complete the transition themselves, either immediately (if they are smart) or when their existing gas water heater fails. An additional incentive that encourages them to add solar PV to cover the water heater load would also not be a bad idea, but as our power grid becomes less carbon-intensive the ecological need for this is declining. From a cost standpoint, people should already be putting as much solar on their homes as they can fit.
c. This is a similar approach to the solar water heating incentives that were implemented over several years and which have now expired. The differences are that instead of reducing gas usage for water heating by 50%-70%, this would eliminate it; and, the cost of the incentive would only need to be a couple thousand dollars per household instead of $3000-8,000. So, more homes could be converted and much more gas usage averted. More bang for the buck.

In the longer term (a decade or two) we need to eliminate natural gas use entirely anyway, in order to meet our greenhouse gas emissions goals. But gas water heater replacement is a "low-hanging fruit" that we should prioritize now. Since water heating accounts for half the natural gas use in a typical California home, this single, simple retrofit could take us halfway to our goal in one relatively painless step.

Sincerely,
Roger L. Davenport