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Impacts of Hydrogen

My name is Barbara W. Brandom, MD. I am a retired physician. I have lived in SWPA for more than 45 years. Today I want to present some of the hazards that hydrogen as an energy source presents.

Hydrogen is a smaller molecule than methane. Therefore it is easier for hydrogen to escape from infrastructure during compression, storage, distribution, and use. Of these emissions 20 to 25% are oxidized. This chemical process uses hydroxyl molecules in the atmosphere. Decreased availability of hydroxyl groups increases the half-life of methane in the atmosphere. This is one way hydrogen increases the effects of GHGs. Other ways that hydrogen increases global warming are that hydrogen increases the production of ozone in the troposphere and of water vapor in the stratosphere of the Earth's atmosphere. Both of these changes trap more heat.

When hydrogen is burned in air, no carbon dioxide is produced, but any type of high-temperature combustion including that of hydrogen can produce oxides of nitrogen (NO_x). Ground level ozone is created by reaction between NO_x and volatile organic compounds in the sunlight. More ozone is produced as the heat increases. Ozone can travel long distances in the wind.

There are many potential uses of hydrogen in industry. More than 40 such uses have been sorted into 'rungs on a ladder', each step representing a judgement about the increasing lack of utility of hydrogen. Among the uses that are least competitive are commercial and residential heating and several types of transportation.

Blending hydrogen with methane, for use in buildings has adverse effects on health and is more costly than other energy sources. Using a FLIR (forward looking infrared) camera one can see methane over a cooking stove. If hydrogen is added to cooking gas, it will also accumulate indoors. To minimize this, and the chances of an explosion, a well functioning hood must be in place over the gas burners. There is no requirement in Pennsylvania for landlords to supply hoods with gas stoves.

Furthermore the pipes that would deliver hydrogen to homes will be made more brittle by hydrogen. We have already seen explosions of homes due to leaks of methane. It is to be expected that this will become more frequent, if hydrogen is there.

Rather than accept these added risks and costs, I plan to replace my old gas stove with an induction cook top and electric oven. These will be cheaper and safer than using a mixture of hydrogen and methane.

More importantly, in Pennsylvania making hydrogen includes using methane as a feedstock. Between 1% and 9% of methane escapes during extraction and production, which increases global warming. Burning fossil gas will produce fewer GHGs than burning hydrogen made from methane (R.W. Howarth, & M.Z. Jacobson, Energy Sci Eng. 2021;9:1676-87.).

Hydrogen essential to industry, should be captured from the ground as methane has been. Hydrogen is produced continuously by geologic processes. Geologists have discovered natural hydrogen in many places, including the USA.

Instead of investing billions of dollars in producing hydrogen from methane and attempting to sequester captured carbon, those funds should be used to develop sources of energy that do not accelerate global warming. Every investment in fossil fuel infrastructure will result in more deaths from heat illness. Heat is already the largest cause of death from weather related events. Just as heat in the USA increased every year so have heat related deaths. In 2023 there were 2,302 recognized heat related deaths in the USA.

I wish to thank the Physicians for Social Responsibility, for presenting much of the material that I spoke about here on their website (<https://www.psrpa.org/>).

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