June 6, 2022

The Honorable Michael Regan, Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Docket ID No. EPA-HQ-OAR-2022-0289

Dear Administrator Regan,

We write as health organizations to voice concerns about issues the Environmental Protection Agency raises in its draft white paper, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Combustion Turbine Electric Generating Units." We represent physicians, nurses, public health and health care professionals, medical students, patients and advocates, all dedicated to promoting health and saving lives. Given the U.S. power generation system's potent effects on health and the climate, and the global recognition that climate change is a health emergency, we applaud the EPA for embracing the need to decarbonize. However, we are impelled to underscore the threats to health and climate inherent in the proposed EPA plan.

Specifically, we comment here on three aspects of the plan. First, the proposal to use hydrogen as a fuel, by itself or blended with methane ("natural") gas, will extend the life of methane-burning power plants and will increase the demand for methane, given that most hydrogen will be derived from methane. This will lead to greater emissions of this dangerous greenhouse gas, accelerating climate change. Second, hydrogen use, whether "green" or "blue," is a false solution, given its many shortcomings, several of which we describe below. Finally, adding carbon capture and sequestration, or carbon capture, use and sequestration, to the process introduces serious and little-recognized health hazards into the energy supply.

1. Hydrogen use will increase upstream leaks of methane, a potent GHG

Hydrogen is the most abundant molecule in the universe, but there is very little free hydrogen gas available on Earth; hydrogen is found almost entirely in chemical compounds like water and hydrocarbons. To make hydrogen gas, energy is used to separate hydrogen from these compounds. Virtually all hydrogen gas (99 percent) in the United States is generated by breaking down fossil fuel hydrocarbons, particularly methane but also coal. For this reason, additional demand for hydrogen will require additional extraction of methane.[1] This is highly problematic, given methane's potency as a greenhouse gas (GHG).

Methane escapes into the atmosphere across its entire supply chain, from the extraction, processing, and distribution systems and from inactive and abandoned wells, at significant rates that sometimes exceed earlier estimates by a factor of two to six.[2] A November 2021 study of the intensely drilled and fracked Uintah Basin in northern Utah found that six to eight percent of the total gas extracted escaped as atmospheric emissions, a shockingly high leakage rate that remained constant between 2015 and 2020, even as gas production in the region declined over the same period.[3] Pipelines that carry methane and the compressor stations that keep the gas moving through those pipelines vent methane into the atmosphere as part of routine maintenance operations and represent another climate risk. The distribution lines that deliver gas into homes and offices are a significant source of leaking methane and also contribute to the death of urban trees, according to a 2020 study.[4] Thus, the increased demand for methane inherent in the proposal to use hydrogen can be expected to accelerate GHG levels and climate change.

In addition to its climate impacts, methane causes an array of other human health impacts. At least 75 percent of the methane in the U.S. is obtained by hydraulic fracturing[5] which involves an extensive range of public health risks, including hazardous air pollutants, diversion and pollution of local water supplies, and seismic events, among others.[6]

2. Use of hydrogen use in electrical generating units will not significantly reduce GHGs

The EPA white paper suggests that hydrogen offers a feasible option for reducing greenhouse gases when used as an alternative to methane, especially as a fuel for combustion turbines. We submit that this is not the case, for three reasons: Truly low-carbon hydrogen ("green" hydrogen) is not available on a commercial scale and, when it is produced, should be reserved for use in hard-to-electrify industrial sectors. Second, "blue" hydrogen—hydrogen derived from methane and using carbon capture, utilization and storage to avoid GHG emissions—is not in fact lower-carbon than direct use of methane. Third, the low density of hydrogen gas means that blending hydrogen with methane will not significantly reduce GHGs at levels of blending that are feasible with today's infrastructure.

a. Sufficient “green” hydrogen does not exist

As the white paper notes, hydrogen extracted by breaking down water molecules through electrolysis can result in significant GHG reductions, if the electrolysis process is fueled by renewable sources such as solar or wind power. The hydrogen thus produced is known as “green” hydrogen, and it is indeed low-carbon. What the paper fails to acknowledge is that as of 2018, green hydrogen made up less than one percent of all commercially available hydrogen worldwide.[7] That small quantity of green hydrogen should be reserved for the purposes for which it is currently used, such as fertilizer production and oil refining, and for hard-to-electrify sectors of the economy such as steel production and long-distance transport, including trucking, shipping, and aviation.[8] The majority of hydrogen gas available today and in the foreseeable future will be made from methane, not from water, and thus will increase the demand for that climate-damaging fossil fuel.

b. “Blue” hydrogen is not lower-carbon than direct use of methane

The paper suggests that “blue” hydrogen—hydrogen produced from methane or coal with the addition of carbon capture utilization and storage (CCUS) to capture carbon dioxide emissions—will reduce greenhouse gases from combustion turbines. Yet the draft white paper provides no evidence of this claim. It cites (see EPA’s footnote 65) a web story by one of the developers of a demonstration project—hardly a neutral source—that reflects work that is “still in the early stages,” based so far only on “lab-scale tests,” not field experimentation, and has not yielded data but nevertheless is called “promising.” EPA neglects to discuss two peer-reviewed papers published in scientific journals that find that blue hydrogen will actually increase greenhouse gases compared to using methane directly.[9, 10] As one of those articles specifies, when we account for lifecycle emissions, including fugitive emissions associated with transporting methane to the plants where it is broken down and the additional greenhouse gases emitted from that process and carbon capture processes, blue hydrogen emits more greenhouse gases than methane.[11] We request that recommendations to utilize blue hydrogen be removed from the white paper because of its impact on greenhouse gas levels.

c. Hydrogen’s low density impedes greenhouse gas reductions

The EPA white paper correctly identifies the challenge arising from differences in volume and energy densities between hydrogen and methane. The challenge arises because hydrogen has the highest energy content by weight of any fuel but has comparatively low density, so it requires a greater physical volume to produce the same energy as other fuels.[12] EPA states that a “50 percent reduction in EGU stack emissions of CO2 requires a fuel blend that is approximately 75 percent hydrogen; a 75 percent CO2 reduction requires a blend of 90 percent hydrogen (Goldmeer and Catillaz, 2021).” (The difference in density means there is not a linear relationship between volume and greenhouse gas reductions.) However, the paper neglects to observe that such high levels of blending are not currently feasible, and it fails to discuss what this means for low blending rates. Examples are cited of combustion turbines using blends of hydrogen at five to 10 percent blending, with a possibility of 20 to 30 percent blending being successful. Yet a 20 percent blend by volume only reduces greenhouse gases by at most six percent.[13] Even a 30 percent blending rate would reduce GHGs by at most 10 percent. Thus, any level of hydrogen blending that is feasible with current infrastructure and technology proves to be insufficient to meet climate targets.

3. Carbon capture and storage introduces dangerous risks to health

Carbon capture and storage (CCS), or carbon capture, use and storage (CCUS), are proposed as a means of decarbonizing hydrogen made from fossil fuels. However, reliance on CCS or CCUS would add to power generation a suite of problems that EPA has failed to take into account. There are public health risks associated with each stage of the CCS process: at the capture site, during transport, and at the sequestration or storage site. Moreover, each stage of CSS technology requires its own energy sources, which generate additional climate-damaging emissions that are not captured.

a. Harms begin at the capture site

Carbon capture systems require energy to operate; thus, the construction of a CCS or CCUS facility at a power plant would increase energy consumption and would release its own greenhouse gases and other pollutants. CO_2 capture systems also require copious amounts of water, leading to extensive water consumption and increased water pollution,[14] often in areas already facing water scarcity. Many of the frontline communities already adversely impacted by energy generation plants would be in danger of further harm caused by the localized pollution in the form of increased emissions and water pollution associated with the addition of carbon capture units. This increase of disproportionate health burdens is unacceptable.

b. Transport extends severe risks to distant communities

Large-scale development of CCS/CCUS across the US will require the construction of thousands of miles of new pipeline infrastructure.[15] Each of these pipelines would impact ecosystems along its route, contributing to such environmental harm as destruction of forests, damage to agricultural land, and, where waterways are crossed, erosion, sedimentation and loss of water quality. The Pipeline and Hazardous Materials Safety Administration (PHMSA) released an advisory regarding CO_2 pipelines in May 2022, warning about the potential for damage to pipelines caused by earth movement and by phenomena associated with climate change, such as increased rainfall and higher temperatures.[16] As we experience increasing climate change, those risks will intensify.

In order to be transported via pipeline, CO_2 is placed under extremely high levels of pressure, compressing the gas and rendering it a highly pressurized liquid. Rupture of a pipeline carrying highly pressurized liquid CO_2 results in an explosive release of an extremely cold (below -70^{o} C) flood of liquid CO_2. That liquid, once released from the pipeline, would then expand into ground-hugging clouds of gas and small particles that continue to spread until the supply is turned off.[17] Because humans exhale CO_2 during respiration, many people hold the misperception that CO_2 is harmless; in fact, concentrated CO_2 is an asphyxiant. At a concentration of four percent or higher, CO_2 is immediately dangerous to life and health.[18] If it were accidently released in large quantities, such as from an accident involving a pipeline, the concentrated CO_2 gas would displace ambient air and endanger the lives of anyone caught in the resulting CO_2-laden cloud. In such a case, the potential exists that mass casualties would overwhelm rural emergency health systems. In addition, because CO_2 displaces oxygen, internal combustion engines would be rendered inoperable near a leak or rupture, interfering with emergency responders.

c. Storage sites would need to remain intact forever

The transported CO_2 is envisioned as being stored in underground vaults or chambers. These chambers would have to remain stable and leak-proof essentially forever; however, the presence of the stored CO_2 could increase the occurrence of earthquakes.[19] Sub-surface leaks of CO_2 could affect drinking water aquifers, since CO_2 when it combines with water forms carbonic acid, thus acidifying the water.[20] If CO_2 were to leak to the surface, it could damage surface ecosystems or structures, and high concentrations of CO_2 could endanger people and animals, as described above. In addition, leaks to the surface would result in the CO_2 entering the atmosphere and contributing to greenhouse gas accumulations, thus undermining the theoretical value of the entire CCS process.

Conclusion

The EPA should not be promoting hydrogen, especially not fossil fuel-derived hydrogen, to meet GHG reduction targets when evidence suggests that it will increase GHG emissions, not reduce them. We can achieve greater reduction of CO_2, and better safeguard human health and safety, by opting not to extend the life of fossil fuel plants. Promotion of a methane-based approach in particular would be harmful to the climate and antithetical to the commitments made in the White House Office of Domestic Climate Policy, which committed to a 30 percent reduction in methane from 2020 levels of emissions by 2030.[21] More broadly, it is an inappropriate role for EPA to advance unproven technologies that contribute negligible benefit or, worse, harm the climate, damage the environment, put local populations at risk and disproportionately impact already disenfranchised communities. Rather, EPA should instead focus its energies, research and funding on existing and accessible renewable energy sources like wind and solar and on energy efficiency.

Sincerely,

Alliance of Nurses for Healthy Environments

American Lung Association

Medical Students for a Sustainable Future

Physicians for Social Responsibility

Chesapeake Physicians for Social Responsibility

Greater Boston Physicians for Social Responsibility

Oregon Physicians for Social Responsibility

Physicians for Social Responsibility Arizona

Physicians for Social Responsibility Pennsylvania

Physicians for Social Responsibility Colorado

Washington Physicians for Social Responsibility

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