Written Testimony on
The Public Health Impacts of Blue Hydrogen
Submitted to the PA House Environmental Resources & Energy Committee
Hearing on Hydrogen Hubs and Climate
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Chair Vitali and other members of the Pennsylvania House Environmental Resources & Energy Committee:

Thank you for the opportunity to submit written testimony on the serious public health threats introduced by the blue hydrogen lifecycle.

"Blue hydrogen" refers to the production of hydrogen through steam methane reformation, an energy-intensive process that mixes methane gas with water to create carbon dioxide and hydrogen. Most of the methane used in this process is extracted from fracking wells, categorizing blue hydrogen as a fossil fuel endeavor. The second key feature of blue hydrogen is the capture and storage of the carbon dioxide released. Referred to as carbon capture and sequestration (CCS), this technology lacks evidence of safety, financial feasibility, and effectiveness.

According to a current article in Scientific American, "[C]arbon dioxide doesn't necessarily stay in the rocks and soil. It may migrate along cracks, faults and fissures before finding its way back to the atmosphere. Keeping pumped carbon in the ground—in other words, achieving net negative emissions—is much harder. Globally there are only [a] handful of places where this is done. None of them is commercially viable…. Meanwhile numerous CCS plants have failed. In 2016 the Massachusetts Institute of Technology closed its Carbon Capture and Sequestration Technologies program because the 43 projects it was involved with had all been canceled, put on hold or converted to other things."[i]

Many experts believe that some end uses—long-haul heavy-duty trucking, high-temperature industrial processes like steelmaking, and long-duration energy storage of renewable energy—may not be readily electrified or decarbonized through other less polluting technology. So, blue hydrogen may offer a way to temporarily decarbonize such uses. But experts also advise that the technology should be deployed only when it serves the most efficient pathway to a decarbonized economy, complementing proven and readily available alternatives.

Health impacts of upstream extraction and fossil fuel infrastructure expansion

The blue hydrogen lifecycle is far from clean. It begins with the extraction of fossil fuels—typically shale gas—as feeder stock. Blue hydrogen's reliance on hydraulically fractured shale gas wells negates any downstream gains in emissions.

The fracking process emits a variety of toxic chemicals, such as fine particulate matter (PM2.5), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), glycol, and radium into Pennsylvania communities. There are more than two dozen epidemiological studies[ii] that associate proximity to shale gas development with negative health outcomes, including the Pennsylvania Environment and Health studies[iii] released just last year, which found associations with poor birth outcomes, childhood cancer, and asthma exacerbation. Other health impacts identified by the broader body of literature include:

- Heart failure and high blood pressure
- Upper and lower respiratory issues
- Cancer
- Chronic fatigue and migraines
- Stress and anxiety

Safety concerns related to transport and storage of hydrogen and carbon dioxide

There are serious public health concerns related to the transportation and storage of gas feeder stock, used wastewater, gas byproducts, and the hydrogen itself once produced. Whether these products or byproducts are transported by diesel trucks, trains, ships, or pipelines, potentially harmful emission releases occur at every stage of the process. The risks of accidents and explosions also increase. Additionally, operators are challenged to find proper ways to store or dispose of waste, which typically contains hazardous chemicals and often radioactive substances.
Hydrogen is highly corrosive, and the molecules are much smaller than methane molecules, which can lead to embrittlement, leaks, and risk of explosion[iv] in pipelines and household gas infrastructure.

With regards to the CSS part of the process, storing carbon dioxide underground will require as many as 96,000 miles[v] of new pipelines that will pose serious, even fatal, health risks. The carbon dioxide flowing through these pipelines and injected underground will be highly concentrated and could lead to asphyxiation by displacing oxygen in the air if leaks occur.[vi] In February 2020, a pipeline carrying CO_2 through the rural town of Satartia, Mississippi, ruptured, sending a cloud of CO_2 mixed with hydrogen sulfide dispersed across the landscape in a green fog.[vii] [viii] As CO_2 displaced oxygen in the air, residents and first responders struggled to breathe and lost consciousness. Over 200 people were evacuated and over 45 hospitalized. Emergency response vehicles entering the area, as well as cars evacuating, stalled or could not start as their combustion engines could not operate without oxygen. The serious public health threats from pipelines carrying CO_2 cannot be overlooked.

A <u>false</u> climate solution

The idea that blue hydrogen and its associated CCS technology will help solve the climate crisis is false. A 2021 study by researchers at Cornell and Stanford Universities[ix] estimates that the greenhouse gas footprint of blue hydrogen is more than 20% greater than burning shale gas for heat, largely due to the methane emissions during the shale gas lifecycle. The researchers' analysis also assumes that CO_2 is captured and stored indefinitely, which they consider "an optimistic and unproven assumption."

A large-scale blue hydrogen industry would facilitate more releases of climate-altering methane, which carries a heavy public health burden, as lethal storms, fires, heat waves, floods, and other extreme weather events impact people's physical and mental health worldwide. Hydrogen itself is also an indirect greenhouse gas and can extend the lifetime of methane and other greenhouse gases.

CCS is touted as the climate saving element of blue hydrogen, but it too will contribute significantly to climate warming through the energy it requires and technological failures. CCS technology is unlikely to meet the Clean Hydrogen Production Standard[x] set by the federal government. To date, many carbon capture projects have not been able to meet the 90% capture rate promised by industry, with some projects well below 40%.[xi] A recent study modeled the carbon intensity of blue hydrogen with more realistic assumptions about capture rates, leakages, and emissions. Under these assumptions, blue hydrogen is at least three times more carbon intensive than the federal standard.[xii]

Further, the primary use of currently captured CO_2 is actually to <u>extract *more* oil and gas in the United States.</u>[xiii] In a method called Enhanced Oil Recovery (EOR), CO_2 is injected into oil-producing rock formations to push out the hydrocarbons from the pore space and into the well. This technology has existed since the 1970s and is a relatively common practice in oil fields, such as the Permian Basin in West Texas. At the end of the day, blue hydrogen is a crutch for the fossil fuel industry.

EHP calls for robust and comprehensive public health protections around any fossil fuel extraction, transportation, or production process:

- Industry must be compelled to effect stringent emissions detection and reporting—working with communities to reduce exposure and alert the public of any unusual releases, whether planned or accidental.
- Government agencies must be intrinsically involved in making sure industry complies with pollution standards, holding operators accountable when they do not comply.

- Health impact assessments and other community health monitoring must be put in place to ensure public health is protected today and into the future. Residents must be informed fully about health risks to which they are exposed.
- It is not enough to regulate sources of emissions singly. All sources of emissions must be aggregated to determine actual levels of pollution the public is exposed to in any given locality.
- Production facilities, well pads, compressor stations, and other infrastructure must be situated far enough from areas of human activity—including homes, schools, businesses, and recreational facilities—to protect public health. EHP recommends these setback distances be at least one-half mile.
- Government subsidies must be reserved for energy projects that are truly clean and based on renewables. Further support for fossil fuels industries will only exacerbate the climate crisis and add to the pollution burden impacted communities already carry.

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