Environmental Defense Fund 45V Public Hearing Testimony

March 26, 2024

Introduction

Hello, my name is Dr. Ilissa Ocko, and I am a Sr. Climate Scientist at the Environmental Defense Fund. EDF is a global environmental organization with a mission to stabilize the climate and build a vital earth for everyone. At EDF, I lead our science team in pursuing research on the climate *impacts* of hydrogen systems. My specific expertise is in atmospheric physics, and I hold a Ph.D. in Atmospheric and Oceanic Sciences from Princeton University.

I want to thank the Department of Treasury for providing me the opportunity to testify today. I also want to commend Treasury on a strong first draft of the 45V guidance and thank you on behalf of EDF for the hard work it has taken to get to this position.

My remarks today will focus on ensuring the climate integrity of hydrogen production systems so that the 45V hydrogen production tax credit does what it is intended to do – which is help the US achieve its climate goals.

Importance of 45V

Clean hydrogen has the potential to solve some of the world's most pressing decarbonization challenges.

However, clean hydrogen is *not inherently* climate neutral. In other words, even clean hydrogen systems can contribute to climate change, in large part based on the way hydrogen is produced. If we want hydrogen to be an effective decarbonization strategy, it is paramount that we adequately account for all climate impacts of hydrogen production projects and only incentivize those that are consistent with climate goals.

And, because 45V will essentially define clean hydrogen in the US, the decisions we make *today* will shape the hydrogen economy for decades to come.

So today I will focus my remarks on three key factors that play an important role in determining the climate impacts of hydrogen production: electricity sourcing, methane emissions, and hydrogen emissions.

Sourcing of electricity

Electricity sourcing is important because electrolytic hydrogen production is a very energy-intensive process. If the renewable electricity we use to split water molecules is diverted from the power grid, which is often referred to as **not** "additional" or "incremental," it is very likely that we will need more fossil fuels to supplement the grid. My teams' research shows how system-wide greenhouse gas emissions can more than triple if this happens, making the climate worse.

This is why accounting for additionality, as in the three pillars framework included in the current 45V draft, is essential for preventing large-scale emissions increases and achieving climate goals.

Studies, including research we commissioned by Environmental Resources Management, also show that there are many benefits to the energy system from requiring the 3 pillars framework -- including incentivizing domestic power sector solutions, hydrogen storage build-out, and the deployment of more flexible electrolyzers that can succeed after 45V expiration.

AND, studies from Princeton University, Energy Innovation, and Evolved Energy Research make abundantly clear that without the 3 pillars, 45V could add hundreds of millions of tons of pollution per year.

We therefore strongly recommend that Treasury upholds the three pillars framework in its final rule for the 45V Production Tax Credit.

Methane emissions

The second issue I want to discuss is methane emissions.

Methane emissions are relevant because producing hydrogen using natural gas with carbon capture is a widely proposed strategy to produce low-carbon hydrogen, and natural gas is comprised primarily of the potent short-lived greenhouse gas methane. When natural gas is vented and leaked throughout the supply chain, it releases methane into the atmosphere.

Hydrogen production facilities using natural gas, including more than half of the DOE Regional Clean Hydrogen Hubs, could make up the majority of new capacity additions in the U.S. over the next decade. For these systems, methane emissions are often the largest contributor to a project's greenhouse gas emissions, and studies, including my teams', show that high methane leakage rates can make hydrogen applications worse for the climate in the near-term than their fossil fuel counterparts.

However, in the draft 45V rules, the GREET model currently assumes a national average methane leak rate that underestimates emissions. This is mostly because it excludes methane emissions from wells that produce and market both oil and gas, which are known as "co-producing wells", and doesn't account for basin-specific leakage rates that are far higher than the national average.

For example, methane leakage rates from natural gas-producing and co-producing wells for the Permian and Uinta basins are around 2% and 4%, respectively; which is two and four times higher than the values used in GREET. If combined with a 90% carbon capture rate, hydrogen producers should not be eligible for the 45V tax credit if using natural gas from these basins. But, because the GREET model doesn't account for basin-level emissions, these projects *would* be eligible, meaning that we are incentivizing hydrogen systems that threaten US climate goals.

To address this issue, we recommend that Treasury kick-start a joint agency process to update GREET methane leakage estimates annually and move towards basin-specific leak rates utilizing reliable and imminent measurement data.

Further, many hydrogen producers have called for Treasury to allow them to submit company-specific gas values, based on differentiated gas certifications or reporting to the GHGRP. This would lead to even greater inaccuracies in methane emission estimates. There are currently no standardized, measurement-based methods for estimating and verifying individual operator emissions. Moreover, because the GREET model relies on a national average, allowing a producer

to substitute a lower loss rate would lead to cherry-picking and make the default national average inaccurate for all other users.

Hydrogen emissions

And finally, I want to discuss hydrogen emissions.

Hydrogen is a leak-prone gas that warms the climate by increasing the concentrations of short-lived greenhouse gases in the atmosphere through chemical reactions. There is scientific consensus regarding hydrogen's warming potency, and its warming effects have been studied for decades and included in four cycles of IPCC reports. A recent multi-model assessment explicitly states that the science is robust enough to be included in policy decisions and tools. But, the warming effects of hydrogen emissions are NOT currently included in 45V greenhouse gas intensity calculations through the GREET model.

Hydrogen is emitted throughout the value chain from both operational releases and leakage. For example, in the production of electrolytic hydrogen, published estimates suggest that nearly 10% of the hydrogen may be emitted from leakage, venting, and purging. While direct measurements are needed to confirm published estimates, these levels of emissions are consequential for the climate. For example, if 10% of hydrogen is lost to the atmosphere from the US's 2030 clean hydrogen production target of 10 MMT, that would have the same 20-year warming impact as adding 8 million gasoline-powered vehicles to the road for one year.

Therefore, hydrogen emissions can significantly undermine the climate benefits of hydrogen use, with two of my teams' peer-reviewed research studies suggesting that the near-term climate benefits of hydrogen deployment can be reduced by 25-40% if hydrogen emissions rates are high.

It is important to note that hydrogen emissions are thought to be a largely solvable engineering challenge. However, this issue won't be solved if industry is not held accountable for these emissions.

Therefore, we recommend that hydrogen emissions be factored into the 45V version of the GREET model. Given that the model already includes hydrogen loss rates, this is as simple as applying a Global Warming Potential value to the loss rates. Ideally, the latest science would be incorporated, but at a minimum, an older value reported in IPCC reports can be used for now.

Conclusion

Overall, only under the *right* conditions can hydrogen be a climate solution, otherwise, we could make climate change even worse.

In closing, here are our three main recommendations:

1) First, continue to implement the three pillars framework;
2) Second, update the methane leakage rate in the GREET model so that it is more accurate and reflects basin-specific rates;
3) And third include the warming effects of hydrogen emissions in greenhouse gas intensity calculations.

Thank you for your time.