Q&A - Hydrogen Emissions Measurement Study

Why is measuring H2 emissions important?

Hydrogen has the potential to be a pivotal part of the energy transition. It is uniquely positioned to tackle emissions from the hardest-to-decarbonize sectors where other solutions fall short.

However, studies indicate that hydrogen released into the atmosphere indirectly causes warming. This warming effect can reduce the intended benefits of hydrogen deployment.

Right now, we know very little about the scale of hydrogen emissions. Studies over the last 20 years suggest emission rate ranges from less than 1% to 20% for various components of the value chain, but this range is uncertain, because there are no empirical data on hydrogen emissions from real-world infrastructure.

We have the opportunity now, as we are building out new hydrogen systems, to learn more about the scale and nature of potential hydrogen emissions, so that we can design effective systems, mitigation strategies, and deploy the best practices that will ensure we maximize hydrogen's climate benefits. Doing this now could also avoid the potential of expensive retrofits in the future.

What does the hydrogen emissions measurement study aim to achieve?

This two-year study will measure and quantify hydrogen emissions across the existing hydrogen value chain in North America and Europe, with the goal of advancing scientific understanding of hydrogen emissions across representative facilities through direct measurement.

By leveraging cutting-edge sensor technology, a unique cross-sector partnership, and proven, peer-reviewed methodologies, the study aims to deliver the most comprehensive, publicly available, representative dataset to date – and ultimately lay the groundwork for best practices and mitigation strategies that will minimize emissions and maximize hydrogen's climate benefits.

Where will you be measuring hydrogen “in the field”?

Measurements will be taken from existing hydrogen operations in North America (mainly the Gulf Coast and California), and Europe (mainly in the Netherlands, France, and Germany). We are targeting locations where existing hydrogen operations are concentrated and prioritizing facilities from our industry partners where access and operational data are available.

When are in-the-field measurements taking place?

After rigorous academic testing in the lab and in the field during 2024, we kicked off the first field measurements in March 2025 in the U.S. Gulf Coast, followed by measurements in the Netherlands in May 2025. Field deployments will be ongoing through early 2026.

How is the hydrogen being measured?

For large industrial facilities, we will capture emissions plumes downwind using an ultra-sensitive hydrogen analyzer developed by Aerodyne Research - the first commercially available instrument capable of measuring hydrogen concentration at the speed and sensitivity needed to quantify site-level hydrogen emissions that are climate-relevant. For smaller refueling stations and vehicles, West Virginia University is developing a new full-flow hydrogen sampling system to directly quantify emissions from individual emission sources, and a portable emission monitoring system connected to tailpipes, respectively.

The new hydrogen sensors used in this study were developed by Aerodyne for the purpose for quantifying emissions in low-concentration plumes (which are climate-relevant) downwind of facilities rather than detecting high concentrations that pose immediate safety risks.

What will the outcome of the study be?

The results will be anonymized and published as papers by the academic leads in peer-reviewed scientific journals.

We will learn about the processes and practices that lead to hydrogen emissions, which will help inform mitigation strategies.