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Refining Hydrogen Emission Measurements: Methodological Insights and Pilot Findings

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Hydrogen is expected to be a key contributor to the energy transition. It represents an energy carrier solution for some sectors that are difficult to decarbonize such as industrial processes or long-distance transport. The hydrogen market is therefore likely to expand rapidly in the coming decades. However, hydrogen has an indirect impact on climate, with an estimated GWP100 around 11.6 ± 2.8 (Sand, 2023). It is thus important to understand how much hydrogen is emitted to the atmosphere during its economic lifecycle (from production, to transport, storage and end-use), as well as design systems to safely minimize the emissions. Frameworks regulating hydrogen emissions are expected in the near future and UK Low Carbon Hydrogen standard already requires measuring, monitoring and reporting hydrogen emissions from hydrogen production facilities.

To ensure the quality and transparency of reported emissions, Equinor started a project in 2023 to develop and test a method to measure emissions from industrial sites. The instrument chosen was a modified mass spectrometer to allow measurements of small concentrations of hydrogen (<1ppm), with a high precision to detect only minor enhancements (~10ppb) above atmospheric background levels. As the performance of the instrument was very encouraging, 2024 was dedicated to trying to quantify emissions from a point source or an industrial site using the tracer ratio method. The selection of tracer was guided by Equinor's safety and sustainability principles adapted to the purposes of this study. Results of small-scale tests, large-scale validation and real-life experiments will be presented.