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Zentrum für Sonnenenergie- and Wasserstoff-Forschung Baden-Württemberg (ZSW)

Location: Helmholtzstr. 8, 89081 Ulm, Germany

Hydrogen Fuel: Assuring Quality to International Standards

ZBT and ZSW build new analysis labs

Hydrogen-powered fuel-cell vehicles enable e-mobility with zero emissions, long range and fast refueling. However, this fuel may be contaminated by impurities that can damage fuel cells, so the quality of hydrogen has to be certified and regularly verified to maximize the service life of vehicular fuel cells. Independent German labs must also be able to conduct these sophisticated analyses in compliance with international standards. Hence, scientists at the *Hydrogen and Fuel Cell Centre (ZBT GmbH)* and the *Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW)* have begun upgrading and extending their laboratories for sampling and analyzing hydrogen as part of the 'Hy-Lab' project. Efforts to this end are underway at the institutes' Duisburg and Ulm facilities.

These days, some 5,000 emission-free, climate-friendly fuel cell-powered cars are already motoring on roads around the world. Like cars equipped with conventional power trains, they have a long service life, can travel far, and be refueled quickly. Hydrogen infrastructure and hydrogen refuelling stations are going up worldwide as manufacturers roll out the first mass-produced models of these cars. Currently, 260 hydrogen refuelling stations are in operation, but the count is expected to rise to 3,500 by 2025, with 600 in place in the USA, 830 in Asia and 2,000 in Europe. Germany plans to extend its installed base of around 25 stations to 400 by 2025. The number of fuel-cell vehicles is to top the 300,000-mark by this time.

Impurities such as sulfur components may contaminate hydrogen during the transport to the refuelling station, and by compressing at the hydrogen station. These contaminants can damage fuel cells. The international SAE J2719 and ISO14687-2 quality standards set out the limits for such impurities. So far, there is no independent laboratory in Germany with the capacity to determine hydrogen quality on the basis of these thresholds. Nevertheless, a quality monitoring of the existing, in planning and under construction refuelling stations must be carried out.

This situation is to be remedied by the project “Hy-Lab - Development of two independed laboratories for hydrogen (H_2) quality measurement according to international standards”. Over the next two and a half years, scientists at ZBT and ZSW are aiming for the evaluation of suitable hydrogen analysis methods and optimised sampling procedures in compliance with international standards. They will also collect and

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analyze hydrogen samples all along the supply chain from production facilities to refuelling stations throughout Germany, and determine the key impurities. In parallel comparative measurements with international laboratories will be carried out. This goes to create the first independent testing facilities in Germany for the very challenging task of monitoring hydrogen quality at refuelling stations, in transit and during production.

All efforts are done in close cooperation with the NOW (National Organization of Hydrogen and Fuel Cell Technology) and the associated partner CEP (Clean Energy Partnership), a network of key automotive companies, gas producers and refuelling station operators.

The German Federal Ministry of Transport and Digital Infrastructure is funding this project with grants totaling EUR 3.08 million as part of the National Innovation Program for Hydrogen and Fuel Cell Technology. NOW is tasked to coordinate this program's implementation.

Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie

Gefördert durch: Bundesministerium für Verkehr und digitale Infrastruktur

Koordiniert durch: NOW Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie

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The Zentrum für BrennstoffzellenTechnik GmbH (Hydrogen and Fuel Cell Centre, ZBT GmbH) is one of the leading European research and development partners in the fields of hydrogen, fuel cells, gas process engineering and storage technologies. The institute currently has around 90 employees and 20 students.

The Zentrum für Sonnenenergie- und Wasserstoff -Forschung Baden-Württemberg (Centre for Solar Energy and Hydrogen Research Baden-Württemberg, ZSW) is one of the leading institutes for applied research in the areas of photovoltaics, renewable fuels, battery technology, fuel cells and energy system analysis. There are currently around 235 scientists, engineers and technicians employed at ZSW's three locations in Stuttgart, Ulm and Widderstall. In addition, there are 90 research and student assistants.

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Pictures and a fact sheet on ZSW are available from:

Solar Consulting GmbH

Sampling at a hydrogen fueling station (photo: ZBT).