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PRESS RELEASE

Project EVERYWH2ERE: Hydrogen as a sustainable option for temporary power generation

Non-road diesel engines account for between five and ten per cent of fine-particle pollution in world cities. These fine-particle emissions from diesel exhaust can be inhaled deep into the lungs and have been declared a carcinogen by the World Health Organisation's International Agency for Research on Cancer. This effect is particularly problematic in cities where construction is an ongoing operation. The London Atmospheric Emissions Inventory (LAEI) estimates that non-road mobile machinery (NRMM) used on construction sites was responsible for 12 per cent of NOx emissions and 15 per cent of PM10 emissions in Greater London.

One solution being investigated is utilising hydrogen as a fuel to replace diesel. The EVERYWH2ERE project, co-ordinated by RINA, aims to make European cities the living laboratory to demonstrate fuel cell and hydrogen technologies by employing temporary hydrogen gensets at construction sites, music festivals and temporary events. The project is building on expertise from seven European nations and will integrate already demonstrated robust proton-exchange membrane fuel cells (PMEFC) stacks and low weight, intrinsically safe pressurised hydrogen technologies into easy to install, easy to transport fuel cell-based transportable gensets.

In a pan-European campaign, eight 25 or 100kW containerised plug and play hydrogen gensets will be tested and data collected.

Hydrogen is the simplest element

An atom of hydrogen consists of only one proton and one electron. It's also the most plentiful element in the universe. Despite its simplicity and abundance, hydrogen doesn't occur naturally as a gas on the Earth - it's always combined with other elements.

The hydrogen in the EVERYWH2ERE project will be supplied by project partner, LINDE Gas Italia, which will allow the team access to all its distribution and production points in Europe. Where possible the hydrogen used will be from renewable sources.

A fuel cell combines hydrogen and oxygen to produce electricity, heat, and water. A single fuel cell consists of an electrolyte sandwiched between two electrodes. Bipolar plates on either side of the cell help distribute gases and serve as current collectors. Depending on the application, a fuel cell stack may contain a few to hundreds of individual fuel cells layered together. This scalability makes fuel cells ideal for a wide variety of applications, such as stationary power stations, portable devices, and transportation.

The fuel cells used are Proton-Exchange Fuel Cells (PEM) supplied by the partner PowerCell Sweden. These are formed by membrane electrode assemblies (MEA) which include the electrodes, electrolyte, catalyst, and gas diffusion layers. An ink of catalyst, carbon, and electrode are sprayed or painted onto the solid electrolyte and carbon paper is hot pressed on either side to protect the inside of the cell and act as electrodes. The pivotal part of the cell is the triple phase boundary (TPB) where the electrolyte, catalyst, and reactants mix and thus where the cell reactions actually occur.

Festival season

Since the 1980s, when outdoor events were becoming more prevalent, a 'plug and play' model has persisted in the events industry, in which event organisers expect power to be cheap, readily available and that power companies will supply generators with an estimated

significant margin of contingency in their capacity to ensure that they can provide a reliable supply of energy, which is often based on unknown or incorrect power requirements.
One of the major sectors that employs temporary power generation are the music festivals that increasingly populate the calendar during the summer months. For each festival attendee, 0.6 litres of diesel are burnt every day, which adds up to five million litres of diesel over each summer in the United Kingdom alone and 12,919 tonnes of CO2 produced. The EVERYWH2ERE project will deploy hydrogen gensets in EU festivals thanks to the support of project partner DELTA1 and the Green Music Initiative. The project already receivedsupport from more than 30 festivals across Europe during the demonstration phase including Dimensions Festival (Croatia), Rock in Rio (Portugal), Akasha Festival, Artlake Festival, Kombinat Festival, Tollwood Festival, Rocken am Brocken Festival (Germany), Wiesen Festival (Switzerland), Somos Estrellas Festival (Spain) and Shambal Festival (UK).
The generators will also be tested at two construction sites belonging to another project partner, ACCIONA, one of the EU leading player in the building infrastructure sector. The first is the construction of the Frederikssund Bridge in Denmark and one is in Spain where they are building high-speed train infrastructure in Galicia.

Sustainable legacy
The EVERYWH2ERE project kicked off in February 2018 and will run for five years until January 2023. The initial three years will be dedicated to understanding and designing the generators with the remaining two years set aside for the live trials and data collection. The results will be analysed and utilised to deliver a commercial roadmap and suitable business model for commercialising the gensets by 2025.

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