PRESS RELEASE

BOC Fuels Ireland's First Hydrogen Bus

Guildford, UK, 11 November 2020 – BOC, a Linde company, is the exclusive hydrogen fuel supplier for Ireland's first hydrogen bus trial. BOC will produce and supply green hydrogen, through the process of electrolysis using renewable electricity, at its plant in Dublin. The eight-week hydrogen bus trial commenced on 9th November and next week will see the public welcomed on board for the first time.

BOC is a member of Hydrogen Mobility Ireland (HMI), a group of industrial stakeholders aiming to develop the use of hydrogen for mobility in Ireland. Other members of HMI supporting the hydrogen bus trial include bus operators Bus Éireann, Dublin Bus, Dublin City University and Dublin Airport, as well as Toyota Ireland and the Department of Transport.

Alan Nolan, HMI Coordinating Director, said: "BOC bring years of experience in developing hydrogen infrastructure as well as safe, reliable refuelling stations. That combined with a strong local presence, producing Hydrogen in Dublin for over 25 years, has made them an ideal HMI member and refuelling partner in this innovative project."

"BOC is delighted to be part of Ireland's first hydrogen powered bus trial. As a Linde company we've installed nearly 200 hydrogen refuelling stations worldwide and successfully fuelled over 1.5 million hydrogen vehicles," said Andreas Bieringer, Director of BOC Ireland. "We have the experience and capability to support HMI's desire to quickly scope and implement profitable hydrogen mobility projects at scale, driving carbon reduction and helping to achieve net-zero emission targets."

BOC is working closely with HMI to develop a hydrogen mobility roadmap for Ireland's transport sector. This will drive forward Ireland's ambition to establish a comprehensive refuelling infrastructure that will support commercial and private hydrogen transport.

BOC has been safely producing, storing and distributing hydrogen throughout Ireland for over 25 years and is currently the only commercial producer of hydrogen in the country, supplying key Irish industry sectors, such as aerospace, electronics, pharmaceutical and medical. BOC owns and operates the UK's

largest and highest performing bus refuelling station at Kittybrewster, Aberdeen, which opened in 2015 as a bus refuelling station. It went on to open to the public for car and van refuelling and recently welcomed the world's first double decker hydrogen bus.

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About BOC

BOC, a Linde company, is leading the UK and Ireland's drive to enable commercial and private hydrogen transport supported by a UK-wide refuelling network. Its clean fuels team designs, builds and operates proven, reliable and scalable refuelling station solutions that offer fast and familiar refuelling, using hydrogen. It supports local councils and transport operators who are aiming to take immediate action on air pollution and achieve net zero emissions by 2050.

BOC is a trusted partner with over 25-years' experience progressing hydrogen as a fuel. It has worked on a range of infrastructure projects including the UK's first open access hydrogen refuelling station in Swindon and UK's largest and highest performing refuelling station at Kittybrewster, Aberdeen. It has also delivered ground-breaking ventures internationally, including the roll-out of hydrogen-fuelled trains in Germany with project partners, Alstom.

Hydrogen as a fuel – summary

Hydrogen is the most abundant element in the universe. It is produced in a number of ways, which vary in efficiency, carbon intensity and cost. Production methods include steam methane reformation (SMR), as well as being a by-product from the chemicals industry.

It is also possible to produce **green hydrogen** from electrolysis using renewable energy. This process extracts hydrogen from water with no emissions and is currently the only way to produce zero-carbon hydrogen.

Hydrogen is stored as a compressed gas at the refuelling station until its needed, when it is pumped into the vehicle under pressure. One of the key benefits of hydrogen is that refuelling is a fast and familiar process, which is similar to refuelling a diesel vehicle. It takes around 10 minutes to refuel a bus, which can cover a range of around 350km, and 5 minutes for a car enabling a range of 500km.

There are zero emissions from the fuel-cell vehicle – just clean water from the tail pipe – and they are virtually noiseless.

Hydrogen is a particularly suitable fuel for larger vehicles, such as buses and trucks. It offers a much better vehicle power-to-weight ratio than batteries, which makes it possible to travel long distances without significantly increasing vehicle weight.

Refuelling station infrastructure

There are four key components of a hydrogen refuelling infrastructure. The first key component is the hydrogen supply, which can either be delivered to site from an offsite production plant or produced onsite. To produce hydrogen on-site, an electrolyser is required to extract hydrogen from water. Power to operate the electrolyser can be sourced directly from a renewable energy project, to produce 'green' hydrogen.

A compressor unit takes the extracted hydrogen and compresses it for efficient storage. The station also requires a hydrogen store, which is capable of storing hydrogen under pressure, and a dispenser for pumping the hydrogen gas to the vehicle under pressure.

To calculate the target pressure for the vehicle being refuelled, the station measures the ambient and hydrogen temperature and uses a test pulse to measure the initial vehicle pressure. The refuelling process starts with the equalisation of the low-pressure bank, followed by the equalisation of the medium-pressure and high-pressure bank. The station performs continuous leak monitoring during the refuelling process.

After refuelling, the station automatically switches to recharge mode and fills the storage banks.

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