Next Generation Clean Local Transport – Birmingham City University's IDEA think tank a lead partner in developing the UK's First Biomethane-Powered Tram

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Wednesday, 22nd July, after a year working on the development of the UK's 'First-of-a-Kind' (FOAK) Biomethane Railcar or tram, the vehicle was launched at a demonstration event hosted at Motorail's Long Marston testing facilities. This was the first UK biomethane-powered tram and understood to be a world first too!

It represents the chance for the West Midlands to lead in the development and export of new clean, green gas, affordable local transport options providing an alternative to the electric vehicles which have so dominated our approach to-date. The recently published **#WM2041** discussion document noted, page 40, that if all cars on the road today in the West Midlands converted to electric vehicles they would require twice the electric power currently used across the region simply to power these vehicles.

Pictured: Ultra Light Rail Partners' Biomethane-powered Railcar Testbed image courtesy of Today's Railways UK https://www.platform5.com/Catalogue/Todays-Railways-UK

The ultra light railcar, when produced for commercial applications, will provide smaller cities, towns and inter-rural to urban locations with a real alternative to expensive heavy rail and metro options. A 120-person biomethane-powered railcar could be produced for £2m each for sale, with on-street relocatable track investment estimated at £1m per km, and the current railcars in operation at Stourbridge costing £2000 per day to operate, these costs representing real value for money options when compared with multi-million pound investments required for larger-city oriented metro systems.

With gas accounting for 40% of the UK's energy supply, between one quarter and a half could be sourced from the green gas, biomethane. This clean gas with the chemical formula CH4 reduces methane emissions which are 34 times more powerful than carbon dioxide as a greenhouse gas. Biomethane is interchangeable with existing natural gas and could provide alternative options for electricity generation, water heating, space heating, cooking, fuelling vehicles. Focussing on production of this green gas could provide considerable economic opportunity for regional areas able to produce it from sewage sludge, food and plant and organic waste, red-meat processing waste, poultry and cattle manure. This in turn could provide smaller cities and rural areas the opportunity to develop a generation of skilled jobs in planning, engineering, operating and maintenance of biogas and biomethane plants.

With over 30 in attendance and a further 30 or so people joining via weblink, there was quite a buzz of anticipation as all present waited to see the UK's first biomethane-powered railcar 'power up'. Thankfully it started up first time working perfectly throughout the event demonstrating the potential for this clean gas in tackling the dual problems of lethal particulate pollution from rubber tyres and excessive transport demand for electricity from electric vehicles. Recent monitoring by Sustainability West Midlands has shown that reducing levels of PM 2.5 emissions by 50% would prevent 952 deaths in the West Midlands and lead to direct savings of £1.4m for the NHS each year.

It's felt like a long time reaching this point and yet in other ways it's all taken place in just over a year, with the last month playing a crucial role in the project development and completion.

Building on the Bristol tram bodywork (in operation 1998-2000) and drawing on the Stourbridge Class 139 railcar designs which have been in operation for over a decade powered by propane and a flywheel providing a kinetic energy store, a new bogie frame, driveline and powertrain have been built. Four key new features include:

- Reconfiguring the propane driveline for biomethane and designing this to fit into a train 'bogie' frame driving both axles, working with Parry People Movers
- Converting a propane-powered Ford engine to run on biomethane, working with the Southampton-based company, Alternatech
- Installing larger volume biomethane gas cannisters and enabling trackside refuelling by hose, with support from Biomethane Ltd
- Providing a cleaner more affordable railcar which does not require overhead wires and can be used in inter-urban and rural locations.

Pictured from left: Beverley Nielsen, Chair, Ultra Light Rail Partners and Director IDEA think tank, Birmingham City University, with Mick Hickinbottom, Premetro Operations https://premetro.co.uk/ , railcar testbed driver, and Engineering Technical Support, Roy Larner, Severn Lamb http://severn-lamb.co.uk/

Assembly and integration through the project was largely managed at Severn Lamb in Alcester with earlier stages hosted at Dudley College of Technology, soon to host the new National Innovation Centre for Very Light Rail.

Back in June 2019 Ultra Light Rail Partners http://ulrpartners.com/ were awarded a 100% funded £350k grant from Innovate UK and Department for Transport to build the new biomethane railcar and lead this project, which following the demonstration event 22nd July, is nearing completion due August 2020. Final stages of the project require detailed noise and emissions testing (Carbon Dioxide, Nitrous Oxide, Sulphur Dioxide and PM 2.5s) of both biomethane and propane-powered railcars, together with emissions testing of the more regularly used diesel trains.

Following the demonstration event it was gratifying to receive same-day notification from the Department for Transport stating:

"The demonstration looked excellent, we clearly saw the vehicle move under power, and this satisfies the requirement for a live demonstration for the Innovate UK project. To have achieved so much in so short a time is highly creditable, and very much the type of output we are pleased to see from the projects we support on behalf of DfT."

One of the most dramatic moments was loading the railcar onto the lorry when moving the vehicle from Severn Lamb to the Long Marston test track. The team at Allelys Logistics are to be congratulated on their huge professionalism.

Pictured: Railcar testbed loaded onto Allelys transport from factory to Long Marston test facility

Those attending the demonstration event hailed from a range of local authorities – Coventry City, Birmingham City, Worcester City, Worcestershire County, Bath and North East Somerset Councils, with representatives from heritage and community railways, the Chair of the Coventry & Warwickshire Local Enterprise Partnership and representatives from Transport for West Midlands, Department for Transport, Innovate UK, the All Party Parliamentary Group for Light Rail attending online with academics from Birmingham City University's School of Engineering as well as housing developers keen to asses new clean affordable ways of providing home to work connectivity or transit oriented regeneration. Media in attendance included Today's Railways UK and Rail Future.

Pictured: John Parry of Parry People Movers (right) in front of a selection of those in attendance for the launch of the biomethane railcar testbed at Long Marston test track 22nd July 2020.

Project partner, Biomethane Ltd, demonstrated just how easily biomethane-powered railcars can be refuelled with company Chairman, Christopher Maltin taking just over a minute to fully refuel the railcar.

Pictured: Christopher Maltin, Director of Biomethane Ltd http://biomethane.co.uk/ and Chairman of Organic Power Ltd http://www.organic-power.co.uk/ , refuels the Railcar testbed.

In reaching this point it may be of interest to review some of the project development that Birmingham City University has supported through its IDEA think tank involvement over the past year, drawing on West Midlands suppliers for 75% of project components, highlighted through a selection of images below.

Previous blog on [Biomethane Railcar](#) project.

Pictured: Integration of flywheel into bogie; Assembly of wheel sets and respective suspensions