**HEADLINE NEWS**

Fleets of hydrogen fuel cell powered buses, vans and taxis are coming into operation around the world.

The motor industry is preparing to launch mass production of fuel cell cars between 2015 and 2017.

In the meantime, the basic hydrogen infrastructure is being installed in Europe, the USA and Asia, in order to give car drivers the required range and flexibility.

Transport operators, backed by local and central governments, are preparing for the widespread utilisation of fuel cell powered vehicles.

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The first anniversary of the SWARM project brought the partners together from across Europe for the AGM in Birmingham in October 2013. SWARM (“Demonstration of Small 4-Wheel fuel cell passenger vehicle Applications in Regional and Municipal transport”) is a four year project with hydrogen and fuel cell vehicles that commenced in October 2012.

The first major event was the rollout of the Microcab with a Horizon fuel cell.

The EU is supporting the commercialisation of hydrogen powered vehicles, which are considered the future of road transport in Europe, but are not widely available for customers in the market today. The European Fuel Cell and Hydrogen Joint Undertaking (FCH JU) funded project SWARM will establish a large demonstration fleet of small passenger vehicles that builds on and expands existing hydrogen refuelling infrastructure.

Three regions are participating in this effort: the British Midlands, the Brussels area and Wallonia, and the Weser-Ems region in Northwestern Germany.

Each of these regions will deploy a new hydrogen refuelling site to close the gaps in a continuous ‘hydrogen highway’ that leads from Scotland via the Midlands to London, connecting to Brussels and on to Cologne and via Bremen to Hamburg/Scandinavia/Berlin.

Two Microcabs were on show at the SWARM AGM. The fuel cell van variant is in the foreground.
MICROCAB’S LIGHT FREIGHT VAN

Microcab’s light van variant uses the same fuel cell platform as the 4-seat car and meets the specifications set by Royal Mail for light duty vans, with a 250kg payload. The vehicle is hydrogen powered and capable of up to 180 miles on one fill. Filling with hydrogen takes about 3 minutes. Microcab CEO John Jostins said, “Urban air quality needs to improve and large numbers of diesel delivery vans operate in our city centres leading to increasing levels of particulates. The Microcab light van is designed to deliver zero emissions in town where human health is at risk from poor air quality.

The base platform can, in theory, go on indefinitely whilst fuel cells, battery systems, interiors and even whole vehicle exteriors can be renewed as necessary. This addresses the growing need to manage finite resources in the context of an expanding global population with increasing disposable income.

Microcab develops mobility (ephemeral by nature) in the round, thereby encompassing users, services, modal integration and resources in an holistic package to deliver solutions to some of the most pressing needs of society today.”

THE CIRCULAR ECONOMY

Microcab is focussed on supplying extremely efficient vehicles by concentrating on a lean weight electric platform with the Lotus chassis at its heart. These vehicles are destined for use in fleets of taxis, light vans and in car clubs where the driver is unlikely to be the vehicle owner. These fleets use the bee hive, ‘back to base’ refuelling model and can be rolled out without having to wait for a dense network of hydrogen refuelling infrastructure. Several hundred vehicles can use a single refilling point.

With vehicles owned by an entity other than the driver it is possible to design with a circular economy in mind, bringing vehicles back to be refitted and refurbished periodically to extend the usable lifetime well beyond that accepted by the mainstream industry.

A Microcab is refuelled at Honda’s refuelling station at Swindon. This was the first UK hydrogen station open to the public.

www.microcab.co.uk
FedEx Express has been awarded $3 million by the U.S. Department of Energy to develop a hydrogen fuel cell delivery truck with a single-fill range of up to 150 miles. Twenty vehicles are to be tested at FedEx facilities in Tennessee and California. The base vehicles are battery electric trucks from Smith Electric Vehicles with their range extended via the installation of 10-kilowatt GenDrive fuel cells from Plug Power. The award to FedEx Express is one of several totaling $7 million “for projects that will help bring cost-effective, advanced hydrogen and fuel cell technologies online faster.”

DoE has also awarded:
$3 million to the Atlanta-based Center for Transportation and the Environment to develop a fuel cell hybrid electric walk-in delivery van with a 150-mile single-fill range. The project includes the retrofit of 15 UPS delivery vans with fuel cell hybrid powertrains with testing at distribution facilities in California. The University of Texas’s Center for Electromechanics, Electric Vehicles International, Hydrogenics USA and Valence Technology will also participate.

$900,000 to Air Products and Chemicals and partner Structural Composites Industries (Worthington Cylinders) to develop a cost-effective tube trailer for hydrogen delivery and storage. Air Products is to conduct tests under real-world operating conditions at hydrogen fuelling stations in Southern California.

$250,000 to Sprint to deploy fuel cell-powered backup power systems for rooftop telecommunications equipment.

DoE says that its support of fuel cell and hydrogen R&D has helped reduce automotive fuel cell costs by more than 50% since 2006 and more than 30% since 2008. Energy Secretary Ernest Moniz said: “At the same time, fuel cell durability has doubled and the amount of expensive platinum needed in fuel cells has fallen by 80% since 2005. By partnering with private industry and universities, the Energy Department is helping to build a strong 21st century transportation sector that cuts harmful pollution, reduces costs for U.S. businesses and leads to a more sustainable energy future. Hydrogen and fuel cell technologies will help ensure America’s continued leadership in clean energy innovation”.

www.plugpower.com
NEWS

HYDROGEN FUEL CELL BUSES IN ABERDEEN.

Key industry and public sector players have joined forces to fund and deliver Europe’s largest demonstration of hydrogen fuel cell buses in Aberdeen, realising an aspiration to become a world-leading city for low carbon technology. The project, which has backing from Europe, the UK Government and the Scottish Government, will deliver a hydrogen infrastructure in Aberdeen in 2014, including:

- Production of hydrogen from a 1mega-watt (MW) electrolyser
- Establishing a state-of-the-art hydrogen refuelling station, Scotland’s first commercial-scale hydrogen refuelling station that will include hydrogen production through electrolysis
- Deployment of a fleet of 10 hydrogen buses, to be operated by FirstGroup and Stagecoach.
- The development of a hydrogen safe maintenance facility, within an operational fleet maintenance depot.

Building on Aberdeen’s world-wide reputation in the energy industry, this H₂ project will open the way for new and innovative hydrogen technology projects and accelerate the commercial use of hydrogen as a fuel.

Bert Colvanaer, the Executive Director of the European Fuel Cell and Hydrogen Joint Undertaking (EFCH JU) has visited Aberdeen and invited them to lead Scottish cities in an application to join other regions in a new €122 million EU study which does not require match funding. This could lead to 100 hydrogen buses being introduced in Scotland. The Leader of Aberdeen City Council, Barney Crockett, said “Aberdeen is fast becoming a leading light in the hydrogen industry and is quickly gaining recognition for the work the city has carried out so far.”

www.aberdeencity.gov.uk

TOYOTA FCV CONCEPT

At the 43rd Tokyo Motor Show in November 2013, Toyota displayed a concept version of their fuel cell vehicle scheduled for launch around 2015. The vehicle has a driving range of at least 500 km and refuelling times as low as three minutes, roughly the same time as for a gasoline vehicle. The vehicle’s exterior design evokes two key characteristics of a fuel cell vehicle: the transformation of air into water as the system produces electricity, and the powerful acceleration enabled by the electric drive motor. The bold front view features pronounced air intakes, while the sleek side view conveys the air-to-water transformation with its flowing-liquid door profile and wave-motif fuel cap. The theme carries to the rear view, which conveys a catamaran’s stern and the flow of water behind.

With Toyota’s proprietary small, light-weight FC Stack and two 70 MPa high-pressure hydrogen tanks placed beneath the specially designed body, the Toyota FCV Concept can accommodate up to four occupants. The hydrogen fuel is environment-friendly and highly energy-efficient. It can be produced using a variety of readily available raw and renewable materials, which makes fuel cell vehicles ideal for achieving sustainable mobility. Toyota is a member of the Mayor of London’s Hydrogen Partnership, which is committed to bringing hydrogen and fuel cells to the Capital.

www.toyota-global.com
LONDON HYDROGEN PARTNERSHIP WELCOMES FUEL CELL VEHICLES

WORLD’S FIRST MASS PRODUCED FUEL CELL VEHICLE

Five emission-free hydrogen powered vehicles from Hyundai will be operating in London. It is the intention that the Hyundai ix35 Fuel Cell models – the first production fuel cell cars in the world – will be an integral part of the London Hydrogen Network Expansion (LNHE) project.

Hyundai Motor, as a supplier to the LHNE project, will join the existing consortium of companies with expertise in hydrogen transport infrastructure and operation, working to establish the UK’s first hydrogen transport network covering London and south east England. The LNHE project, a government-backed initiative co-funded by the Technology Strategy Board, will put hydrogen-fuelled vehicles into daily business use and deliver the refuelling infrastructure to support their operation.

The fuel cell vehicles will be leased to key public and private fleet users in the capital. They are among the first of 1,000 examples that Hyundai has committed to produce between now and 2015 and are built on the same production line, in Ulsan, Korea, as the Tucson.

The majority of those 1,000 cars will be available in Europe where the European Commission has established a number of schemes, such as the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), to promote the use of hydrogen as an energy carrier with zero carbon content. With various hydrogen projects concentrating on establishing hydrogen infrastructure in Europe, the timing is right for hydrogen-powered vehicles to accelerate the project.

As the first car company in the world to assembly line-produce fuel cell vehicles, Hyundai has enabled not just the real start of Europe’s Hydrogen Roadmap but also accelerated London’s plans to become one of the major hydrogen capitals of the world.

For Hyundai, the philosophy behind the ix35 Fuel Cell project has been to produce a car that offers the same practicality, safety levels and driving experience as an ix35 driven by an internal combustion engine, but with zero tailpipe emissions. That means comparable performance – 100mph maximum, 0-62mph in 12.5 seconds and a range of almost 370 miles from each tank – but with no emissions: the only emission is water.

QUICK AND EASY REFUELLING

Just as importantly, a Fuel Cell vehicle can be refilled in two to three minutes and, in use, an ix35 Fuel Cell demands no compromise from the driver. Although Hyundai has been developing its fuel cell vehicles for more than 15 years, it is only now - with the start of a viable hydrogen refuelling network in place - that it can consider putting a fuel cell car into series production, so after a number of ‘false dawns’ for hydrogen-powered cars, this time the Fuel Cell vehicle has a genuine, clear and realistic future here in the UK. Much of this is down to the work of the London Hydrogen Partnership and that of other projects such as the London Hydrogen Network Expansion project, which is led by Air Products.

With these key partners working together, hydrogen mobility is about to become a reality. Two hydrogen fuel stations are already open in the Capital – one of which has public access – with a third to come as part of the London Hydrogen Network Expansion (LHNE) project.
**TEN-FOLD INCREASE IN FUEL CELL VEHICLES BY 2015**

A further three fuelling stations are planned by 2015, by which time it is expected that the number of fuel cell vehicles in London will have risen ten-fold from the initial five to at least 50 or more, including passenger cars, buses and scooters.

Kit Malthouse, London Deputy Mayor for Business and Enterprise and Chairman of the London Hydrogen Partnership, said: “The work of the London Hydrogen Partnership and other projects has really catapulted London towards the forefront of the move to a hydrogen future.

Battery electric vehicles are a great technology but like the fax machine they are only temporary and there is a great deal of consumer resistance towards them for all manner of reasons, including range and the time it takes to recharge them. Even though we have around 1,300 charging points in the capital you cannot guarantee getting a space outside your house to charge overnight: London is just too densely populated. For me, hydrogen cracks all those problems and it also solves other issues along the way such as making best use of wind energy, for example.

**HYDROGEN FROM RENEWABLES**

We also produce a huge amount of waste and we are looking at schemes that convert biomass into hydrogen, so as well as producing a clean fuel we would be reducing the amount of waste we put into landfill.

These are early days, but I am tremendously excited by the prospects of London’s hydrogen future. Hyundai is providing invaluable insights and bringing global experience to the Mayor’s innovative low carbon, low emission transport activities.” Tony Whitehorn, President and CEO of Hyundai Motor UK, added: “Hydrogen delivers considerable environmental benefits and we are looking forward to working closely with the other partners to drive forward its widespread introduction.”

The London Hydrogen Partnership has initiated more than £50 million worth of hydrogen projects already. Its partners have been involved in the implementation of the two existing refuelling stations, the operation of five fuel cell London buses which joined the Transport for London fleet in 2011, with another three to join, as well as a fleet of iconic London taxis, fuelled by hydrogen. worldwide.hyundai.com
Ballard Power Systems has signed a non-binding Memorandum of Understanding (MOU) with Van Hool NV, Europe’s fourth largest bus manufacturer, in support of the manufacture and further deployment of zero emission fuel cell buses.

The companies plan to jointly respond to the call for proposals under the EU Hydrogen Fuel Cell Joint Undertaking, as well as future calls for proposals under the Horizon 2020 program. The EU Hydrogen Fuel Cell Joint Undertaking is a public-private partnership supporting research, technological development and demonstration activities in fuel cell and hydrogen energy technologies, providing subsidies for eligible projects through a cost share mechanism. The European Commission and industry have each committed to contribute €470 million of funding into fuel cell and hydrogen research in the 2008-17 period. Following this, the Horizon 2020 program will extend this initiative through the year 2020 with an incremental budget of €700 million.

Leopold Van Hool, Van Hool Chairman of the Board said, “We look forward to expanding the success of our zero-emission bus partnership with Ballard to include even more cities in the European transit bus market.” Van Hool is a Belgium-based independent bus, coach and industrial vehicle OEM with a strong history of innovation in bus manufacturing. In 2014, there will be 27 Van Hool fuel cell buses in public transit operation in Europe, powered by Ballard fuel cell power modules. Ballard FCvelocity®-HD6 fuel cell power modules are delivering a high level of performance in European buses, with availability greater than 97% in buses operating in London and Amsterdam.

For the newly funded buses, Ballard will deliver its next-generation fuel cell power module to Van Hool for incorporation into hybrid bus platforms. This new FCvelocity®-HD7 power module will offer improved durability and reliability, along with significant cost reduction.

The MOU also provides for the establishment of a dedicated service and parts center at Van Hool facilities in Belgium, to support all buses powered by Ballard fuel cells in Europe. John Sheridan, Ballard’s President and CEO said, “We are very pleased to partner with Van Hool in our application for EU funding to support the deployment of additional fuel cell-powered buses. This will help generate economies of scale that we expect to drive further overall cost reduction.”

Ballard has also recently announced a licensing agreement in support of a planned fuel cell bus program for the China market—the largest bus market in the world. In the USA in 2014 Ballard is powering two additional fuel cell electric buses for Sunline Transit in Palm Springs, CA, as well as buses to be deployed in Hartford, CT and Boston, MA.

www.ballard.com
PROJECT WITH ALKALINE FUEL CELL POWERED TRAM

Britain is the birthplace of alkaline fuel cell technology. Trams, trains, lorries, buses even London taxis can be built using fuel cells, particularly low cost, efficient alkaline technology. By doing so, the air would be cleaner, climate change would be reduced, exports increased and employment given. Fuel cells generate electricity cheaply. The costs of Alkaline fuel cells are below the installed cost of coal fired electricity stations. In some transport applications such as trams, they are cheaper than the cost of maintaining overhead cables.

However, the UK Technology Strategy Board (TSB) turned down a proposal by a West Midlands engineering company to build an alkaline fuel cell powered tram. The engineering company was supported with the expertise of the Tram Authority for Birmingham and Wolverhampton, a university and a fuel cell company. The fuel cell development has been independently assessed by leading scientists at universities in Norway and the USA.

In 1999 the first fuel cell London Taxi was powered by alkaline fuel cells, followed by two improved models over the next year. The then Mayor fully supported the project, which included a hydrogen filling station in Hyde Park. There are six companies in the UK now championing alkaline fuel cell technology, but without reasonable support from the Government, they will require backing from other nations. ZeTek Power was once the largest fuel cell company in Europe, but never obtained support from the Government. ZeTek acquired patents from Elenco NV, a Dutch/ Belgian company which carried out the basic development work. After further lengthy development, the successor to ZeTek, the Cygnus Atratus Group, is well placed to meet the new EU Air Quality Standard.

URBAN AIR QUALITY

As more people move into towns, the EU has introduced new standards to improve urban air quality and there is a growing need for clean efficient public transport. Fuel cells powered by renewable energy have no emissions, apart from pure water. Fuel cell powered trams have the additional advantage that there is no visual intrusion of overhead wires. The engineers have assessed weight distribution and centrifugal force and confirm that fuel cells can be installed on the roof of a tram in place of the pantograph. They are lighter in weight and stable in operation.

BALANCING THE ELECTRICITY LOAD

Alkaline fuel cells offer an important strand for developing a balanced power industry for Britain. Although the UK Government is financially supporting the marketing efforts of the motor industry to introduce battery powered electric cars, there is clear evidence that in the near future, the energy industry is unlikely to be able to meet the demand for household electricity. The use of waste to fuel public transport will help to balance the load.

The TSB queried the use of fuel cells to power the tram. Battery cars need and deserve support, but the use of fuel cells in transport and energy production also require attention. Not just the fuel cells that everyone makes, but new types and developments from fresh minds. Fuel cells generate electricity quickly and cheaply and efficiently. We need a Government that can operate with the same criteria.

www.cygnusatratusgroup.com
PUTTING THE FUEL CELL ON THE ROAD

GERMANY PLANS 400 HYDROGEN FILLING STATIONS IN COMING DECADE

Daimler and its partners in the H2 Mobility initiative - Air Liquide, Linde, OMV, Shell and Total have drawn up a detailed plan of action for setting up a Germany-wide network of hydrogen filling stations for fuel cell vehicles. The number of hydrogen filling stations in Germany is to be increased to around 400 by 2023 from the current total of 15.

SERIES PRODUCTON OF FUEL CELL DRIVE

The wide-scale market launch of the world’s first competitive electric vehicles fitted with a fuel cell is planned for 2017. This was decided upon by Daimler in a strategic agreement with Renault-Nissan and Ford with the aim of bringing zero-emission technology to market faster and reducing investment costs. The partnership on three continents between the three vehicle manufacturers will also help to define international specifications and standards for components.

Manufacture of a small series of the Mercedes-Benz B-Class F-CELL commenced in 2009. www.daimler.com
EU Environment Commissioner, Janez Potočnik has launched a new plan entitled ‘Environment: New Policy Package To Clean Up Europe’s Air.’ He said “Air pollution is still an ‘invisible killer’ and it prevents many people from living a fully active life. The actions we are proposing will halve the number of premature deaths from air pollution and improve quality of life for all. It’s also good news for nature and fragile ecosystems.”

According to the EU report, the total external health-related costs to society from air pollution are estimated to be in the range of €330-940 billion per year. The situation is especially severe in urban areas, which are now home to a majority of Europeans. Another EU report entitled ‘Portfolio of Power Trains for Europe’ states that no single power train will satisfy all key criteria for economics, performance and the environment. The world is likely to move from a single power train to a portfolio of power-trains, including battery electric vehicles, hybrids and fuel cell powered vehicles.

The World Health Organisation (WHO) also said recently: “We now know that outdoor air pollution is not only a major risk to health in general, but also a leading environmental cause of cancer deaths.”

Fuel cells powered by renewable energy have zero emissions and do not add to global warming gases.

**PROTON POWER SYSTEMS**

Proton Power Systems plc, the designer, developer and producer of fuel cells and fuel cell electric hybrid systems, has agreed the terms of a €2.4 million loan with Roundstone Properties Limited.

Their wholly owned subsidiary, Proton Motor Fuel Cell GmbH is an expert in industrial fuel cells, fuel cell and hybrid systems with more than 17 years of experience in this sector. Based near Munich, Proton Motor offers complete fuel cell and hybrid systems from a single source – from the development and production through to the implementation of customized solutions.

In the summer of 2013, Proton announced that their 7kW Fuel Cell Stack PM200 had successfully achieved 10,000 hours of start/stop operation. The PM200 fuel cell has been running in a long term test with daily start and stop operation since 2008. After 10,000 hours of operation, the PM200 fuel cell stack is performing well and achieving the predicted low power degradation. The test proves that the Proton fuel cell stack is a reliable solution for backup power, maritime and mobile applications. Fuel cell based backup power systems can provide power with a very long back up time in banks, data centers, hospitals and other applications.

For mobile applications, there is an immediate demand in the bus sector for public transport and for logistic light duty vehicles. Dr. Faiz Nahab, CEO of Proton said, “Our successful testing proves the reliability of our stacks and systems, which is very important for stable day-to-day operations. Our product and system technology is a benchmark in the industry.”
ITM Power is leading the EcoIsland Hydrogen Vehicle Refueller project, which is supported by the UK’s innovation agency, the Technology Strategy Board. The £4.45m project will build and integrate into the power system, a hydrogen energy storage and vehicle refuelling system on the Isle of Wight.

The three year project is now coming to the end of its first year. The project is on time and on budget with the following achievements in year 1. ITM Power have concluded the design of a modular 80kg/day hydrogen generation unit, the first deployment of a station this size which the Company intends to use for the roll-out of hydrogen refuelling stations in the UK in the H2Mobility project. This modular design allows generation capacity to be increased at refuelling stations as demand increases. Key components are ordered and build is underway and on track.

ITM Power has been granted planning permission for an 80kg/day hydrogen refuelling station at four locations and at one for a 15kg/day marine refuelling station.

All planning applications submitted on the Isle of Wight have been successful. ITM has chosen two of these sites to take forward for installation of hydrogen refuellers ready for operation in November 2014. The approvals process involved several stages including the identification of candidate sites prior to conducting a detailed survey, preparation of plans together with a Design and Access Planning Statement and liaison with stakeholders including the Isle of Wight Council and the Environment Agency.

The sites surveyed included two owned by Vestas; one being their R&D centre at Stag Lane and the other Monks Brook, one operated by Scotia Gas Networks in East Cowes, and one at the St Cross Business Park, Newport. The marine refueller is to be sited on the dock-side at Cheetah Marine in Ventnor. ITM Power has decided to proceed with the site owned by Scotia Gas Networks, providing an opportunity to further develop commercial links with SGN.

The project is proceeding well with delivery of the refuelling units anticipated in spring 2014 for the 12 month trial to start in autumn 2014.
PARTNER RESPONSIBILITIES:

The project will design, build, install and operate two grid-connected hydrogen refuelling platforms, with 80kg/day and 15kg/day capacities for the operation of a fleet of hydrogen vehicles including vehicles from Hyundai, Microcab and converted Ford Transit vans. Vehicles showcased will include FCEV cars, hydrogen internal combustion engine (“HICE”) vans and a HICE boat. ITM Power has successfully converted a Honda 135 Outboard motor to dual fuel hydrogen/petrol operation for use on a catamaran designed and built by Cheetah Marine, which will operate it in validation trials.

ITM Power will design and build the two refuellers and take a key role in the system integration. SSE is providing the grid connection to utilise the island’s renewables and will utilise the refueller and vehicles in the final year demonstration. Toshiba will ensure compatibility of the hydrogen system with its Energy Management System and the Distribution Network Operator networks – enabling it to actively participate in the energy balancing of the distribution network in future.

IBM will develop a user interface to allow smart card payments facilities to the refuellers to meter and monitor hydrogen provision. Vodafone will provide communications to allow remote monitoring of both refueller and vehicles and allow data collection and data cloud integration.

National Physical Laboratory will develop hydrogen purity tests to ensure compliance with FCEV requirements (ISO14687-2). Arcola Energy will develop an educational and dissemination package and will provide public and commercial engagement activities, and will operate the hydrogen car club. With ITM Power they will organise and run a FCEV road show with ride and drive.

The University of Nottingham and The University of South Wales will evaluate the performance and operating characteristics of the refuelling stations and use their own ITM Power electrolyser fed refuelling stations for the generation of refuelling strategies to optimise the efficiency of operation.

ESTABLISHING STANDARDS

ITM Power sits on three Working Groups of the ISO Technical Committee 197, which has as its stated scope the standardization in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen. Furthermore, ITM Power sits on the British Compressed Gas Association Technical Steering Committees with particular emphasis on Code of Practice 41, which addresses “The Design, Construction, Maintenance and Operation of Filling Stations Providing Gaseous Fuels”.

Dr Graham Cooley, Chief Executive of ITM Power, said: “The expertise required to achieve planning permission and satisfy compliance bodies is often underestimated. I am delighted that ITM has been successful in gaining approval to commence the build of two hydrogen refuelling stations on the Isle of Wight. Furthermore, the continued support from the Isle of Wight council and their determination to become a prime location for hydrogen fuel cell vehicle deployment provides a fantastic backdrop to this exciting project.”

A hydrogen storage tank is delivered to the Isle of Wight.

www.itm-power.com
ACAL Energy Ltd, the British chemical engineering company, has announced that its FlowCath® chemistry and engineering has enabled a PEM hydrogen fuel cell to reach 10,000 hours runtime on a third party automotive industry durability test without any significant signs of degradation. ACAL Energy’s breakthrough approach is also significantly cheaper than conventional fuel cell technology.

10,000 hours, the equivalent of 300,000 driven miles, is the point at which hydrogen fuel cell endurance is comparable to the best lightweight diesel engines under such test conditions. This endurance far exceeds the current 2017 US Department of Energy (DoE) industry target for fuel cell powered vehicles to last 5,000 hours, equivalent to 150,000 road miles, with an expected degradation threshold of approximately 10%.

Over the last 16 months, ACAL Energy has put its proprietary design fuel cell through an industry standard automotive stress test protocol that simulates a 40-minute car journey with a start-stop at the end of each cycle. The cycle, which was repeated 24 hours a day, seven days a week, mimics a vehicle journey with frequent stops, starts and a highway cruise. This particular test is employed to accelerate aging and to stress wear on car engines and fuel cell systems over time.

Unlike a conventional PEM hydrogen fuel cell design, ACAL Energy’s technology does not rely on platinum as the catalyst for the reaction between oxygen and hydrogen. The platinum and gas have been replaced with a patented liquid catalyst, which ACAL Energy calls FlowCath®. This revolutionary approach dramatically improves a PEM fuel cell’s durability and at the same time reduces the cost of a system. The liquid acts as both a coolant and catalyst for the cells, ensuring that they last longer by removing most of the known decay mechanisms. Importantly, ACAL Energy’s technology reduces significantly the total cost and weight of a fuel cell and enables a competitive fuel cell drive-train with a power output of 100kW. This is equivalent to that of a 2 litre diesel engine. Many of the world’s largest auto makers including Hyundai, Honda and Toyota have announced plans to launch fuel cell vehicles by 2015.

SELECTED FOR TRIAL BY TOP AUTOMOTIVE COMPANIES

Greg McCray, CEO of ACAL Energy, said: “Degradation has long held back the potential for the widespread use of hydrogen fuel cells in the automotive sector. Breaking the 10,000 hour threshold during rigorous automotive testing is a key reason our hydrogen fuel cell design and chemistry has been selected for trial by a number of the top automotive OEMs. With our technology, hydrogen fuel cell vehicles can drive over 500 miles per tank of fuel, and can be refuelled in less than five minutes, emitting only water. For a driver, the only difference from driving an internal combustion engine car is what’s going in the tank but for the environment the significance of zero carbon emissions is enormous”.

Kevin Treco of the Carbon Trust added: “ACAL Energy continues to make impressive progress towards developing a novel, robust hydrogen fuel cell system that has the potential to reduce costs to be competitive with conventional engines. The Carbon Trust invested in ACAL Energy under the Polymer Fuel Cell Challenge, recognising that ACAL Energy’s technology was one of a few that could potentially achieve such cost reductions and accelerate the introduction of fuel cell vehicles and their associated carbon emission savings. We are excited by the current world leading 10,000 hour durability demonstrated and the partnerships it is helping to secure”. www.acalenergy.co.uk
Air products have taken a leading position in the development of the hydrogen infrastructure that is required for fuel cell vehicles. Hydrogen offers many advantages over other alternative fuels, it is the cleanest and the simplest to use. Fuel cell powered vehicles that turn hydrogen into electricity are non-polluting, quieter and up to three times more efficient than diesel engines. Air Products found that hydrogen fuel cells operated without problems in the recent icy US weather.

The Linde Group is taking an international role in establishing the hydrogen infrastructure for fuel cell vehicles. Linde North America has joined the U.S. Department of Energy’s newly formed H2USA, a public-private partnership focused on advancing hydrogen fuelling infrastructure to support cleaner transportation energy options for U.S. consumers. Pat Murphy, president of Linde North America, said “Linde has long been a leader in developing alternative fuel technologies. We believe this DOE-led effort to create a consortium of like-minded public/private entities will accelerate the advancement of both fuel cell vehicles and the infrastructure required to expand their use throughout the U.S.”

Linde has already equipped over 80 hydrogen fuelling stations around the world, supplying hydrogen for projects large and small. Hydrogen fuelling stations using Linde technology in the U.S. have passed the half-million mark in fills, powering a variety of vehicles, including forklifts, cars and buses. In the San Francisco Bay area, Linde hydrogen stations have been fuelling a dozen fuel cell buses for AC Transit since 2010, showing that it is possible to fuel fuel-cell cars and buses as fast and conveniently as with gasoline or diesel today. www.the-linde-group.com

Air Products offers fully-integrated fuelling stations from hydrogen supply through to dispensing. The equipment is designed for minimal installation and can be used with any source of hydrogen. www.airproducts.co.uk
The sleekly styled Honda FCEV Concept, made its world debut at the Los Angeles International Auto Show in November 2013. The Concept expresses a potential styling direction for Honda's next-generation fuel-cell vehicle anticipated to launch in the U.S. and Japan in 2015, followed by Europe.

The Concept features the world's first application of a fuel-cell powertrain packaged completely in the engine room of the vehicle, allowing for efficiencies in cabin space as well as flexibility in the potential application of FC technology to multiple vehicle types in the future. Significant technological advancements to the fuel-cell stack have yielded more than 100kW of power output. The power density is now 3kW/l an increase of 60%, with the stack size reduced 33% compared to the FCX Clarity. The next generation Honda FCEV is anticipated to deliver a driving range of more than 300 miles with a quick refuelling time of about three minutes at a pressure of 70 MPa. “The Honda FCEV Concept not only sets our direction for our next generation fuel-cell vehicle in 2015, but for future improvements in electric drive technology,” said Mike Accavitti, senior vice president of American Honda Motor Co. “The advancements we are making are substantial, meaningful and very real.”

Honda has led the industry for nearly two decades in the development and deployment of fuel-cell technology through extensive real world testing, including the first government fleet deployment and retail customer leasing program. Honda has made significant technological advancements in fuel-cell operation in both hot and sub-freezing weather, meeting stringent emissions requirements and safety regulations since the introduction of its first generation fuel-cell vehicle, the FCX in 2002.

Honda began leasing its first-generation FCEV, the Honda FCX, in 2002 and has deployed vehicles in the U.S. and Japan, including its successor, the FCX Clarity, which was named the 2009 World Green Car. Honda has delivered these vehicles to individual retail consumers in the U.S. and collected valuable data concerning real-world use of fuel cell-electric vehicles and hydrogen stations.

In the effort to speed the advance of a refuelling infrastructure, in May 2013, American Honda joined the public-private partnership H2USA, which brings together automakers, government agencies, hydrogen suppliers, and the hydrogen and fuel-cell industries to coordinate research and identify cost-effective solutions to deploy infrastructure that can deliver affordable, clean hydrogen fuel in the United States.

In July 2013, Honda entered into a long-term collaborative agreement with General Motors to co-develop the next-generation of fuel-cell systems and hydrogen storage technologies, aiming for the 2020 timeframe. http://world.honda.com
INTELLIGENT ENERGY FOR TRANSPORT AND MOBILITY

ADVANCED PROPULSION CENTRE

Intelligent Energy has joined automotive industry leaders in supporting the vision of the Advanced Propulsion Centre (APC) for the development and commercialisation of new automotive powertrain technologies for use in low carbon vehicles in the UK.

‘Driving Success: A strategy for growth and sustainability in the UK Automotive sector’ is the result of a partnership between the UK automotive industry and the Government. It establishes a clear roadmap for technology and outlines the opportunities for the UK supply chain and the development of key technologies in securing the long-term future of the sector by growing the UK share of the value chain. The strategy also highlights the importance of research, innovation and development of ultra-low emission vehicles, to give the UK an edge in delivering the vehicle powertrain technology of tomorrow over the next 20-30 years. In establishing the Advanced Powertrain Centre, the Government and industry have committed to invest £1bn over 10 years in support of developing, commercialising and manufacturing the key powertrain technologies necessary for low carbon vehicle leadership in the UK.

UK H2 MOBILITY

The Government’s strategy for the automotive sector recognises the important role played by the UKH2Mobility programme. Intelligent Energy has been a leading proponent in the Programme – a joint government and industry initiative to facilitate the rollout of fuel cell electric vehicles and supporting hydrogen fuelling infrastructure.

The Greater London Authority, the Welsh Government and Transport Scotland are the latest organisations to join UK H2Mobility, Each of the new members plays a key role in planning, developing and administering transport infrastructures serving millions of people. Their experience, insights and responsibilities will be of great value as UK H2Mobility continues its second phase of work with the development of a co-ordinated business plan to harness the potential of hydrogen fuel for UK business and transport. A lady is seen here refuelling a hydrogen fuel cell car.

MEETING NEW AIR QUALITY STANDARDS

In the light of the reports about air quality in European towns, Dr H Winand, Chief Executive of Intelligent Energy, outlined in an article published on the Institute of Energy and Technology (IET) website how fuel cell vehicles can improve air quality. “This remains a pressing issue for high density cities and conurbations in all parts of the world” he said. “The European Environment Agency has reported that more than 90% of people living in European cities breathe air that leads to respiratory problems, heart diseases and shortened lives. After energy use and supply, road transport is the largest contributor to air pollution in the UK with 33% of emissions a direct result of road transport. The World Health Organisation (WHO) has also recently given a stark reminder of the carcinogenic impact of air pollution.”
Dr Winand continued “Air quality has been high on London’s agenda for some time. London has a large number of diesel fuelled vehicles on its roads and is taking the lead in reducing transport emissions, having implemented the inner-city charge zone in 2003 and with plans for an ultra-low emission zone. The Mayor has also encouraged the introduction of zero emission fuel cell buses and taxis, and other electric vehicles.

It is unrealistic to expect to eliminate the internal combustion engine today, but zero emission electric and fuel cell powered vehicle technology (FCEV) has now progressed to a stage where they can be successfully introduced as a direct replacement for today’s diesel and petrol powered vehicles. Intelligent Energy and London Taxis International worked with the Mayor’s office to introduce a fleet of fuel cell powered black cabs during the London 2012 Olympics to transport the Mayor’s VIP guests. The fuel cell taxis are still running in the Capital as part of a wider European programme (HyTEC).

The UKH₂Mobility programme is working towards the UK’s own refilling station network to support an estimated 1.6 million FCEVs to be on Britain’s roads by 2030.”

Over the past year, Intelligent Energy has also experienced considerable commercial success and job creation for its Motive Division – as they continue to partner with some of the world’s leading automotive manufacturers to provide the power technology and system knowledge to make fuel cell electric vehicles a near term reality.

www.intelligent-energy.com

NEWS

HORIZON FUEL CELLS LEAD IN SHELL ECO MARATHON

UITM Malaysia swept to victory at this year’s Shell Eco Marathon Asia, achieving success in both the Urban Concept and Prototype categories. Horizon’s XP series fuel cell stacks provided the power and helped propel the team to a double triumph. Not only that, but the second place participant also used a Horizon system – making 2014 the fourth consecutive podium year for Horizon’s high performance XP fuel cells.

Over 100 teams from the top universities and Engineering institutes all over Asia competed to design the most energy efficient vehicles capable of travelling the longest distances. Each vehicle is given the same amount of energy and then put through its paces in a series of endurance and safety tests conducted by Shell engineers. At 59% peak efficiency, the Horizon H-1000XP fuel cell used for the best vehicles on the field is a product of years of continuous collaboration with university teams and ex-champions of the Eco-marathon competition. The Horizon fuel cell was fully integrated by Arcola Energy.

www.horizonfuelcell.com
CHANGING THE TRANSPORT SYSTEM TO HYDROGEN FUEL CELLS

The change of the transport system to fuel cell power in the 21st century requires system change, not just new technology. If transport is provided as a service rather than the sale of alternative fuel vehicles, manufacturers will then be rewarded for longevity and low running costs, rather than for obsolescence and high running costs.

The sale of service will enable the manufacturer to refurbish vehicles and recycle materials. The asset remains in his balance sheet so there is an incentive to design for longevity and maximum value recovery at the end of life.

Open source information encourages the proliferation of the technology and is the fastest way to build volume in the supply chain. There is no conflict between open source and building a brand, particularly when selling mobility as a service, as there are more opportunities to differentiate. When faced with a disruptive shift, incrementalism creates barriers and risks, whereas system level change lowers them. “You cannot cross a chasm in two leaps” said Hugo Spowers of Riversimple.

Riversimple’s new design hydrogen fuel cell vehicles will commence fleet operation in 2015 and 2016. www.riversimple.com

10TH INTERNATIONAL HYDROGEN & FUEL CELL CONFERENCE.

MILLENIUM POINT, BIRMINGHAM B4 7XG, 25 MARCH 2014

This will bring together experts from around the world in order to showcase the widespread utilisation of hydrogen and fuel cell power for buildings and vehicles.

It will feature a Horizon 2020 programme for EU and international projects. There will be a major workshop for discussing the topics in the call, for generating novel ideas of innovations and for creating new consortia making bids led by Enterprise Europe Networks. Partnerships in Horizon 2020 can include countries outside the EU.

Presentations at the conference will include Birmingham’s work with Korea and a review by the Fuel Cell Institute in Shanghai of their work with 30 organisations in China. A hydrogen refuelling station in China is seen below. Registration: www.climate-change-solutions.co.uk Telephone 024 76217746 email tony@climate-change-solutions.co.uk

www.climate-change-solutions.co.uk
EVENTS

25th March 2014
2020 Hydrogen & Fuel Cell Economy.
The 10th International Conference, Exhibition and Partnering Event will be held at Millenium Point, in Birmingham, UK. There will be displays of hydrogen and fuel cell powered vehicles and renewable energies for hydrogen production.

The conference will be a major forum for the new Horizon 2020 programme for EU projects: generating novel ideas for innovations and creating new consortia making bids. There is a special offer of a 50% discounted registration for our readers and their contacts.
www.climate-change-solutions.co.uk

7th –11th April 2014,
Group Exhibit Hydrogen + Fuel Cells
Hannover Fair, Germany. Includes Europe’s largest hydrogen, fuel cells and battery exhibition. www.h2fc-fair.com

21st—22nd May 2014,
All Energy 2014,
Aberdeen, Scotland. The largest UK renewable energy event is free to attend and includes sessions on hydrogen and fuel cells. www.all-energy.co.uk

1st—4th July 2014,
11th European SOFC (solid oxide fuel cell) & SOE (solid oxide electrolyser) Forum,
Lucerne, Switzerland. www.efcf.com

Fuel Cell Power’s Blog covers all types of fuel cells and their applications in distributed power generation, portable power, CHP and transport. For millennia, energy has been obtained by burning fuels, which is changing the chemistry of the atmosphere and the oceans. Cleanly, quietly and efficiently the electrochemical conversion of fuels is now becoming a practical alternative to combustion. Fuel cells utilize fossil fuels or energy from waste efficiently. They can equally be powered by hydrogen which can be generated from intermittent renewable energy sources. Articles and features in Fuel Cell Power will help individuals, businesses and communities to plan for long term energy efficiency, price stability and cuts in harmful emissions.

www.fuelcellpower.org.uk

Fuel Cell Power provides information on the practical application of fuel cells.
It is produced by the family and friends of the late Dr F T Bacon OBE, FRS, who dedicated his life to the development of fuel cell technology.
Information can be obtained from: Jean Aldous, Editor, Fuel Cell Power, The Gallery, The Street, Woolpit, Suffolk, IP30 9QG.
Telephone: 01359 245073
www.hydrogen.co.uk www.futureenergies.com www.fuelcellpower.org.uk