The Group Exhibit Hydrogen + Fuel Cells is Europe’s largest fuel cell exhibition, hosted annually at the Hannover Messe – the world’s largest industrial technology fair. This year more than 130 exhibitors from 20 countries demonstrated the latest developments in the European and global fuel cell industries. Bolstering this were 150 interviews and technical presentations, and fuel cell vehicle ride and drives with on-site refuelling from Linde and ITM Power.

Fuel Cell Today has been attending the Group Exhibit for many years and it is interesting to see how the industry has changed, refocused and evolved each year; we noticed several prominent themes that have emerged or gained substantial traction since last year’s show. Perhaps the most noticeable change, and one noticed by many others at the show, was the increased presence of electrolyser companies exhibiting at the fair. As fuel cells continue to move from R&D to commercialisation en masse we can see a desire for the provision of clean fuel – only then can a truly sustainable power solution be presented. As well as an increased presence of electrolysis, we noticed a rise in micro-CHP and power-to-gas solutions: ways of utilising hydrogen and fuel cells to meet the wider needs of future energy use. As ever, progress towards commercialisation was a strong underlying theme.

**Domestic CHP and Distributed Generation**

Interest in the distributed generation of energy is growing rapidly. At the smaller end of the scale, this is being driven by the desire of households and communities to be self-sustaining, coupled with concerns around rising energy bills. There is also a widespread loss of confidence in traditional, centralised energy generation, with energy security concerns stemming from the use of fossil fuels and nuclear power falling out of favour in some countries following the Fukushima disaster in Japan.
Natural-gas-fed fuel cells from 0.7 kW to 5 kW for small-scale combined heat and power (micro-CHP) are gaining in popularity as a result of this.

Looking to Japan: the Ene-Farm Programme

The Ene-Farm programme in Japan is blazing the trail. Ene-Farm is an umbrella brand under which Japanese gas utilities and fuel cell manufacturers partner to offer micro-CHP fuel cells to consumers; more than 20,000 units have been installed since the programme opened in 2009 and, with recent surges in demand accounted for, it is predicted that a further 20,000 will be sold in this year alone.

The potential to emulate such a programme in Europe is significant, not least of all in Germany. With a commitment made to remove all nuclear power after the Fukushima disaster, the country has set stringent targets for the adoption of renewable energy in electricity generation: 35% by 2020, 55% by 2030, and 80% by 2050. Using incumbent solutions the transition to non-nuclear would require an additional ~4,000 km of high voltage lines. The reach of the German gas grid is comparable to that of the existing electrical grid, making fuel cell micro-CHP an attractive proposition for distributed generation; furthermore fuel cell micro-CHP systems can feed into the low voltage grid. Approximately 40% of Germany’s total carbon emissions come from buildings and fuel cell micro-CHP technology has the potential to reduce this by 30–40%, another strong driver. Lastly, energy prices in Germany have risen by ~50% in the last eight years, so methods of maximising energy are enticing.

One could see the presence of Ene-Farm member JX Nippon Oil & Energy Corp. at the show as an indication of the potential demand from, and desirability of, the German and European markets. Indeed the company was presenting its 700 W ENEOS solid oxide fuel cell system to gauge European interest and this follows earlier news that Panasonic (also an Ene-Farm member; not exhibiting) has opened fuel cell research centres in Germany and Cardiff. The Japanese Ene-Farm systems have all ranged from 0.7 kW to 1 kW and this level of output is generally what has been seen to date elsewhere in examples such as the Callux project.

Callux and the German Fuel Cell Initiative

The Initiative Brennstoffzelle (IBZ) coalition is working to accelerate the commercialisation of domestic micro-CHP systems in Germany and it presented an impressive stand at the Group Exhibit (right): systems from Baxi Innotech, Vaillant, Hexis, Ceramic Fuel Cells Limited and Elcore were all showcased. Baxi, Vaillant and Hexis have all been involved in the Callux residential fuel cell demonstration project. Systems used in Callux offer 1 kW_e with 1.8 kW_th or 2 kW_th; the first phase has ended with 260 systems installed and evaluation will take place over the next three years.

A 300 W_e micro-CHP concept was presented by Elcore, a new company established by SFC Energy founder Dr Manfred Stefener, who on the first day of the show officially announced this first offering to the micro-CHP market: the Elcore 2400. An output of 300 W_e may not sound substantial but the company has taken a novel approach: its product is designed to cater for the base load of an average German home, without attempting to meet the occasional peaks in demand or
contribute power to the grid, and for this 300 W<sub>e</sub> is sufficient. The unit also offers 600 W<sub>th</sub> heating capacity, enough to meet the continuous, year-round requirement for hot water with some excess for space heating. Importantly the product is not a replacement for an existing boiler/burner nor the grid, but an addition, as shown below, which the company says considerably de-risks customer purchase whilst still offering significant cost savings.

Thanks to its small size, the system is priced competitively at €9,000 and it will be available to consumers from early 2013 after a fifty-unit deployment to select partners later this year.

**Fuel Cell CHP for Larger Buildings**

ClearEdge Power, Tropical and RBZ were all displaying 5 kW<sub>e</sub> micro-CHP systems. This level of output is generally more than would be needed by average European homes and these systems also find application in multi-apartment complexes and other larger buildings. They offer a value proposition to building owners who have emissions reduction or energy efficiency targets to meet, or who simply wish to advertise an environmentally-friendly image.

For example, Athens-based Tropical has recently received a 500 unit order for its 5 kW<sub>e</sub>/6 kW<sub>th</sub> natural-gas-fed GreenGen NG-5 (left) for integration into new ‘green energy homes’ to be built in Greece by construction firm ASPATE SA. Tropical is ready for international opportunities and is looking for distribution partners for business-to-business sales.

ClearEdge Power also offers a natural gas fuelled 5 kW<sub>e</sub> system. There are already over 100 of these ClearEdge5 CHP units installed in California and the company is commencing commercial production of the system this year, with models for North American, Asian and European markets planned; it has acquired the necessary certification in the USA and Canada and is pursuing CE accreditation for Europe. It also has KGS, a globally-recognised Korean gas standard, allowing it to sell into South Korea. The company says the value proposition offered by the ClearEdge5 is sound: its levelised cost of energy is $0.09 per kWh – undercutting the grid price in much of America.

Riesaer Brennstoffzellentechnik (RBZ) is developing a German-made 5 kW<sub>e</sub> (10 kW<sub>th</sub>) system named the inhouse5000, which has completed its first field test stage with five units installed in Germany and one in Milan. They are now preparing for the second phase field test with an optimised system which would involve a twelve-unit installation within Germany. The company expects to be ready for small-series production by 2015.

All three of these 5 kW<sub>e</sub> micro-CHP systems are based on high-temperature proton exchange membrane fuel cells (HT-PEMFC); this is one of the first consistent uses of the technology that we have seen and it appears to be growing in popularity among manufacturers.
Centralised Renewable Generation

Moving towards distributed generation is a prudent decision in many areas but it is not one that will be swift. There are pressing issues emerging as governments search for ways to decarbonise the grid and remove nuclear power generation. Countries across the world are investing heavily in renewable energies, particularly wind and solar power. These energies share a common strength and weakness: they are products of nature, both fundamentally sustainable and inherently variable. Most electricity grids cannot support the large-scale employment of such variable renewables and mismatches in supply and demand are inevitable as consumer demand does not undulate sporadically with the strength of the wind. Therefore energy storage is needed as an intermediate step between renewables and the grid.

Hydrogen and Power-to-Gas

Hydrogen’s potential as an energy vector is well known and it has an important role to play in future renewable energy storage. An implementation of this that emerged as a key theme at the Group Exhibit was power-to-gas: storing electricity as hydrogen that is then injected, stored and distributed through the existing natural gas grid. In many countries the gas grid supplies heating and hot water needs and transmits significantly more energy (in kilowatt-hour terms) than the electricity grid; it hence has huge potential for energy storage.

Take Germany as an example once again: the electricity grid supplies 600 TWh annually but at present there is just 0.7 TWh of energy storage capacity available; the gas grid, by contrast, offers 2,000 times the storage capacity of the country’s pumped hydro reservoirs, claims Germany Trade and Invest, which works to foster international partnerships with German companies and is now discussing power-to-gas with prospective investors.

Current regulations permit the injection of hydrogen into the German gas grid up to a level of 5 vol%; this may not sound like much but it actually represents significant storage capacity. Pushing this up to 10% should be relatively straightforward, with the necessary validation and approvals. However, pipelines are not the only place to store hydrogen: significant capacity exists in underground salt caverns, which are already being used for natural gas storage and are thus grid connected.

Electrolysers as Enabling Technology

The key to unlocking the potential of power-to-gas is electrolyser technology. The German Aerospace Centre (DLR) is working on several projects to develop electrolysers that work well with the fluctuating supply that is characteristic of renewable electricity sources – it says both alkaline and PEM electrolysers can be suitable for this application, and each offers different advantages. Solid oxide electrolysers are also being investigated for this, notably in a collaborative effort by German companies Staxera and Sunfire.

The growing interest in electrolysers for power-to-gas is global. Hydrogenics announced during the show that it will be working with Enbridge, Canada’s largest natural gas distribution company, to develop a power-to-gas storage system using Hydrogenics’ electrolysers to generate hydrogen from renewable energy to be injected in small quantities into the gas grid, with the added marketable benefit of raising the renewable content of the gas.

ITM Power in February announced the launch of a 1 MW electrolyser system based on a new high-pressure, high-volume (25 kg hydrogen per day) stack, which it exhibited at the Group Exhibit. The system is scalable in a modular fashion and is being specifically targeted at power-to-gas applications. The company was awarded a grant by the UK Technology Strategy Board (TSB) earlier this year alongside the Scottish Hydrogen & Fuel Cell Association (SHFCA) and GASTEC at CRE to
investigate the technical, financial and operational feasibility of injecting hydrogen from electrolysis into the UK gas grid. The company is well aware of the international potential of power-to-gas and, with the vast potential storage available in the German gas grid, this is an application its German subsidiary ITM Power GmbH will be pursuing.

Implementing Electrolysers

Power-to-gas is the latest in a series of exciting opportunities for electrolysers. As was mentioned at the beginning of this report, there was a significant presence of electrolyser companies at the show this year: Acta, Avalence, CETH₂, ErreDue, H2 Nitidor, Heliocentris, H-tec Systems, Hydrogenics, ITM Power, NEL Hydrogen, Next Hydrogen Corporation, and Proton OnSite all presented electrolyser technology at the Group Exhibit.

Electrolysers are as versatile as their power-producing fuel cell cousins, and their commercialisation does not rely solely on the deployment of fuel cells as hydrogen is used in a variety of industrial applications. A readily accessible and commercially lucrative opportunity for electrolysers is in the on-site generation of hydrogen to replace packaged gas delivery in power plant operation, the process industries, laboratories and elsewhere.

Exploiting the Industrial Market

This is something that Proton OnSite (below) has been capitalising on for sixteen years. The company has sold over 2,000 units into more than 70 countries and is continually improving its electrolyser technology and applying it to markets as they become commercially viable: what it calls the ‘fast follower’ approach. This has helped it become one of a handful of profitable electrolyser businesses. With this as a solid base it is now turning its eye to markets being created by fuel cells and has completed more than twenty hydrogen filling stations for fuel cell vehicles worldwide, some integrated with renewables. The company also has a unit ready for 1–2 MW demonstrations, which can be modularly scaled up to 10 MW and easily adapted to large-scale renewable energy storage and power-to-gas applications.

NEL Hydrogen, which has existed since 1927, first as Norsk Hydro then as Statoil’s Hydrogen Technologies, is now under new ownership. The company has for decades supplied the world’s largest electrolysers to provide hydrogen for ammonia fertilizer production and, like Proton OnSite,
has become profitable doing so. It is very aware of the potential of the fuel cell market: it supplied the world’s first publicly available hydrogen refuelling station to Reykjavik in 2003, and will be launching a new product this year that is suitable for hydrogen production in refuelling stations. However, it is awaiting the widespread introduction of fuel cell vehicles from 2015 onwards before it begins to seriously pursue this as a commercial opportunity.

ITM Power is a leading UK technological innovator and has been making an impact in the electrolysis sector over the last year. It is targeting its electrolysers both at fuel cell applications such as vehicle refuelling but also at existing industrial niches that can benefit from clean hydrogen production. ITM’s HFlame product generates hydrogen for safe combustion in brazing torches in the construction industry, offering a safer alternative to incumbent oxy-acetylene and oxy-propane solutions; the HFlame product is being incorporated into a larger SafeFlame EU project with several partners. Another niche project ITM is working on is CREO (CO₂ Reduction through Emissions Optimisation) alongside partners Ford, Jaguar Land Rover and Johnson Matthey, as well as several universities. As part of the project ITM will provide a small-scale electrolyser for on-board generation of hydrogen to improve internal combustion and after-treatment efficiency (above).

Italian electrolyser manufacturer Acta offers a technology that it says combines the advantages of PEM electrolysers (no hazardous caustic solution) with those of alkaline electrolysers (cheaper catalyst). The generated hydrogen and oxygen are physically separated by the company’s proprietary polymeric membrane, so there is no risk of recombination and explosion, making the technology ideal for residential and non-specialist use. This is being exploited in Acta’s Pure Flame 300, an oxygen–hydrogen generator for flame torch welding, soldering and brazing, which like the HFlame is safer than incumbent technology and is quickly finding a market. It is an equally beneficial safety factor in the company’s domestic hydrogen generators.

Electrolysers in non-fuel-cell applications are enabling fuel cell technology: these businesses have capitalised on valuable early markets to create viable operations, bring down costs and improve reliability, thereby laying the foundation for affordable hydrogen infrastructure. These applications also familiarise people with electrolysis, which in turn helps provide a fundamental understanding of what fuel cells offer. Indeed, the two technologies have many synergies and together can provide a total clean energy solution.

**Integrating Fuel Cells with Electrolysers**

At the Exhibit were two new products that each allow for the integration of electrolysers with fuel cells and small-scale wind or solar power to provide autonomous back-up power systems (on the same principle as the Electro Power Systems’ ElectroSelf unit that is already on the market). This has been arrived at from opposite starting points: one product is by Acta, an electrolyser company, and the other by FutureE, a fuel cell stack developer.

Acta’s hydrogen generating system grew out of an Italian government-funded project with Enel to develop a product for micro-generator peak shaving. Enel specified a 5 kW system producing hydrogen at 30 bar as optimal for use within an average Italian home fitted with solar PV panels and
this is what Acta has produced, fitting it into a cabinet the size of a small refrigerator. During sunny periods excess solar energy is used to electrolyse water and produce hydrogen, which is stored and can be used by a fuel cell to generate electricity when the sun is not shining. The system sources its own water, which is collected in a gutter installed under the solar panels to catch rainwater run-off and then treated and filtered. It is based on Acta’s commercially available rack-mounted electrolyser stack. Heliocentris is one fuel cell company that has recognised the benefit of offering a combined electrolyser–fuel cell solution to its customers (right): it recently entered into a licensing agreement with Acta to use its electrolyser technology and is working to roll out commercial autonomous power and zero-emission energy management solutions, particularly for the telecommunications sector.

The FutureE Independence system uses two of the company’s Jupiter 2 kW rack-mounted fuel cell stack integrated with a water tank, an electrolyser, two cabinet-sized hydrogen storage cylinders and a small battery for power management. The system requires minimal servicing, as hydrogen is produced during periods of excess power and stored in the tanks for later use by the fuel cells during power outages: it is capable of sustaining power during lengthy outages of several hours. The company’s development of back-up systems that are specifically aimed at the telecoms industry has been customer-driven: following the deployment of Jupiter back-up systems at Deutsche Telekom (DT) sites, DT bought further systems and took a stake in FutureE. The company is now poised to manufacture and deliver hundreds or even thousands of units and is awaiting orders.

Fuel Distribution: Barriers and Solutions

A frequently cited barrier in commercialising fuel cell technology is the lack of fuel distribution channels: the perception is that hydrogen infrastructure must be established from scratch before fuel cells are viable. However, this is by no means the case in all instances. In the preceding discussion, two separate solutions have already been touched on: the use of the existing natural gas distribution grid, and on-site electrolysis.

In a presentation at the Public Forum, Alexander Dauensteiner, Head of Product Management Innovation at Valliant, emphasised that natural gas offers an undervalued opportunity to reduce carbon emissions significantly in the near future. While we work on longer-term renewable energy solutions, why not make the most of this opportunity? With the high electrical and overall efficiency of fuel cell appliances, carbon dioxide emissions resulting from building energy consumption (currently accounting for 40% of Germany’s total CO$_2$ emissions, as stated before) could be considerably reduced.

The injection of hydrogen generated for wind or solar energy storage into the gas grid would further enhance this benefit by increasing the renewable content of the gas. It should also be possible to separate the hydrogen from the natural gas at point of use if this is desired, meaning the gas grid could eventually double as hydrogen distribution infrastructure.
On-site generation of hydrogen by electrolysis eliminates the issue of gas distribution altogether and offers other benefits besides. Integration with renewable energy sources, hydrogen storage and fuel cells – whether at large or small scale, distributed or centralised – allows for a reliable, predictable source of clean energy. Electrolysers are produced in a range of sizes and hydrogen generation can just as easily take place in the home, on the refuelling station forecourt, or in a large hybrid power plant.

But fuel cell developers are also looking at other ways to circumvent or simplify the distribution and provision of fuel for their products. Two solutions using alternative fuels are described below.

**Methanol: a Convenient Liquid Fuel**

SFC Energy has created a successful business with its methanol-fuelled line of EFOY DMFC, targeted at a wide range of industrial applications and the lucrative consumer leisure market. It was one of the first fuel cell companies to be successful in the consumer market and it is telling that the company has not exhibited at the Group Exhibit for several years; this year the company exhibited elsewhere in the Messe aiming at end-user markets with its partner Rittal, a sign that the company is now fully commercially focused.

Danish outfit Serenergy, which was showcasing its range of solutions at the Group Exhibit, is also using methanol. Its fuel cell power modules are based on a high-temperature PEMFC with integrated fuel reformer and fuelled with liquid methanol. Methanol is very easy to handle and store and is cheaper than diesel. The advantage of the technology is exemplified in the EcoMotion landscaping maintenance truck, (left) developed by Serenergy in cooperation with its Danish partners. The incumbent technology in this niche is the diesel internal combustion engine; Serenergy’s HT-PEMFC variant utilises the same truck architecture but replaces the diesel tank with a methanol tank and the combustion engine with two of its 350 W HT-PEMFC systems and a battery; this configuration allows the truck to consume just 50% of the energy used by its diesel equivalent, allowing it to operate for over a week on a single tank. Quiet operation and reduced emissions allow the EcoMotion to be used in pollution-sensitive environments such as parks, municipal grounds, cemeteries, golf clubs, zoos, stadiums, amusement parks and even hospitals.

**LPG: a Readily Available Fuel**

Truma was exhibiting a product at the Group Exhibit that is ready for mass production and will launch soon; it is a competitively priced 250 W auxiliary power unit (APU) that uses a high-temperature PEMFC integrated with a fuel processor. The VeGA runs on LPG, supplied in conventional camping-gas cylinders and easily obtainable through retail outlets, and is being aimed at the camping and leisure market, in which Truma already has a significant presence and where fuel cells have seen previous success. It is also suitable for industrial use: for example, the VeGA was demonstrated at the Exhibit as part of a rig for powering temporary electronic traffic signs. The VeGA keeps the battery charged and is supplied by two standard LPG gas cylinders mounted on the rig; at full load the system can run for over a week without refuelling.
Another company looking to capitalise on the widespread availability of LPG is eZelleron, which was exhibiting at the Brennstoffzellen Initiative Sachsen (Fuel Cell Initiative of Saxony) stand (right). eZelleron is now mass-manufacturing its micro-tubular SOFCs, with capacity for production of 1,000 cells a day, and sales are climbing healthily. The target application is chargers for portable electronics and the advantage of the technology is that it is very lightweight – as an example, it is currently working on a customer solution using an 850 W stack that weighs only 2 kg. While the cells and stacks are already finding a market, the company is also working on its own consumer products which will be released over the next few years. These products will be LPG-fuelled portable electronics chargers of varying size and output; innovatively they can also be fuelled using conventional disposable cigarette lighters, completely removing the infrastructure barrier.

**Fuel Cell Commercialisation**

This year’s show, the eighteenth edition of the Group Exhibit, showed considerable progress towards commercialisation, as one would hope. Many companies we spoke to last year were back, having made great strides towards the market in the intervening period. Others were absent as they have now moved on to trade shows in their end-user markets. It also seemed to us that there was more willingness to discuss numbers – prices, lifetimes and production volumes – and to state targets with confidence, providing much reason for optimism. Below, notable examples from the show illustrate some important areas in the commercialisation of fuel cell technology.

**Fuel Cell Buses: Coming Soon**

Fuel cell buses, although they continue to be successfully demonstrated in a number of projects around the world, are generally viewed as still being some way from commercial viability – but this horizon may be a lot closer than we think.

Ballard’s plans for the future of its fuel cell bus module were outlined by European Account Director Geoff Budd in a very well-attended interview at the Public Forum. While the drive for clean air and reduced carbon dioxide emissions is a compelling reason to adopt fuel cell buses in cities, Budd was clear that the buses should be cost-competitive too. Ballard has a product in development that it believes will help achieve this: its seventh generation fuel cell module, the HD7, is being designed-to-cost in an intensive development programme, and redevelopment of other elements of the drivetrain and ancillaries is also underway. The aim is for the total cost of ownership of a fuel cell bus to match that of a comparable diesel-hybrid bus by 2014. A parallel aim is to increase the lifetime of the fuel cell units to match that of internal combustion engines in conventional buses in their first lifetime, which means at least 30,000 hours of operation, and it is expected that this target will be met in the second half of 2014. In technology development terms, that is just around the corner.

Hydrogenics is also focusing on fuel cell bus technology. Its HyPM module has been designed to be very compact, light and simple to integrate, and is being produced in various outputs to suit bus size and level of integration. The company currently offers a warranty to 20,000 hours of stack operation plus an all-in service contract to reduce customer risk and is in talks with bus OEMs and transit companies.
Mass Production for Cost Reduction

By now, considerable cost reduction in fuel cells has taken place through enhancements to the technology, but it is widely appreciated that further reductions must be delivered by economies of scale. Here manufacturers face a paradox: in order to achieve increased production volumes and lower costs, a market for their products must be established – but prices need to come down before market demand is created. Companies are looking at a variety of ways to boost early volumes and achieve economies of scale as quickly as possible.

For instance, Baltic Fuel Cells is focusing on a single market offering: a 300 W PEMFC fuel cell module, designed for easy integration without expert knowledge (left). The aim is for the product to be suitable for a range of markets, so that a single production line caters to aggregated demand. With the addition of a hydrogen fuel cartridge, a power converter and a small monitoring and control unit, the SuSy 300 subsystem is ready for use. It will be sold to integrators for off-grid applications such as portable generators for camping and leisure, or integrated with domestic wind turbines and electrolysers in power systems for remote homes, for example. The SuSy 300 is in small-series production but has been designed with mass-manufacturing in mind. Next year, a hundred or more systems will be produced at a cost of around €3,000 each, ramping up to thousands of systems in the two to three years after that, at which point Baltic has a price target of €1,000 in mind; it is thought possible to bring the price down as low as €500 per kilowatt at mass production of over 5,000 units per year.

Establishing the Supply Chain

As stated in the previous section, eZelleron is already mass producing its fuel cells but is keen to also manufacture its own products for the consumer market. This ambition is being somewhat hampered by the difficulty of sourcing certain components of the necessary balance of plant suitable for micro-tubular SOFC. This is something that came up many times as we discussed commercialisation plans with the fuel cell exhibitors at the show: the challenge they face in sourcing cost-effective balance of plant and establishing supply chains.

This is part of any process of commercialisation of course, but is perhaps especially complicated for a new technology that is versatile enough to take a plethora of forms. Components may be bespoke or modified or not yet supplied as mass-produced products, or the high performance of the system may rely on specialised materials that aren’t yet readily available outside the laboratory environment. Companies with expertise throughout the entire supply chain are rare and perhaps in a fortunate position as they are not reliant on external technology. However, holding such a position can be capital-intensive and will not appeal to companies with key intellectual property in a specific technology who wish to focus on their core strength.

It is here that commercialisation partners in the supply chain are important, but not necessarily easy to find. However, it is encouraging to see that players in other markets are becoming more aware of fuel cells and electrolysers and are seeking partners with IP in those technologies through whom they can access a new market. A good example was present at the Exhibit: Kaori is a forty year old Taiwanese company with a solid reputation whose background is in heat treatment of metals. The company has a unique vision for itself: to transition from an energy consuming business to an energy reducing business and finally to an energy producing business. It plans to complete this final stage through the development and sale of fuel cell system components, primarily balance of plant. Most
recently Kaori has attracted attention through its supply of hotboxes to US stationary SOFC manufacturer Bloom Energy. The hotboxes hold the SOFC stack and facilitate gas flow and heat transfer, as well as providing a mechanical structure for the system. The company strongly believes in the potential of fuel cells and wants to aid the industry, first in Asia and then globally, through reducing the cost of balance of plant and by providing cost-effective quality manufacture.

The potential for established manufacturers to benefit from a growing market for fuel cells can be attested to by another supplier to Bloom Energy, Austria’s Plansee. Plansee supplies products made from refractory metals and metallic composite materials to various markets, and it now produces 1.5 million interconnect plates for SOFC a year. Since last year, the company’s technology is being mass-produced by affiliate Global Tungsten and Powders Corp. (GTP) on a Bloom-only production line in the USA, running at full capacity on three shifts to keep up with orders – hardly surprising after recent high-profile announcements of Bloom fuel cells being used by the likes of Adobe, Coca-Cola, NASA and Apple.

Concluding Remarks

The Exhibit always has a wide range of fuel cell products on display and this year’s show was distinguished by not just that range but also the size of some of the products on show. In the indoor exhibition area visitors could see: the Smith Electric Vehicles truck with integrated fuel cell range extender from Proton Motor Fuel Cell (below); a Citaro fuel cell bus; the EcoMotion truck; a Mercedes-Benz F-CELL; the eSLED fuel cell snowmobile at the Finnish Pavilion; Truma’s mobile rig with its fuel cell powered sign; and even an aircraft with hydrogen fuel cell propulsion, the Antares DLR-H2. The presence of these made a concrete statement about the relevance of fuel cells to our daily lives.

Each year at the Group Exhibit we see more companies advancing towards commercialisation and new companies entering the arena. The focus of the exhibition is now moving from applied research and development to routes-to-market, and topics such as energy storage, fuel provision, supply chain responsiveness and cost competitiveness were all dominant this year. We look forward to seeing how these issues develop over the next year and for our return to the Hannover Messe in 2013 for the 19th Group Exhibit Hydrogen + Fuel Cells.

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