Fuel Cell Industry Report

Global News on Advances and Applications in Fuel Cell Technology

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TRANSPORTATION

Daimler debuts new Mercedes-Benz B Class F-CELL

According to Dr. Thomas Weber, Member of the Board of Management of Daimler AG responsible for Group Research and Development for Mercedes-Benz Cars, the company is launching its first series-produced fuel cell car: the B Class F-CELL. Weber says, "The environmentally friendly electric car has a performance similar to 2.0-litre petrol car and is fully suited for everyday driving. The zero-emission drive system consumes the equivalent of 3.3 liters of diesel per 100 kilometers in the NEDC (New European Driving Cycle)... Thanks to its great range of about 400 kilometers and short refueling times of around three minutes, the B Class F-CELL ensures local zero-emission mobility even for long stretches" The electric motor has a peak performance of 100 kW/136 hp and a maximum torque of 290 Nm, which is available from the first rotation.

According to the company, production of the B Class F-CELL will commence in late 2009 with a small lot. The first of around 200 vehicles will be delivered to customers in Europe and the USA at the beginning

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INDUSTRY NEWS

UK Technology Strategy Board funding £9 million in fuel cell and hydrogen development

According to Technology Strategy Board lead technologist Filomena La Porta, "The organization is funding £17 million worth of new research and development into innovative technologies to help meet climate change targets and secure the UK's energy supplies." Specifically, "The government-funded organization, created to drive technological innovation in the UK, is to invest nearly £9 million in the nine world-leading, industry-driven development projects involving fuel cells and hydrogen technologies. The total value of the research, taking into account contributions from the participating companies, is in the region of £17 million... The projects will develop innovative solutions for fuel cell applications in the stationary, transport and portable power markets. The technologies to be developed will aim to lower costs while significantly improving reliability, durability and performance

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FUEL CELL NEWSWIRE

DOE releases "Introduction to Hydrogen for Code Officials"

The U.S. DOE's Introduction to Hydrogen for Code Officials online training course provides an overview of hydrogen and fuel cell technologies, how these technologies are used in real-world applications, and the codes and standards required for permitting them. The course consists of four modules: (1) Hydrogen and fuel cell technology basics; (2) Hydrogen and fuel cell applications; (3) Permitting hydrogen fueling stations; and (4)

Permitting fuel cell facilities. A short quiz is offered at the end of each module. At the end of the course, you may print a "certificate of completion" that tallies your quiz score. In addition, the course features a Library section with supplementary information including publications, related links, and a glossary of terms used in the course. Find it at www.hydrogen.energy.gov/pdfs/introduction_to_hydrogen_for_code_officials_text_version.pdf.

U.S. Tax credit for fuel cells

The U.S. Department of the Treasury and the U.S. DOE have initiated a program to award $2.3 billion in tax credits for manufacturers of advanced energy equipment. Authorized by the American Recovery and Reinvestment Act. This new program will provide tax credits to manufacturers who produce clean energy equipment. Specifically, the Recovery Act created a new tax credit program by authorizing Treasury to provide developers with an investment tax credit of 30% for facilities that manufacture particular types of energy equipment including fuel cells, batteries; EVs (including fuel cell powered vehicles), and electric grids to support the transmission of renewable energy. The manufacturing tax credit is capped at $2.3 billion, and credits are available for two years or until the cap is reached. Companies can expect to receive payments within 180 days of filing for the credit. Details are at http://www.energy.gov/recovery/48C.htm.

Posco Power orders 30.8 MW of FuelCell Energy modules and components with estimated value of $58 million

According to Posco Power President and CEO Soung-Sik Cho, the company has ordered 30.8 megawatts (MW) of FuelCell Energy Direct FuelCell (DFC) modules and components. The order represents an estimated sales value to the Company of $58 million and calls for delivery during 2010 and early 2011. According to Cho, Posco Power and FuelCell Energy also signed a Memorandum of Agreement whereby the parties agree to pursue a licensing agreement to allow Posco Power to assemble FuelCell Energy cell and module components into stack modules for sale in South Korea. As part of the transaction, Posco Power will purchase $25 million in FuelCell Energy common stock at $3.59 per share (the 10-day average FuelCell Energy stock closing price through June 8, 2009) once the licensing agreement is finalized.

South Korea will provide 80% subsidy for household fuel cells

The South Korean government will soon offer households a subsidy that will cover 80% of the cost of domestic hydrogen fuel cells. The subsidy is designed to directly benefit fuel cell makers like South Korean FuelCellPower

and GS Fuel Cell. The size of the subsidy will fall to 50% between 2013 and 2016 and lower again to 30% from 2017 to 2020. The goal is to ultimately lower the price to consumers from $8,000 by 2015 and to $4,000 by 2018. By 2013, the government reportedly hopes to be subsidizing at least 1,000 units annually.

BlueBird Aero Systems and Horizon debut world's first commercial fuel cell UAS

An Unmanned Aerial System developed by BlueBird Aero Systems and powered by Horizon Fuel Cell Technologies was recently showcased as the world's first long endurance, commercial hydrogen fuel cell powered UAS. BlueBird's "Boomerang" is a field-operational 9 kg electric powered UAS which is now able to fly for over nine hours using Horizon's high performance hydrogen-electric power system. BlueBird Aero Systems recently concluded a three-year effort to integrate the PEM fuel cell technology into a specially designed UAS, developing support systems like hybrid capabilities for system power redundancy, fuel-cell cooling mechanism and more. The fuel cell-powered UAS is already licensed for flights in Israel and is graded as a "matured" system. According to BlueBird, "Hydrogen-electric powered UAS will bring important new capabilities - reduced acoustic signature, smaller size, as well as increased effectiveness in increasingly important persistent intelligence, surveillance and reconnaissance (ISR) missions. Where battery performance limits the effective use of these promising systems, Horizon's next-generation fuel cell power systems will improve versatility and open new mission possibilities for small aircraft such as BlueBird's Boomerang UAS. In addition to increasing flight endurance, Horizon's new fuel cell system also makes it possible to increase the capability of smaller and lower cost aircraft by integrating more power draining electronic devices, such as electro-optical sensors, infrared cameras and laser designators."

Hydrogenics contract with Vision Industries

According to Hydrogenics Corp. President and CEO Daryl Wilson, the company has received a contract to provide HyPM 16 fuel modules for use in zero emission class 8 short haul trucks being developed by Vision Industries Corp. Wilson added that Vision's Tyrano truck is thought to be the world's first plug-in electric/hydrogen fuel cell powered heavy duty class 8 vehicle. "The contract calls for Hydrogenics' HyPM fuel modules to be delivered in two stages. The initial units will be used to complete testing and demonstrate the vehicles in and around the Port of Los Angeles and Port of Long Beach. Second stage deliveries will be dependent on purchase orders for the trucks being received by Vision. With the Los Angeles basin heavily polluted by commercial trucking operations, the Ports have implemented a Clean Truck Program to replace older, inefficient, traditional means of transportation by the end of 2012 with clean energy alternatives."

ReVolt Technology applies for $30 million in government research grants accelerating zinc-air FC development

According to ReVolt Technology CEO James P. McDougall, the company is applying for $30 million in grants from U.S. DOE under the American Reinvestment and Recovery Act to accelerate the commercialization of its large format zinc-air fuel cell/batteries for energy storage and electric vehicle applications. ReVolt today also announced it has selected Portland, OR as the location for its U.S. headquarters and manufacturing center. By locating in Oregon, the company will be eligible, and intends to apply for, Business Energy Tax Credits from the Oregon Department of Energy for battery research and production. McDougall says, "Securing government grants and tax credits will allow ReVolt to significantly accelerate its operations in Portland and U.S. expansion. ReVolt's zinc-air batteries deliver more than twice the energy of conventional rechargeable designs such as lithium-ion. Made using naturally abundant zinc, the batteries have low manufacturing costs and reduce dependence on imported fuels and other energy materials. They degrade into environmentally-safe substances when exhausted, cutting pollution risks and the need for costly battery waste capture programs."

ReVolt plans to employ up to 75 highly skilled employees at its Portland site during its development phase and up to 250 employees in subsequent pilot and production phases.

Polyfuel ceases operations

Would-be portable fuel cell maker Polyfuel has ceased operations as of mid-August. The 1999 Stanford Research Institute-inspired company sited inability to obtain more capital as contributing to the closing. In a final indignity, the company's www.polyfuel.com website has apparently been hijacked by computer hackers who are using it to download potentially dangerous software to visiting computers. ❖

Texas A&M researcher receives NSF grant to develop a microbial fuel cell array

Dr. Arum Han, assistant professor in the Texas A&M Department of Electrical and Computer Engineering and Dr. Paul de Figueiredo from the plant pathology and microbiology department has received a grant from the National Science Foundation to develop a microbial fuel cell array for bioenergy research. Han will develop a microfabricated MFC array, a compact and user-friendly platform for the identification and characterization of microbes capable of direct electricity generation.

According to a statement from the university, "MFCs have generated significant excitement in the bioenergy community because of their potential for powering diverse technologies, including wastewater treatment and bioremediation devices, autonomous sensors for long-term operations in low accessibility regions, mobile robot/sensor platforms, microscopic drug-delivery systems and renewable energy systems."

"MFC devices currently being used and studied do not generate sufficient power to support widespread and cost-effective applications so research has focused on strategies to enhance the power output of the MFC devices, including exploring more electrochemically active microbes to expand the few already known electricigen families. However, most of the MFC devices are not compatible with high throughput screening for finding microbes with higher electricity generation capabilities. The MFC array being developed in the Han and de Figueiredo labs has 24-96 miniaturized MFCs on a single chip format and enables direct and parallel comparisons of microbial electricity generation."

Contact: www.tamu.edu.❖

Adaptive Materials introduces 250-watt fuel cell system to portable power market

According to Adaptive Materials chief business officer Michelle Crumm, the company has introduced a 250-watt portable SOFC to the market. Crumm says, "The system, which joins the 50-watt portable system and 180-watt unmanned vehicle power system in Adaptive Materials' fuel cell portfolio, will provide lightweight power ideal for recharging batteries and powering portable electronic devices."

"Our 250-watt system was developed to address the real need for soldiers to carry reliable, safe power into the field, Weighing just nine kilograms and occupying 17 liters, our 250-watt fuel cell system can directly power a six bay military issue battery charger for BB-2590s, Li-145s and other lower capacity battery types. Plus, like all of our fuel cell systems, Adaptive Materials' 250-watt fuel cell is powered by globally-available, lightweight propane."

Adaptive Materials' 250-watt fuel cell was developed as part of an internal project funded under IRAD. Adaptive Materials will deliver three 250-watt fuel cell systems to the U.S. Government in late 2009 for field testing.

According to a statement from the company, "Adaptive Materials' 250-watt fuel cell system is designed to be a portable unit for applications requiring more power and longer run time than batteries can provide, including electronics, radios, computers, and battery charging. Designed to fit in the market space between batteries and engine powered generators, Adaptive Materials' 250-watt unit weighs 20 pounds, significantly less than the smallest military generator, a 3 kilowatt unit weighing 364 pounds. In comparison, Adaptive Materials' 250-watt system replaces 13 standard military BA-5590 battery units that weigh 13 kilograms each." Adaptive Materials' 250-watt fuel cell system has also demonstrated a 1500-hour life expectancy.

The company indicated that in addition to its value to soldiers in the field, Adaptive Materials' 250-watt system is useful to a wide range of potential consumer applications. "Especially for people who enjoy going off-grid for camping, boating, hiking or other recreational activities, the 250-watt fuel cell is an ideal source of portable power," Crumm added.

Contact: www.adaptivematerials.com.❖

Typical Adaptive Material Portable SOFC

AIST announces a new type of high capacity lithium-air fuel cell

According to Japan's National Institute of Advanced Industrial Science and Technology (AIST), researchers have developed a lithium-air fuel cell which uses recyclable lithium and organic and aqueous electrolytes, separated by a solid state electrolyte. This allows the fabrication of large capacity (50,000 mAh/g on air electrode basis) cells.

Specifically, "An organic electrolyte is used on the anode (metallic lithium) side and an aqueous electrolyte is used on the cathode (air) side. The two electrolytes are separated by a solid state electrolyte (lithium superion conductor glass film called LISICON) so that the two electrolytic solutions do not intermix. Only lithium ions pass through the solid electrolyte, and the battery reactions proceed smoothly. At the cathode, the reaction product in the discharge process is water-soluble and no solid substances are produced."

"This technology holds great potential for automobile batteries. At a filling station, the driver of a vehicle thus equipped could exchange the aqueous electrolyte for the air electrode and refill the metallic lithium for the anode in the form of cassettes, and then continue driving without waiting for batteries to be recharged. It is easy to retrieve metallic lithium from the aqueous electrolyte, so that lithium can be reused. This is truly a new type of lithium fuel cell."

The work was performed by Haoshen Zhou (Leader), the Energy Interface Technology Group, the Energy Technology Research Institute (Director: Yasuo Hasegawa) of the National Institute of Advanced Industrial Science and Technology (AIST) (President: Hiroyuki Yoshikawa), and Yonggang Wang (Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellow). This study was partly supported by Grants-in-Aid for Scientific Research program of JSPS.

"Targeting high performance lithium-ion batteries, the Energy Technology Research Institute of AIST demonstrated that nanostructured electrode materials provide high rate performance of Lithium ion batteries. Lithium-air batteries also have been aggressively developed to achieve even larger energy densities. Problems with conventional lithium-air cells include: (1) A solid reaction product (Li_2O) accumulates at the cathode. It blocks pores, and disturbs discharging; (2) Hydrogen gas, which is dangerous, is produced if moisture in the air reacts with metallic lithium; and (3) Discharging would be disturbed if the nitrogen gas in the air reacts with metallic lithium."

"To overcome problems with conventional lithium-air batteries, AIST has been developing new lithium-air batteries that use an organic electrolyte and metallic lithium on the anode side, the air and an aqueous electrolyte on the cathode side, and a solid electrolyte LISICON as a partition wall to separate them."

"This study is based on the idea of using an organic electrolyte only on the anode side, and using an aqueous electrolyte on the cathode side. If the two sides are separated by a solid electrolyte which allows only lithium ions passing through, the two electrolytic solutions do not mix with each other while the charge-discharge reactions proceed smoothly. In this system, it has been confirmed that the discharge reaction product is not a solid substance like lithium oxide (Li_2O), but lithium hydroxide (LiOH), which dissolves in the aqueous electrolyte, and so clogging of the pores does not occur at the carbon cathode. Furthermore, as water and nitrogen do not pass through the solid electrolyte (the partition wall), there are no unwanted reactions with the metallic lithium anode. During charging, corrosion and degradation of the air electrode is prevented by using another cathode electrode exclusively for charging."

"Metallic lithium is used as the anode, and an organic electrolyte containing lithium salt is used on the anode side. A lithium-ion solid electrolyte is placed in between the two electrolytic solutions as a partition wall to separate the cathode and anode sides. An alkaline water-soluble gel is used as the aqueous electrolyte for the cathode side and the cathode consists of porous carbon and an inexpensive oxide catalyst. The newly developed lithium-air cell with alkaline aqueous electrolyte gel has a discharging capacity of approximately 9000 mAh/g when it is discharged in the air at a discharge rate of 0.1 A/g. The charging capacity is about 9600 mAh/g. These values are considerably larger than the reported values of conventional lithium-air batteries (700 - 3000 mAh/g). Furthermore, by using an alkaline aqueous solution in place of an alkaline water-soluble gel, continuous discharging up to 20 days at the discharge rate of 0.1 A/g in the air has been realized."

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"The new lithium-air batteries allow for continuous operation if the aqueous electrolyte on the cathode side is exchanged and metallic lithium is resupplied to the anode by means of cassettes, etc. This concept can be taken as a new type fuel cell, called a 'lithium fuel cell.' By retrieving LiOH from the aqueous electrolyte in the air electrode, metallic lithium can be recovered easily and reused as fuel."

The lithium-air battery newly developed by AIST needs further technical improvement toward practical use. Generally, there are two directions in this new lithium-air battery research, one is for rechargeable lithium air battery and the other is for lithium fuel cell.

Contact: www.aist.go.jp. ❖

Nissan becomes first automaker to commercially deploy methanol fuel cells for material handling equipment

According to Nissan North America Manager for Material Handling Mark Sorgi, the company has become the first vehicle manufacturer to commercially deploy methanol fuel cells to power its material handling equipment (tugs). Specifically, the company uses OorjaPac methanol fuel cells from Oorja Protonics at their Smyrna, Tenn., assembly plant. Sixty tug are used to transport thousands of vehicle parts throughout the 5.4 million-square-foot facility.

Sorgi added that by using OorjaPac, Nissan is able to get rid of more than 70 electric battery chargers that were consuming almost 540,000 kilowatt-hours of electricity annually. This will reduce Nissan's electric bill and eliminate more than 300 tons of CO_2 emissions.

According to a statement from the company, "Methanol is an alternative liquid transportation fuel that is derived from various sources including wood, grass, landfills, natural gas and coal. Nissan is retrofitting the 60 tugs with methanol fuel cells that are easily, quickly and safely filled with methanol by the technicians who drive them. The fuel cell provides a constant charge that puts less strain on the tugs electrical system, increasing the life of the battery and other electrical parts... The methanol fuel cells have made us more productive by saving us almost 35 hours a day that were spent by employees changing out batteries. There's no changing out of low or dead batteries, which involves a battery technician and 15 to 20 minutes. Now the tug driver can refill the fuel cell in less than one minute and they're on their way."

Since no batteries are exchanged and the drivers refuel the tugs themselves, some battery technicians have been moved to other value-added positions in the plant, better utilizing Nissan personnel. Also, the time saved by not having to change batteries has created a more efficient material-handling operation, allowing Nissan to reassign four material handlers.

Contact: www.NissanUSA.com and www.oorjaprotonics.com. ❖

U.S. DOE funds Reynolds Community College Advanced Electric Drive Vehicle Career Studies

J. Sargeant Reynolds Community College has been awarded a $720,000 U.S. DOE grant for the development of a new Advanced Electric Drive Vehicle Career Studies Certificate. The new program will focus on EVs, PHEVs, and fuel cell electric vehicles. According to JSRCC Dean of the School of Business and Engineering Technologies Bob Heinz, "Today's vehicles are increasingly complex, as manufacturers design them to operate with sophisticated electric drive systems that provide for increased energy efficiency ... As these new systems are incorporated into vehicles, service facilities must deal with developing and maintaining a supply of qualified technicians. Unfortunately, traditional college automotive programs do not cover these emerging technologies. Some manufacturer training exists in these areas, but it is limited in scope and not available to independent repair facilities. This new program will provide a source of trained technicians in addition to providing educational opportunities in these new technologies for existing technicians."

"This grant will allow JSRCC to maintain its position of providing leading edge automotive technology to our students. As manufactures move toward electric propulsion vehicles, JSRCC will be able to provide highly qualified graduates for these emerging technologies. By providing the courses in a distance learning format, the reach of the program will be national in scope."

Contact: www.reynolds.edu. ❖

Daimler debuts new Mercedes-Benz B Class F-CELL...

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of next year."

"The vehicle's technological heart is the new generation of the compact, high-performance fuel cell system, in which gaseous hydrogen reacts with atmospheric oxygen at 700 bar to generate a current for the electric motor. The fuel cell system of the B Class F-CELL has a very good cold-start capability even at temperatures as low as minus 25 degrees Celsius. The drive system was completely newly developed versus the F-CELL A-Class presented in 2004, with Mercedes-Benz engineers achieving considerable improvements in output, torque, operating range, reliability, starting characteristics and comfort"

As in hybrids with combustion engines, the fuel-cell car uses a lithium-ion battery with an output of 35 kW and a capacity of 1.4 kWh to boost power and recover braking energy. Lithium-ion technology offers several advantages over conventional batteries, including compact dimensions, high performance, great recharge efficiency and a long service life. The B Class F-CELL employs the unique sandwich floor architecture that is well-known from the A- and B-Class. The advantage of this design is that the drive components are located in the sandwich floor, where they are protected and don't take up much space so that the vehicle's interior remains fully usable and a boot capacity of 416 liters is available.

Daimler used the introduction of the B-Class F-CELL as a chance to define and focus the company's long term plans for EVs and fuel cell vehicles. "With more than 100 test vehicles and a combined total of over 4.5 million kilometers of trial testing, Daimler and Mercedes-Benz have the most extensive experience with fuel cell vehicles of any manufacturer worldwide. The B-Class F-CELL is further testimony of this technology's high level of development for automotive use. However, a comprehensive network of hydrogen filling stations still has to be set up before locally zero-emission driving can become a widespread reality. To make this possible, Daimler is cooperating with government authorities, energy utilities and oil companies in joint projects in places such as Hamburg, Stuttgart and California."

"Mercedes-Benz views the development of electric cars with battery and fuel cell drives for local zero-emission driving as a means of supplementing vehicles with high-tech internal combustion engines. Advanced diesel and petrol engines will remain important for automotive applications for a long time to come—not only for individual mobility in passenger cars—especially over long distances—but, more importantly, for freight transport in trucks. Electric vehicles, on the other hand, will increasingly be used in urban transport."

Contact: www.daimler.com ❖

Mercedes-Benz B-Class F-Cell Technical Specifications

Drive	Electric motor with fuel cell
Rated output (kW/hp)	100/136
Rated torque (Nm)	290
Maximum speed (km/h)	170
Consumption (NEDC) (l of diesel equivalent/100 km)	3.3
Total CO_2 (g/km min.–max.)	0.0
Range (km) NEDC	385
Capacity of lithium-ion battery (kWh/kW)	1.4 /35
Cold-start capability	to -25 °C

Mercedes-Benz B Class F-CELL

Morphic Technologies: Polish Navy orders a fuel cell for testing in underwater crafts

According to Morphic Technologies President and CEO Martin Valfridsson, the company has received an order for a new type of fuel cell that will be used in underwater crafts. The customer is the Polish Navy in Gdynia. Valfridsson added, "The development work has been carried out parallel with the ongoing industrialization process for Polaris 140, the fuel cell system for recreational vehicles such as boats, travel trailers and motor homes. All volume manufacturing of fuel cell stacks follows one primary process, and the in-house designed machinery that is used is the same for all of Energy's products."

"Morphic will deliver an unconventional, AIP-fuel cell system where electricity is generated in environments with no contact with the atmosphere. The fuel cells are driven by pure hydrogen gas and pure oxygen as opposed to a conventional fuel cell where oxygen is extracted from the air. The advantages of this is that the system can be made more compact and it also increases efficiency."

Contact: www.morphic.se/en. ❖

Neah Power Systems provides energy solution for long duration applications in limited air environments

Neah Power Systems Vice President of Engineering Tsali Cross Ph.D., recently released a technology briefing that describes, "A new and unique approach to direct methanol fuel cell (DMFC) design" developed by Neah. The DMFC is based on a porous silicon, catalyst-supporting electrode structure and circulating liquid fuel, electrolyte and oxidant.

According to Cross, "We believe that there are currently no other commercially available DMFC's able to operate in non-air breathing environments with such unique capabilities. Neah Power's anaerobic fuel cell represents a major breakthrough in portable power for long-duration missions operating in environments without air. Neah plans to leverage this advantage by initially targeting this market..."

Neah Power's silicon-based architecture and use of liquid electrolyte creates a three dimensional reaction zone that is able to generate industry leading power densities of greater than 180mW/cmand allows for air availability limited operations.

Using Methanol as a fuel provides distinct advantages over traditional power sources such as lead-acid or lithium-ion based power sources including energy density, weight and volume for long-duration and low-power (0-200W) electronic applications based on the theoretical densities.

Most fuel cells for such portable applications are based on a PEM which uses oxygen from air as the oxidant. These systems are limited by the availability of air or extended periods of time, such as in a smoke-filled building, a soldier's pack, or in pressure challenged environments (i.e. high altitude or underwater).

In a separate announcement, Neah recently told shareholders, "Originally, Neah was a fuel cell development company; however, as Neah transitions from development to commercialization, our market research indicates that the company can build around its differentiated fuel cell technology to provide the most dynamic renewable energy solutions to the market place. Market research indicates that the demand for hybrid, renewable energy solutions spans individual and corporate consumers globally and across all walks of life. We believe that the new integrated solutions could provide energy at competitive, profitable prices, while making a meaningful and positive difference towards addressing broader environmental issues. Neah will continue to evaluate other world class, renewable energy products for its product portfolio."

"Neah plans to serve the range of industrial, military and consumer markets that are available to us. We believe that the energy storage and generation markets are also large market opportunities that can be competitively served by our technology. The company is adopting a staggered market entry strategy of initially pursuing specialized markets like the anaerobic (non-air breathing) markets where there is limited competition. Examples include the EKO Vehicle and Hobie Cat relationships. These early market entries allow the company to scale up the technology, validate the supply chain that Neah has in place, and use those experiences to pursue the larger consumer markets for phones, computers, and other consumer devices. "

Contact: www.neahpower.com ❖

STATIONARY

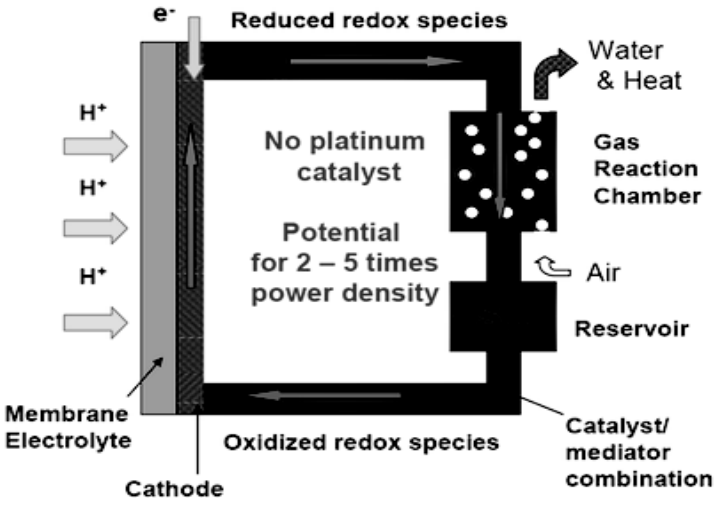
ACAL Energy starts operation of 1kW liquid cathode

According to ACAL Energy CEO Dr S B Cha, the company has completed the successful start-up of its kilowatt-scale fuel cell system using its patented liquid cathode technology, FlowCath. Cha added, "The hydrogen-fuelled 'short-stack' unit has already achieved a continuous power output of over 600W, and will deliver over 1.5kW with the full stack, expected later this summer. Fuel cell systems utilizing FlowCath ultimately will be a clean and economically sensible alternative to diesel and gasoline generators in stationary and transportation applications requiring between 1kW and 200kW of electrical power."

"ACAL Energy's FlowCath technology replaces up to 90% of the current level of platinum catalyst in a proton exchange membrane (PEM) fuel cell with a low cost, durable liquid chemical. ACAL Energy has developed a family of proprietary chemical compounds that can deliver the same level of fuel cell performance as platinum, and which are expected to exceed this level in the future. The technology also significantly reduces the balance of plant costs by eliminating the need for hydration, pressurization, complex cooling and other expensive mechanical sub-systems commonly found in conventional PEM fuel cells."

"This unit represents a 20-fold scale-up from our last demonstration unit... We will soon make data from the 1kW unit available to key OEM partners to enable them to start designing systems incorporating FlowCath."

Contact: www.acalenergy.co.uk. ❖



ACAL Cathode Side of Redox Cell

COMPONENTS & MATERIALS

University of California alkaline fuel cell membrane alternative to expensive Nafion

According to University of California Riverside researcher Professor Yushan Yan, his research team has developed an alkaline membrane that they believe will one day replace Nafion and enable non-precious metal fuel cell catalysts that are composed of elements such as cobalt, nickel, iron and silver. "These metals cost between $2 and $12 per ounce as compared to platinum that currently trades in the range of $1,200 per ounce and peaked at over $2,000 per ounce last summer. As this innovation is commercialized it will lead to a massive drop in the cost of goods needed to produce fuel cells. This price reduction will allow fuel cells to have a lower price point per watt than internal combustion engines and batteries. Currently fuel cells are considered to be superior to internal combustion engines and batteries in terms of size, weight, temperature, noise, safety, scalability and carbon footprint. Fuel cells are currently used to power backup generators, unmanned aerial vehicles, scooters, golf carts, cell phones, laptops, emergency generators and in fuel cell electric vehicles like the Honda FCX Clarity."

Despite the many advantages and demonstrated uses of fuel cells, they are expensive because they require platinum and other precious metals as catalysts. The best way to eliminate platinum while maintaining the many benefits is through the use of a high performance hydroxide exchange membrane, the Nafion equivalent for a alkaline fuel cell. Recently, Dr Yan's lab has demonstrated a power density of 250 mW/cm^2 using an alkaline membrane composed of quaternary phosphonium based polymers. His team expects to improve this in the near future.

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Dr. Yan says, "By switching from an acidic medium to a basic one, hydroxide (OH-) exchange membrane fuel cells (HEMFCs) have the potential to solve the problems of catalyst cost and durability while achieving high power and energy density. In a basic environment, the cathode oxygen reduction over-potential can be significantly reduced, leading to high fuel cell efficiency, and non-precious metals can be used as catalysts which are also more durable in a basic medium. Further, HEMFCs can offer fuel flexibility using hydrogen, methanol, ethanol, ethylene glycol, and other inexpensive, easily produced and biodegradable fuels because of their low overpotential for hydrocarbon fuel oxidation and reduced fuel crossover. "This is a breakthrough that will make fuel cells so efficient and inexpensive that it will revolutionize energy conversion and storage on a global scale."

Dr. Yan and UC Riverside have licensed this invention to Full Cycle Energy, a California start-up that is leading the revolution in low-cost high-durability fuel cell technology. Currently Full Cycle is commercializing another of Yan's inventions, a platinum nanotube fuel cell catalyst (PtNT) that reduces cost by 2/3 and increases durability by a factor of 10. Production of PtNT is currently being scaled up for integration into a range of fuel cell products. According to CEO Andrew Behar, "The only thing stopping fuel cells from replacing fossil fuels and batteries is cost and durability. Dr. Yan's innovations will enable a world powered by inexpensive, clean and abundant energy."

Contact: www.fullcycleenergy.com. ❖

NexTech expands manufacturing capability

NexTech recently expanded its ceramic manufacturing capacity and introduced a new line of premium ceramic powders through its fuelcellmaterials.com division. The product of years of development experience at NexTech, the Premium Powder line is tailored to provide improved ceramic processing behavior at lower temperatures. Premium Powders are available in laboratory volumes, 500-g minimum to 25-kg lot size. For commercial applications, larger production volumes are available. Each powder lot is supplied with complete chemical, physical, and electrical analyses on a convenient thumb drive. Ceramic powders include various electrolyte and electrode materials used primarily in solid oxide fuel cell applications.

Products are available directly from fuelcellmaterials.com and through NexTech's distribution network. NexTech currently has distributors in South Korea (C&S Specialty Chemical), Japan (Itochu), Taiwan (KH Union) and Europe (HaikuTech). NexTech is continuing to expand its distribution network throughout the world.

Contact: www.fuelcellmaterials.com. ❖

Ballard fuel cells to power telecom backup power units for Motorola

According toBac2 spokesperson James Lewis, the company has developed a latent acid catalyst, CSR10, that can be added to highly reactive pre-polymeric resins to enable them to be stored for at least 3 months prior to controlled polymerization at around 120°C. Lewis says, "Alternative catalysts have relatively poor storage characteristics, typically retarding violent polymerization reactions for just a few hours. Others require temperatures above 200°C for activation, levels that are impractical for most polymer manufacturing processes. CSR10 will be particularly useful where polymeric premix production is not carried out close to molding operations, as it enables safer transportation and storage of the bulk materials and reduces handling costs."

"Pre-polymeric resins catalyzed by acids include phenol-formaldehyde resoles, furfuryl alcohol resins and amino-formaldehyde resins. They are widely used in everyday products including chipboard and laminates, composites in glass-reinforced plastics, foam insulation, abrasives and many other high volume products. The ability to control the reactivity of a pre-polymer-catalyst system is crucial in terms of safety and processing economics. Thermosetting resins can be violently reactive when mixed with strong acids and dangerous exothermic reactions can result. Furfuryl alcohol, for example, is a reactive pre-polymer component in varnishes, binders and composites. Like other thermosetting pre-polymers, furfuryl alcohol reacts violently when acidified, restricting its use to applications where acids are not used or where bulk preparation and stor-

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age is not important. CSR10 has been used to harness the reactivity of pre-polymers in order to reduce materials handling and processing costs, and enable the use of a wider range of pre-polymers in industrial applications."

The catalyst was originally developed for use with Electro-Phen, Bac2's conductive polymer used in the production of components for fuel cell plates1. In this application it had been necessary to pre-mix the catalyst and resin immediately before molding. The development of CSR10 has enabled storage life of the pre-mix to be extended from 30 minutes to over 3 months, dramatically reducing processing and equipment costs and increasing quality and reproducibility.

Contact: www.bac2.co.uk. ❖

University of Massachusetts Amherst researchers develop new Geobacter strain to produce more electricity

A University of Massachusetts Amherst research team lead by Derek Lovley took Geobacter, a sediment-loving microbe whose hairlike filaments help it to produce electric current from mud and wastewater and supervised the evolution of a new strain that dramatically increases power output per cell and overall bulk power. Lovley also says it works with a thinner biofilm than earlier strains, cutting the time to reach electricity-producing concentrations on the electrode. He added, "This new study shows that output can be boosted and it gives us good insights into what it will take to genetically select a higher-power organism." The work was supported by the Office of Naval Research and the U.S. DOE.

Findings open the door to improved microbial fuel cell architecture and should lead to "new applications that extend well beyond extracting electricity from mud," Lovley says. In the new experiments, the researchers adapted the microbe's environment, which pushed it to adapt more efficient electric current transfer methods. "In very short order we increased the power output by eight-fold, as a conservative estimate. With this, we've broken through the plateau in power production that's been holding us back in recent years." Now, planning can move forward to design microbial fuel cells that convert waste water and renewable biomass to electricity, treat a single home's waste while producing localized power (especially attractive in developing countries), power mobile electronics, vehicles and implanted medical devices, and drive bioremediation of contaminated environments.

Geobacter's hairlike pili are extremely fine, only 3 to 5 nanometers in diameter or about 20,000 times finer than a human hair, and more than a thousand times longer than they are wide. Nevertheless, they are strong. Nicknamed nanowires for their role in moving electrons, pili are the secret to this particular microbe's ability to produce electric current from organic waste and sediment. Geobacter's pili seem critical for forming the biofilm which aids transfer of the electron products to iron in soil and sediment. In nature, bacteria colonies form gluey biofilms to anchor to a surface such as a tooth or an underwater rock, providing a living environment near a food source.

The Geobacter biofilm's "fortuitous" electron-transferring skill, the product of natural selection, suggested a pathway to Lovley—a way he might use selective pressure to increase its capacity to produce power. He and colleagues grew Geobacter as usual on a graphite electrode, providing acetate as food and allowing a colony to form the biologically active slime, or biofilm where electron transfer takes place across the nanowires. But for this new experiment they added a tiny, 400-millivolt "pushback" current in the electrode that forced Geobacter to press harder to get rid of its electrons.

The result of providing a more challenging environment, within five months was evolution of a beefed-up microorganism that can press at least eight times more electric current across the electrode than the original strain.

Lovley's first experiments with the anaerobic microbe, Geobacter, which he and colleagues discovered in sediment under the Potomac River in 1987, explored its use in decontaminating soil due to its ability to respire iron and other metals the way we breathe oxygen. Geobacter showed promise for a variety of bioremediation tasks, but the microbiologists further discovered in 2002 that it could produce electricity from the organic matter found in soils, sediments and wastewater. This ability appeared to be a feature of the electrically conductive pili, discovered in 2005. Together, these discoveries have led to intense research on how to harness the microbes for producing electricity in microbial fuel cells.

Contact: www.umass.edu. ❖

SDK develops high efficiency catalysts platinum substitute for PEFCs

According to Yokohama National University Professor Kenichiro Ota, Showa Denko K.K. (SDK) has developed new platinum-substitute catalysts for polymer electrolyte fuel cells (PEFCs). Professor Ota led the project for the New Energy and Industrial Technology Development Organization's (NEDO).

According to a statement from the company, "These new catalysts comprise a niobium-oxide-based catalyst and a titanium-oxide-based catalyst, each containing carbon and nitrogen atoms. They exhibit the world's highest levels of efficiency in terms of open circuit voltage and durability among platinum-substitute catalysts so far announced in the world."

Specifications include the following:

- Open circuit voltage: 1.00V or more.
- Durability: 500 hours or more (The performance test is continuing and the record is being renewed.)
- Production cost: ¥500/KW or less (about $6/kw).

SDK's spec also indicated that In the case of platinum-based catalyst, open circuit voltage is 1.03-1.05V. Durability must exceed 5,000 hours for practical use. However, durability of 100 hours has been the tentative goal for the development of non-precious-metal catalysts. The cost is 1/20 or less when compared with the present cost of platinum-based catalyst.

"PEFC catalysts are used at both anode and cathode, encouraging chemical reactions of hydrogen and oxygen. While platinum is now mainly used as catalyst, the metal's high price and low levels of reserves tend to restrict the spread of PEFCs. Furthermore, a platinum-based catalyst used at a point close to cathode has a possibility of melting...

As the newly developed Niobium and titanium-based catalysts have lower solubility than platinum, they will enable substantial cost reductions and longer life of PEFCs. Based on very-fine-particle manufacturing technologies and high-conductivity carbon materials, SDK will further improve the catalyst performance and establish volume production technologies to encourage the use of the new catalysts in fuel cell EVs, mobile devices and homes."

According to a statement from NEDO, ENEOS Celltech, a joint venture of oil refiner Nippon Oil and battery maker Sanyo Electric, launched commercial production of the PEFC cells in April 2009.

Contact: www.sdk.co.jp. ❖

Great Lakes Bioenergy Research Center reports on microbial fuel cell processes

According to Michigan State University College of Natural Science spokesperson Michael Steger, assistant professor of microbiology and molecular genetics and of crop and soil sciences Gemma Reguera has developed a process that can be harnessed to produce clean, cheap electricity and fuel from plant biomass.

"Using a specific selection of metal-reducing microorganisms in the Geobacter species Reguera was able to design a microbial fuel cell that acts as a natural battery to convert plant biomass into electrical power and produces a high yield, low-cost cellulosic ethanol product. Reguera says, "All the work of this process is done by bacteria inside a microbial fuel cell. Some of the bacteria decompose plant material while others move electrons to survive. The electron-moving microorganisms such as those in Geobacter naturally replace metal oxides with electrodes to get energy." She said that producing ethanol is viewed as the main purpose, but having the fuel cell create electrical power as a by-product has added benefits. In the future, farms could be powered by their own plant by-products and fuel their own tractors from the same microbial fuel cell.

As part of her work with the Great Lakes Bioenergy Research Center, Reguera has modified a type of Geobacter to live in the same conditions as Cyanobacteria. Cyanobacteria are bacteria that produce energy from sunlight. The combination of these two types of bacteria means the fuel cells can produce electricity directly from sunlight. Reguera's next step is to make the fuel cells more efficient and successful at a larger scale. A team of Australian researchers is currently experimenting with microbial fuel cells to treat waste water effluent from a brewery while producing power. Microbial fuel cells are also being tested in ethanol biorefineries to remove toxic products from biomass pretreatments while generating ca. 25% of the electrical power needs of the biorefinery.

Contact: www.msu.edu. ❖

DOE awards $377 million in funding for 46 Energy Frontier Research Centers

According to U.S. Energy Secretary Steven Chu, the DOE will provide $377 million in funding for 46 new multi-million-dollar Energy Frontier Research Centers (EFRCs) located at universities, national laboratories, nonprofit organizations, and private firms across the nation. Chu added, "As global energy demand grows, there is an urgent need to reduce our dependence on imported oil and curtail greenhouse gas emissions. Meeting the challenge to reduce our dependence on imported oil and curtail greenhouse gas emissions will require significant scientific advances. These centers will mobilize the enormous talents and skills of our nation's scientific workforce in pursuit of the breakthroughs that are essential to expand the use of clean and renewable energy."

Of the $377 million awarded to the EFRCs, $277 million comes from funding made available through the Recovery Act with the remaining $100 million made from DOE's FY2009 budget. The 46 EFRCs are being funded at $2-5 million per year each for a planned initial five-year period and were selected from a pool of applications received in response to a solicitation issued by the U.S. DOE Office of Science in 2008 and announced on April 27, 2009. Selection of the EFRCs was based on a rigorous merit review process utilizing outside panels composed of scientific experts. In total, the EFRC initiative represents a planned DOE commitment of $777 million over five years.

Fuel cell and hydrogen fuel related EFRCs funded by the American Recovery and Reinvestment Act include:

- Arizona State University (Tempe, AZ)—$14 million for five years to adapt the fundamental principles of natural photosynthesis to the man-made production of hydrogen or other fuels from sunlight.
- Cornell University (Ithaca, NY)—$17.5 million for five years to understand and control the nature, structure, and dynamics of reactions at electrodes in fuel cells, batteries, solar photovolataics, and catalysts.
- University of Delaware (Newark, DE)—$17.5 million for five years to design and characterize novel catalysts for the efficient conversion of the complex molecules comprising biomass into chemicals and fuels.
- University of North Carolina (Chapel Hill, NC)—$17.5 million for five years to synthesize new molecular catalysts and light absorbers and integrate them into nanoscale architectures for improved generation of fuels and electricity from sunlight.
- Northwestern University (Evanston, IL)—$19 million for five years to synthesize, characterize, and understand new classes of materials under conditions far from equilibrium relevant to solar energy conversion, storage of electricity and hydrogen, and catalysis.

Contact: www.sc.doe.gov/bes/EFRC.html❖

New method for recycling ammonia borane for on-board hydrogen storage

According to researchers from Los Alamos National Laboratory (LANL) and the University of Alabama, working within the U.S. DOE's Chemical Hydrogen Storage Center of Excellence, have developed and demonstrated a new method for the efficient off-board recycling of ammonia borane (AB) used in on-board hydrogen storage. Researchers include Dr. Gene Peterson, leader of the Chemistry Division at Los Alamos, Benjamin Davis, David Dixon, Edward Garner, John Gordon, Myrna Matus, Brian Scott, and Frances Stephens.

According to a statement from LANL, "The team discovered that a specific form of dehydrogenated fuel, called polyborazylene (PB), could be recycled with relative ease using modest energy input. This development is a significant step toward using ammonia borane as a possible energy carrier for transportation purposes."

"Ammonia borane (H3NBH3) is of interest as a hydrogen storage material because of its high hydrogen content (19.6 wt%) and low molecular weight (30.7 gmol-1). However, the material suffers from a number of drawbacks, including the lack of energy-efficient methods to reintroduce hydrogen back into the spent fuel once it has been released. Other issues have included the temperature required for dehydrogenation; releasing the hydrogen from AB usually requires temperatures of more than 100°C, making it too hot for polymer-based fuel cells.

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Other issues with its use are the release of other gases which could poison the hydrogen and instability, e.g., rapid expansion or turning into foam. Work at LANL is also addressing the release and impurities issues."

"Although spent fuel composition depends on the dehydrogenation method, we have focused our efforts on the spent fuel resulting from metal-based catalysis, which has to date shown the most promise to meet the DOE H_2 storage requirements for release rate and extent. Although the first transition-metal-catalyzed dehydrogenation of AB generated many products, more recent metal catalysts have produced single products, the fastest rates for a single equivalent of H_2 released from AB, and the greatest extent of H_2 release (up to 2.5 equiv of H_2 can be produced within 2 hours)."

"While ongoing work is being carried out to tailor the composition of spent AB fuel, we have developed a method for regenerating the predominant product, polyborazylene, resulting from dehydrogenation by nickel carbene catalysts. Their approach uses benzenedithiol as a reagent to avoid the formation of thermodynamically stable B-O bonds and the subsequent need for high-energy reducing agents. Heating PB and benzenedithiol produces a set of intermediate products (including ammonia). A feature of the first step in this cycle requires highlighting: some of the nitrogen in the spent fuel is transformed into NH_3, which is subsequently retained by $(C_6H_4S_2)B–H•(NH_3)$. This process contrasts with other proposed methods, which solely generate NH_4 + salts (which require thermal cracking to release and recycle NH_3). Tributylstannane (Bu3SnH) is used as a reductant on the products resulting from the first step, transforming them into a new boron-containing product. Bu_2SnH_2 then generates the AB. Using this methodology, including the stepwise addition of excess reductant, the team generated an overall yield of 67% isolated AB on their first attempt."

Contact: www.lanl.gov. ❖

INDUSTRY NEWS

Universal Precision Products and Nuvera Fuel Cells manufacturing partnership

According to Universal Precision Products president Jon Munson, the company and Nuvera Fuel Cells have signed a 5-year manufacturing agreement for the integration of the compression and storage components of their PowerTap Hydrogen Station. The unit will provide compressed hydrogen used to fuel forklift trucks equipped with Nuvera's PowerEdge hybrid fuel cell systems which replace standard lead acid batteries. Munson says, "Munson Nuvera's PowerTap Hydrogen Station, along with the Hydrogen Generator and PowerEdge, together form the Total Power Solution, a set of purpose built products for the material handling industry specifically matched to maximize customer productivity and minimize customer life cycle costs."

Nuvera and Airgas, Inc. also recently announced a five-year marketing, sales, and service agreement to provide PowerTap hydrogen generators and stations to the North American material handling market. Under the agreement, Nuvera will manufacture the PowerTap systems and Airgas will provide distribution, installation, monitoring and maintenance of the equipment, as well as backup hydrogen, at customer sites. PowerTap is a hydrogen generator and hydrogen station, part of the Nuvera Total Power Solution that includes PowerEdge, a fuel cell hybrid system that replaces standard lead acid batteries in material handling equipment such as forklift trucks. The PowerTap generator uses steam reformation technology to produce hydrogen from natural gas.

Contact: www.nuvera.com. ❖

Quantum regains compliance after receiving NASDAQ notice of violation of shareholder approval rule

Quantum Fuel Systems Technologies Worldwide, Inc. recently received a letter from the Listing Qualifications department of The NASDAQ Stock Market notifying the company that it violated Nasdaq Marketplace Rule 5635 and IM-5635 as a result of the debt restructuring transactions that occurred on July 10, 2009.

However, the letter further stated that as a result of the amendments to the transaction documents that occurred on August 3, 2009, the Nasdaq Listing Qualifications department has determined that the company has regained compliance with the Marketplace rule and that the matter was closed. ❖

UK Technology Strategy Board funding £9 million ...

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levels of low, intermediate and high temperature fuel cell systems."

"The hydrogen technologies projects will identify how to help the adoption of hydrogen as an energy vector in the UK and develop a sustainable hydrogen supply, in parallel with other major developing low carbon energy industries such as those in fuel cells, alternative fuels and carbon abatement technologies. In particular, the projects will look to tackle the challenges related to hydrogen generation, storage and utilization."

"Fuel cells and hydrogen technologies are priority areas for our investment as new technologies can contribute to tackling the UK and EU climate change targets and security of energy supply challenges, while at the same time they can provide significant market opportunities for British companies. We expect the technologies that will be developed to help us make real progress towards market adoption."

One of the projects, led by ACAL Energy, will build & install the world's first fuel cell system using low cost platinum free cathode technology. The three-year project will research, build and test the world's first low cost, integrated 1kW remote environmental monitoring system using ACAL Energy's novel platinum-free cathode technology, FlowCath. The project will deliver a low cost, practical system in a genuine application with an optimized design, located and field tested at Solvay Interox in Cheshire. JM Fuel Cells will provide bespoke Membrane Electrode Assembly technology, UPS Systems will bring their experience in fuel cell back up power units to lead the installation, the University of Southampton will use their expertise in fluid and electrochemical modeling to optimize the liquid and electrode flows, the Manufacturing Engineering Centre at Cardiff University will provide capability in low cost system design and engineering to meet the target low cost parameters, and the Centre for Process Innovation will provide their experience in hazop and safety to ensure that the system meets real application standards and requirements. The Technology Strategy Board will invest £974,000 in the project, which will in total cost in the region of £1.9 million.

A second project, led by Intelligent Energy, will develop enhanced fuel cell systems for commercial and passenger vehicle applications. The 3 year program, starting October 2009, is targeted at enhanced reliability, durability and performance of Intelligent Energy's class leading fuel cell engines (already in use in Peugeot-Citroën and Fuel Cell Taxi vehicles), whilst also reducing costs. The Partners will follow a systems engineering approach with core component modules redesigned, tested and validated against operational criteria to achieve 'production intent' fuel cell platforms for passenger and light commercial vehicles. Intelligent Energy will focus on overall fuel cell system redesign with development and engineering services support from Ricardo UK; test and validation of fuel cell modules and complete systems will be provided by TRW Conekt; while Dyson will aim to dramatically reduce compressor cost by adapting a component already designed for mass production. The Advisory Panel (Royal Mail, DHL, TATA) will provide operational and related data for future zero emission fleet vehicle requirements and are looking to speed their own access to fuel cell powered light cargo and passenger vehicles. Environmental and social benefits of fuel cell vehicles are based around the potential to deliver dramatic reductions in CO2 emissions at the local and national level. Total project cost will be £2.8 million with the Technology Strategy Board investing £1.4 million.

Other fuel cells and hydrogen technologies projects to be funded include:

- Novel Processes and Designs for High Volume MEA Manufacture; Partners: Johnson Matthey Fuel Cells Ltd (lead), HumiSeal Europe Ltd, Marlin Precision Manufacturing Ltd, University of Bradford.
- Component Development for Improved MEA and Stack Stability; Partners: Johnson Matthey Fuel Cells Ltd (lead), Calcarb Limited, Intelligent Energy Ltd, Loughborough University, NPL Management Ltd, Technical Fibre Products Ltd, University of Birmingham.
- Innovative Air Cooled Fuel Cell Power Systems for MHE; Partners: Intelligent Energy Ltd (lead), other partners to be announced.
- High Performance Low Temperature Direct Ethanol Fuel Cells; Partners: Johnson Matthey plc, Queen's University Belfast.

Contact: www.tsb.gov.uk. ❖

New Chief Business Development Officer for Neah; Indian Inestments announced

Neah Power Systems, Inc. has appointed Kenth Pedersen as Chief Business Development Officer. Prior to joining Neah in February 2009, Kenth was Founder and CEO of Hyphase Energy, Founder and CEO of Boegeskov Energy, and inventor of a novel technology used in creating non-planar fuel cell electrodes. Kenth studied entrepreneurial development at UC Berkeley and fuel cell and renewable energy technologies at the College of Engineering, ITS, UC Davis. Kenth has more than 20 years experience in entrepreneurial finance and development, with a focus on sustainable energy technology ventures over the past decade.

In a separate announcement, Wearology Ltd., a Poddar Group division, and associated entities, have committed to invest up to $500,000 in Neah. "Dr. Christopher D'Couto, NEAH's CEO, and Rohitashwa Poddar, Group Managing Director, Poddar Group in Mumbai, India, announced the covenant jointly, saying the two companies' business plans support their joint philosophy of environmentally friendly, pollution-free businesses. This capital infusion will allow a rapid move to the AMEX, and facilitates funding for production of prototypes for various companies, such as Hobie Boats, EKO Vehicles, of India, and others which we have joint venture deals with." The Poddar Group of Companies in India includes Wearology Ltd, Organically Grown, Poddar Developers, Poddar Infrastructure and Idhasoft Ltd. Wearology Limited, the division taking the investment position, is a Public Limited Company, listed on the BSE in Mumbai, India, with offices in the USA, India, China, Italy, and headquartered in Mumbai. ❖

Genco purchases 136 GenDrive Plug Power fuel cells

According to Plug Power CEO Andy Marsh, Genco Supply Chain Solutions has ordered 136 GenDrive fuel cell power units. The order consists of 100 class-3 pallet jack units and 36 class-2 stand-up reach truck units. Genco will provide the units to Wegmans at its distribution facilities for conversion of lift truck fleets in their produce and grocery buildings. At Wegmans' Pottsville, PA facility, the GenDrive units will be placed into Crown lift trucks provided by Lift Inc. The funding for the fuel cells is part of a $6.1 million award made to Genco in April, 2009 by the U.S. DOE through the American Recovery and Reinvestment Act. The DOE intends this funding to accelerate the commercialization and deployment of fuel cells and create jobs in fuel cell manufacturing, installation, maintenance and support services. The Wegmans project will consist of various phases through 2012. The first phase includes a 59 unit fleet conversion of the produce building. Subsequent phases will allow Wegmans to expand its use of the GenDrive solution at its facilities. Over the lifetime of the project, 4,064,445 kWh of energy will be off-set. ❖

SymPowerco signs non-disclosure agreement, provides corporate update

According to SymPowerco Corp. CEO John Davenport, the company has, "Entered discussions and has signed a Non-Disclosure Agreement with an alternative energy and power systems corporation for the purpose of determining the advisability of establishing a business relationship that may include an acquisition or joint venture. SymPowerco has also entered similar discussions with a second group that owns advanced power system technologies and intellectual properties that appear to offer market opportunities for SymPowerco." SymPowerco also announces the termination, by mutual agreement, of the Share Exchange Agreement amongst Steven Humphries, Hoss Motor Sport, Inc. (HMSI), Highline Hydrogen Hybrids, Inc. (HHHI) and SymPowerco. Carleton University, the company's partner in the development of its Flowing Electrolyte Direct Methanol Fuel Cell, has informed SymPowerco that it has selected the first two team members for the Fuel Cell project, one of whom is a Post-Doctoral Fellow at the University. The project at Carleton's Department of Mechanical and Aerospace Engineering will employ as many as five graduate students under the direction of the Department Head and other department scholars and is to be funded through a recently announced grant from Ontario Centres of Excellence. ❖