Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
islands around Jeju Island, off the southwestern tip of South Korea.

A total of 15,000 masks were transferred to Gapado, Marado and Biyang Island, representing a three-month supply for the 490 residents. These remote islands do not have a pharmacy or post office, the official channel for mask supply in Korea, so drone-based delivery is an innovative solution during the Covid-19 crisis.

The drone flew 8.8 km (5.5 miles) from Jeju to reach drop-off points on Marado, and was also used to distribute masks in two consecutive trips to Gapado and Biyang Island. The event was executed in collaboration with Jeju Special Self-Governing Province, and TruWeather Solutions provided accurate maritime weather and wind data using its micro-model.

This was the first ‘contactless’ (i.e. Beyond Visual Line of Sight, BVLOS) flight conducted for Covid-19 relief in Korea, with a special waiver from the Ministry of Land, Infrastructure and Transport (MOLIT). In the event, DMI’s DS30 drone flew approximately 30 km (19 miles), but the range is effectively unlimited as flight control is LTE-based, i.e. the wireless broadband standard. The use of hydrogen fuel cell drones that can fly for up to 2 h opens up a new frontier for contactless delivery, giving a round-trip range of 40 km (25 miles).

The drone maintained stable performance on the autonomous flight despite heavy winds, demonstrating its robust hardware and software capabilities. In 10 m/s (22 mph) wind the DS30 maintained a ground speed of 5 m/s (11 mph), but this could more than double in better weather conditions. DMI’s R&D team is further developing the model to improve wind resistance and speed, and the company is working with the Jeju government to expand a drone delivery service for medical supplies.

Last autumn, a DS30 drone delivered medications between two Caribbean islands, with an open ocean crossing of 69 km (43 miles) [FCB, December 2019, p5], and the company recently showcased the benefits of fuel cell drones in Africa, demonstrating the DS30 long-endurance drone and DP30 power pack [April 2020, p6].

Another Doosan subsidiary, Doosan Fuel Cell, is partnering with Korean telecom giant KT to expand its phosphoric acid fuel cell power plant business and develop an artificial intelligence based power plant automatic control platform [see page 14].

Doosan Mobility Innovation:
www.doosanmobility.com

ABBB signs MOU with HDF to produce MW-scale systems to power ocean-going vessels

Swiss-based engineering multinational ABB has signed a Memorandum of Understanding with French hydrogen technologies specialist Hydrogène de France (HDF), for close collaboration on the assembly and production of MW-scale fuel cell power plants for marine applications, in particular for powering large ships.

The new partnership builds on ABB’s two-year-old collaboration with Canadian-based Ballard Power Systems, a leading global provider of PEM fuel cell solutions [FCB, July 2018, p4], and will see ABB and HDF optimise fuel cell manufacturing capabilities to produce a MW-scale power plant for marine vessels.

The new system will be based on the MW-scale fuel cell power plant jointly developed by ABB and Ballard, and will be manufactured at HDF’s new facility in Bordeaux.

At the end of last year Ballard [see also pages 2 and 4] signed a Product Development Agreement with HDF Energy, to develop and integrate a multi-MW scale fuel cell system into HDF’s Renewstable® power plant for stationary power applications [January 2020, p7].

Shipping is responsible for about 2.5% of the world’s total greenhouse gas emissions, so there is increasing pressure for the maritime industry to transition to more sustainable power sources. The International Maritime Organization has set a global target of cutting annual emissions by at least 50% from 2008 levels by 2050.

ABB is already well advanced in collaborative development of fuel cell systems for ships. It partnered with Norwegian research organisation SINTEF to study and test the viability of fuel cells for main ship propulsion [December 2018, p6], and they subsequently joined the HYBRIDship project to convert a ferry to run on a combination of batteries and hydrogen fuel cells [May 2019, p6]. ABB and Ballard are also providing the power and propulsion solution for a French push-boat on the Rhône river in the FLAGSHIP project [June 2019, p6]. And ABB’s 165 kW fuel cell power generation system – developed with PowerCell Sweden – is powering dynamic positioning and electrical equipment onboard the Finnish research vessel Arctica during measurements [April 2020, p6].

ABB, Marine: www.abb.com/marine
HDF Energy: www.hdf-energy.com
Ballard Power Systems: www.ballard.com

Bloom Energy powers two California sites in fast pandemic response

In California, Bloom Energy completed two rapid-deployment fuel cell microgrid projects in early April to support patients affected by Covid-19. Bloom Energy Servers provide electricity with almost zero particulate emissions, ensuring that Covid-19 patients with severe respiratory issues can breathe clean air. The crisis has overwhelmed existing hospitals, necessitating the deployment of secondary locations to treat patients, and these new locations need reliable power.

At the Vallejo site of a national hospital system, Bloom deployed a solid oxide fuel cell based microgrid capable of powering a temporary field hospital in the main hospital’s parking lot to accommodate patient overflow, if needed. Bloom already has 1.2 MW of Energy Servers powering the main hospital, and was able to leverage its on-the-ground capabilities to install the microgrid in only three days – five days ahead of schedule. The compact microgrid – occupying only three parking spaces – is almost vibration-free and quiet, eliminating the potential for damaging sensitive medical equipment and disruption to the local community.

‘Our modular Energy Servers were designed with ‘quick time to power’ as an important value proposition. We advanced our rapid deploy microgrid offering greatly after the Public Safety Power Shutoff (PSPS) events last year to help customers affected by the wildfire related power outages in California [FCB, February 2020, p7],’ says KR Sridhar, the firm’s founder, chairman and CEO. ‘In the future we will be able to use this solution for other rapid deploy scenarios for emergency management.’

The State of California called on Bloom to rapidly deploy a primary power energy solution at Sleep Train Arena in Sacramento, the former home of the Sacramento Kings basketball team, where the system will support a field hospital assembled to treat overflow Covid-19 patients. Bloom took only two weeks to install a 400 kW SOFC microgrid to power a training facility onsite that will hold some 100 hospital beds.

Bloom also hit the headlines with its work to refurbish out-of-service ventilators, at the behest of California Governor Gavin Newsom. In just over three weeks, the company

FCB

LARGE STATIONARY

May 2020

NEWS

Fuel Cells Bulletin
Second Megamie unit enters service in Japan with Hazama Ando

In Japan, Mitsubishi Hitachi Power Systems (MHPS) – now renamed Mitsubishi Power – has delivered a Megamie pressurised solid oxide fuel cell-micro gas turbine (SOFC-MGT) hybrid power system to the Hazama Ando Technical Research Institute in Tsukuba, Ibaraki Prefecture, and operation has commenced.

This is the second 250 kW commercial-use Megamie system to begin operation, joining the unit installed in the Marunouchi Building in Tokyo [FCB, February 2018, p6]. Hazama Ando Corporation placed the order for its system a year ago [May 2019, p8], and is now using it as a next-generation distributed power supply system at its Technical Research Institute in Tsukuba, to support the ‘Hazama Ando Next-Generation Energy Project’. This is a power interchange verification project for in-house electricity generation utilising distributed power sources with low CO₂ emissions, supplying power to the company’s business locations through a self-consignment system.

This Megamie system is operating on city gas, supplying clean power and heat with low CO₂ emissions. In future Hazama Ando plans to switch to hydrogen, for zero CO₂ emissions. This system will combine cogeneration equipment incorporating a gas engine capable of utilising a hydrogen-city gas mixture with large capacity sodium-sulfur batteries, to support a planned energy supply.

The Triangle Street power plant is the company’s first deployment of the SureSource 4000 platform, which is designed to deliver 60% electrical efficiency while operating with a 95% capacity factor. This is comparable to large-scale gas turbines but is much cleaner, and since it generates power near end-users, it does not incur the transmission losses typical of larger, central generation plants. The SureSource 4000 system generates enough power for approximately 3700 average sized homes.

The SureSource 4000 is targeted at applications with large load requirements and limited thermal needs, such as utility/grid support or data centres, utilising a scalable and affordable configuration that generates renewable energy credits and qualifies for investment tax credits.

‘Based on our modular design, we are able to locate our platforms right where the power is needed: in this case, in the middle of downtown Danbury, Connecticut, avoiding inefficient and unsightly transmission infrastructure,’ says Jason Few, President and CEO of FuelCell Energy. ‘Our energy platforms provide electricity, thermal energy, and hydrogen generation. We are accelerating our development on carbon capture [e.g. FCB, December 2019, p7], electrolysis, and long-duration hydrogen-based energy storage [e.g. June 2017, p10].’

FuelCell Energy is currently developing two SureSource 4000 power plants in a microgrid application on the US Navy Sub Base in Groton, Connecticut, which are anticipated to become commercially operational later this year [November 2017, p7 and January 2020, p7].

FuelCell Energy: www.fuelcellenergy.com

BWR develops mobile fuel cell generator sanitation systems

Blue Water Resolve (BWR) Innovations in North Dakota, USA has developed a line of small, mobile fuel cell generator sanitation systems, featuring a 10 kW electrical generator on a movable cart. The SFC 110 Fuel Cell Thermal Sanitizer combines heat produced by a fuel cell with ultraviolet light to inactivate a full spectrum of biological contaminants – including viruses, bacteria and fungi – while providing uniform sanitisation coverage with minimal risk of material compatibility issues.

BWR Innovations collaborated with Element 1, US Hybrid and Mosebach Manufacturing Company to adapt the SFC 110 design to integrate five commercially available technologies. A methanol to hydrogen generator (from e1) produces ultrapure hydrogen, which is supplied to a fuel cell power generator (US Hybrid) that produces electricity and thermal energy. The electricity is used in a resistive heater (Mosebach) to produce up to 20 kW of thermal energy for primary thermal sanitisation, and UVC light for secondary sanitisation (and also powering air distribution fans). The system also utilises Internet-of-Things (IoT) telemetry for remote monitoring and management.

The primary components are located on separate medical quality rolling carts, using quick-disconnect hoses and electrical cords to create a self-contained mobile solution. It takes 30–60 min to set it up and heat a 500 sq ft (46 m²) room to 60°C, maintained for 30 min to provide thorough thermal sanitisation – including inactivation of the SARS-CoV-2 virus, according to Dr Joel Jorgenson, CEO and founder of BWR Innovations.

BWR Innovations: www.bwr-innovations.com
Element 1: www.e1na.com
US Hybrid: www.ushybrid.com
Mosebach Manufacturing Company: www.mosebachresistors.com

McPhy to equip two zero-emission mobility projects in France

French hydrogen production and distribution equipment manufacturer