international association for hydrogen energy
Clean and Abundant Energy for Sustainability

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A ferry that runs on hydrogen fuel cells is coming to San Francisco

After Tom Escher took over his family's century-old ferry company in 1997, he wanted to buy a zero-emissions vessel that could whisk tourists around San Francisco without spewing harmful pollutants. Escher, who is 71, said he worried about the health of his four grandchildren and the environment they'd live in.

"Our boats were getting greener, and we were cleaning up, but I said, 'Are we doing the best we can?'" Escher recalled.

A few years ago, he began searching in earnest for a fossil fuel-free ship, but he quickly hit a wall. Even as battery-powered cars and rooftop solar panels proliferated on land, the maritime industry had been slow to embrace clean energy at sea.

An innovative ferry project could soon change that.

On Monday, the California Air Resources Board (CARB) announced a $3 million grant to help build a hydrogen fuel cell ferry. Once built, it would be be the first of its kind in the United States, and the first commercial hydrogen fuel cell ferry in the world.

The planned vessel, named *Water-Go-Round,* would carry 84 passengers and stretch 70 feet long. Construction is expected to start early this fall in Alameda, California, and the vessel is slated to hit the water a year later.

The project is one of myriad efforts by cities in the U.S. and globally to clean up their passenger ships. While ferries contribute a relatively small slice of total maritime air pollution and carbon emissions, they typically operate around densely populated areas, where emissions are known to pose the biggest health threats.

Ferries, tug boats, and other harbor craft can be particularly dirty because they often use the same inefficient engines for decades, said Christina Wolfe, who manages the Environmental Defense Fund's air quality program for ports. "They're old, high-horsepower, and high-usage, and that just makes a recipe for very high emissions," she said of ferry engines.

Some local officials are considering more straightforward solutions, like installing efficient Tier 4 diesel engines or adding onshore electricity supplies, so boats can turn off their engines while at port. Other places are taking a more ambitious tack: In rural Alabama, the Gee's Bend Ferry operators are replacing John Deere engines with a battery-electric propulsion system, which will make it the first zero-emissions ferry of its kind in the United States. A ferry in Skagit County, Washington, may soon follow suit.

The *Water-Go-Round* hydrogen ferry is also representative of a larger push by the global shipping industry to clean up dirty fuel-burning ships. In April, the International Maritime Organization adopted a landmark deal to reduce greenhouse gas emissions from ships, a policy that will require a massive uptake of zero-emissions vessels.

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IAHE Objective

The objective of the IAHE is to advance the day when hydrogen energy will become the principal means by which the world will achieve its long-sought goal of abundant clean energy for mankind. Toward this end, the IAHE stimulates the exchange of information in the hydrogen energy field through its publications and sponsorship of international workshops, short courses, symposia, and conferences. In addition, the IAHE endeavors to inform the general public of the important role of hydrogen energy in the planning of an inexhaustible and clean energy system.

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Passenger ships are often first to deploy cutting-edge ship technologies because they consume far less fuel and power than ocean-going vessels. Ferries typically keep close to shore, making it easier to recharge batteries or refill hydrogen tanks. And ferry operators face strong public pressure to clean up because they carry throngs of passengers who—unlike lifeless box containers—inhale the diesel fumes, hear the growling engines, and see the noxious black plumes rising from exhaust funnels.

A boat like *Water-Go-Round* won't have such concerns.

Fuel cells combine hydrogen and oxygen to produce electricity. Unlike diesel engines, they don't emit any carbon dioxide or health-threatening pollutants — only a little heat and water vapor. "I'm going to drink the exhaust," pledged Escher, who is investing in the new ferry, in addition to operating it.

Hydrogen itself isn't always "zero-emissions." The most common methods for producing hydrogen today require fossil fuels—and thus result in some greenhouse gases. But more facilities are starting to produce "green" hydrogen with renewable electricity or biogas.

The idea to build *Water-Go-Round* came from an extensive 2016 study by Sandia National Labs. Researchers established that a high-speed passenger ferry powered by hydrogen fuel cells was feasible from a technical, regulatory, and economic perspective. Around two dozen early ship projects already deploy the technology, primarily in Europe.

Joseph Pratt, who co-authored the Sandia study, is now the CEO of Golden Gate Zero Emission Marine, one of several partners in the CARB grant project.

"We're at the point where we've studied it enough, we've figured out how you can do it," Pratt said from San Francisco. "Now we just have to do it."

The plan is for Escher's company, Red and White Fleet, to operate the vessel for the first three months—and eventually buy it to add to its fleet. Meanwhile, scientists at Sandia and CARB are expected to collect data on the ship's operations, performance, and maintenance.

The $3 million CARB grant is part of California's larger $20 million investment in zero-emissions off-road demonstration projects. The funding comes from revenues raised by the state's cap-and-trade program. *Water-Go-Round*'s partners have committed another $2.5 million to help launch the vessel.

The planned ferry would carry onboard storage tanks with enough hydrogen to last about two days before a truck refuels them at port. Lithium-ion batteries and electric motors will round out the ship's power system. Pratt said the goal is to use green hydrogen supplies when possible.

Marine fuel cells face several hurdles to wider adoption. The technology is still relatively expensive, and shipbuilders and maritime officials in many places may be less familiar with hydrogen than, say, batteries. If successful, a project like *Water-Go-Round* could nevertheless drive interest in fuel cells and hydrogen—particularly where officials or companies are seeking to curb maritime pollution, said Alan Lloyd, the former secretary of California's Environmental Protection Agency.

"People are going to want to follow that lead," said Lloyd, a senior research fellow at the University of Texas at Austin's Energy Institute.

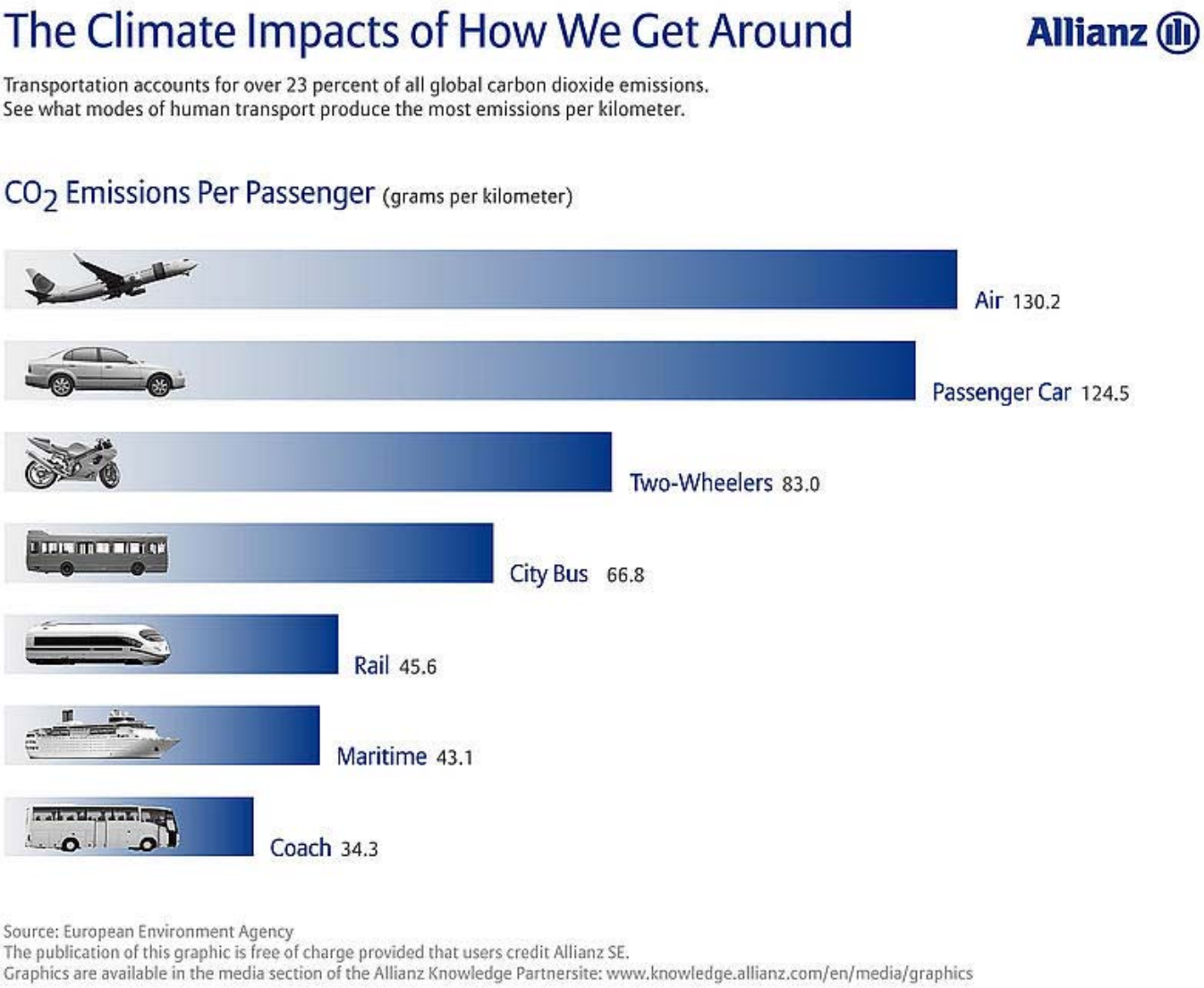
A similar narrative is already playing out with battery-powered ferries, after Norway launched a fully electric car ferry in 2015.

Dan Berentson, the director of public works in Skagit County, in northwest Washington, said his team is closely following developments in Scandinavia, where more electric ferries are expected to ply the fjords. Skagit County officials are now hoping to build their own electric boat to replace their county's clunky 39-year-old ferry. If all goes to plan, it could launch in 2020.

"Our hope is that the industry will embrace this," Berentson said.

Source: https://grist.org/article/a-ferry-that-runs-on-hydrogen-fuel-cells-is-coming-to-san-francisco/

Emissions Produced from Transportation



Toyota sends the world's first hydrogen-powered ship on a six-year voyage

Toyota is sponsoring the world's first autonomous hydrogen-powered ship on a six-year world tour. The specially adapted race boat, Energy Observer, uses solar, wind and wave-generated power – as well as carbon-free hydrogen generated from seawater.

The base technology already exists for use on land, where it helps overcome the problem of intermittent power supply from renewables, but this is the first time it's been used at sea to produce hydrogen 'live' during stopovers and navigation.

The ship creates hydrogen by demineralizing seawater (removing salt and ions), then separating the oxygen and hydrogen through electrolysis. The hydrogen is compressed at 350-700 bar, then stored in tanks ready to be used in the energy stacks when needed.

World first

Energy Observer was built in Canada in 1983 by naval architect Nigel Irens, and this latest voyage won't be its first world record. In 1984, it became the first racing sailboat the break the 500-mile limit in 24 hours.

The boat has been lengthened four times since its racing days, and is now 30.5m long and 12.8m wide. At 28 metric tons, it has a considerable weight advantage compared to ships powered by storage batteries alone.

A team of over 30 people, including architects, designers and engineers, worked to prepare the ship for its six-year voyage, in which it will navigate 50 countries and stop in 101 ports of call.

A northern European tour is scheduled for next year, including the UK. The crew aims to reach Tokyo in 2020, in time for the Olympic Games.

The ship is captained by professional racer Victorien Erussard, accompanied by leader of exploration Jérôme Delafosse, a deep-sea diver and filmmaker.

During their journey, the team will produce documentary content about reliable energy sources. This will be broadcast through an eight-episode series on French TV network Planète+ and as a web series shared on social media.

"Energy Observer is a conversion that has a double meaning: to recycle a reliable and lightweight catamaran which is an around the world record holder and to invest in research and development, instead of in composites," says Erussard.

Hydrogen society

Toyota is already using hydrogen to help power vehicles on land, including cars like the Toyota Mirai, as well as buses, trucks and forklifts.

Toyota France provided Energy Observer's crew with eight vehicles for use during layovers when the ship set off last year, and now Toyota Motor Europe has put its full support behind the voyage.

"Energy Observer is an exciting initiative and we at Toyota Motor Europe are delighted to be associated with such a passionate and dedicated team," says Matt Harrison, vice president of sales and marketing.

"This project once again demonstrates the many practical uses of hydrogen that can be developed as we transition towards a hydrogen society."

Source: https://www.techradar.com/news/toyota-sends-autonomous-hydrogen-powered-ship-on-a-six-year-world-tour

A hydrogen-powered research boat has many advantages over diesel, lab says

A fuel-cell research vessel would produce its own water to boot.

Sandia National Laboratories says a hydrogen fuel cell-powered research boat is technically and economically feasible today.

The lab network has released a report describing the specifications of an ideal hydrogen fuel-cell research vessel. Currently, research boats are largely powered by diesel, but a shift to hydrogen fuel cells could offer some significant advantages over traditional technologies. Not least among these could be a complete reduction in carbon dioxide and other emissions that contribute to global warming and sea pollution during use.

Building such a vessel would require an entrepreneur to find funding and a buyer, but Sandia's previous work on hydrogen-powered boats has sparked just that kind of entrepreneurship already with a company called Golden Gate Zero Emission Marine (GGZEM). GGZEM was founded by a researcher who worked on a earlier Sandia project, studying the feasibility of hydrogen-powered passenger ferries. Now, the company is building the world's first commercial hydrogen-powered passenger ferry, called the Water-Go-Round. GGZEM confirmed to Ars that the Water-Go-Round is on-track to launch in Fall 2019.

Fuel cell on a boat

Hydrogen fuel cell-powered transportation, on water or on land, has yet to break into the mainstream. This is in part due to the lack of infrastructure supporting the transportation of hydrogen fuel, and in part due to the fact that hydrogen fuel can be difficult to store (it requires very cold or high-pressure environments). Fuel-grade hydrogen also requires energy to make, leading some opponents to contend that unless renewable energy is being used to make fuel, hydrogen fuel cells really aren't all that green.

But there are advantages to hydrogen fuel cells as well. The only emission they release is water, so if hydrogen is made with renewable energy, it is indeed a very green source of fuel. Hydrogen can also be stored and used at will in a way that renewable energy can't be—just fill up the tank and you're good to go, no need to wait for good conditions for solar panels to start working.

For a research vessel, the emissions issue is a big one. On a hydrogen-fuel-powered boat, researchers could take air samples without concern about diesel emissions sullying the data. Additionally, Sandia reports that "Hydrogen can be readily used in Arctic Oceanographic exploration because hydrogen is not susceptible to the waxing/ freezing problems of the petroleum-based fuels." An electrically-powered hydrogen fuel cell boat is also much quieter, so sonar mapping could be improved.

Another advantage is that the waste from hydrogen fuel cells can be consumed. "Fuel cells generate pure, deionized water which can be captured for other purposes such as drinking water for the scientific staff and crew, or for experimental and analytical purposes," the report notes. "This can offset the weight of potable or experimental water needed to be carried on-board."

And none of those potential advantages includes the significant fact that such a boat would contribute less to climate change than a similar diesel vessel.

Research specifications

Sandia worked with the Scripps Institution of Oceanography to determine how the vessel, called the Zero-V, would be used and how it would refuel. It also consulted with naval architecture firm Glosten as well as DNV GL, which does risk management for maritime operations.

The Zero-V is designed to carry fewer people than a ferry, but for a much longer period of time (2,400 nautical miles or a 15-day excursion, to be exact). It requires propulsion devices on either side of its hull to stabilize the boat if it has to lower equipment to the ocean floor for research purposes. And in addition to 11 crew and 18 scientist berths, the boat needs to house three laboratories.

"Part of the solution was selecting a trimaran boat design," a Sandia press release noted. "A trimaran has three parallel hulls, and is usually used for high-speed boats. The design offers a great deal of space above deck for the tanks, and adequate below-deck space for other science instrumentation and machinery."

Scripps also identified ports of call for such a vessel where

hydrogen fuel companies could refuel the boat by truck. Nimitz Marine Facility in San Diego, Moss Landing Marine Laboratory in Monterey, Pier 54 in San Francisco, and Wharf 5 in Redwood City could all accommodate hydrogen refueling operations, the report said.

The problem is always cost

While the vessel that Sandia and its partners developed would be economic to build and is estimated to cost no more than an equivalent diesel-powered vehicle, the one thing standing in the way is operating cost. Unlike with a battery-electric vehicle, where initial cost is high but maintenance and refueling costs are much lower, hydrogen fuel cell vehicles struggle in long-term competitiveness due to the cost of hydrogen fuel.

The researchers estimated that, using natural gas-derived hydrogen fuel, the Zero-V would cost seven percent more than a comparable diesel vessel to maintain and keep fueled. But natural gas-derived hydrogen fuel offers no overall emissions benefits compared to diesel when the production, storage, and transportation of hydrogen is factored in. Researchers also spoke to two hydrogen fuel companies that said they would be able to produce hydrogen from renewable energy in the quantities that the ship would need, but at that point, "the total annual O&M costs for operating the Zero-V are 41.9 percent higher," the report stated.

Still, in the Sandia press release Scripps fleet manager Bruce Applegate was optimistic and compared hydrogen-powered vessels today to solar panels several years ago. "Like other game-changing ideas, this approach initially seems expensive. But solar power was very expensive not too long ago, and now it's affordable and widely adopted. Hydrogen fuel cells are just as transformative a technology."

Source: https://arstechnica.com/science/2018/07/a-hydrogen-powered-research-boat-has-many-advantages-over-diesel-lab-says/

South Korea hydrogen vehicle sales start in 2019

Mass sales of hydrogen powered vehicles were expected to start in South Korea next year after the government announced it would soon ease regulations on the production and transportation of the fuel.

The news emerged this week after the minister of trade, industry and energy, Paik Un-gyu, held a meeting with the president of Korea Gas Corporation, Cheong Seung-il, Hyundai Motor vice-president, Park Kwang-sik, and the heads of four related companies.

Hyundai, along with Toyota, is amongst the few car makers worldwide to have seriously targeted hydrogen as a mass market fuel in the short to medium term.

After the meeting, Paik told reporters the government would soon ease regulations on the production and transportation of hydrogen which are key issues that have, so far, held back the market for hydrogen powered vehicles.

In particular, the government would allow the use of reformers, which convert natural gas into hydrogen, in chosen districts as well as increasing the allowed carrying capacity of hydrogen transporters.

New operational standards had been developed for hydrogen refueling, including a provision allowing for movable stations to provide additional flexibility and reach to a network of fixed stations.

The government planned to provide grants worth KRW2.6 trillion (US$2.3bn) to develop a hydrogen fuel 'eco-system'.

Hydrogen powered public service buses would be targeted initially with mass sales expected to start next year and 1,000 expected to be in operation by 2022.

Private vehicles also would be targeted, with some 15,000 units expected to be in circulation by 2022 once a refueling network of some 310 stations was in place across the country and with help from generous government subsidies.

Source: https://www.just-auto.com/news/south-korea-hydrogen-vehicle-sales-start-in-2019_id183712.aspx

Toyota plans to expand production, shrink cost of hydrogen fuel cell vehicles

Toyota Motor Corp is doubling down on its investment in hydrogen fuel cell vehicles, designing lower-cost, mass-market passenger cars and SUVs and pushing the tech-

nology into buses and trucks to build economies of scale.

As Toyota cranks up improvements for the next generation of its Mirai hydrogen fuel cell vehicle (FCV), expected in the early 2020s, it is hoping it can prove wrong rival automakers and industry experts who have mostly dismissed such plans as commercially unviable.

The maker of the Prius, the world's first mass-produced "eco-friendly" gasoline-hybrid car in the 1990s, says it can popularize FCVs in part by making them cheaper.

"We're going to shift from limited production to mass production, reduce the amount of expensive materials like platinum used in FCV components, and make the system more compact and powerful," Yoshikazu Tanaka, chief engineer of the Mirai, said in an interview with Reuters.

It is planning a phased introduction of other FCV models, including a range of SUVs, pick-up trucks, and commercial trucks beginning around 2025, a source with knowledge of the automaker's plans said.

The automaker declined to comment on specific future product plans. But it has developed FCV prototypes of small delivery vehicles and large transport trucks based on models already on the road, as Tesla Inc (TSLA.O) develops a battery-operated commercial semi-truck from the ground up.

"We're going to use as many parts from existing passenger cars and other models as possible in fuel cell trucks," said Ikuo Ota, manager of new business planning for fuel cell projects at Toyota. "Otherwise, we won't see the benefits of mass production."

The company is also betting on improved performance. Toyota wants to push the driving range of the next Mirai to 700-750 kilometers from around 500 kilometers, and to hit 1,000 kilometers by 2025, a separate source said.

Driven by the belief that hydrogen will become a key source of clean energy in the next 100 years, Toyota has been developing FCVs since the early 1990s.

Hydrogen is the most abundant element in the universe and stores more energy than a battery of equivalent weight.

The Mirai was the world's first production FCV when it was launched in 2014. But its high cost, around $60,000 before government incentives, and lack of refueling infrastructure have limited its appeal. Fewer than 6,000 have been sold globally.

LMC Automotive forecasts FCVs to make up only 0.2 percent of global passenger car sales in 2027, compared with 11.7 percent for battery EVs. The International Energy Agency predicts fewer FCVs than battery-powered and plug-in hybrid electric vehicles through 2040.

Many automakers, including Nissan Motor Co (7201.T) and Tesla, see battery-powered cars as a better, zero-emission solution to gasoline engines. Only a handful, including Honda Motor Co (7267.T) and Hyundai Motor Co (005380.KS), produce FCVs.

But people familiar with Toyota's plans said the automaker thinks demand will perk up as more countries, including China, warm to fuel cell technology. The company also sees FCVs as a hedge against a scarcity of key EV battery materials such as cobalt.

Hand built

For now, Mirais are assembled by hand at a plant in Toyota City, where 13 technicians push partially constructed units into assembly bays for detailed inspections. This process yields just 6.5 cars a day, a sliver of Toyota's average domestic daily production of about 13,400 vehicles.

Strategic Analysis Inc, which has analyzed costs of FCVs including the Mirai, estimates that it costs Toyota about $11,000 to produce each of its fuel cell stacks, by far the vehicles' most expensive part.

Toyota has been building up production capacity to change that, as it expects global FCV sales climb to 30,000 units annually after 2020 from about 3,000. Strategic Analysis estimates that would allow Toyota to reduce costs to about $8,000 per stack.

It has already begun to use parts developed for the Mirai in other models, such as the fuel cell stack, which is used in Kenworth freight trucks being tested in California, the Sora FC bus it released in Japan in March and the delivery trucks it will test with Seven-Eleven stores in Japan next year.

"It will be difficult for Toyota to lower FCV production costs if it only produces the Mirai," the first source told Reuters on condition of anonymity as he was not authorized to speak publicly about the issue.

"By using the FCV system in larger models, it is looking to lower costs by mass-producing and using common parts across vehicle classes," he added.

The Mirai's high production costs are largely due to expensive materials including platinum, titanium and carbon fiber used in the fuel cell and hydrogen storage systems.

Engineers have been reducing that by improving the platinum catalyst, a key component in the 370 layered cells in the fuel cell stack, which facilitates the reaction between hydrogen and oxygen that produces electricity.

"We've been able to decrease the platinum loading by 10 percent to 20 percent and deliver the same performance," said Eri Ichikawa, a fuel cell engineer at Cataler Corp, a Toyota subsidiary that specializes in catalytic converters.

Strategic Analysis says using that much less of the precious metal would save up to $300 per fuel cell stack, based on an estimate that Toyota now uses about 30 grams of platinum per unit.

"By consistently focusing on these issues, we will be able to progressively lower the cost of FCVs in the future," Tanaka said.

Source: https://www.reuters.com/article/us-toyota-hydrogen/toyota-plans-to-expand-production-shrink-cost-of-hydrogen-fuel-cell-vehicles-idUSKBN1KG0Y0

Hydrogen fuel for passenger cars comes to Hawaii

The blessing of a fuel cell vehicle (FCV) hydrogen filling station is not something you see every day. But when the occasion is Hawaii's first and only hydrogen filling station for passenger cars, a traditional island blessing makes perfect sense.

Honolulu-based Toyota dealer and distributor Servco Pacific unveiled the station by having Kahu Bruce Ah Leong bless it using Hawaiian Ti leaves and water from sacred waterfalls high in the mountains of Oahu after traditional Japanese Taiko drummers kicked off the ceremony. Servco, a local 100-year-old company that also owns dealerships in Australia and has commercial products distribution and private equity investments divisions, hopes that the availability of hydrogen to power passenger cars will spur sales of fuel cell vehicles (FCVs) on Oahu and eventually other Hawaiian Islands.

The hydrogen filling station at Servco's flagship Toyota dealership near Honolulu will allow the company to begin leasing the Toyota Mirai fuel cell vehicle, and customers to fill up fast and for free.

While the filling station will allow Servco to begin leasing Toyota's Mirai FCV to its customers, in addition to other benefits such as easy and fast filling and long range, company chairman and CEO Mark Fukunaga hopes that the car's freedom from imported fossil fuels will help Hawaii meet its ambitious renewable energy objectives.

"FCVs offer zero carbon emissions and zero compromise on refueling time and driving range," Fukunaga said. "And our hydrogen station will help show Hawaii residents how FCVs can make a real impact on our sustainability goals."

"Hawaii is the only state in the country committed to a 100% clean, renewable energy future," Hawaii Governor David Ige said at the hydrogen station blessing ceremony. "In this past legislative session, we made a resolution to decarbonize our economy by 2045, and decarbonizing transportation is really the next step for our clean energy future."

"I really do believe that the Mirai and hydrogen fuel cells have a part in our clean, renewable energy future," Governor Ige added. "And I congratulate Servco for taking a step forward and putting a stake in the ground to our commitment to zero-emission transportation and making this facility a reality."

The hydrogen station, located at Servco's flagship Toyota dealership near Honolulu, can produce up to 12 kg of hydrogen per day and store up to 100 kg of hydrogen on-site, roughly enough to fill up 12 vehicles. Thor Toma, Servco senior vice president, pointed out that the hydrogen filling station was entirely funded by Servco.

"We didn't get any funding from Toyota or grants from the state," he said, "but we really believe that this is key for Hawaii. Hawaii doesn't have any natural energy sources and we're highly dependent on petroleum products. Hydrogen is something that can be produced locally through electrolyzing water, so it totally makes sense," he added.

The Toyota Mirai, which has an EPA estimated range of 312 miles on a full tank, will be offered for lease by Servco at the end of this month and the lease includes service and hydrogen fuel. Like gassing up a traditional internal combustion engine, completely filling the Mirai's fuel tank from empty takes approximately 5 minutes.

"The refueling process is as intuitive as learning to fuel a gasoline vehicle for the first time—and is fast," Fukunaga said. The driver connects the fuel station's nozzle to the car's fuel receptacle. Once the two are locked in place, the station and car perform a system check, and when the tank is filled the dispenser stops the flow of fuel and can be disconnected from the car.

"It's so difficult to say [FCVs] makes sense when you're reading about it or looking at a picture," Toma added. "Now that there's a tangible example here people can see that this works and it's safe, and that's a critical piece to getting other public and private partnerships together to do more stations."

Source: https://www.forbes.com/sites/dougnewcomb/2018/07/21/hydrogen-fuel-for-passenger-cars-comes-to-hawaii/#17debb115460

Mercedes-Benz unveils fuel-cell Sprinter van concept

In the battle to reduce vehicular emissions, there are two main weapons of choice: batteries and hydrogen fuel cells. Mercedes-Benz has already confirmed plans for a line of battery-electric cars and battery-powered versions of the Sprinter and Vito vans. In addition to these hybridized efforts, the German automaker's new Concept Sprinter F-Cell shows that Mercedes hasn't given up on fuel cells either.

The rear-wheel-drive Concept Sprinter F-Cell's powertrain produces 147 horsepower and 258 pound-feet of torque. Three tanks mounted under the floor can store enough hydrogen for 300 kilometers (186 miles) of driving, according to Mercedes. Another tank can be added to the rear of the vehicle, boosting range to 500 km (310 mi), the automaker said, but that's not all.

Like the hydrogen-powered Mercedes-Benz GLC variant, the Concept Sprinter F-Cell also features a small battery pack to supplement the fuel cells, adding 30 km (18 mi) of range. That makes the Concept Sprinter a plug-in hybrid, but using a combination of fuel cells and batteries instead of an internal-combustion engine and electricity.

The Concept Sprinter F-Cell was configured as a motorhome to show off the packaging advantages of its alternative-fuel powertrain. With the tanks positioned under the floor and the fuel-cell stack mounted in the front where a gasoline or diesel engine would normally go, there is plenty of interior space to work with. Per Mercedes, the fuel-cell setup could be made to work with a variety of body styles.

But will a fuel-cell van ever go into production? Mercedes parent Daimler claims to be agnostic on powertrain technologies.

"Daimler strategy does not provide a dogmatic, ideological answer to this question but instead makes it dependent upon the best possible customer benefits," the company said in a statement.

Yet the company's current plans indicate a lower level of confidence in fuel cells. While Mercedes has committed to putting the battery-powered eSprinter into mass produc-

tion, it did not confirm production plans for the Sprinter F-Cell. Mercedes is planning a limited production run of the GLC F-Cell, so it's possible the van could be churned out in small numbers as well. Both models also use battery packs to supplement their fuel cells.

Mercedes may be sincerely willing to explore all options. It may just be finding that hydrogen isn't the best bet. While lack of fueling infrastructure remains a major problem for fuel-cell vehicles, the number of charging stations for battery-electric vehicles has steadily grown. However, this may be less of an issue for commercial vehicles operating on set routes near designated terminals, so fuel-cell vans like the Sprinter F-Cell might have a future.

Source: http://www.thedrive.com/tech/21896/mercedes-benz-unveils-fuel-cell-sprinter-van-concept

Japan wants all new cars to be electric by 2050

Japan has announced a new plan under which, by 2050, all new passenger cars will be electric or hybrid. The government will also set up a new group to help manufacturers source cobalt for batteries.

The race for car electrification just got more intense as Japan, the world's third-largest economy, announced plans to switch to electric cars in under two decades. The government panel also set a goal for emissions reduction: by 2050, all emissions from passenger vehicles must drop by 90% compared to 2010 levels.

The panel also includes members from major automobile companies such as Toyota and Nissan, who will work together on acquiring the much-needed cobalt for the cars' batteries. This collaboration is particularly significant as Chinese investors are aggressively securingdeposits of the rare resource. It's very rare for carmakers to agree to this type of deal, which seems to bode well for the overall success of the initiative.

Overall, the fleet of light-duty plug-in electric vehicles in Japan ranked as the third largest in the world, trailing only after China and the US. However, the rate of growth of the plug-in segment has dropped somewhat, particularly due to the heavy promotion of hydrogen fuel cell vehicles over plug-in electric vehicles. Even though these vehicles hit the market only in 2015, they steered some of the Japanese buyers away from electric cars even before that year.

Now, Japan's leaders want to infuse new life into the electric car market and continue to reduce emissions associated with transportation. Hiroshige Seko, Minister of Economy, Trade, and Industry, said:

"Japan would like to contribute to achieve zero emissions on a global scale by spreading electric vehicles worldwide.

"That's a goal only Japan, home to the top level of the auto industry, can set."

However, while Japan's initiative is certainly laudable, it's far from being a unique objective. Germany wants to make all cars electric by 2030, while France has announced a ban on gasoline and diesel cars by 2040. The UK plans a similar ban by 2040, but the country which seems lead this race is Norway. More than half of all cars sold in Norway are already, and the percentage is growing steadily.

Still, only a handful of countries have concrete plans to do this.

Source: https://www.zmescience.com/ecology/renewable-energy-ecology/japan-electric-cars-27062018/

First hydrogen fuel cell passenger train approved for service in Germany

Coradia iLint, the world's first hydrogen fuel cell passenger train, has been granted approval by the German Railway Office (EBA) for passenger service in Germany.

"With the approval of the German Railway Office (EBA), we are sending the first passenger train with fuel cell technol-

ogy onto the tracks. This is a strong sign of the mobility of the future. Hydrogen is a true low-emission and efficient alternative to diesel. Especially on secondary lines, where overhead lines are not yet available, these trains are a clean and environmentally friendly option. That is why we support and promote the technology, in order to bring it to the surface," said Enak Ferlemann, the German Federal Government's authorized delegate for rail transportation.

The Coradia iLint produces electrical power for traction and emits low levels of noise, with exhausts of only steam and condensed water. The Coradia iLint is special for its combination of different innovative elements: Clean energy conversion, flexible energy storage in batteries and smart management of traction power and available energy. Specifically designed for operation on non-electrified lines, it enables clean, sustainable train operation while ensuring high levels of performance.

"This approval is a major milestone for the Coradia iLint and a decisive step towards clean and future-oriented mobility. Alstom is immensely proud of this hydrogen-powered regional train, a breakthrough in emission-free mobility, and the fact that it will now go into regular passenger operation," said Wolfram Schwab, Alstom Vice President of R&D and Innovation.

In November 2017, Alstom and the local transport authority of Lower Saxony (LNVG) signed a contract for the delivery of 14 hydrogen fuel cell trains, along with 30 years of maintenance and energy supply. The 14 trains will be produced by Alstom for LNVG's vehicle pool and will transport passengers between Cuxhaven, Bremerhaven, Bremervörde and Buxtehude from December 2021. Following this approval granted by EBA, the two Coradia iLint prototypes will enter pilot operation in the Elbe-Weser network.

The Coradia iLint was designed by Alstom teams in Salzgitter (Germany), a center of excellence for regional trains, and in Tarbes (France), a center of excellence for traction systems. The development of the Coradia iLint was funded with €8 million from the German government as part of the National Innovation Program for Hydrogen and Fuel Cell Technology (NIP).

Source: https://www.globalrailwayreview.com/news/71394/hydrogen-fuel-cell-germany/

Will hydrogen-powered cars gradually become mainstream in Europe?

The role of fuel cell electric vehicles (FCEVs) in the transition to a clean, low-carbon energy system is increasingly recognized worldwide. Yet, their mass roll-out is still years away. This is not surprising because high costs, efficiency issues and the limited number of hydrogen refueling stations (HRSs) affect the business case for their production and use on a large scale.

The EU-funded ZEFER project is addressing this challenge by introducing 180 FCEVs in Brussels, London and Paris. As explained in a press release on the project website, their regular use on a daily basis will create hydrogen demand from each vehicle roughly four times that of a normal privately owned car. "This will help to ensure high utilization of the early networks of HRS which are already operating in each city." As a result, the economics of operating the stations will be improved and the uptake of FCEVs will speed up.

Business case for FCEVs

Project partners hope most of the vehicles will be deployed by the end of 2018. ZEFER predicts the FCEVs will cover a lot of ground. For Paris and Brussels, the estimate for mileages is over 90,000 km per year and for London 40,000 km. It will collect data on the vehicles as they make their rounds, and will also provide an analysis of the business cases and technical performance of the deployments.

Stored in vehicles in a tank just like petrol or diesel, hydrogen is utilized in an electrochemical energy conversion process with oxygen in fuel cells to generate electrici-

ty. This powers the electric motor to propel the FCEV. A similar electrochemical process is used to produce electricity from batteries. But while a battery will lose its charge over time, a fuel cell will continue to work so long as it has hydrogen and oxygen flowing into it.

Another advantage of hydrogen-powered cars is that they have a long range, over 480 km, with some in the market travelling up to 800 km or more on a single tank. They also charge faster than traditional battery-powered vehicles—the refueling time is typically 3 minutes. If the hydrogen is generated by renewable sources, FCEVs could provide zero-emission transportation opportunities.

The ongoing ZEFER (Zero Emission Fleet vehicles For European Roll-out) project was set up to demonstrate viable business cases for captive fleets of FCEVs in operations that can realize value from hydrogen vehicles. This could be done, for example, by intensive use of vehicles and HRSs, or by avoiding pollution charges in city centers with applications where the refueling characteristics of FCEVs suit the duty cycles of the vehicles.

Source: https://phys.org/news/2018-07-hydrogen-powered-cars-gradually-mainstream-europe.html

Hydrogen is finally getting attention from Norwegian politicians

Green hydrogen is an important piece of the zero-emission puzzle, both in Norway and the rest of the world, according to Vegard Frihammer from Greenstat.

Hydrogen has some fantastic characteristics as a zero-emission energy carrier. It has the quality of a very high energy to weight density and only emits water. It can be produced anywhere from renewable energy and will work well as a range extender in existing electrical drive lines. Hydrogen will, in combination with batteries and a share of sustainable biofuel, play an important role in the transition to 100 % zero emission transport.

The ever-present "battery versus hydrogen discussion" finally seems to be losing momentum, as politicians and others prefer to focus on the "fossil versus zero emission discussion", which is far more important and productive. In Norway, there are 2.5 million cars and even with a record-breaking high penetration of BEV (battery electric vehicles), counting for 22.3 % of new cars sold, there are almost 2.4 million fossil cars that need to be replaced. The need for hydrogen solutions for cars, buses and heavy-duty vehicles is both necessary and beneficial.

Hydrogen friendly politics is emerging

Despite a strong effort from the minority parties, hydrogen has, until recently, not been a prioritized issue among national politicians in Norway. This has resulted in low budgets and small-scale local initiatives, rather than national programs. But this is finally about to change. After a smart move from the government where ENOVA, the national funding scheme, was moved from the Ministry of Petroleum and Energy to the Ministry of Climate and Environment, where a hydrogen friendly minister, Ola Elvestuen, now is the head of ENOVA, and so the future looks a lot brighter.

The hydrogen industry now has three different ministers seeing hydrogen as a part of the low carbon solution. Elvestuen will focus on green hydrogen production, storage and usage in the transport sector. The Minister of Transport and Communications, Ketil Solvik-Olsen, is also investing heavily in hydrogen. Through The Norwegian Public Roads Administration he launched the first public hydrogen ferry tender in 2017, which is to be operational in 2017. The Minister of Petroleum and Energy, Terje Søviknes, on the other hand is mainly focusing on hydrogen from natural gas with CCS as Equinor (Statoil) and other oil companies have picked up the interest in hydrogen.

From 120 in 2018 to 500,000 hydrogen cars by 2030

Currently, there are seven hydrogen stations for cars in Norway, five in the capital Oslo, one in Bergen and one in Trondheim—serving approximately 120 cars. However, during the last two years ENOVA, has released two new programs supporting new hydrogen stations. The number of stations is, therefore, expected to grow rapidly over the next few years.

The National Transport Plan (NTP) has stated that by 2025, no more fossil cars should be sold. With a yearly sale of roughly 150,000 cars in Norway and assuming that hydrogen cars will have a rising market share from 30% to 50% in the years from 2025 to 2030, the number of hydrogen cars will accumulate to roughly 500,000 by 2030. These cars will then consume around 75,000 tons of hy-

drogen, which in turn, will require 4 TWh of renewable electric energy.

In addition to the car market, there will be a strong demand for green hydrogen in the heavy duty vehicle market, the maritime market and potentially, the airborne industry.

Both large-scale and small-scale hydrogen production plants needed

When setting up a hydrogen production plant, the question of whether to place the facility close to the consumer or the power production is raised. As the sales price of hydrogen will be a result of the production and the transportation cost, this will vary depending on the location for the consumer and for the power source.

The production price is significantly reduced by setting up large-scale production facilities, but to keep the transportation costs down, you need large consumers nearby. For remote locations with smaller quantities, local production and distribution are favorable.

Electrolysis as the end solution, but fossil hydrogen with CCS could speed up the transition

Norway has a large production of natural gas, with a yearly export of nearly 1000 TWh. For the Norwegian gas industry, hydrogen could provide a new market and even if green energy from renewable energy is the favorable solution from a climate perspective, hydrogen with CCS could boost the transition by securing stable large-scale production from existing facilities.

However, hydrogen from natural gas with CCS is only economically viable in large-scale, several hundred tons per day, and close to existing CCS infrastructure. This leaves room for green hydrogen to cover most of the domestic market in Norway where the typical project sizes range from a few hundred kg to some tons per day will be the typical project size.

Promising future if policies stay on course

The future of hydrogen in Norway is still vulnerable to political shifts, but as most parties have included hydrogen as a part of their platform and politicians, in general, are more hydrogen friendly, Norway could emerge as the hydrogen nation of Europe.

Source: https://www.openaccessgovernment.org/hydrogen-is-finally-getting-attention-from-norwegian-politicians/47244/

Hydrogen car-ferry project launches

A European consortium led by a Scottish engineering company and university is aiming to launch the world's first hydrogen-powered car ferry in 2021.

John Morgan of Ferguson Marine Engineering, which is running the project with the University of St. Andrews, said: "There are a few European groups in the market with similar ambitions, but we believe ours can be the first vessel on this scale."

The HySeas III project, which started this month, also involves Germany's aerospace agency (DLR), global ferry owners' organization Interferry and Denmark's Ballard Power Systems, which is providing the technology for the vessel's modular drive train, based on its hydrogen-powered road-transport experience.

HySeas III was recently awarded a €9.3-million grant by the EU's Horizon 2020 research and innovation fund, with a total budget estimated at €12.6 million.

Horizon 2020 is the EU's largest ever research and innovation program with a budget of around €80 billion, running for seven years until 2020.

The group said it would run on hydrogen produced using renewable energy in its operating area around the Orkney Isles, where the gas is already being produced from excess wind and tidal power.

Hyseas III aims to test the ferry's modular drive train on land using simulations at the Ferguson shipyard on the River Clyde, which has seen a £25-million makeover during the past four years, according to Jim McColl, chief executive of yard owner Blowers Capital.

Since the Port Glasgow yard was acquired and its site upgraded by McColl's investment vehicle, all the other newbuild contracts it has won have been for Caledonian Maritime Assets (CMAL), the Scottish state-owned ports, harbors and ferry division with headquarters across the road

from the Ferguson site.

The shipyard has seen innovation in the past with the launch in 2012 of the first ferry in the world to operate under hybrid-battery power, using diesel and lithium-ion batteries.

Last year Ferguson launched the UK's first dual-fuel ferry, MV Glen Sannox, which was powered by a combination of marine diesel and LNG (liquified natural gas).

HySeas III project coordinator Dr. Martin Smith from St. Andrews University said: "This opens the real possibility of Scotland and her key European partners delivering another world-first, not simply in shipbuilding but also in building sustainable sources of fueling in parallel."

The University of St. Andrews is home to research and development in hydrogen, battery and other energy technologies and a key part of the developmental aspect is the transferal of knowledge and expertise into real-world applications.

Smith previously played a leading role in the introduction of Scottish hydrogen buses, a development which is now set to move beyond Aberdeen with Dundee currently following and other Scottish cities considering fleets.

Source: https://www.energy-reporters.com/storage/hydrogen-car-ferry-project-launches/

Canada's first retail hydrogen fueling station opens in Vancouver

Canada's fledgling hydrogen-fueled vehicle industry took a significant step forward on Friday, as Shell opened the country's first publicly accessible hydrogen fueling station in Vancouver.

The station is nestled between traditional fuel pumps at a Shell outlet in Vancouver's Marpole neighborhood. The company has plans for two more in the city.

The modest, but noteworthy piece of hydrogen fuel infrastructure was opened with some fanfare, as auto manufacturers Honda, Hyundai, and Toyota had vehicles on hand for test drives.

"It's a great day for Shell, but it's also a great day for society," said Shell's general manager of hydrogen, Oliver Bishop, who travelled from Europe for the launch.

Bishop highlighted the lack of greenhouse gas emissions from hydrogen fuel cell vehicles, and the abundance of the element in the universe.

But it's unclear how ready the consumer market is for the new technology. Refueling options are limited to the new station for now, and a couple of privately-accessed stations in other provinces.

"The customer, by and large, is not aware of fuel cell electric vehicles," said Bishop. "These are electric vehicles. That's what a hydrogen car is ... They function in a very similar way to a battery electric vehicle. They have an electric motor."

While Hyundai Canada CEO Don Romano took a shot at Tesla electric cars during Friday's launch event, Bishop declined to pit hydrogen against battery powered electric cars, saying Shell will provide whatever sort of energy the consumer demands, and offers electric fast-charging stations in some markets.

But he touted the short amount of time it takes to refuel a hydrogen tank—about five minutes—and the range the vehicles can travel before refueling—hundreds of kilometers.

And Bishop defended the safety of of the technology, dismissing associations with the 1937 Hindenberg disaster, when a hydrogen-filled airship burst into flames, killing dozens.

"Hydrogen is as safe as any other fuel. If you mishandle any form of energy which is being stored, you may get hurt, and so of course, this is all about treating energy carefully," he said.

"That's the same whether it's gasoline, or diesel or [liquefied petroleum gas], or lithium ion battery. If you mistreat it, it could hurt you."

Source: https://www.cbc.ca/news/canada/british-columbia/hydrogen-fuel-pump-opens-in-vancouver-1.4709016

Toyota rolls out version 2.0 of its hydrogen fuel cell truck, dubbed the "Beta Truck"

Toyota unveiled version 2.0 of its hydrogen fuel cell electric Class 8 truck at a Management Briefing Seminar at the Center for Automotive Research (CAR) today.

The new truck builds on Toyota's learnings from version 1.0 of the truck, which it had dubbed the Alpha Truck. The naming convention was carried through to the current version, which has been christened as the Beta truck. Of course, this follows the pre-production naming convention used for software releases.

The Beta truck has received a range boost that allows it to travel more than 300 miles per fill up — an increase from the 200 mile range of the Alpha truck — and now comes with a sleeper cab that has been combined with the fuel cabinet that allows for more usable space without increasing the wheelbase on the vehicle. The increase in range was one of the many improvements Toyota rolled into the Beta truck based on lessons learned from the more than 10,000 miles it has put on the Alpha truck since April of 2017 in the ports of Long Beach and Los Angeles.

On the performance side of things, Toyota's Beta truck maintains the 670 horsepower and 1,325 pound-feet of torque that the Alpha truck produced from its twin Toyota Mirai fuel cell stacks and 12kWh battery. These specs enable its gross combined weight capacity of 80,000 lb.

The Alpha truck was taken from concept to prototype in less than a year to see if Toyota's hydrogen fuel cell technology could be a good fit for a Class 8 heavy duty truck. The improvements rolled into the Beta truck continue the rapid deployment strategy, with the truck slated to move into full operations in the fall at the ports of Long Beach and Los Angeles.

"By evaluating the first truck in our test facilities and on the actual roads in the LA area, we made a list of improvements for the Beta truck build process and performance enhancements," said Andrew Lund, Chief Engineer for the project. He continued, "We needed to move beyond a proof of concept, which the first truck accomplished, to something that is not only better than the original but is also more commercially viable."

The paired ports of Long Beach and Los Angeles are serviced by 16,000 heavy trucks today and have become a hotspot for poor air quality as a result. As a result, the area has become the focus of efforts by the South Coast Air Quality Management District (SCAQMD) to improve air quality, especially as the number of trucks servicing the ports is expected to double to more than 32,000 trucks per day in 2030.

Looking out across the United States, there are more than 43,000 drayage trucks working in ports that could also benefit from the work being done by Toyota if the solution is determined to be commercially viable. That's exactly the focus for Toyota as it looks to use the Beta truck to take its hydrogen-powered truck to the masses.

"Our goal with the first truck was to see if it could be accomplished, and we did that," said Senior Manager for Toyota's North American Electrified Vehicle & Technologies Office Craig Scott, "This time we're looking at commercial viability. We want to help make a difference … a significant difference when it comes to the air quality not only in the LA area but across the US and around the globe."

To further sweeten the deal, Toyota is generating renewable hydrogen at its Toyota Logistics Services facility in the Port of Long Beach. As we shared last year, the plant will use agricultural waste to generate water, electricity, and hydrogen that will support Toyota Logistics Services' (TLS) operations at the Port of Long Beach as well as its growing fleet of hydrogen trucks working in the ports.

Source: https://cleantechnica.com/2018/07/30/toyota-rolls-out-version-2-0-of-its-hydrogen-fuel-cell-truck-dubbed-the-beta-truck/

World agrees to cut shipping emissions 50 percent by 2050

The UN's International Maritime Organization has approved the world's first broad agreement to cut greenhouse gas emissions from worldwide ocean shipping and said it hopes to phase them out entirely "as soon as possible in this century."

The agency called the agreement, reached by countries on Friday, a first step and promised further action in the future. Some negotiators and observers said it was not yet strong enough to guarantee that shipping, a rapidly growing contributor to global warming, will come into line with the Paris climate agreement. The IMO called it a "pathway" in that direction.

The IMO called on shipping companies to reduce emissions by the year 2050 to 50 percent of their 2008 level, with emissions growth peaking as soon as possible. The organization is a specialized United Nations agency with 173 member states who cooperate on regulations governing the international industry, including setting pollution standards.

Even relatively modest first steps would require considerable changes in how cargo ships are built, fueled and operated. At present, ships run almost entirely on fossil fuels, generally the dirtiest grades of oil, and burn them inefficiently to boot.

Meeting the new goals would require shippers to significantly increase fuel efficiency and to shift to low- and zero-carbon fuels such as biofuels or perhaps hydrogen, while adopting new propulsion technologies, some of them still unproven.

The next step is for the IMO to decide whether to make some of these short-term measures mandatory and determine how to enforce the rules. The deal is to be reviewed and perhaps tightened in five years.

Cutting Shipping Emissions Takes a Global Deal

Until now, little has been done to address the industry's carbon pollution. Shipping is not directly controlled by the Paris agreement, and it is widely neglected in the Paris pledges made by individual nations.

About 90 percent of global trade in goods travels by ship, and the vessels together emit about as much greenhouse gases as Germany, the nation with the sixth-highest emissions in the world. Emissions from shipping have been projected to rise 250 percent by 2050 unless controls are imposed. For competitive reasons, and because ships are registered in various countries without regard to where their owners are based or what ports they visit, this can only be done by a global agreement.

Delegates from many countries, meeting in London this week, spoke of the need to do more.

The Marshall Islands made clear from the outset that it would not endorse any agreement that fell short of the Paris targets. The low-lying Pacific Ocean archipelago is probably doomed unless carbon dioxide emissions are reined in sharply and rapidly, but it is also home to one of the world's biggest shipping registries. The vessels registered there fly a flag of convenience as the islands' people face an inconvenient truth.

"I will not go home to my children, and my country's children, endorsing an outcome from the IMO that fails to face up to the greatest threat of the century," Environment Minister David Paul said.

After the decision, President Hilda Heine of the Marshall Islands said the outcome "made history."

"While it may not be enough to give my country the certainty it wanted, it makes clear that international shipping will now urgently reduce emissions and play its part in giving my country a pathway to survival," she said.

Kitack Lim, the IMO secretary-general, told delegates, "I am confident in relying on your ability to relentlessly continue your efforts and develop further actions that will soon contribute to reducing GHG [green house emissions] from ships."

Island States Wanted a Zero-Emissions Target

Climate advocacy groups welcomed the move as a long overdue step but called it insufficient.

"Without concrete, urgent measures to cut emissions from shipping now, the Paris ambition to limit warming to 1.5 degrees will become swiftly out of reach," said Veronica

Frank of Greenpeace International. "Although the deal lists possible mitigation measures, the lack of an action plan for their development and the tone of discussions at the IMO does not give much confidence that measures will be adopted soon."

A more suitable target, some say, would be to aim for zero emissions from shipping as early as 2035, as was demanded by the Marshall Islands and several other small island states. European Union countries were willing to cut more deeply than the IMO decided; Japan wanted to move more slowly than the IMO target. In the end, they compromised.

For the world's nations to achieve the Paris targets of keeping warming well below 2 degrees Celsius, scientists say net emissions of carbon dioxide from all energy systems need to be reduced rapidly, reaching zero some time in the second half of this century.

Here's How Shipping Can Cut Its Emissions

While it may sound Pollyannaish to talk of rapidly bringing emissions from shipping down to anything close to zero, the Organization for Economic Cooperation and Development (OECD) published a report as the negotiations began describing possible pathways to get there.

Technology: "Maximum deployment of currently known technologies could make it possible to reach almost complete decarbonization of maritime shipping by 2035," it said. "This reduction equals the annual emissions of approximately 185 coal-fired power plants."

Less Fossil Fuel Use Globally: Some progress might come simply from a worldwide reduction in the use of fossil fuels, especially coal and crude oil. Much of these commodities move by sea. Declining exports from producing countries would reduce the amount of shipping, and that alone would make a dent in smokestack emissions at sea.

Electrified Ports: In addition, lots of the pollution from ships is given off while they are in port, their engines idling to produce on-board power. Plugging them in to clean electricity supplies would prevent that—and would considerably reduce the local smog and soot that choke some port cities.

Slowing Down: The next obvious way to cut emissions is by simply slowing ships down. Just as Americans used to save gasoline by driving at 55 miles per hour on highways, ships can cruise more efficiently if they go slower. Of course, that means more ships are needed to carry the same amount of fuel. New shipbuilding would be an opportunity to build modern, efficient ships or new varieties that incorporate novel technologies, such as fuel cells or other electric propulsion.

Alternative Fuels: Then there's the possibility of substituting alternative fuels. One approach would use synthetic biofuels. This would require careful attention to life-cycle emissions, since biofuels don't always have a lower carbon footprint, especially in the short run. Another approach would substitute fuels like hydrogen for the heavy, dirty fuel oil that is commonly used.

A Price on Carbon: The most effective way to spur this kind of change, the report said, would be to impose a price on greenhouse gas emissions, such as a carbon tax. Then the marketplace could decide what methods to use to hold down emissions and avoid the tax.

"An effective carbon price coupled with technology and operational improvements will be key to unlocking the huge potential for pollution-free shipping," said Kelsey Perlman, international transport policy officer for Carbon Market Watch.

Source: https://insideclimatenews.org/news/13042018/ocean-shipping-imo-agreement-reduce-climate-change-emissions-fuel-oil-zero-carbon-clean-energy-technology

Researchers create hydrogen sensor that works at room temperature

Hydrogen has the potential to replace fossil fuels as an energy carrier, but it is highly flammable, so sensors to detect it are an absolute necessity if there's to be a transition to a hydrogen economy.

However, the challenge to date is that most current hydrogen sensors require high temperatures in order to function and have low sensitivity and slow response times.

Researchers at TU Delft (The Delft University of Technology in the Netherlands), say they have cracked this challenge with a new sensor made of a thin layer of tungsten trioxide (WO_3). Its high electrical resistance coupled with

ability to sense hydrogen using a platinum catalyst means it can detect hydrogen concentrations down to 1 pppm near room temperature, with response times as low as 1 s when the concentration exceeds 100 pppm.

One of the properties of tungsten trioxide is that its crystal lattice structure contains a lot of open spaces. As a result, the material can easily be doped, which is the practice of changing its electronic properties by introducing other atoms.

"By itself, tungsten trioxide is an insulator," said Giordano Mattoni, the lead author of the paper published on their work. "But when you dope it, you add electronic charges which turn the material into a different color and also gradually change it into a metal. We wanted to try to dope thin films of tungsten trioxide with hydrogen gas to see if it could function as a sensor."

It turns out that it can. The researchers first created thin sheets of tungsten trioxide using a method called pulsed laser deposition. That way, they were able to deposit single layers of the material onto a substrate one by one. "Using this method, we created sheets of tungsten trioxide with a thickness of only nine nanometers," said Mattoni.

The researchers then put platinum droplets on top of the thin layers of tungsten trioxide. Platinum is well known to function as a catalyst which separates the hydrogen molecules into single hydrogen atoms. These atoms, the researchers observed, could then enter the lattice structure of tungsten trioxide, slowly turning it from an insulator into a metal.

"This means that, by measuring the resistance of the material, we can determine the amount of hydrogen present in the environment," Mattoni said.

What sets this new hydrogen sensor apart from most other sensors is that it can be used at room temperature. "It is also much more sensitive than commercially available products and it can be reused in a matter of minutes," Mattoni added. "Also, by increasing or decreasing the temperature of the sensor, the sensitivity range can be tuned for different applications."

Finally, the thin film nature and the compatibility with current semiconductor technologies allow the sensor to be scaled up towards mass production. Mattoni and TU Delft have filed a patent application for this new sensing technology.

Source: https://www.eetimes.com/document.asp?doc_id=1333477

ARENA provides $1.5m for Australian hydrogen hub

The Australian Renewable Energy Agency (ARENA) has provided $1.5m in funding for Australia's first green hydrogen (H_2) innovation hub at ATCO's operations facility in the Perth suburb of Jandakot, Australia.

The project's centerpiece is a display home where H_2 will be tested in household appliances designed for natural gas.

An array of 1100 solar panels paired with battery storage will power the site, diverting excess energy that would otherwise be wasted to produce green H_2.

Renewable green H_2 is made using electricity generated by renewable sources such as solar and wind, ensuring the process is carbon free.

ATCO is building the Clean Energy Innovation Hub to explore opportunities for surplus renewable energy to be stored as H_2.

Head of innovation Samuel Lee Mohan says this journey started more than two years ago when they embarked on a project to understand the role natural gas can play in a residential hybrid energy system.

"We designed a hybrid energy system which uses natural gas as a backup to renewable solar and battery technology. That trial was very successful," said Mohan.

With the gas industry releasing a vision to be a low carbon energy provider by 2050 and global trends towards decentralization and decarbonization, ATCO set out to take their hybrid concept to a commercial scale.

"Hydrogen is a clean energy that can provide storage of intermittent renewable technology. It achieves two things – decentralization in the short term with hydrogen as a backup," Mohan continued.

Looking to the 2050 low carbon vision, Mohan said, "Biogas and hydrogen have a role to play, and that requires us to innovate today".

ATCO is on track to have the solar panels installed by August and be producing renewable H_2 by March 2019.

H_2 will be piped in two lines—one blended in low concentrations with natural gas to test how a cooktop, hot water boiler and space heater respond to different proportions of the renewable gas, and a second delivering 100% H_2 for dedicated H_2 appliances that will be installed in the future.

The technical challenges aren't the only barriers to overcome before renewable H_2 can start replacing natural gas in homes.

Mohan explained, "One is understanding the engineering and technical challenges of producing and injecting hydrogen into the gas network. The second is economics. Understanding the cost and time of changing appliances and some network upgrades".

He believes the technical barriers could be overcome within five to eight years.

Storage vital as renewables take over

As renewables take off, attention is shifting to how surplus electricity generated by solar and wind can be stored for later use to provide dispatchable power. H_2 is one option, using excess renewable energy to power an electrolyzer that separates water molecules into H_2 and oxygen.

ATCO's electrolyzer will be powered entirely by onsite solar, creating renewable H_2 that is completely free of emissions. The system is expected to deliver enough electricity to produce about four tones of renewable H_2 per year.

H_2 has upsides over other storage technologies, being easily stored and transported, able to quickly fill fuel tanks and only emitting water vapor when used to power a fuel cell.

The Clean Energy Innovation Hub will also use H_2 to power a fuel cell to stabilize the electricity supply, in addition to combusting it in the place of natural gas in domestic appliances.

Source: https://www.gasworld.com/arena-provides-15m-for-australian-hydrogen-hub-/2015069.article

Excess energy: is surplus solar and wind power a good source of hydrogen?

Of all the energy challenges facing Western industrialized nations, what to do with surplus power generated by renewable sources such as wind and solar PV would appear to be the least of them.

However, the familiar problem of balancing supply and demand is becoming more pressing. In April, National Grid published a report warning that electricity demand in the UK could fall to near record lows this summer – peak transmission system demand for June-August was forecast at 33.7GW – because of the growing supply of power from small-scale solar and wind farms that bypass the grid.

"Increased supply and demand variability caused by these periods of low demand and high levels of renewable generation can create operability challenges," the report said.

"As a result, we may need to take more actions to curtail generation and possibly instruct inflexible generators to reduce their output in order to balance the system."

Clean energy provides a third of the UK's power at certain times of the day. That, coupled with the UK Government's ambitious program of offshore wind farm construction and the inflexibility of some solar power plants, means the problem of what to do with excess electricity is now a priority.

Hydrogen storage explained

A recent report from the Institution of Mechanical Engineers (ImechE) entitled 'Energy from Gas: Taking a Whole System Approach' offers compelling evidence that hydrogen storage could help to optimize surplus low-carbon power.

The concept is built around 'power to gas', a process by which electricity—most commonly excess power on the grid or in industry—is used to create gas, usually in the form of hydrogen.

This is then electrolyzed from water and the energy used

across all sectors of the UK energy system, such as electricity, heat, industry, storage and transport, helping to decarbonize the power network.

"Power to gas provides a conduit for connecting the energy system together, providing fuel from excess power and reducing both air pollution and CO_2 emissions," explains Dr. Jenifer Baxter, head of engineering at ImechE and lead author of the report.

"The use of hydrogen technologies is not a new concept, but as climate change, health concerns and security of energy supplies across sectors begin to impact our everyday lives, the appeal of the use of hydrogen technologies as part of the whole energy system grows."

In addition to decarbonizing the power grid, there is another ethical dimension to hydrogen storage; namely, that it offers an environmentally friendly alternative to mining for metals such as lithium, the central component of lithium-ion batteries and an increasingly popular form of energy storage.

Everything from mobile phones to electric cars relies on metals like lithium, nickel, graphite and cobalt, so demand and prices are soaring. The Financial Times reports that the price of cobalt, mostly mined in the Democratic Republic of Congo, has increased by more than 190% over the past 18 months.

A 2017 report by Amnesty International alleges that industry giants such as Microsoft, Lenovo and Renault are not doing enough to tackle child labor allegations in cobalt battery supply chains.

"The UK Government should commission a comprehensive comparative study of the long-term sustainability of materials used to create Lithium-ion EV batteries versus power-to-gas/gas systems and fuel cells, particularly for energy storage, to identify appropriate technology and lifecycle analysis," says Baxter, quoting one of the IMechE report's key findings.

Solving the problem of excess energy

According to IMechE, the appeal of sustainable or 'green' hydrogen is that it offers clean, limitless energy that can fulfill the requirements of all energy sectors, as well as many heavy industries. For example, hydrogen can be used as an effective alternative fuel to oil for large vehicles such as HGVs.

The institution's report includes case studies detailing the use of renewables at refineries to generate hydrogen through electrolyzers for use in petroleum refining. Gas distribution company Cadent is also looking at generating hydrogen for industry through steam methane reforming, using carbon, capture and storage (CCS) to remove CO_2 from the process.

"ITM have a hydrogen reforming station in London that will be supplying the Metropolitan Police vehicles." Baxter adds. "We will likely see improvements in electrolyzers using renewables, the use of CCS in steam methane reforming and the general greening of existing and new hydrogen.

"Clean limitless energy that can fulfil the requirements of all energy sectors provides a great option for the UK."

Not everyone agrees. A recent report by the Oxford Institute for Energy Studies warned that there were 'major technical challenges' to decarbonizing heating by switching to greener gases like hydrogen.

"There is good evidence to show that there is little or no change needed to introduce up to 20% hydrogen into the heating network, and also using biogases reduces the overall greenhouse gas (GHG) emissions," Baxter counters.

"Until recently, there has not been regulation or the level of public awareness around GHG emissions and air pollution to force manufacturers to change behaviors. The 2008 Climate Change Act pushed change in the power sector first and now other more difficult sectors are beginning to change."

Power to gas vs. battery storage

The Guardian reports that in 2017, the UK Government made pledges amounting to £246m for battery research and development, compared with just £25m to explore using hydrogen for heating.

IMechE calls for investment and research into both batteries and hydrogen production, storage and use. The institution would like to see more investment in hydrogen, but not at the expense of other technologies. "The UK Gov-

ernment must work with the gas industry to promote the use of up to 20% hydrogen in the gas distribution network including change in pipes and materials by 2023," states Baxter, again referencing one of the IMechE report's key findings.

"Funding programs and demonstration sites are crucial to decarbonizing gas," she continues. "Government has the power to finance research, development and demonstration and support deployment through programs such as Innovate UK, as well as bespoke programs designed to deliver future UK infrastructure."

"The government must also commit to creating an industrial forum that brings together the nuclear, renewable power and gas sectors to promote the generation and storage of hydrogen for use across the UK energy system in heat, transport, power generation and heavy industry.

"Investment now in the future hydrogen economy will begin to encourage further innovation, open up markets and help clarify legislation and regulation."

Source: https://www.power-technology.com/features/excess-energy-surplus-solar-wind-power-good-source-hydrogen/

Europe may thrive on renewable energy despite unpredictable weather

Researchers in Ireland, Switzerland, and the United Kingdom have shown how long-term weather patterns affect wind and solar renewable energy technologies across Europe. Using 30 years of meteorological data, the scientists have examined and further modelled the impact of renewable energy on the electricity sector out to the year 2030. The work suggests that despite the unpredictable nature of wind and solar energy, the European power system can comfortably generate at least 35% of its electricity using these renewables alone without major impacts on prices or system stability.

Wind and solar energy have exploded in popularity across Europe in the last decade as green alternatives to traditional carbon-based energy, quadrupling in use between 2007 and 2016. However, these technologies are not without their drawbacks—both are susceptible to fluctuating weather patterns, raising concerns about Europe's ability to endure long spells with low winds or overcast skies. Researchers have used decades of historic weather data to model this variability in wind and solar energy and its effect on markets, but many studies only analyse data from one given year or focus solely on one country or small region.

The researchers challenge both the temporal and spatial limitations of previous studies by analyzing electricity system operation across Europe—including power transmission between countries and technical operational constraints—using wind and solar data spanning the 30-year period from 1985 to 2014. By uncovering trends from this longstanding data trove across a vast, interconnected region, the team was able to model how Europe would fare under five different renewable energy scenarios with varying sustainability ambitions 12 years into the future. It turns out that the breadth and depth of their data pool made all the difference when it came to understanding trends in CO_2 emissions, system costs, and system operation—all of which are essential to the effective development of energy policy.

"When planning future power systems with higher levels of wind and solar generation, one year of weather data analysis is not sufficient," says Seán Collins, a researcher at MaREI, the Marine and Renewable Energy Centre at University College Cork. "We find that single-year studies could yield results that deviate by as much as 9% from the long-term average at a European level and even more at a country level. When there are legally binding targets on carbon emissions and the share of renewable energy, or promises to avoid sharp price hikes, this makes all the difference."

By using multiple years to better understand the way other variables respond as wind and solar energy penetrate

the market, Collins and his team found that CO_2 emissions and total energy generation costs fluctuate wildly in future scenarios. These can become up to five times more uncertain as weather-dependent resources gain greater traction in the market. However, they also found that Europe could withstand this variability quite well thanks to its close integration—their models estimate Europe could use renewables for more than two-thirds of its electricity by 2030, with more than one-third coming from wind and solar.

Collins and his team believe their models and data could be used to depict a variety of possible future scenarios to help policymakers better understand the reliability and impact of renewable energy, including the impacts of a shift to 100% renewable electricity systems. By making their models and data openly available, the researchers also hope that future work will demonstrate greater awareness of these long-term weather patterns in order to accurately depict a more renewable-energy-reliant world.

"For future policy developments to be robust and to capture the meteorological dependency of decarbonized energy systems, they should be based on open modelling analyses that utilize common long-term datasets," says Collins.

Source: https://irishtechnews.ie/europe-may-thrive-on-renewable-energy-despite-unpredictable-weather/

Record wind farm construction now underway in the US

US wind farm construction now surpasses 90 GW with strong demand from Fortune 500 brands and utilities according to second quarter results released today by the American Wind Energy Association (AWEA).

Strong demand for low-cost wind power from US utilities and other buyers, including major corporations like AT&T and Walmart this quarter, continues to drive the industry's growth across America. Wind power's low cost makes it one of the most competitive energy sources in many parts of the country and the low cost of wind continues to fall due to technological innovation and increased manufacturing. The five-year extension and phase out of the wind energy Production Tax Credit – which ends in 2019 – is another factor in driving growth forward.

"Wind power's job creating engine just kicked into a higher gear" said Tom Kiernan, CEO of AWEA. "And all Americans will benefit as the record number of wind farms under construction begin delivering new revenue to rural communities and affordable homegrown energy to consumers."

AWEA's US Wind Industry Second Quarter 2018 Market Report reveals that wind farm construction now totals 5,322 MW during the second quarter of 2018, bringing total construction activity to 18,987 MW. A single new American wind turbine represents 2.32 MW of capacity on average, roughly enough to power 750 typical homes.

Beyond projects currently under construction, another 3,901 MW of new wind power capacity entered advanced development. Projects in advanced development are likely to enter construction in the near term because they have achieved a major milestone such as placing a turbine order or finding a buyer for their power. The entire near-term US wind farm development pipeline grew 13 percent over the previous quarter to a grand total of 37,794 MW under construction or in advanced development.

The US wind industry installed 626 MW this quarter, bringing year-to-date installations to 1,032 MW. Those installations mean American power capacity cracked 90,000 MW nationally, extending wind's lead as the largest source of US renewable energy capacity. The country's 90,004 MW of total installed wind capacity is capable of generating enough affordable, clean electricity to power over 27 million average homes.

Wind energy buyers value the ability to lock in long-term, stable prices through power purchase agreements (PPA) or direct ownership of wind farms. Wind farm developers signed 1,524 MW of PPAs during the second quarter, and the overall volume of wind capacity contracted through PPAs is up 44 percent compared to the first half of 2017. Corporate customers including AT&T, Grupo Bimbo, Walmart, and Merck & Co accounted for 56 percent of contracted capacity in the quarter, with utilities contracting the remainder.

Utilities also announced plans to add 1,491 MW of wind capacity under direct ownership, including MidAmerican's

591 MW Wind XII project in Iowa and Ameren Missouri's 400 MW High Prairie project in Missouri.

Offshore wind power's growing momentum reached new heights in three New England states this quarter. In May and June, Massachusetts, Rhode Island and Connecticut selected competitive bids representing 1,400 MW of offshore wind capacity for development. Project developers are now working out PPA terms with utilities. Bringing these projects online is a major step toward scaling up U.S. offshore wind, which will create American jobs, infrastructure investment and economic opportunity throughout coastal communities.

Wind energy supporters around the country will celebrate the rapid growth in U.S. wind power and the opportunity it creates for job seekers, consumers and communities during American Wind Week, which kicks off in less than two weeks from August 5-11.

Source: https://www.renewableenergymagazine.com/wind/record-wind-farm-construction-now-underway-in-20180727

Fujitsu announces 100% renewable energy target, joins RE100

Japanese IT giant Fujitsu announced last week that it has committed to sourcing 100% of its needed electricity from renewable energy sources by 2050, coupled with its decision to join the RE100 initiative.

Fujitsu becomes the latest in a long string of companies making large-scale renewable energy commitments, and the 140th to join the RE100 initiative—a global initiative designed to support and bring together companies making 100% renewable energy commitments formed by The Climate Group in partnership with CDP (formerly the Carbon Disclosure Project).

Fujitsu's commitment to source 100% renewable energy by 2050 is part of its medium- to long-term environmental outlook, launched in May as the "Fujitsu Climate and Energy Vision" which aims to bring the company's CO_2 emissions down to zero by 2050. This puts into place the company's greenhouse gas emissions reduction target which was approved in August of 2017 by the Science Based Targets initiative. Specifically, Fujitsu will reduce its absolute Scope 1 and 2 greenhouse gas emissions 33% by 2030 and by 80% by 2050 and reduce its Scope 3 greenhouse gas emissions by 30% by 2030.

The company's decision to source 100% of its electricity needs from renewable energy by 2050 applies to all the Fujitsu Group's locations both inside and outside its home country of Japan and will make use of a range of procurement methods including renewable energy certificates, Power Purchase Agreements (PPAs), and on-site installations including solar and energy storage.

Beyond its commitment to source its own electricity needs, Fujitsu will also commit its technological expertise to continuing research and development and technology trials for energy management and storage, a move which will go beyond benefiting the company's own efforts but will also benefit the global power sector as a whole.

"With our technology and expertise, Fujitsu will show leadership in providing solutions for overcoming any barriers to disseminating renewable energy, such as cost," said Hideyuki Kanemitsu, VP, Head of Responsible Business Unit, Fujitsu. "Joining RE100 demonstrates our strong intention to deliver on our Fujitsu Climate and Energy Vision. We expect to see opportunities to collaborate with customers and various stakeholders through our RE100 membership."

"We are delighted to welcome Fujitsu to RE100" added Sam Kimmins, Head of RE100, The Climate Group. "Their commitment comes at a crucial time, sending a clear message to the world that Japanese companies are committed, alongside their global peers, to using 100% renewable power."

Source: https://cleantechnica.com/2018/07/24/fujitsu-announces-100-renewable-energy-target-joins-re100/

Zoo waste to energy project the first of its kind in North America

Michigan State University and the Detroit Zoo have partnered for a clean energy project.

A zoo waste to energy solution has been given the green light in Detroit. A Michigan State University (MSU) research team will build an anaerobic digester at the Detroit Zoo as a clean solution for the zoo's animal and food

waste problem.

This will be the first anaerobic digester implemented at a zoo in North America.

The team of university researchers, led by MSU researcher Dana Kirk, worked with the Detroit Zoo to build the zoo waste to energy technology. The anaerobic digester at the animal enclosure facility will convert animal and food waste into clean energy that is capable of powering some of the zoo's operations, stated an MSU report.

An anaerobic digester is a sealed tank that contains zero oxygen. Within this tank, organic waste is degraded at a high temperature, allowing for the quick decomposition of waste material and the production of methane, which is captured and transformed into energy.

The Detroit Zoo waste to energy system will power its animal hospital.

The Detroit Zoo digester powers the facility's animal hospital, which requires 100-150 kilowatts per hour to operate. This is significant when you consider that the average US household uses approximately 900 kilowatts of energy a month.

Beyond lowering the zoo's electricity cost, the digester repurposes animal and food waste and lowers greenhouse gas emissions. With over 1.5 million visitors every year, the Detroit Zoo is helping more people learn about the value of generating and using clean energy from sources that are readily available.

MSU is well known for its experience and expertise in anaerobic digester research and development. Lead team researcher Dana Kirk is an assistant professor of biosystems and agricultural engineering and the manager of the university's Anaerobic Digestion Research and Education Center. Kirk has helped with other waste-to-energy projects both in the US and internationally.

"Over the span of more than eight years, we have worked with hundreds of clients around the United States to understand how much energy can be produced from organic wastes," Kirk said.

Currently, there are as many as 60 million anaerobic digesters worldwide. The United States is home to more than 1,500 of them. This number is expected to increase as others, like the Detroit Zoo waste to energy system, become operational.

Source: http://www.hydrogenfuelnews.com/zoo-waste-to-energy-project-the-first-of-its-kind-in-north-america/8535568/

Simple solar energy technology could change the world

The SunSaluter solar panel has gone open source.

The solar energy technology behind the simple solar panel efficiency device known as the SunSaluter has been made open source so that anyone can build it. Now that it is no longer patented, the device can bring renewable energy to those who need it the most.

The SunSaluter also produces clean drinking water.

Developed by Chinese-Canadian software/mechanical engineer Eden Full Goh, the SunSaluter rotates and follows the sun throughout the day and boosts efficiency by 30%. Additionally, it produces four liters of clean drinking water daily.

The solar energy technology uses only the power of gravity and water to follow the sun throughout the day. The device was developed using inexpensive and recycled materials found across the world and is easy to put together. It is 30 times less expensive than traditional motorized solar panel rotators, is more reliable and the device itself consumes zero electricity.

The revolutionary solar energy technology produces electricity more consistently throughout the day.

Part of Full Goh's original idea for the initial SunSaluter device was to design a solar panel that points directly at the sun at all times. This is known as solar tracking.

The solar panel she created rotates to follow the sun's position in the sky as it changes. This means it's not only pointing directly at the sun around midday, as is the case with most traditional non-rotating panels. Instead, the SunSaluter continues to point directly at the sun throughout the day as the sun changes position in the sky.

By reducing the cost of solar energy, the SunSaluter helps impoverished families living in rural areas to work and study for longer hours, charge cell phones and eliminate the use of kerosene gas as well as the need for batteries to store energy that is usually generated mostly around high noon.

"We've impacted 17,000 people so far, but I'd really like us to expand our reach," Eden Full Goh said when she spoke at Inspirefest 2018, as reported by Silicon Republic.

Source: http://www.hydrogenfuelnews.com/simple-solar-energy-technology-could-change-the-world/8535502/

UK wind energy capacity to almost double in the next decade

The UK government's support for the nations wind power sector will dramatically boost this renewable in the country.

With the government recently confirming its support for more UK wind energy projects, this renewable power source is expected to nearly double in size within the next decade. More specifically, under government energy plans, between one-fifth and one-third of the UK's power is set to be produced by offshore wind turbines by 2030, reported Oilprice.com.

Auctions are to be held every two years to continue building offshore wind energy projects.

Contract auctions have been planned to be held every two years, according to Energy minister Claire Perry. The auctions will begin next May and will occur until the 2020s to award the £557 million (approximately $730 million) that the government has set aside to support the lowest cost offshore UK wind energy projects.

The purpose of the auctions is to provide the industry with the stability that is required to continue to build the large wind turbine structures needed for offshore wind farms. It forces firms to become more transparent regarding the amount of support they need and will also help to increase jobs and cut costs for consumer at the same time. This system is considered to be the most responsible for the development of clean energy in Britain.

"The UK renewables sector is thriving, with more offshore wind capacity here than anywhere else in the world and 50% of electricity coming from low-carbon sources last year in what was our greenest year ever," said Perry.

Offshore UK wind energy has become an increasingly affordable source of green energy.

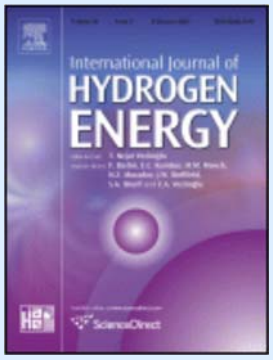
Commenting on the auction process, Hugh McNeal, Industry body RenewableUK's CEO said that it sets the nation on the path to provide the tens of billions of pounds of investment that will be required to meet the ambitious goal of at least 30 gigawatts by 2030.

"We can look forward to a pipeline of new offshore wind projects that will support tens of thousands of jobs across the UK," McNeal added.

Although the environmental group Greenpeace welcomes the support for more offshore UK wind projects, Greenpeace has also called on the UK government to support other low-cost forms of renewable power, such as onshore wind power and solar energy.

Source: http://www.hydrogenfuelnews.com/uk-wind-energy-capacity-to-almost-double-in-the-next-decade/8535555/

International Journal of Hydrogen Energy Highlights



The *International Journal of Hydrogen Energy* aims to provide a central vehicle for the exchange and dissemination of new ideas, technology developments and research results in the field of Hydrogen Energy between scientists and engineers throughout the world. The emphasis is placed on original research, both analytical and experimental, covering all aspects of Hydrogen Energy, including production, storage, transmission, utilization, enabling technologies, environmental impact, economic and international aspects of hydrogen and hydrogen carriers such as NH_3, CH_4, alcohols, etc.

The utilization includes thermochemical (combustion), photochemical, electrochemical (fuel cells) and nuclear conversion of hydrogen, hydrogen isotopes and/or hydrogen carriers to thermal, mechanical and electrical energies, and their applications in transportation (including aerospace), industrial, commercial and residential sectors. When outstanding new advances are made, or when new areas have been developed to a definitive stage, special review articles will be considered. Shorter communications are also welcome.

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An evolving energy solution: Intermediate hydrogen storage

M. Nagpal and R. Kakkar. Int J Hydrogen Energy 2018: 43(27):12168-12188

For hydrogen to emerge as a sufficiently robust energy carrier efforts must be made with regard to safe and efficient production and storage. The US department of Energy, in 2017, set the target of a 5.5 wt% in hydrogen storage material for viability. Hydrogen storage capacity refers to the amount of hydrogen adsorbed on the material surface and compressed within the framework of pores (expressed in wt%). Candidates for a good hydrogen storage material should store it rapidly and reversibly with high volumetric and gravimetric densities of H_2, have long-term cycling stability, and minimum refueling time. Solid state hydrogen storage includes physical hydrogen storage, chemical hydrogen storage and intermediate hydrogen storage.

Physical hydrogen storage involves hydrogen adsorption on the materials by physical forces (weak van der Waals interactions). Materials that have been used for this method of storage include carbon materials, zeolites, metal organic frameworks, clathrate hydrates, polymer nanocomposites, etc. Chemical storage involves hydrogen being bound to the system by chemical forces, resulting in the absorption of hydrogen as chemical compounds. Compounds like hydrides, amides, imides, alanates, nitrides, etc. are used for chemical storage of hydrogen. Intermediate hydrogen storage methods lie between physical and chemical storage.

Chemical storage is hindered by the need for high temperatures to release the stored hydrogen as well as slow kinetics and oxidative instability, while physical storage is hindered by the weakness of the storage interaction which has low binding energy, which necessitates low temperatures to keep hydrogen bound to the system. Considering these two anecdotal problems, among others, the focus has shifted toward finding adsorbents with binding energies higher than physical storage, but without compromising reversibility. This journal article serves as a review of materials that have been investigated in this context and primarily looks at: alkaline-based materials, 2D materials (graphene and MXenes), group III nitrides and nano-structred inorganic compounds.

https://www.sciencedirect.com/science/article/pii/S0360319918312606

-By Cyrus Daugherty

Low voltage water electrolysis: Decoupling hydrogen production using bioelectrochemical system

P. Belleville, F. Guillet, A. Pons, J. Deseure, G. Merlin, F. Druart, J. Ramousse, E. Grindler. Int J Hydrogen Energy 2018: 43(32): 14867-14875

One alternative approach to the conventional water electrolysis process is dividing the water splitting into two steps, whereby the electrons and protons generated are taken up during oxygen production using an electron-coupled proton buffer (ECPB), instead of being used directly to produce H_2. Utilizing this technique enables H2 production at elevated pressures and even facilitates the dissociation rate. Therefore, using a redox mediator to split the conventional water electrolysis process into separate H_2 and O_2 production steps, overcomes the gas-mixing issues.

The present work validates the proof of concept of decoupled electrolyser associated with a bioelectrochemical system (MFC-DES) through a redox flow mediator (potassium hexacyanoferrate (KHCF)). Low voltage (1 V) hydrogen production was achieved with a current density up to 25 mA cm-2. Regeneration of the mediator was performed by glucose fed microbial fuel cells. The oxidation rate of KHCF in the electrolyser is, at least, an order of magnitude higher than the reduction rate in MFC cascade fed system. MFC-DES is thus a promising set up as it desynchronizes limited microbial rate and hydrogen production, generates value from wastewater and reduces energetic cost of water electrolysis.

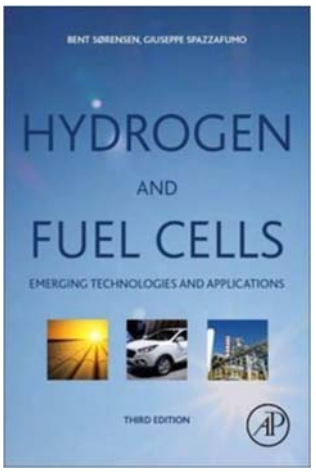
https://www.sciencedirect.com/science/article/pii/S0360319918319293

-By Yasser Ashraf Gandomi

From the Bookshelf

Hydrogen and Fuel Cells

Authors: Brent Sorenson and Giuseppe Spazzafumo



In a multidisciplinary field such as energy, Hydrogen and Fuel Cells stands out by covering the entire width of hydrogen production and usage technologies, giving detailed descriptions of not just one but the range of very different fuel cells that have been developed or are under development.

In this one-volume book, Bent Sorensen and Giuseppe Spazzafumo provide the basic scientific theory underlying hydrogen and fuel cell technologies, but at the same time present applications and sustainable integration into society in a way accessible to a broad range of people working in this field, whether in technical, economic or management roles.

The third edition reflects both recently emerged technologies and the market penetration of the most promising technologies, and it gives an appraisal of how far fuel cell technology may go in the future, considering current challenges and economic trends. This new edition has updated and expanded content on hydrogen storage and transmission, molten carbonate fuel cells, PEM fuel cells, solid oxide fuel cells, biofuel cells, including microbial fuel cells, applications in transportation and power plants, future scenarios and life-cycle assessment. It is ideal for researchers and professionals in the field of energy, and renewable energy in particular, both in academia and industry. It is also useful to lecturers and graduate students in engineering, physics, and environmental sciences, as well as professionals involved in energy or environmental regulation and policy.

Key Features

- Gain thorough understanding of the science and applications of hydrogen and a range of different fuel cells, including economic and social aspects of the field
- Updated sections include hydrogen storage and transportation, biofuel cells, PEM and solid oxide fuel cells, applications in transportation and large scale power generation, and life-cycle assessment

https://www.elsevier.com/books/hydrogen-and-fuel-cells/sorensen/978-0-08-100708-2

Have suggestions for a future book feature? If so, send the book title to Kathy Williams at williamk@utk.edu.

Become a Member of IAHE

The International Association for Hydrogen Energy (IAHE) has four categories of membership:

- **H-Members:** Scientists, engineers, and laypersons who are interested in fields relating to Hydrogen Energy. They receive IAHE e-newsletter, hard copies of the International Journal of Hydrogen Energy (IJHE), and reduced registration for IAHE conferences.
- **E-Members:** Scientists, engineers and laypersons who are interested in fields relating to Hydrogen Energy. They receive IAHE e-newsletter, access to electronic copies of the International Journal of Hydrogen Energy (IJHE), and reduced registration for IAHE conferences.
- **Student Members:** They are students who are interested in hydrogen energy. They receive the IAHE e-newsletter. The student membership is free and led by Dr. John Sheffield. Please email him at john.sheffield@dnvkema.com for more information.
- **IAHE Fellows:** Long-time IAHE members who have significantly impacted society by promotion of Hydrogen Economy through research, education and/or service.

If you are interested in becoming a member of IAHE, please visit the membership page at www.iahe.org. You can sign up for membership directly on the membership page.

Global Hydrogen Energy Unit

Institute of Innovation Research, Tokyo Institute of Technology

Overview:

To make hydrogen energy a practical reality, it is necessary to explore the development of elemental technology and systems as well as industrial and social structures to identify and address issues of importance. Hydrogen is a secondary energy source with high potential to contribute to the goal of realizing a low-carbon society and bringing about a change in energy structure.

The Global Hydrogen Energy Unit was established to evaluate a wide range of issues from a multilateral, subjective, and scientific perspective through industry-government-academia collaboration centered around Tokyo Tech. The unit also identifies bottlenecks in problem solving and determines development goals related to the technology and systems required to realize a hydrogen energy society.

Major activities at this center includes:

1. Global hydrogen supply chain

The goal of the Global Hydrogen Energy Unit is to establish a global-scale hydrogen supply chain which converts unused overseas energy to hydrogen and transports it to Japan. Specifically, the unit plans to separate brown coal into CO_2 and hydrogen in Australia, store the CO_2 underground, and transport liquefied hydrogen to Japan for storage and conversion to energy. The unit will also link this with the use of hydrogen energy generated from renewable energy sources in Japan. The Global Hydrogen Energy Unit conducts research on the organization of accurate and subjective information, creates new value, designs and evaluates systems, and identifies and solves technical development problems.

2. Multiscale analysis of the hydrogen supply chain

Tokyo Tech has a wide range of achievements in energy-related research and education that it has accumulated over the years. In 2012, the Environmental Energy Innovation Building was completed at the Ookayama Campus and the original smart power grid management system "Ene-Swallow" was initiated. Experts in innovation and technical assessment are participating in the research along with specialists on campus to push technological and system advancements. The major focus of this unique Research Unit is engaging in global and open collaboration in a wide range of activities with other consortium members.

3. The Global Hydrogen Energy Unit vision

To realize a hydrogen energy society, it is essential to organically link universities that provide outstanding technology and research, industries that promote the commercialization of hydrogen energy, and governmental agencies that establish and execute policy. The Global Hydrogen Energy Consortium was established through industry-government-academia collaboration within the Global Hydrogen Energy Unit. The unit operates the consortium and facilitates multilateral assessment, the development of technology for elements and systems, and the exchange of information among members.

4. The Global Hydrogen Energy Unit future plans

The Global Hydrogen Energy Unit's initial 5-year plan was based on the requirements for achieving the desired energy society in the next 30 years. The unit's primary plan is to first establish a system for the subjective and diversified assessment of introduction and use of hydrogen both in and outside of Japan. In FY 2016, the Unit scheduled to start joint assessment with industry, government, and universities with the goal of encouraging external funding. Based on this assessment, in FY 2018, the Unit will examine the identified issues and implement specific research projects that focus on solving top priority problems. In FY 2019, the Unit plan to establish a foundation to facilitate the application of our achievements to advance to the next stage.

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CONFERENCE FOCUSES ON

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Conference will discuss the theme "Finding ways to recover renewable resources and technology transmission towards Sustainable Development" where we bring together leaders and visionaries from industries, universities, government, the scientific community, and the private sector that are looking at energy and sustainable development to speak about and debate the developments and changes, which would redefine the future of energy worldwide.

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2nd International Conference on Energy Materials and Fuel Cell Research.

Conference Dates: August 27-28, 2018 **Boston, Massachusetts, USA**

About Conference:

The EMFC 2018: 2nd International Conference on **Energy Materials and Fuel Cell Research** is going to be held on **August 27-28**, **2018** in **Boston, Massachusetts, USA** which aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Advanced Energy Materials, Hydrogen Energy and Fuel Cell Technology with the Theme: *Generation of Energy Evolution for Sustainable Future*. EMFC Conference 2018 has become a premier event to connect professionals, scientists, academics, and students in the energy industry and provides a premier interdisciplinary platform to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Energy Materials and Fuel Cell Technology.

The 2-days conference at Boston will become a must-attend event for the Energy and Fuel Cell Industry to hear about future infrastructure projects plans, government strategies and market-leading innovation. We invite you to contribute and help to shape the Energy Materials and Fuel Cell Research Congress through submission of your research abstracts, papers and e-posters.

More changes have occurred recently in the global energy sector since 100 years prior. In its 2nd edition, the EMFC Conference 2018 will be exploring enabling technologies for the future of clean energy, energy digitization, and existing energy infrastructure.

We will bring together leaders and visionaries from industry, government, the scientific community, and the private sector that are looking at the entire value chain in a holistic way and can speak about and debate the development of these complex changes, which are redefining the future of energy worldwide.

Why to attend?

»» Certificate Accreditation from the International Organizing Committee (IOCM)
»» Access to All Sessions
»» Ask the Expert Forum (One to One Pre-Scheduled meeting on interest & availability) ·
»» Each registrant will get 50% abatement on manuscript publication fees
»» 10% abatement on the registration fees for the next annual conference -Abstracts will be published in the conference souvenir and respected international journals.

Conference Highlights:

1. Advanced Materials for Energy
2. Fuel Cell Technology
3. Advanced Nanomaterials
4. Hydrogen Economy and Alternative Fuels
5. Advances in Materials Science and Engineering
6. Advanced Solar Energy Materials
7. Electric, Hybrid, and Fuel-Cell Vehicles
8. Green Energy Materials

9. Batteries and Energy Storage
10. Graphene and 2D Energy Materials
11. Biomaterials and Surface Science Engineering
12. Electrical, Optical and Magnetic Materials

Benefits:
Student Delegate for 300$
E Poster for 99$

Best Poster Awards:
Student Poster competition is organized at Energy Materials 2017 Conference, to encourage students and recent Graduates to present their original research which will be later published in Respective International Journal with D.O.I number by Cross Ref.

Young Researchers Forum:
The young research offers young researchers the possibility to meet and discuss research topics and methodologies, share and develop ideas learn from each other and gain knowledge from senior research researchers. They can present their research in the form of an Oral presentation. Best Y.R.F competition is organized at Energy Materials 2018.

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September 10-12, 2018
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International conferences on:

- Advanced Energy Materials
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- Advanced Graphene Materials

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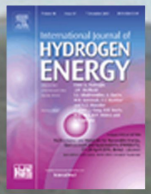
Special Issues



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18th f-cell 2018 Features New Concept

Hydrogen and fuel cell technologies are increasingly assuming a pivotal role at the international level and not just with the electrification of the transportation sector. In 2018, the 18th f-cell will present its new format in Stuttgart for the first time in this innovative environment. In doing so, active participation and vibrant discussion will be the focus of technical exchange of information.

Stuttgart, June 29, 2018

The current versatile applications and developments of hydrogen and fuel cell technologies form the topic field at this year's 18th f-cell. "Hydrogen really is an endless amount of fun. Hydrogen is clean, safe, and can be produced everywhere. However, hydrogen technology doesn't just make fossil fuel technologies appear obsolete. Battery technologies are also having a hard time outperforming the advantages of hydrogen," says Jorgo Chatzimarkakis, Secretary General Hydrogen Europe, Brussels.

During two efficient scheduled days full of new impulses, the f-cell will present this new world of hydrogen using profiled, international hydrogen and fuel cell projects and through renowned hydrogen specialists to answer questions about energy, mobility, and logistics.

New Orientation and New Formats

In mid-September, the 18th f-cell provides the opportunity to come into active contact with a multitude of expert participants during the moderated and open dialog. For the first time, all formats will be oriented in dialog format; i.e., greater importance is attached to active participation and lively discussion. "With the f-cell, we are specifically initiating dialogs between different project and technology approaches. In other words, exactly where innovations often arise. This means that we can gain real added-value for all participants," stresses Peter Sauber, CEO of Peter Sauber Agentur Messen und Kongresse GmbH.

In 2018, the 18th f-cell's offerings include prominent experts moderating topic tables in order to intensively discuss, in small groups, trends and leading technologies. A matchmaking platform and a spontaneous "speed dating" for the initiation of business at a professional level is enabled through the aid of a specially developed app and will complement the range of offers available at the 18th f-cell.

International and Cross-Sector Projects

In addition to the initial market penetration, an increasing internationalization of the projects and continually more intensive linking between the energy and transportation sector are emerging in the hydrogen and fuel cell industry. The 18th f-cell takes into account this trend with the presentation of exemplary international projects that are close to market from Germany, the EU, Canada, Norway, Japan, and China.

The f-cell award 2018: Focus on Norway

In 2018, the f-cell award is honoring goal-oriented cooperation between the state of Baden-Wuerttemberg and Norway. The following can be submitted: Concept ideas and collaboration projects from all research and application fields focusing on fuel cells and hydrogen technologies. The project must feature the participation of at least one institute or scientific institution based in Baden-Wuerttemberg and one in Norway, and the consortium leader must originate from one of the two countries. The submission deadline for all contributions ends on July 28, 2018.

Partners of the 18th f-cell 2018:

- Canadian Hydrogen and Fuel Cell Association (CHFCA), Vancouver
- Cluster Brennstoffzelle BW, Stuttgart
- Deutscher Wasserstoff- und Brennstoffzellen-Verband (DWV), Berlin (German Hydrogen and Fuel Cell Association)
- e-mobil BW GmbH – Landesagentur für neue Mobilitätslösungen und Automotive Baden-Württemberg, Stuttgart (State Agency for New Mobility Solutions and Automotive Baden-Württemberg)
- Fuel Cells and Hydrogen Joint Undertaking (FCH JU), Brussels
- Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg (Fraunhofer Institute for Solar Energy Systems)
- Government of Canada – Trade Commissioner Service
- Hydrogen Europe, Brussels
- HySUT, Japan
- H2 MOBILITY, Berlin
- Innovation Norway, Oslo
- Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg, Stuttgart (Federal Ministry for Environment, Climate, and Energy)
- Norwegian Hydrogen Forum
- NOW GmbH – Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie, Berlin (National Organization for Hydrogen and Fuel Cell Technology)
- Wirtschaftsförderung Region Stuttgart (Economic Development Region Stuttgart)
- Zentrum für BrennstoffzellenTechnik (ZBT), Duisburg (Center for Fuel Cell Technology)

For Additional Information on the 18th f-cell:

www.f-cell.de

Contact:

Ms. Silke Frank

silke.frank@messe-sauber.de, +49 711 656960-55

www.tmrees.org

"TMREES Conference Series" aim to promote sustainable, healthy and diverse ecosystems; encourage & support the Sustainability and development of security systems through green-based and clean resources and processes, bringing together participants from international organizations, universities, industry and administrative around the world to exchange innovative and novel ideas, explore enabling technologies, share experiences in sustainability issues and to open a new window on the circumstances of the classical energy sources and their harmful impact on the society.

Important deadlines:

Abstracts or papers submission: Up to August 05, 2018

Full Papers submission: Up to September 10, 2018

Hydrogen Energy Topics:

The Chairs are now calling for excellent research papers for the SPECIAL Edition in IJHE.

Special session related to Hydrogen Energy Topics

Special Issue of high quality hydrogen related papers at International Journal of Hydrogen Energy

Paper Guidelines **IJHE INDEX SUB-TOPICS**

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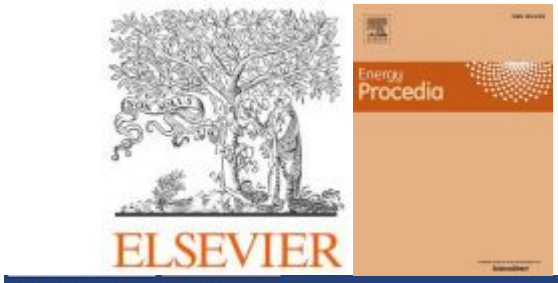
Accepted Papers Related to Renewable Energy and Sustainability, and not included in IJHE SI, will be published in a Special Volumes by Elsevier at EGYPRO



Contact: info@tmrees.org

NURER 2018

CALL FOR PAPERS

6th International Conference
Nuclear and Renewable Energy Resources

September 30~October 3, 2018
Jeju, Korea

The 6th International Conference on Nuclear and Renewable Energy Resources (NURER2018) is recognized as one of the major international conference for the exchange of information on scientific, engineering, and other technical aspects of innovative nuclear and renewable energy science and technology. The conference is intended to provide an excellent opportunity to report on recent technical progress, discuss key issues and fostering international collaboration for the promotion of innovative nuclear and renewable energy system development and their synergic collaborations. Papers related to science, engineering, facilities, experiments, modeling, analysis, design and safety are welcome.

Technical Topics

- **Fission Energy**
- **Fusion Energy**
- **Renewable Energy**
- **Hydrogen and Solar Energy**
- **Energy Management and Environmental Issues**
- **Renewable-Nuclear Synergy, International Cooperation and Innovation**
- **Other relevant topics**

The working language of the conference and the proceedings is English. Technical papers will be peer reviewed and accepted papers will be published in a symposium proceedings. The authors are encouraged to send full extended papers to The International Journal of Hydrogen Energy, The International Journal of Energy Research, Fusion Science and Engineering and The International Journal of Renewable Energy after the conference.

Authors are invited to submit a one-page 400 word abstract (text only) to the NURER-2018.

Website: http://nurer2018.org

Due Dates

March 31	**2018**	**Abstract Submission Deadline**
May 31	**2018**	**Abstract Acceptance Notification**
July 31	**2018**	**Early Registration Deadline**
August 31	**2018**	**Manuscripts Submission Deadline**
September 30~October 3	**2018**	**Conference Convened**

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NURER 2018

September 30~October 3, 2018, Jeju, Korea

Venue

RAMADA PLAZA JEJU HOTEL

Located only five minutes away from Jeju International Airport and Jeju Port.
Web Site : http://www.ramadajeju.co.kr/ENG/

The Sights

JEJU ISLAND

JEJU ISLAND is located in south-west and is the biggest island of Republic of Korea. Basalt rocks cover more than 90% area of this volcanic island. The island is oval-shaped with Halla Mountain in the center stretching 73 km from east to west and 41 km from north to south. It has a mild oceanic climate, where the temperature does not reach sub-zero levels (in most cases) even in the winters. A universal recreational island with beautiful natural landscape received as a gift from nature. Relatively isolated from the rest of the world, the island's nature has been well preserved in its original state.

WORLD NATURAL HERITAGE refers to tangible assets with outstanding universal values, which can't be replaced by any others once destroyed and must be preserved and maintained for the whole humankind. Jeju Island was designated as World Natural Heritage in the title of 'Jeju Volcanic Island and Lava Tube' in 2007.

More Information : http://www.ijto.or.kr/korean/

İstanbul-Türkiye

4th International Conference on Recycling and Reuse

(R&R 2018)

24-26 October 2018

Aim and scope

The purpose of the conference is to provide an excellent platform for researchers and practitioners, to exchange emerging ideas and investigate key issues such as; recycling and reuse concerns, advanced wastewater treatment, membrane technologies for recycling and reuse, advanced oxidation technologies, waste reduction, water and wastewater management, solid waste treatment and management, hazardous waste management, resource use, renewable energy technologies, current and future recycling markets, public health issues, laws and policies of recycling and reuse.

Topics

- Renewable energy technologies,
- Hydrogen Recycling Systems
- Utilizing modified fuel cell technology for hydrogen recovery and recycling.
- Hydrogen production and energy technologies,
- Solid waste management for recycling, reuse and energy recovery,
- Green technologies for energy production and wastewater reuse,
- Wastewater treatment, recycling and reuse technologies,
- Membrane technologies and wastewater separation technologies,
- Hazardous waste management,
- Public health issues,
- Laws and policies of recycling and reuse

Important Dates

Date	Event
15 May 2018	Abstract submission
1 June 2018	Notification of acceptance
1 July 2018	Early bird registration
24-26 October 2018	Conference dates

Information

For registration and more information please visit the conference website: http://rr.istanbul.edu.tr or send an e-mail to rr@istanbul.edu.tr

Keynote Speakers

Giorgio Bertanza

Ibrahim Dincer

Mustafa Ersoz

Bilsen Beler Baykal

Gianluca Li Puma

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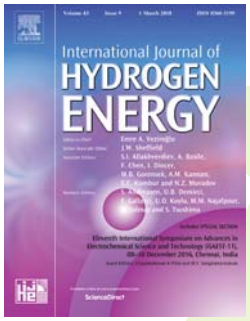

International Journal of Hydrogen Energy

Hydrogen and hydrogen energy technologies related special issue is supported by

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Oct.28th-Nov. 2nd 2018, Guangzhou China

www.MH2018.cn

Crowne Plaza
No. 28 Ningcai Road
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IMPORTANT DATE

Tuesday May. 1, 2018
Open for abstract submission

Saturday Jun. 30, 2018
Deadline for abstract submission

Friday Aug. 31, 2018
Deadline for early bird registration

Sunday Oct. 28. 2018
Registration and conference opening

CONTACT
Dr. Liuzhang OUYANG
Email: meouyang@scut.edu.cn
Tel:+86 20 8711 4253

South China University of Technology

Key Laboratory of Advanced Energy Storage Materials of Guangdong Province

IC2EM'2018

International Conference on Electronics, Energy and Measurement

November 27-29, 2018, Algiers, Algeria

The Laboratory of Instrumentation at USTHB organizes the *International Conference on Electronics, Energy and Measurement, IC2EM'2018* on November 27-29, 2018. The conference provides opportunity to bring scientists and engineers from academia, research institutes and industrial establishments to present and discuss the latest results in the field of electronics, instrumentation and measurement, sensors and energy. This event follows previous workshops of the Laboratory of Instrumentation series (JLINS) that held in 2007, 2010 and 2012 respectively.

Conference themes

Papers are invited in the following themes, including, but not restricted to:

Electronic systems

- Analog and digital circuits
- Microwaves circuits design
- Power Electronics
- Embedded systems

Energy systems

- Renewable energy
- Hybrid energy systems
- Energy storage
- Energy efficiency
- Hydrogen energy

Measurement

- Metrology and standards
- Laboratory accreditation
- Data acquisition systems
- Virtual measurement systems

Telecommunications

- Signal and image processing
- RF and wireless technology
- Networks and cryptography

Instrumentation

- Sensors technology and modeling
- Advanced in sensing materials
- Smart sensors and interfaces
- MEMS, MOEMS and RFID technology
- Optical fiber instrumentation
- Microwaves instrumentation

Applications

- Solar and wind energy
- Petroleum and gas industries
- Health sciences
- Sport technology
- Agriculture and Environment
- Smart cities and IoT devices
- Disaster mitigation
- Automotive industry
- Avionics.

Important dates

Full paper submission **July 10, 2018**
Acceptance notification **September 15, 2018**
Final version paper **September 30, 2018**
Registration **October 15, 2018**
IC2EM-2018 Conference **November 27-29, 2018**
Conference website: https://ic2em-2018.sciencesconf.org/

Call for Papers

1st International Conference on Smart Innovation, Ergonomics and Applied Human Factors

SEAHF 2019

22nd-24th January 2019, Madrid, Spain

URL http://www.seahf.eu

Scope

The 1st edition of SEAHF conference targets different scientific fields and invites academics, researchers and educators to share innovative ideas and expose their works in the presence of experts from all over the world.

SEAHF focuses on original research and practice-driven applications. It provides a common linkage between a vibrant scientific and research community and industry professionals by offering a clear view on modern problems and challenges in information technology. SEAHF offers a balance between innovative industrial approaches and original research work while keeping the readers informed of the security techniques, approaches, applications and new technologies. The conference is an opportunity for students, doctors, academics and researchers to open up to the outside world, make connections and collaborate with various domain experts. SEAHF particularly welcomes papers on the following topics:

- Smart technologies and Artificial Intelligence (SAI)
- Green Energy Production and Transfer Systems (GETS)
- Aerospace Engineering/ Robotics and IT (AERIT)
- Information Security and Mobile Engineering (ISME)
- IT in Bio-Medical Engineering and smart agronomy (BESA)
- IT, Smart Marketing, Management & Tourism Policy (SMTP)
- Technology and Education (TE)
- Hydrogen & Fuel cell energy technologies (HFCET)

Important Dates:

Paper submission due: October 31st, 2018
Decision notification: November 30th, 2018
Camera-ready copy due: December 15th, 2018

Submission Types:

Accepted types of submissions are including:

- Full papers,
- Short papers,
- Posters.

Also parallel activities and special session proposals are accepted:

- Tutorial
- Workshop
- Demonstration

7th INTERNATIONAL HYDROGEN & FUEL CELL CONFERENCE

Hydrogen Association of India

WITH SUPPORT FROM INTERNATIONAL JOURNAL OF HYDROGEN ENERGY (IJHE), OFFICIAL JOURNAL OF THE IAHE, USA

Theme: To build partnerships for a Sustainable Hydrogen Energy Economy at Jodhpur – The Blue City

Call for Papers

Abstracts invited & last date of submission **Sep. 30th, 2018**

Abstracts Selection by **Oct. 31st, 2018**

Submission of Full Manuscript by **Nov. 30th, 2018**

Date : 9th-11th December 2018

Registration & Fee : Rs.15,000/- Inclusive GST (US$250)

From 1st September 2018 onwards

*Early Bird Rates : Rs. 10,000/- (US $ 200)
Upto 30 September 2018

Note: Limited Seats - Allotment on "First Come First Serve" basis

Note: Pre-registration information is available at contact point.Program details and highlight will issued soon.

Please pay by crossed Cheque/DD drawn in favor of "Hydrogen Association of India- A/c 31132125420" Payable at Faridabad

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CONTACT POINT :

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121007, Ph.No. +91-129-2294443
Mobile : + 91 9818601855
E-mail: sharmaa@indianoil.in

HYDROGEN ASSOCIATION OF INDIA

The much awaited seventh (7th) in the series, International Hydrogen & Fuel Cell Conference (IHFC-2018) is being held during 9th–11th December 2018 at FairfieldSM Marriott®, Jodhpur (India) by Hydrogen Association of India. The conference is once again patronized by the most prestigious International Association of Hydrogen Energy (IAHE), USA and with continuous support from many Indian Business Houses, Government Organizations and Academic Institutes working in the area of hydrogen energy.

In past six years, event has evolved starting from hydrogen related research & novel topics in the area of hydrogen production through novel routes, storage & transportation through innovative approaches, hydrogen applications and safety aspects involved with hydrogen handling. With constructive feedback from the participants and our patrons, the conference has now started incorporating the commercialization techniques, market penetration ideas, roadblock in implementation of hydrogen economy etc. with extensive deliberation by conducting a full day panel discussions on various facets of hydrogen. The Speakers / Experts / Senior Govt. Officials / Overseas Partners from the hydrogen and related area will likely to deliberate on the issues which are highly flagged during past two conferences.

Like in past this year also we are expecting a huge participation from the hydrogen related Industry and Government organizations for the extended deliberation on the promotion of hydrogen related economy in the country.

The aims and objectives of the Hydrogen Association of India are to conduct scientific activities which shall include the following:

- To promote, encourage and develop the growth of Hydrogen Energy and its applications in the country.
- To establish an active association of all those persons, bodies, institutions (private or public) and industries interested in promotion of Hydrogen Production, Storage, Transportation, Distribution and Dispensing related technologies in India.
- To disseminate information concerning the developments in Hydrogen Energy and its applications through publications, such as bulletins, reports, newsletters, journals, workshop and conference etc.
- To render advice (technical or otherwise) to government and commercial bodies on matters pertaining to Hydrogen Energy and its applications, when needed or requested.

Sponsorship:

Platinum	: Rs.10 lakhs / USD 16000	10 Delegates and One Stall Free
Diamond	: Rs.5 lakhs / USD 8000	5 Delegates and One Stall Free
Gold	: Rs.3 lakhs / USD 5000	3 Delegates and One Stall Free
Silver	: Rs.2 lakhs / USD 4000	2 Delegates Free
Session Sponsor	: Rs.1.5 lakh /USD 2400	1 Delegate Free

Hydrogen Association of India
Indian Oil Corporation R&D Centre,
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THE KEY PERSONS ASSOCIATED WITH HYDROGEN ASSOCIATION OF INDIA (HAI)

President	: Dr.R.K.Malhotra, Director General Federation of India Petroleum Industry (FIPI)
Vice President	: Arun Nemani, Expert in the area of Fuel Cell
Secretary	: K. K. Gandhi, Executive Director Society of Indian Automobile Manufacturers (SIAM)
Joint Secretary	: Puneet Kishore, General Manager ONGC Energy Centre
Treasurer	: Alok Sharma, Chief General Manager Indian Oil Corporation Limited (IOCL)

Participants in this conference would automatically become member of HAI for 2018-19

Accommodation At

Fairfield by Marriott Jodhpur,
Opposite New High Court,
Near Shatabdi Circle, Vijay Raje Nagar,
Jodhpur – 342013, Rajasthan, India.
Website - www.fairfieldjodhpur.com
Telephone - 91- 291-711-2222

SPECIAL RATES FOR HAI

Rs. 7000/-
(Inclusive of all taxes)
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Rs. 7000/- which includes
All Taxes, Breakfast &
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International Association for Hydrogen Energy (IAHE)

With support from International Journal of Hydrogen Energy (IJHE) Official Journal of the IAHE, USA

9th International Seminar on Fire and Explosion Hazards

St. Petersburg, Russia, 21-26 April 2019

The 9th International Seminar on Fire and Explosion Hazards ISFEH9 (www.isfeh9.org) will be held in St.-Petersburg, Russia, on 21-26 April 2019. This conference continues past successful events organized in Moscow, Russia (1995, 1997), Lake Windermere, UK (2000), Londonderry, UK (2003), Edinburgh, UK (2007), Leeds, UK (2010), Providence, USA (2013), and Hefei, China (2016).

During its more than 20-year history, the Seminar has become one of the important international events in fire and explosion science and engineering. The Seminar program will include broad areas of fire and explosion studies, mitigation, and prevention. The following conference tracks (with the variety of topics therein) are available for paper submission:

- Combustion fundamentals of fires
- Deflagration, DDT, detonation
- Fire dynamics
- Material behavior in fires
- Fire safety engineering
- Fire suppression
- Hydrogen safety
- Wildland fires
- Toxicity
- Evacuation and human behavior

Papers will be peer-reviewed and, if accepted, will be included in the book of the Seminar Proceedings. Authors of selected papers will be invited to submit extended versions for publication in special issues of *Fire Safety Journal*, *Combustion Explosion and Shock Waves*, and *International Journal of Hydrogen Energy*. These journals are indexed by Scopus and Web of Science.

Abstract submission deadline is July 1st, 2018. Please do your best to submit the one- or two-page abstract via the conference website http://www.isfeh9.org/submission by this date, and do not hesitate to contact ISFEH9 Organizing Committee at info@isfeh9.org if you have any inquiries. Notification with the decision on the abstract will be sent off as indicated in the Key Dates section of the conference website www.isfeh9.org.

The city of St.Petersburg is an exciting place to visit and has much to offer for participants and accompanying persons, for whom an extensive social program is being developed.

Welcome to submit your research to ISFEH9 and to visit St.Petersburg!

Upcoming Meetings & Activities

August 2018

17th International Conference on Sustainable Energy Technologies
August 21-23, 2018
Wuhan, China
http://set2018.org/

International Conference on Renewable Recovery and Sustainable Development
August 23-24, 2018
Singapore
https://www.renewableconference.com/index.php/home/venue

2nd International Conference on Energy Materials and Fuel Cell Research
August 27-28, 2018
Boston, MA
https://energymaterials.conferenceseries.com/

September 2018

Advance Energy Materials Conference
September 10-12, 2018
Guildford, England
http://www.advanced-energymaterials-conference.com/

European Summer School on Hydrogen Safety 2018
September 17-21, 2018
Athens, Greece
http://www.jess-summerschool.eu/

18th f-cell
September 18-19, 2018
Stuttgart, Germany
www.f-cell.de/en/

TMREES-Greece Int'l Conference
September 19-21, 2018
Athens, Greece
http://tmrees.org/

Hydrogen + Fuel Cells North America
September 24-27, 2018
Anaheim, CA
https://www.h2fc-fair.com/usa/

6th International Conference on Nuclear and Renewable Energy Resources
September 30-October 3, 2018
Ramada Plaza Jeju, Korea
http://nurer2018.org/

October 2018

4th International Conference on Recycling an Reuse
October 24-26, 2018
Istanbul, Turkey
http://rr.istanbul.edu.tr/

16th International Symposium on Metal-Hydrogen Systems
October 28-November 2, 2018
Guangzhou, China
http://www.mh2018.cn/dct/page/1

November 2018

International Conference on Electronics, Energy and Measurement
November 27-29, 2018
Algiers, Algeria
https://ic2em-2018.sciencesconf.org/

December 2018

7th International Hydrogen & Fuel Cell Conference
December 9-11, 2018
Jodhpur, India

January 2019

1st International Conference on Smart Innovation, Ergonomics and Applied Human Factors
January 22-24, 2019
Madrid, Spain
http://www.seahf.eu/

Do you have a hydrogen-related meeting, workshop, or activity you would like us to include in the next issue of the IAHE Newsletter? If so, please email a description and web link to Kathy Williams at williamk@utk.edu.

Get Connected—Internet Groups of Interest

LinkedIn Connections

Hydrogen Group

Hydrogen Group is a global specialist recruitment business, placing exceptional, hard to find candidates in over 70 countries.

Global Hydrogen Ambassadors Network

Their goal is to exchange opinions on a topic, which may look easy at first glance, but is rather complex. All questions are allowed. A wealth of answers can be expected.

World EcoEnergy Forum: Driving Innovation in the Energy Storage and Smart Grid Industry

The aim of this group is to bring together executives responsible for R&D to discuss about new product development and sustainable development in the energy storage and smart-grid industry.

Hydrogen Pathway

This is a very active group-page within LinkedIn that includes discussions and latest news regarding hydrogen energy.

Renewable Energy Solutions

I.R.E.S. platform to create bridges between international based investors, manufactures and wholesale companies in the Renewable Business Industry. Solar power, wind energy, tidal power, geothermal power, air power, hydrogen, waste management.

Global Renewable Energy Network

Global Renewable Energy Network (GReEN) is the premier business network for professionals and companies involved in the development, commercialization, and utilization of renewable energies (e.g. bioenergy, geothermal, hydro, hydrogen, ocean, solar, and wind), worldwide.

Fuel Cell & Hydrogen Network

Bringing together professionals and enthusiasts alike, the Fuel Cell & Hydrogen Network serves to connect those advocating fuel cell and hydrogen technologies. The group welcomes people who are interested in all types of fuel cell technologies as well as the wide variety of hydrogen technologies, and is not exclusive of hydrogen fuel cells.

Fuel Cells

Welcomes those who are interested in clean energy fuel cell applications and technologies. Encourages members to start discussions that are relevant to fuel cells, to post promotions and jobs, and to use this group to develop their professional network.

Fuel Cell Energy

The Fuel Cell Energy Group advocates the use of Fuel Cell Energy & the promotion of its Technology and for those interested in learning more about Fuel Cell Technology. Fuel Cell Professionals, Renewable Energy, Clean Technology, and Environmental Advocates are welcome. Solar, Wind, Biomass, Biofuel, Tidal Power & Wave Professionals also welcome to learn about this emerging technology.

Facebook Connections

Horizon Fuel Cell Technologies

Horizon Fuel Cell Technologies was founded in Singapore in 2003 and currently owns 5 international subsidiaries, including a new subsidiary in the United States. Having started commercialization with small and simple products while preparing for larger and more complex applications, Horizon already emerged as the world's largest volume producer of commercial micro-fuel cell products, serving customers in over 65 countries.

International Association for Hydrogen Energy

Facebook community for sharing the information regarding advances in hydrogen energy.

Blogs

Fuel Cell Nation

Fact-Based Analysis and Discussion of Clean Energy
http://blog.fuelcellnation.com/

H2-International

Offers a blog and newsletter that contains articles which are published in the German magazine HZwei. Offers detailed information on hydrogen and fuel cells, and is a respectful attempt at continuing the work of Peter Hoffman, the author of *Hydrogen & Fuel Cell Letter*.
http://www.h2-international.com/

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