



H2-international – e-Journal

May 2017

Content

- [News & Articles](#) – Recently Published 2
 - [Events](#) – Timetable for Trade Shows and Conferences worldwide 29
 - [Companies](#) – List of Global Manufacturers, Suppliers, Sellers, etc. 30
 - [Social Media](#) – Facebook, Google+, LinkedIn, Twitter, Xing 38
 - [Specials](#) – Discounts and Free Tickets for Fairs and Congresses 39
 - [Imprint](#) – Stay Connected 40
-

H₂ Refueling, the German Way

Comment by Sven Geitmann

Have you ever driven a fuel cell car? And have you ever filled up the tank of one at a hydrogen station? If so, you probably have made the same experience as I have: No fuel without a fuel card by the Clean Energy Partnership.



Fuel cell cars are already in the showroom

Recently, I've had the opportunity to test-drive a Toyota Mirai (see next H2-international issue) – and try out refueling too. Driving the car was a great experience; the technology has matured enough. But the question I ultimately had was how the issue of hydrogen refueling would be solved in the foreseeable future.

Can you really talk about market maturity if all drivers of fuel cell vehicles are required to complete a course in refueling first before they can fill up a tank on their own? And what may even be more important to ask is why this odd requirement from days past has not long since been dropped? You don't have any special restrictions or need to participate in a refueling course with LPG and natural gas vehicles. Why isn't the same true for hydrogen?

I went and asked H2 Mobility Germany about it. Their answer: "Unfortunately, [refueling] hasn't been possible yet without a CEP card." And the CEP said quite simply: "Things will certainly change during the further expansion of the infrastructure

and the takeover of gas stations by H2 Mobility.” At least, they promised to take a look at introducing other methods of payment. Right now, the only option available is the H₂ card, which is used to authorize and pay refills (by invoice).

Then, I contacted BeeZero, since their carsharing customers would certainly be impacted as well, at least that’s what I thought. But whoever rents a car from the Linde subsidiary in Munich, is offered a very special package deal. In BeeZero-speak, that means: “Currently, you need to receive instructions before being able to fill up a fuel cell vehicle yourself in Germany, a service that we are happy to provide for our customers.” On request, the business would also offer a “short introduction into refueling on-site,” but not all BeeZero drivers would need to go through this process. In an extraordinarily friendly tone, I was told: “If you like to take a longer trip, we will be happy to offer you a course in refueling. That’s no trouble at all.”

Great! I ask: “And how do I pay?” The answer: “In Germany, you can only pay by CEP card.” Registered customers, who have completed a refueling course, will consequently receive one of these cards along with their car-share for the rental period. BeeZero will pay for refueling.

The situation is different in Austria. The card won’t be valid at stations in Bolzano or Innsbruck; you will have to pay out of pocket (cash or credit), but will get reimbursed by BeeZero (“included in our prices”). Additionally, BeeZero said it made sure “that there always are enough cars with a full tank available.”

The reason for the lengthy process is that officially, every fill-up is still being considered “industrial refueling,” and this kind of procedure requires instructions to be given. Expectations are that there won’t be any changes to it before the end of this year.

One factor why “industrial refueling” is still necessary and the tank cannot be filled up by just anyone is the correct gauging of the hydrogen amount, as was confirmed by H2 Mobility: “Official calibration is challenging.”

The refueling stations that are up and running today were approved individually and given a special operating license. This made sense, as each H₂ station had a different design because of its status as a demonstration system to develop and test out new technologies. Meanwhile, however, this testing stage has been completed and the first “normal” customers want to fill up the tanks of their cars.

The signs of a new era of commercial availability had been there for a long time: Early enough, one could predict when carmakers – first from Asia – would put fuel cell vehicles on the market. That the drivers of these vehicles now need to stand at demonstration systems and are not allowed to refuel their cars without prior instructions simply means that several groups of industry stakeholders have missed the point at which to get involved: the operators of the gas stations, the gas companies, NOW (including the CEP) and politics. To put it another way: Toyota and Hyundai together were seemingly not able to make sure that the end of the central stage of the Clean Energy Partnership would see freely accessible and operational H₂ gas stations in Germany.

Instead of debating the chicken-and-egg dilemma for years, it would have been enough if only one of the stakeholders had proved a bit of long-term strategical

thinking and cleared the way in time. There were early warning signs one could have taken to heart (for example, see [Metering: Hydrogen for the Energy Industry](#)): “Metering: Hydrogen for the Energy Industry”).

Now, the situation is comparable to a scenario in which Apple founder Steve Jobs had introduced iPhones to the market, but had told people after they had bought them that to charge the new devices, they would have to participate in a training course. This is why one shouldn't be surprised about the low sales of the Toyota Mirai in Germany.

Tesla has chosen a different path for marketing its electric vehicles: Instead of holding a lecture, Tesla's CEO Elon Musk promised all first customers free charging for life. That's how it's done.

Vaillant Puts Fuel Cell Heating on Ice

News

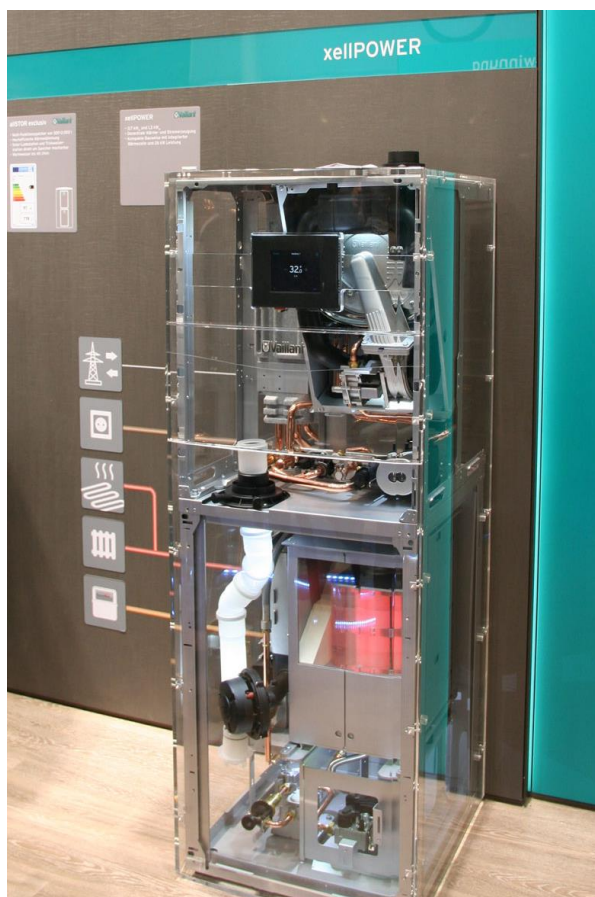


Fig. 1: The xellPOWER shown during the SHK 2016 will not reach the market.

Heating system manufacturer Vaillant has – again – put its fuel cell business on hold. Management announced on March 14, 2017, during the ISH in Frankfurt, Germany, that it had “reduced development capacities in fuel cells [and] put the market introduction of the fuel cell heating system for single-family buildings on hold for the time being.” Instead, Carsten Voigtländer, CEO of the Vaillant Group, intends to put a

greater focus on renewable energy and heat pumps. In his view, “there currently is no fuel cell heating system that would be economically feasible for owners of real estate.”

Dresden-based partner Sunfire, which together with Vaillant had advanced the development of high-temperature fuel cells since 2009, openly criticized the decision as “hard to fathom.” Sunfire’s CEO, Carl Berninghausen, said: “[The decision] is wrong strategically. These small [fuel cell] power plants are the second essential technology besides electric heat pumps for a successful transformation of the heat market. To introduce only systems that consume but not supply power leads to a dead end in energy policy.”

After Vaillant had switched technologies several times and had to cope with lagging behind considerably in its development, the business’s sixth generation of devices had been undergoing field tests, but had not yet reached the consumer market – in contrast to the units of many competitors (see [H2-international issue from November 2016](#)). Originally, the plan was to commercialize xellPOWER, which houses an SOFC stack by Sunfire, at the end of 2016. Despite millions upon millions of euros Vaillant had received in subsidies for its R&D activities, these plans have now been scrapped.

Nils Aldag, COO of Sunfire, explained: “We will make the most of this surprising development and, if possible, intend to continue work on our own. The devices have met all agreed-upon requirements. It would be irresponsible to leave their potential untapped.”

Practically in response to Vaillant’s exit, Joachim Janssen, CEO of the Viessmann Group, said during the ISH press conference: “We believe fuel cell heating systems have a promising future ahead.” And the DVGW, the German Technical and Scientific Association for Gas and Water, announced at around the same time that it had signed a cooperation agreement with the IBZ, the Fuel Cell Initiative, to “establish stationary fuel cell systems on the market even faster than expected.”

Ballard Power – Perfect Market Position

Stock Market

On March 1, 2017, China Today reported in detail about the Asian country’s joint efforts together with Canada in environmental protection and clean energies. Canadian-based Ballard Power Systems was mentioned as a model example and positive force behind many fuel cell and mass transportation projects and agreements in China (bus, rails). What Ballard and the fuel cell companies discussed in this article have in common is that they will be in the black in two to three years’ time and that the fuel cell markets are at a turning point for the better. The five businesses and their shares should be viewed based on their very promising long-term outlook and not based on their admittedly disappointing short-term results.

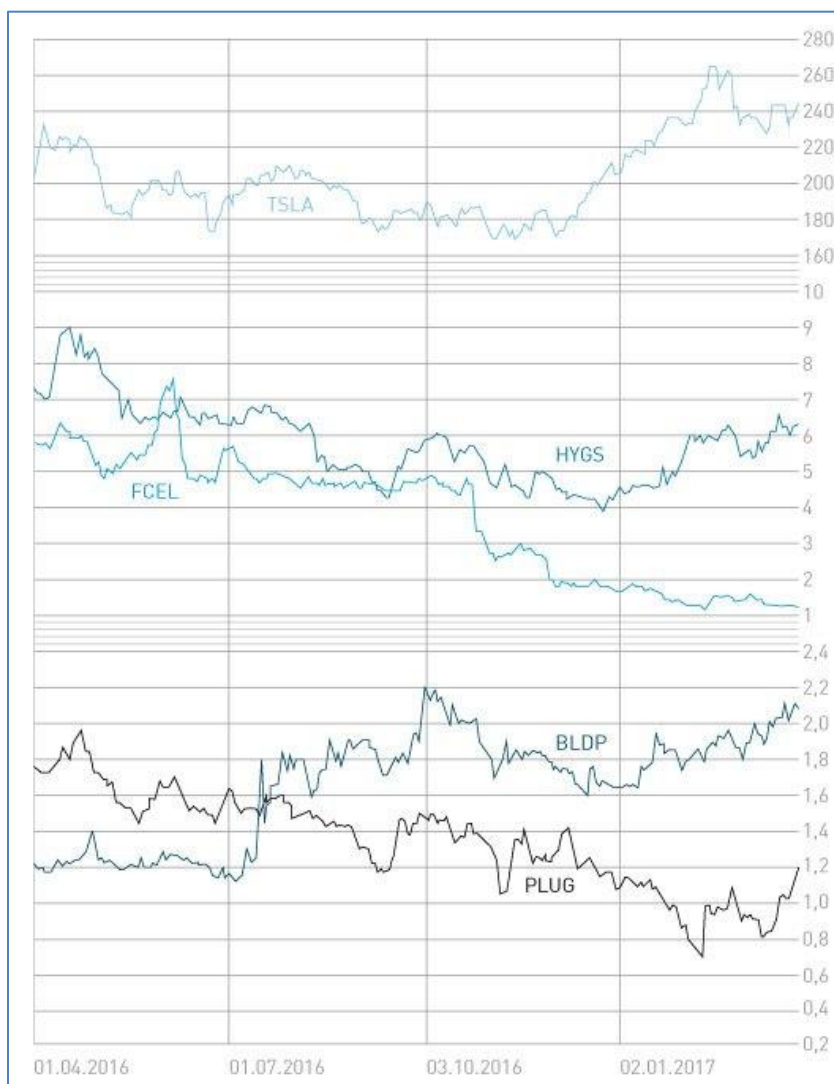
If you listened to the most recent conference call about fiscal year 2016 and the business outlook for Ballard Power Systems (NASDAQ: BLDP) and, adding to that,

reread the transcript of the call, you could easily feel very enthusiastic about the company's prospects.

New year starts with well-filled schedule

Last year, revenue jumped 51 percent to USD 85.3 million and the gross profit margin increased for the second time in a row. It climbed to 28 percent for the full year and is expected to reach 30 percent – as it did in the final quarter of 2016. The contract value of bookings has already grown to more than USD 87 million and – if all goes as planned – will grow considerably more in the future. Cash reserves added up to USD 72.6 million – at zero debt. The net loss of USD 0.01 per share in the final quarter of 2016 was at least around 3 cents lower than the market or the analysts had expected. To put it another way: The company is well on its way to profitability.

By its own account, Ballard was the “opportunity of choice for fuel cell investors,” going “stronger than ever.” It occupies top spots in all the markets it serves and is investing heavily in research, as it intends to remain market leader for more than just six months. At the same time, management has been focusing on steady profit gains by concentrating on high-margin products in key markets.



Historical prices of the five businesses discussed on the following pages

Source: wallstreet-online.de

When it comes to collaborations with large customers and partners – particularly in China and Japan –Ballard pursues a holistic strategy. This means that it is always on the lookout for cost-cutting potential across all components that make up a fuel cell system. The potential is expected to be as high as 40 percent. And especially because of economies of scale, such as with bus stacks in China, Ballard and its business partners are becoming increasingly important for the global supplier industry. As reported elsewhere, fuel cell buses are said to cost EUR 650,000 per unit these days. A few years ago, the price was way above a million euros. These new fuel cell buses need less than seven kilograms of H₂ on 100 kilometers (62 miles), as opposed to the around 20 kilograms they had required a few years ago.

China in particular is stepping on the “gas.” Ballard shareholder Broad-Ocean both placed an initial order for 10,000 fuel cell vehicles and found and won over communities and cities as buyers. Purchases range from 1,000 fuel cell buses in five years to 5,000 in two. Bus manufacturer Zhuhai Yinlong has not only placed an order for initially equipping 10 buses with fuel cell modules, but also plans to install them in 20 percent of the 35,000 electric buses manufactured each year from 2020. It would be of great interest here to know the share in revenue and profit that Ballard receives. After all, it is Ballard which supplies these Chinese businesses with the key MEA component.

Due to an existing framework agreement, the company’s USD 150 million in bookings will only be a baseline over the next five years. The total order value is expected to be much higher considering the ambitious plans and aggressive marketing strategies of Synergy und Broad-Ocean. Unfortunately, Ballard has yet to provide any details here.

The Chinese government provides another impetus to advance the implementation of fuel cells in buses by granting subsidies of up to two-thirds of the price. Which progressive community will say no to that?

Japan: First orders from Toyota Tsusho

Ballard said that it was doing well on several fuel cell markets in collaboration with Toyota Tsusho. It expressly mentioned the heavy-duty market (trucks, buses, trains), but also stationary fuel cells and materials handling (forklift trucks) as well as marine applications. As the first orders are still expected for this year, it has gathered a sizeable team in Japan to be able to collaborate closely with its Japanese business partner. In my view, this promises interesting times for Ballard in Japan and one can expect orders that are unlikely to be small. However, the Canadian-based business has been hesitant to provide any details on collaboration potential because of “the sensitive environment.” As I interpret it, this cannot really be a bad sign.

Multi-billion-dollar drone market

Fuel cell systems for the U.S. military are expected to result in interesting and, more importantly, long-term contracts. By its own account, Ballard subsidiary Protonex has been testing products together with several renown manufacturers – worldwide. A study by PwC has shown that the use of drones will increase dramatically over time – a large growth market for fuel cells. Even here, Ballard is in a perfect market position.

Conclusion: Through its collaborations and partnerships with Chinese businesses, Ballard will be able to derive considerable benefits from the economies of scale and

cost-cutting potential of manufacturing several types of fuel cell systems, not least because of the exclusive distribution rights for markets outside China. This could prompt an annual growth rate of above 50 percent over the coming years, which will finally provide Ballard with a stable and – increasingly – profitable business environment. Critics may argue that Ballard is relying too much on the Chinese market, but the company is skilled at diversifying its customer base and distributing risks across partnerships, products and geographical locations. Without the benefits from the company's Chinese ventures, Ballard would not be able to supply the global market with fuel cell technology for buses at inexpensive prices. The fuel cell is gradually attracting interest from several growth markets worldwide, which will increase the number of possible applications (products). Ballard is the global leader in the business by a mile and intends to continue its success story. Over time, the stock market will not get around a re-evaluation that will have to price in the enormous growth rates.

Risk warning

Investors must understand that buying and selling shares is done at their own risk. Consider spreading the risk as a sensible precaution. The fuel cell companies mentioned in this article are small and mid-cap ones, i.e., they do not represent stakes in big companies and the volatility is significantly higher. This article is not to be taken as a recommendation of what shares to buy or sell – it comes without any explicit or implicit guarantee or warranty. All information is based on publicly available sources and the assessments put forth in this article represent exclusively the author's own opinion. This article focuses on mid-term and long-term perspectives and not short-term profit. The author may own shares in any of the companies mentioned in this article.

Author: Sven Jösting (text was written in March 2017)

Hydrogenics – Record-High Order Figures

Stock Market

Canadian-based Hydrogenics (NASDAQ: HYGS) reported revenue of USD 8.7 million for the fourth quarter of last year and a net loss of USD 0.20 per share. This means revenue in all of 2016 was at USD 29 million, at a net loss of USD 9.9 million. Conversely, the number of order bookings has skyrocketed and backlog totaled USD 106.6 million, of which around USD 38 million are said to be recognized as revenue in the current fiscal year – at a steadily increasing profit margin of above 20 percent.

These figures need to be seen in conjunction with expectations for Hydrogenics to become a future technological force to be reckoned with, as several projects promise very high growth rates, some of them in China and Europe (introduction of hydrogen-powered trains in collaboration with Alstom) and, consequently, the jump to profitability. I evaluate the company mainly based on the technologies it has to offer (electrolyzers, H₂ filling stations, fuel cell components for trucks, rolling stock, buses) and its know-how and rate Hydrogenics in the expectation that sooner or later, it will be bought up by some other company because of its technical expertise (intellectual property). Hydrogenics operates on the fuel cell markets that promise the highest growth rates in the industry and should be viewed as a small cap value on the stock exchange. That China is a driving force in this field is also felt at Hydrogenics, as the company has already garnered bookings for retrofitting about 2,000 vehicles (trucks and buses). Additionally, the first power-to-gas plant based on renewable energy has

been inaugurated in California. Hydrogenics should be viewed as a “technology player” and a target for acquisition.



Electrolyzer manufacturing, Source: Hydrogenics

[Risk warning: see page 8](#)

Author: Sven Jösting (text was written in March 2017)

FuelCell Energy – Exxon – Trump – Tillerson

Stock Market

During the industry conference Energy – Think Outside the Box in Berlin, William M. Colton, vice president corporate strategic planning at ExxonMobil, talked about the big potential of a technology called “carbon capture.” By that, he meant the option to add CO₂ to hydrogen to create methane and convert the result into power and heat inside a fuel cell. ExxonMobil’s partner for generating energy from emissions is FuelCell Energy (NASDAQ: FCEL). Days later, U.S. President Donald Trump said in a speech that he intended to “end the war on coal” and that the United States was going to have “clean coal.” A co-incidence? One of the members of Trump’s team is former ExxonMobil chair Rex Tillerson, who could have told Trump about the technology.

In any case, it’s good news for FuelCell Energy, which has the great opportunity after the construction and successful operation of a joint test facility together with ExxonMobil to set up similar installations with the help of this partner/customer worldwide. Why else would Colton have pointed to FuelCell Energy in his speech?

On March 16, 2017, ExxonMobil also held a presentation on carbon capture storage at company headquarters, an event said to have been attended by the new chair of the corporation, Darren Woods. One day earlier, FuelCell Energy had spoken in front of the National Coal Council, an organization that reports directly to the U.S. government, highlighting the carbon capture solution.



William M. Colton, Source: Euroforum

First-quarter figures

With a net loss of USD 0.39 per basic and diluted share and revenue down to USD 17 million – as the collaboration with Korean-based POSCO Energy is no longer generating sales but license and royalty revenue – business development did not meet expectations. Still, FuelCell Energy has the chance to be awarded the contract in several bidding projects. At least, it was able to up backlog to above USD 437 million. With USD 57.6 million in cash and cash equivalents, a value that matches the current market cap of the business, liquidity has been maintained as well. Add to that the around USD 43.5 million in “restricted cash” and a financing facility worth USD 40 million.

New projects in the pipeline

The 63 MW project Beacon Falls is progressing and FuelCell Energy is still in it to win it. The company said that it had “numerous projects in several markets” where a final decision was expected soon. Members of management have held a series of

presentations in front of politicians, associations and businesses to highlight the benefits of the company's fuel cell technologies (efficiencies, cost-benefit ratio, decentralized and clean energy generation, etc.). FuelCell Energy also operates 11.2 MW capacity on its own, a portfolio to which 6.5 MW are said to be added to drive up revenue by selling power and generate cash flow from operating activities.

My thoughts: FuelCell Energy should be evaluated based on its technological prowess. Customers such as ExxonMobil have the potential to market these technologies (e.g., carbon capture) on a large scale. This idea of large-scale projects is, in my opinion, the basis for an evaluation of the company going forward. That it needs to create sustainable profit is par for the course.

[Risk warning: see page 8](#)

Author: Sven Jösting (text was written in March 2017)

Plug Power – USD 130 Million Revenue in 2017

Stock Market

The minus USD 0.11 per share was a much higher loss than the USD 0.06 that had been anticipated. The adjusted EPS is said to be at USD 0.08 per share. The company's revenue increased to USD 32.6 million in the final quarter of 2016 – while USD 34.8 million had been expected. The net loss attributable to common shareholders (incl. large extraordinary items) added up to USD 57.6 million at USD 85.9 million in revenue. This fiscal year, GAAP revenue is expected to grow to USD 130 million. Where does the company go from here? The focus of Plug Power (NASDAQ: PLUG) is the materials handling market, and it's doing well on it regarding customers and bookings. Additionally, the Canadian-based business intends to earn money over the long term by selling its own hydrogen. It has already set up 40 stations to fill up hydrogen tanks. That there is no longer government support for retrofitting forklift trucks (a new regulation could be in the works, but that is a pretty unlikely scenario under Trump) should not be an important factor when evaluating the company. More than USD 325 million in new bookings speak for themselves; the same is true for liquidity, of which FuelCell Energy has USD 46 million freely available – at a total of USD 100.6 million and a market cap of below USD 200 million.

[Risk warning: see page 8](#)

Author: Sven Jösting (text was written in March 2017)

Tesla – Has That Been the Squeeze Already?

Stock Market

Just recently, the stock price of Tesla (NASDAQ: TSLA) had known no bounds: Prices went up more than 40 percent within a few weeks. But the hike was followed by a hefty decline from USD 286 to around USD 240. There had been no reassuring news and figures based on which you could make a logical argument for the price explosion. One of my theories focuses less on the influence of tweets and the

content of statements made by Tesla's CEO Elon Musk, but on the shareholder structure: A good 50 percent of the around 160 million shares are in the hands of a few funds (four to five) and Musk himself (around 20 percent). In light of the over 35 million shares that were sold short (to bet on falling prices), 50 percent and more are – I feel – “unavailable.” That adds up to an impressive 80 to 90 million and this figure should be seen in relation to the short interest generated (33 to 35 million). It may be that hedge funds had been inclined to trigger a squeeze by buying an increasing number of shares to put pressure on the short sellers and make them realize losses through short covering.

It is a plausible answer or reason for the price hike. Additionally, the much higher market value may have – although I say this with no guarantee it'll become true – people expect the next capital raise soon if the four to five funds and Musk agree to maintain their position, meaning not to sell shares while the stock price is rising.

There have been no news that could justify the massive increase in market value. Tesla was indeed able to up sales by an impressive 51 percent to 76,230 vehicles (Model S and X), but the net loss per share of USD 0.78 was much higher than expected for the fourth quarter of 2016. What also needs to be considered are extraordinary items (accounting profit of SolarCity), so that the loss would have been even higher if you remove those from calculation. The only reason for the development I can think of is Musk generating media attention by asking to meet with the new U.S. President, Donald Trump, several times – possibly to talk about tax benefits for electric vehicles and renewable energies, such as solar (see SolarCity), and prove himself as a lobbyist for “America First.” And that Model 3 proceeds as scheduled has been well received by the stock market.

High expectations for Model 3

The conference call on Feb. 22, 2017, produced only very vague statements about Model 3. There would be test vehicles, but only a small number of cars would be manufactured in series no earlier than the second half of this year (from July). Many analysts from UBS, Goldman Sachs and elsewhere have been highly skeptical of the forecast, as the target for year's end is as many as 5,000 Model 3 units leaving the factory each week. They have asked many critical questions about the financing of such a large capacity expansion (the target for 2018 is 500,000 units of all three models combined; the plan for 2020 is even one million).

The replies by management and Musk have been very short and there was no comment on the about 400,000 preorders, if that is still the number we should be talking about. Additionally, the conference call did not answer the question of how Tesla intends to finance all of what it proposes – including the battery factory – but a capital raise is not only the most likely option considering the high market value [...], but also the most sensible one for acquiring funds over the short and medium term in light of the schedule. UBS analysts see a capital need of more than USD 8.5 billion looming on the horizon if the corporation implements its plans as stated.

Tesla seems to have imposed extended payment terms on its car part suppliers or requested an increase in supplier credit – with the explanation that capacities would go up eventually. Musk's statements about planning other battery factories (three to five) worldwide should be taken with a grain of salt. One analyst remarked that the

Gigafactory in Nevada should be up and running and producing batteries before the next project is started.

I remain skeptical, as other carmakers will put a number of competitive products on the market soon. These will be comparable to Tesla's in price and battery range. There have been many delays in setting up production and it should come as no surprise if the company cannot adhere to Musk's very tight schedule. This, however, is the basis for the current evaluation, although it continues to be quite an optimistic one at a current market value of USD 40 billion.

Industry analysts from Goldman Sachs and UBS expect stock prices in the range from USD 160 to USD 185 until there is certainty about when the battery factory will start producing and what will become of Model 3.



Tesla's Gigafactory in January 2017, Source: Tesla

SolarCity integration

With the acquisition of SolarCity, Tesla now has almost 30,000 employees. However, around 2,500 left SolarCity only last year. One will have to wait and see how successfully Tesla can incorporate its new addition to the family and how the debt acquired (around USD 3 billion) can be refinanced. Musk expects a saving potential of more than USD 150 million per year. But implementing his plans will take time. SolarCity could also become a burden, as some analysts don't see what added value it brings to the table.

"Small" capital raise

The expectation on the stock market – that a capital raise will be on the agenda very soon – has been confirmed: Tesla receives USD 1.2 billion, USD 350 million from shares (USD 262 per share = very optimistic) and USD 850 million from a convertible bond. The latter will again increase debt. Considering the capital requirements for launching the production of Model 3 and the Gigafactory, this "small" capital raise is unlikely to be the last in 2017.

That Tesla's CFO resigned during this key stage – he is being replaced by his predecessor – is another thing to be cautious about, in my view – despite the fact that the former and current CFO was the one who had already steered Tesla out of a crisis before. In short: 2017 will be an extremely important year for Tesla, as the bar has been set very high but all positive developments have already been priced into the current market value, so that I maintain my view that the stock price will fall drastically over time.

[Risk warning: see page 8](#)

Author: Sven Jösting (text was written in March 2017)

The Break-Up of Heliocentris

ODASCO and Horizon Divide the Spoils

Domestic Market



Heliocentris Energy Solutions, which filed for bankruptcy in late 2016, will be no more, although its expertise will live on. The manufacturing and the education division were sold to different companies, but many employees who worked in Berlin lost their job.

The business founded in Berlin, Germany, announced on Jan. 12, 2017, that important assets of the Heliocentris Group had been sold to a subsidiary of Odeh Asalem Automation Systems from Dubai. The stake in Heliocentris Italy and important assets of Heliocentris Fuel Cell Solutions and Heliocentris Industry now belong to the Arab technology provider. With approval by the creditor's committees, Acta S.p.A. based in Pisa will be renamed ODASCO – Heliocentris Italy S.r.l., whereas FutureE Fuel Cell Solutions GmbH based in Wendlingen, Germany, will become ODASCO – Heliocentris Fuel Cell Solutions GmbH and Munich-based P21 will be known as ODASCO – Heliocentris Industry GmbH.

However, while many working at the business's southern German locations can keep their job, the employees at the headquarters in Berlin-Adlershof will not be so lucky. The former had even posted new job offers for industry specialists since February, but the latter will be closed down entirely. Assets and shares in what used to be Acta and were held by the Berlin location have been retransferred from the German Spree region to Italy, so that work in the technology center in Berlin ended recently. This means that a few tens employees lost their jobs.

The education division, Heliocentris Academia, was incorporated into the Horizon Educational Group from Singapore on Feb. 1, 2017, which means that important assets and some of the jobs have remained. However, these jobs are far from secure, as it seems unlikely that the Asian corporation will maintain a large presence in Berlin.

Mark-Uwe Oßwald, formerly managing director of FutureE, has meanwhile returned to Stuttgart after an almost two-year stint at the Italian subsidiary of Heliocentris. It has been reported that the UPS system for the BOS locations could be built by the new German business after all, as the NIP tender had been adapted to reflect the change in circumstances. No one knows how the story will continue in Italy, particularly in light of the fresh capital Heliocentris had received from Inabata Europe in 2015. The subsidiary of Japanese trading corporation Inabata & Co had entered into a strategic partnership with the Berlin-based business to receive the exclusive distribution rights for all Heliocentris products sold on the Japanese market for five years.

What is certain, however, is that former COO Sabine Kauper left Heliocentris on Jan. 31, 2017, and that company founder Henrik Colell continues at the helm of Home Power Solutions. Colell had founded HPS at the end of 2014 in Wildau together with Zeyad Abul-Ella, the brother of Heliocentris CEO Ayad Abul-Ella. During the ISH, HPS showcased its new Picea system (see [New Priorities in Hanover](#)) for grid-independent power supply of buildings through solar energy and hydrogen. Pilots of the system are being tested; more details should become available after the Hanover trade show. Colell has also kept his position as spokesperson of Clean Power Net. HPS joined the business network during the CPN general assembly in mid-March 2017.

Ayad Abul-Ella, formerly CEO of Heliocentris Energy Solutions, will have left the company by now.

New Priorities in Hanover

Trade Show

For many years, heating systems based on fuel cells had played a central role on the joint booth Hydrogen + Fuel Cells + Batteries at Hannover Messe. This time, however, the Fuel Cell Initiative, IBZ, was nowhere to be found, not because there was no interest in the technology, but because it has been made available on the market. The businesses which had used the opportunity of staying on top of R&D activities by exhibiting in hall 27 have meanwhile begun to unveil their finished products at B2C shows. This is not to say that a visit to the world's biggest industrial trade show in Hanover was no longer a rewarding experience.

For many years, the Fuel Cell Initiative had had a comparatively large joint booth, at which it informed attendees about the latest developments in fuel cell heating. As most manufacturers that had participated in the booth project have meanwhile started to offer fuel cell units on the market, the IBZ joined the exhibit of Zukunft Erdgas to showcase four systems by Buderus, SenerTec, SOLIDpower and Viessmann.

Finding the right market spot

NOW, the National Organization Hydrogen and Fuel Cell Technology, said about the changes: “The IBZ is starting to feel the impact of some members having commercialized part of their research. This has made business-to-customer shows, such as the ISH, more attractive than the industrial trade show in Hanover, which targets a broader audience. Another consequence is that manufacturers have stepped up their efforts to market fuel cells or their product offerings on their own.”

NOW again stressed that the IBZ was not bound to the National Innovation Program. It had rather been envisioned as an R&D platform for energy suppliers and manufacturers of heating systems to improve the technology and test out collaborations between market partners that had joined the program. “Overall, the companies that participated in the project have completed this stage with success,” the organization said. The next step would be successful positioning on the market. If and how cooperation would continue was currently under review.

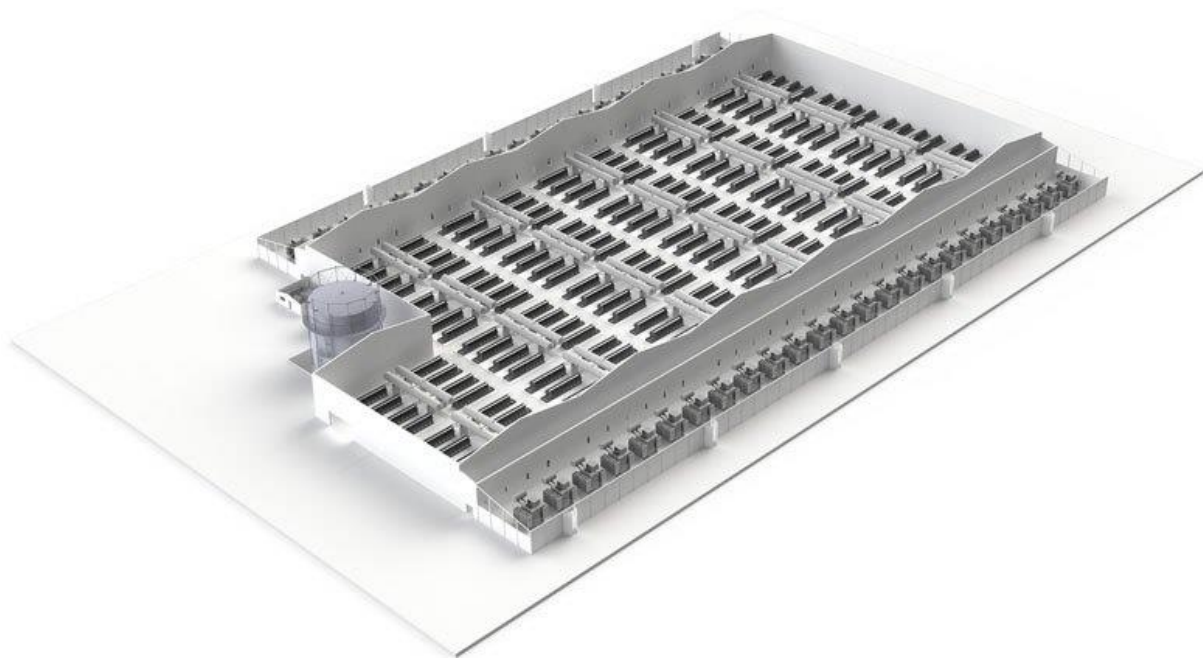


In 2016, French presidential candidate Emmanuel Macron visited the joint booth Hydrogen + Fuel Cells + Batteries while serving as France's economy minister.

Andreas Ballhausen, the new CEO of SOLIDpower (see [Gummert Leaves SOLIDpower](#)), explained: “We focus increasingly on trade shows and events at which we meet our partners on the market and our customers.” This means that instead of having a booth in Hanover, his company was at the ISH in Frankfurt (read in the next issue) and will be at the interCogen in Karlsruhe this year.

Still, residential fuel cells were not absent from one of the lead shows, the “Energy”, between April 24 and 28, 2017. For example, Viessmann was present at the joint booth of the German state of Hesse and SenerTec could be found in the same hall. Vaillant came as well, and set up its exhibit directly at the main hallway, but had put a lid on its fuel cell ambitions in March (see [Vaillant Puts Fuel Cell Heating on Ice](#)).

Nel Hydrogen celebrated its 90th year of company history at the trade show. The Norwegian-based supplier also showcased its design for a 400 MW plant consisting of 176 electrolyzer units.



Source: Nel Hydrogen

Despite the IBZ's exit, Tobias Renz had again managed to attract nearly 150 exhibitors to his 5,000 m² space in the hall at the west entrance. Renz, who exactly 10 years ago had organized the joint booth of hydrogen and fuel cells on his own for the first time, told H2-international: “Fluctuation was higher this year than in previous years. But with as many as 40 new exhibitors, we were able to fully compensate for the exit of IBZ and Linde from the hall.” He added: “We are also pleased that BMW and Shell have decided to organize a joint booth.” Moreover, it was the first time that fuel cell cars by Audi and BMW were made available for test drives during a Ride & Drive outdoors, whereas Daimler did not show up this year.

A central theme was again energy storage, particularly hydrogen generation through electrolysis (see the comprehensive market in the next issue). For example, there was GP Joule, the parent company of H-Tec Systems, which presented its CONNECT product to show how smart solutions can help integrate renewable energies into everyday applications. Additionally, it had published a feasibility study in mid-March 2017 during the New Energy Husum to prove that “Schleswig-Holstein can take the next step from renewable power producer to a place that creates added value in renewable energies.” [1]

Other booths that made hydrogen and fuel cells part of the discussion in Energy hall 27 were the joint ones of North Rhine-Westphalia and Baden-Württemberg, and even the one of Celeroton, which showcased its fuel cell inverters. More suppliers could be

found all over the trade show premises, for example, Bronkhorst High-Tech, which presented its latest mass flowmeters. J. Schneider Elektrotechnik showed a fuel cell UPS unit, whereas Gustav Klein from Tyrol offered systems for static energy storage at the same location right down the hallway. Another potentially interesting supplier was Gardner Denver, which unveiled their newest oil-free compressed air and vacuum solutions.

More to the entrance in hall 27, there was first-time exhibitor Home Power Solutions. Because of its status as a former subsidiary or sister company of Heliocentris (see [The Break-Up of Heliocentris](#)), it was interesting to see how their product was received and what the company would do differently compared to Heliocentris.

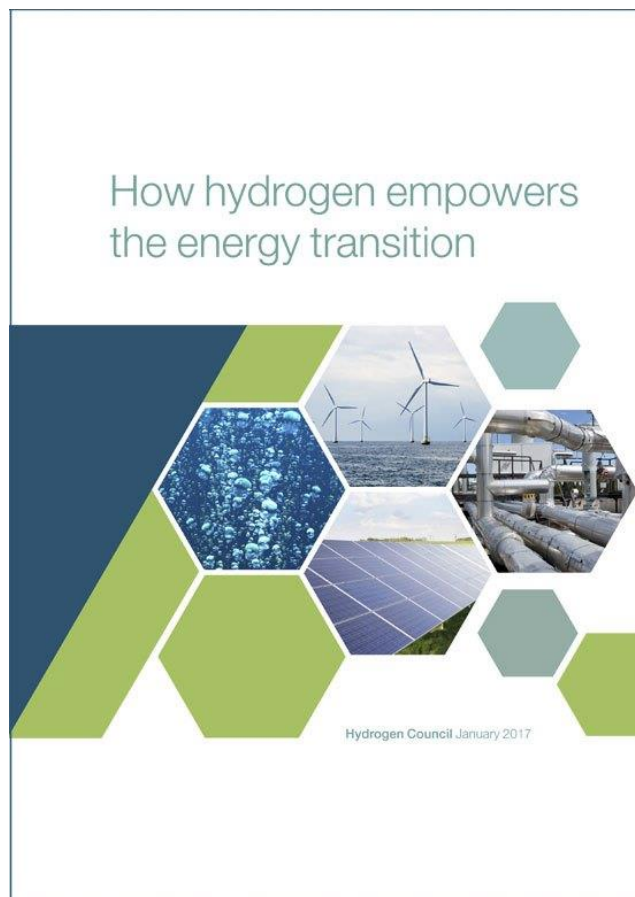
The MobiliTec was a third smaller this time than in past years. Although there had been many discussions focused on electric transportation at the booths and during the forum, the reduction in size was another indicator that electric transportation is – if at all – more a topic for automotive trade shows and not much one for an industrial fair. Another detail that fits into the picture is that the Phileas fuel cell bus by HyCologne had not been used this year for shuttling attendees to the trade show premises.

All in all, the Energy (one of the seven main trade shows) boasted more than 1,200 exhibitors, with most of them coming from abroad. Total exhibition space was at around 43,000 square meters (462,848 square feet). This time, the buzzwords were “sector integration” and “integrated energy.” For example, at the Integrated Energy Plaza, a combination of forum, exposition and interactive exhibits, the main topics presented and discussed were the digitization of a changing energy industry, virtual power plants and innovative storage solutions. The third item includes the Kopernikus projects, which had been launched by the German education ministry in response to the energy transformation. And, of course, large-scale power-to-X systems were talked about as well.

[1] GP Joule, Akzeptanz durch Wertschöpfung – Wasserstoff als Bindeglied zwischen der Erzeugung erneuerbarer Energien und der Nutzung im Verkehrs-, Industrie- und Wärmesektor, March 2017

Hydrogen Council Founded

News



At the beginning of 2017, several businesses joined forces to advance the energy transformation and spread the vision of a hydrogen economy. On Jan. 18, 2017, during the World Economic Forum in Davos, Switzerland, the heads of thirteen globally operating businesses held a press conference to announce the launch of the Hydrogen Council. The council's secretary general is Pierre-Etienne Franc, vice president of advanced business and technologies at Air Liquide and formerly board chair of the Fuel Cells and Hydrogen Joint Undertaking, and its chair is Benoît Potier, CEO of Air Liquide.

Potier explained in Davos: "The Hydrogen Council brings together some of the global leaders in the industrial sector and the automotive and energy industry with a clear ambition to explain why hydrogen has emerged as a key solution for transforming the energy market – not only in transportation, but in industry and the residential building segment. The implementation of such a far-reaching plan requires the development of new strategies. However, we cannot go it alone. We need market stakeholders, such as governments, to support us in our large-scale investment in infrastructure projects. We call on business leaders across the globe to back our efforts in hydrogen development, so that we can meet our shared targets in environmental policy and give new impetus to the growing hydrogen economy." The council's strategy paper "How Hydrogen empowers the energy transition" (see download link

and [Japan Leads the Way – Germany Stays Behind](#)) lays out in detail what this means for the market.

Members: Air Liquide, Alstom, Anglo American, BMW, Daimler, Engie, Honda, Hyundai, Kawasaki, Shell, Linde, Total and Toyota.

www.hydrogeit.de/Hydrogen-Council.pdf

Japan Leads the Way – Germany Stays Behind

Report on the Mood at Tokyo's FC Expo

Global Market

The German pavilion at the 13th FC Expo held from March 1 through 3 this year in Japan's capital was packed with exhibitors. One of the members of the joint booth was again the H2BZ-Initiative Hessen. Birgit Scheppat, board member and professor at RheinMain University of Applied Sciences, traveled for the fair to Tokyo and reports for H2-international on her experiences.

The exposition took up about the same space as last year – according to the organizers, there were around 280 booths, although several by first-time exhibitors. In addition to the German exhibit, there was one by Norway, France and Taiwan. North America was represented by both the United States and Canada, although there was nothing new to report from the booth of either. China and Taiwan showed much more confidence this year than in 2016, when they had made only vague statements about availability of supply and prices.

The trade show presented attendees with various types of fuel cells, particularly small- and large-capacity PEMs, and differently sized hydrogen storage units, both metal-hydride ones and clever replacement systems for scooters or electric wheelchairs. Additionally, attendees could take a look at small H₂ production units based on methanol or electrolysis. Conversely, components for high-pressure applications – which had been numerous the past year – had dwindled in number.

An important item on Japan's agenda is power-to-gas, where development is underway. The desired excess power does not yet exist, as producers of renewable energy are few, but it is nevertheless a crucial part of the country's future energy policy. The huge exhibition areas for PV and batteries were nearly overcrowded: People pushed through the hallways as if they were at the entrance of a soccer stadium.

China wants H₂ and fuel cells

There are many, many expectations, although Japanese carmakers believe that the advance of the technology cannot be stopped. China, too, seems to have adopted this belief Professor Jin Liu from Tsing Innovation Capital. reported about the 300 H₂ buses that are to be delivered within two years' time. It remained unclear, however, how to cope with the logistic challenge of refueling 100 buses per station. Jin said that the reason for the great interest in fuel cell buses was the "substantial" support of the government, which pays two-thirds of the cost. China wants the technology – the price doesn't seem to be a factor for the time being.

During the keynote session, Air Liquide's Pierre-Etienne Franc, spokesperson of the Hydrogen Council (see [Hydrogen Council Founded](#)), was added to the program schedule. He stressed the importance of the technology – but remained very vague about timeframes and implementation. Then, Masaru Yamazumi from Japan's economy ministry METI reported that hydrogen was to be produced from brown coal in Australia before being shipped to Japan, at least in the first stage during which hydrogen as a byproduct would be virtually non-existent. It was planned to commercialize the technology first and switch H₂ production from “black” to “green” hydrogen later. In the last stage, the ministry sees hydrogen being generated on a large scale from renewable sources only. The reason for the three-step model is an insufficient number of storage units to date and not enough capacity by producers of energy in the country. Additionally, Japan does not have a gas grid as far-reaching as the one in Germany.

Christian Mohrdieck from Daimler offered a clear direction when starting his speech: “Yes, hydrogen is a good solution.” – not for today's market, not for tomorrow's, but for some time in the future. The potential of combustion engines had not been tapped entirely; first, there should be hybrid vehicles and one would see how to go from there, that was his main message. Daimler would indeed offer a small number of GLC cars this year, but this sentence was followed by one “but” after another – the Japanese attendees understood and left the room in droves.

It is a déjà vu for me: The situation was the same as in 1992, when the then-chair of the RWE board explained that solar modules would always remain a niche product and that renewable sources would never endanger existing market structures. You can and are allowed to be wrong – this will again have dramatic consequences for Germany – but where is the courage to the many funds that not only this one company has invested in hydrogen and fuel cells, but all citizens?

It is really a miserable situation, to see all this timidity, all this despondency. Oh Germany, your businesses, they administrate, not innovate!

Problem-solving

Greatly intriguing were the speeches by Björn Simonsen from NEL and Kristian Vik, secretary general of the Norwegian Hydrogen Forum: In Norway, ships and “zero-emission tourism” had been the latest trend, which is why electric and emission-free transportation was planned for ships crossing sensitive habitats (sightseeing, ferries, etc.), cruises and buses (coaches). Market surveys have shown that there are “financially well-off customers” who – because of environmental concerns – are willing to pay much more for solutions that are effective in preserving the environment. Obviously, the idea to equip electric buses with diesel heating is out of the question. What about long-distance buses equipped with hydrogen systems instead?

A greatly irritating issue are the compressors for filling stations: Some of the businesses on the market do not want or cannot be aware of the dissatisfaction that exists. They are viewed as arrogant, offer only pseudo-explanations and risk the reputation of an entire industry. Still, everyone seems to understand that hydrogen-powered transportation can only be successful if combined with refueling units that work properly. Customers have many stories to tell about that, but they do not want to be the ones getting the industry in trouble when problems become public.

Nevertheless, membrane-type compressors are supposed to run and not stand still. Owners of other systems which operate well may have issues finding replacement parts when there is a breakdown. Sometimes, however, interruptions are a normal part of everyday operation, and so on.

Anyone actively engaged in a field of technology knows that there are always issues at the start. One can only hope that the attitude toward these problems will change. In dismay, I think of the idea that we in the Rhein-Main region may have eleven fully functional buses which cannot be refueled for weeks – a truly horrendous situation that will put a stop to the technology for a long time. I would wish for a solution that helps both suppliers of refueling units and operators of filling stations. Pushing aside criticism is not an option and being offended is no alternative either.



Pavilion organizer Silke Frank and Professor Birgit Scheppat (right), Source: Peter Sauber Agentur

What about Germany's role?

The attendees visiting the joint booth often asked what the situation was in Germany and where the country intends to go from there. It received much praise for its energy transformation, and there were follow-up questions about the next steps that would be taken. In contrast, Chinese attendees were more on a shopping or sales tour: They intended to buy electric vehicles and buses and sell their small fuel cell units and components. The figures one heard mentioned in connection with Chinese bus projects were impressive: Not ten buses, no, always more than a hundred or even several hundred. When the question came to refueling, however, replies got evasive.

All cities in China have a stake in passenger transportation: They purchase additional know-how from abroad because they strongly believe that this will compensate for the country's disadvantageous position on the combustion engine market. What remains in the dark is the motivation behind the shift toward hydrogen. Several times, however, one could hear about problems related to ageing battery systems, their

recycling and – surprisingly – their charging infrastructure cost as well as the required grid adjustments.

The proper framework

Sugarcoating the reality will not help – German carmakers must rethink their timid approach toward fuel cell vehicles. Where are the leaders to pull people off the fence? The question to politicians is: After all this money has been spent, when do you lay down objectives organizations need to fulfill, targets that would also provide a sense of security for these businesses? Maybe a law stipulating a share in zero-emission vehicles – like the one in California – would help.

Japan offers a great many subsidies: The price for a fuel cell vehicle is around EUR 70,000, of which EUR 20,000 are paid by the government. “Generous” is the right way to put it. Stationary systems (based on SOFC or PEM fuel cells) are expected to be half as expensive in seven to eight years’ time. With the implementation of an H₂ infrastructure, expectations are that owners of small and heavy-duty trucks will make the switch too. The Japanese have set clear rules and expectations.

There is much we do not know about the development in China. Korea, in contrast, has established a transparent framework like Japan and manages all relevant technological aspects with great focus. In the United States, the driving forces can be found at state level. We will see when and if the rest of the world will follow.

Germany squanders away head start

Europe, however, is drifting apart: There are several activities in France, a similar number in the UK and, of course, many in Scandinavia. Personally, I think that Germany has squandered away its technological lead. The shift from a system becoming ever more rigid, where people are afraid of making mistakes and believe that the expertise of others can be bought off “overnight,” will lead to fuel cells and hydrogen in transportation not being associated with the central European country. After this trade show, I fear that without swift and targeted actions, Germany will no longer be relevant in this new field of technology.

A few businesses may have opportunities, but most of them will not. As a reminder to everyone: 63 percent of an electric vehicle does not consist of parts specifically produced for the automotive industry. They can be manufactured by any other business. The key components are the electric motors, the control systems and the energy storage units. Which of those will we continue to produce in Germany?

As an alternative to the automotive market, there are many smaller applications for scooters, electric wheelchairs, golf carts and ones in special fields and materials handling. The components for all these technologies have already been available; someone just needs to assemble them in a “smart” way. Of course, costs need to go down still – but even here, considerable reductions are expected over the next years, particularly because of an increase in production capacities.

Maybe my outlook is too gloomy – which would be a relief – but if there is one thing I have taken away from Tokyo it is that hydrogen and the associated fuel cell technologies are being turned into products with which manufacturers and suppliers earn money – slowly, but steadily. In my opinion, the question about where the technologies will originate has almost been decided: They will come from places with

a concentration of know-how in component manufacturing and, consequently, systems. Will that be Europe? Perhaps the trade show in Hanover will prove me wrong – which I would very much like to be in this case ...

Author: Professor Birgit Scheppat, Hochschule RheinMain, Birgit.Scheppat@hs-rm.de

Gummert Leaves SOLIDpower

Residential Market



Guido Gummert, Source: SOLIDpower

“Everything has progressed at a much faster pace than I expected,” Guido Gummert, formerly CEO of SOLIDpower, had told the Aachener Nachrichten in early 2017. What he meant was the rapid turnaround at Ceramic Fuel Cells after it filed for bankruptcy in March 2015. When SOLIDpower took over Ceramic Fuel Cells, business recovered fast and Gummert left the Italian-based manufacturer of stationary fuel cells at the end of February 2017 at his own request.

Alberto Ravagni, CEO of the SOLIDpower Group, signed a cooperation agreement with Korea Electric Power Corporation, a South Korean energy supplier, in Gwangju in December 2016. It was this agreement that led Gummert to say in late January 2017 how pleased he was that the business based in Mezzolombardo, Italy, had meanwhile grown “from 30 employees to now 55.”

Shortly thereafter, on Feb. 27, 2017, it was announced that Andreas Ballhausen, formerly sales and business development manager and board member of SOLIDpower, would head business operations in the future. In March, Gummert then took on an executive position at a northern German energy supplier, which means he will stay in his home region. Ravagni expressly recognized Gummerts' accomplishments and regrets him leaving the company.

MCFC Power Plant in Hotel Use

News



Source: Radisson Blu

After last year's project of a 1.4 MW fuel cell power plant in Mannheim, energy supplier E.ON established a partnership with the Radisson Blu Hotel in Frankfurt, Germany, in mid-February 2017 to operate yet another industrial-grade fuel cell there. In addition to its distinct architectural features, the hotel is now to be equipped with a state-of-the-art energy system by FuelCell Energy Solutions. It is said to be installed during a fall 2017 project subsidized with EUR 800,000 to generate power and heat for the hotel's 400 rooms – for at least 10 years.

It will be the same kind of molten carbonate fuel cell that had been manufactured by FuelCell Energy Solutions and installed by E.ON Connecting Energies at Friatec in Mannheim-Friedrichsfeld. The Mannheim MCFC unit went online in September 2016. Said a spokesperson: "E.ON believes in the potential of fuel cells – for industrial use, as was the case at Friatec, for hotel and commercial applications, as is the case at the Radisson Blu Frankfurt, and for business-to-customer projects." The third item was a reference to the venture capital E.ON invested in Elcore (see next issue).

Karsten Wildberger, board member of E.ON SE, said: “Innovative energy solutions such as the fuel cell can provide real benefits to hotels by severely reducing energy costs while drastically improving environmental quality – up to the point of being carbon-neutral.”

Energy Storage Needs Political Backing

Trade Shows / Conferences

Sector integration, flexibility, level playing field – these were the buzzwords during the Energy Storage from March 14 to 16, 2017, both at the trade show exhibits and during the conferences. They made it unmistakably clear that the main issues were no longer questions in basic research, but energy policy, competition and marketing.



T. Constantinescu listening to an explanation of P2G projects

Stakeholders from the hydrogen and fuel cell industry needed some time to get used to the new environment, whereas it was normal for most attendees that the discussion revolved around the most recent draft of the renewable energy act coming from Brussels, the “winter package,” or that politics and business debate the latest developments in economic policy.

The around one dozen fuel cell and H₂ businesses exhibiting in Düsseldorf had little experience with those issues, as their focus the past years had been research and

development. But one could feel that for some, the situation was gradually changing. Despite a few research institutes, most organizations exhibiting in hall 8B were businesses which had already entered the market and were open to visions and new technologies.

It was the first time that Messe Düsseldorf had made an entire hall available for the event, and the move from the Congress Center Düsseldorf to the new location had been well received by most. Presentations and exhibits were in close vicinity to each other, but some visitors thought the conference area – which had been merely set apart by fabric dividers – looked a bit strange. Still, it served its purpose.

However, what looked less like a professionally set-up space was the one titled “Sector Integration,” which had been intended as the main point of contact for all those who wanted to learn about the entire process of renewable energy generation, from electrolysis to gas distribution. As unfortunate as it was for the businesses exhibiting there, the area looked cheap and, consequently, was frequented by few.

Apart from that, the mood was mainly a good one among attendees, whose number jumped to 4,200 – a considerable increase over previous years. The number of exhibitors also increased compared to 2016, to around 160, but there had been not as many as the organizers had originally expected (see New Location for Energy Storage Conference). Last year, the figure was 142, around 50 percent above the one of 2015.

Energy storage gets the short end

As a warm-up to the conferences, Thorsten Herdan, director of energy policy at the German federal economy ministry, invited attendees to play an active part in shaping the energy transformation, but stressed that it was not about replacing conventional technologies merely because that was what some investors intended to do with their money right now.

Tudor Constantinescu, principal adviser to the EC’s Director General for Energy, again repeated the objectives of the European Commission’s “winter package” and conceded that energy storage had received little attention at EU level. The issue he was most concerned with was how to sensibly decarbonize backup capacities. There was consensus among the stakeholders that the regulatory framework for energy storage was not up to date or even severely impeded further development.

Industry meeting or trade show?

Stakeholders from the H₂ and fuel cell industry will have to decide soon whether they intend to use the Düsseldorf location simply as another industry meeting point or as an opportunity to exhibit at a trade show – besides the f-cell and the one in Hanover. In addition to the Energy Storage Europe, there is, of course, still the ees Europe in Munich to showcase storage technologies. This one shows similar growth potential and has the added advantage of taking place at the same time as Germany’s largest solar trade fair, the Intersolar. And even the New Energy World in Leipzig, the emove360° in Munich and the E-world in Essen attract some market actors. But maybe, the time for H₂ and fuel cell-only events has passed altogether.

Green Gas Replaces Oil

Residential Market



The heating industry continues to move forward with establishing natural gas as the go-to source for the energy supply of residential buildings, while increasingly adding efficient fuel cell technologies and eco-gas to the mix. The members of the Zukunft Erdgas advocacy group expect oil to no longer play an important role as an energy carrier in the medium term, as they believe it will gradually be replaced by renewable gases. A recent study has shown that this could lead to an around 80 percent cut in CO₂ emissions from heat supply.

During the E-world 2017 in Essen in early February 2017, the association presented a new study titled “Heat Market 2050” to show how to decarbonize the market. Timm Kehler, chair of Zukunft Erdgas, explained: “Politics will definitely need to create incentives for property owners if they want them to upgrade heating systems in their buildings.” He added that “highly efficient gas technologies, such as the fuel cell” would assume a key role in the future. And the addition of renewable natural gas to power-to-gas processes could mean a considerable contribution to meeting that 80 percent target.

Zukunft Erdgas, Wärmemarkt 2050, March 2017

read more: www.h2-international.com

Events

- May 8th to 12th, 2017, **10th Energy Storage World Forum**, in Berlin, Germany, www.energystorageforum.com
- May 10th to 11th, 2017, **Electric Vehicles**, Berlin, Germany, www.idtechex.com
- May 31st to June 1st, 2017, Fuel Cell & Hydrogen Technical Conference, University of Birmingham, United Kingdom, www.birmingham.ac.uk
- May 31th to June 2nd, 2017, ees Europe & Intersolar, Conference: May 30th to 31st, 2017, in Munich, Germany, www.ees-europe.com
- June 5th to 6th, 2017, **Hydrogen + Fuel Cells HFC 2017**, in Vancouver, Canada, www.hfc2017.com
- June 19th to 22th, 2017, **17th Advanced Automotive Battery Conference**, in San Francisco, CA, USA, www.advancedautobat.com
- June 27th to 28th, 2017, **International Hydrail Conference**, in Graz, Austria, www.hydrail.org
- July 4th to 7th, 2017, **European PEFC & Electrolyser-Forum**, in Lucerne, Switzerland, www.efcf.com

read more: www.h2-international.com/events/

Companies

Electrolyzers

AREVA H₂Gen

- **AREVA H2Gen GmbH**, Maarweg 137, 50825 Cologne, Germany, Phone +49-(0)221-888244-88, Fax -67, www.arevah2gen.com



Diamond Lite SA

- **Diamond Lite S.A.**, Rheineckerstr. 12, PO Box 9, 9425 Thal, Switzerland, Phone +41-(0)71-880020-0, Fax -1, diamondlite@diamondlite.com, www.diamondlite.com



- **Giner, Inc.**, 89 Rumford Avenue, Newton, Massachusetts 02466, USA, Phone +1-(0)781-529-0500, information@ginerinc.com, www.ginerinc.com

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- **GKN Powder Metallurgy**, GKN Sinter Metals, PO Box 55, Ipsley House, United Kingdom – Redditch B98 0TL, Worcestershire, www.gkn.com/sintermetals

- **HPS Home Power Solutions GmbH**, Carl-Scheele-Str. 16, 12489 Berlin, Germany, Phone +49-(0)30-5169-5810, mail@homepowersolutions.de, www.homepowersolutions.de



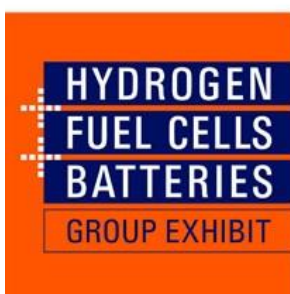
- **Hydrogenious Technologies GmbH**, Weidenweg 13, 91058 Erlangen, Germany, Phone +49-(0)9131-12640-220, Fax -29, www.hydrogenious.net



- **MicrobEnergy GmbH**, Specialist in Methanisation, Bayernwerk 8, 92421 Schwandorf, Germany, Phone +49-(0)9431-751-400, Fax -5400, info@microbenergy.com, www.viessmann.co.uk

Event Organizers

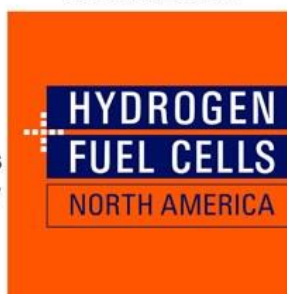
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EUROPEAN FUEL CELL FORUM

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- European Fuel Cell Forum, Obgardihalde 2, 6043 Luzern-Adligenswil, Switzerland, Phone +41-4-45865644, Fax 35080622, forum@efcf.com, www.efcf.com



- **Peter Sauber Agentur Messen und Kongresse GmbH**, f-cell and BATTERY+STORAGE, Wankelstr. 1, 70563 Stuttgart, Germany, Phone +49-711-656960-55, Fax -9055, www.f-cell.de, www.battery-storage.de

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www.ptec.eu

- **PTEC – Pressure Technology GmbH**, pipelines, screw connections, filters, valves, regulators, TPRD, Linde 11, 51399 Burscheid, Germany, Phone +49-2174-748-722, mail@ptec.eu, www.ptec.eu

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- **Busch Clean Air S.A.**, Chemin des Grandes-Vies 54, 2900 Porrentruy, Switzerland, Phone +41-(0)32-46589-60, Fax -79, info@buschcleanair.com, www.buschcleanair.com

Gas Diffusion Layers (GDL)

- **MeliCon GmbH**, Metallic Lightweight Construction, Porschestr. 6, 41836 Hückelhoven, Germany, Phone +49-(0)2433-44674-0, Fax -22, www.melicon.de



- **SGL Carbon GmbH**, Werner-von-Siemens-Str. 18, 86405 Meitingen, Germany, Phone +48 (0)8271-83-3360, Fax -103360, fuelcellcomponents@sglgroup.com, www.sglgroup.com

Hydrogen Distribution

- **Hydrogenious Technologies GmbH**, Weidenweg 13, 91058 Erlangen, Germany, Phone +49-(0)9131-12640-220, Fax -29, www.hydrogenious.net



- **Wystrach GmbH**, Industriestrasse 60, Germany – 47652 Weeze, Phone +49-(0)2837-9135-0, Fax -30, www.wystrach-gmbh.de

Membrane and Separator



- **FUMATECH BWT GmbH**, Carl-Benz-Str. 4, 74321 Bietigheim-Bissingen, Germany, Phone +49-(0)7142-3737-900, Fax -999, www.fumatech.com



- **Plansee SE**, Bipolar Plates, Interconnects and Metal Supported Cells, 6600 Reutte, Austria, Phone +43-(0)5672-600-2422, www.plansee.com

Organization



- **Deutscher Wasserstoff- und Brennstoffzellen-Verband**
German Hydrogen and Fuel Cell Association, Deutscher Wasserstoff- und Brennstoffzellen-Verband e.V. (DWV), Moltkestr. 42, 12203 Berlin, Germany, Phone +49-(0)30-398209946-0, Fax -9, www.dwv-info.de
- **hySOLUTIONS GmbH**, Steinstrasse 25, 20095 Hamburg, Germany, Phone +49-(0)40-3288353-2, Fax -8, hysolutions-hamburg.de



- **Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie**
National Organisation Hydrogen and Fuel Cell Technology (NOW GmbH),
Fasanenstr. 5, 10623 Berlin, Germany, Phone +49-(0)30-3116116-15, Fax -99,
www.now-gmbh.de

Reformers

- **WS Reformer GmbH**, Dornierstrasse 14, 71272 Renningen, Germany, Phone +49-(0)7159-163242, Fax -2738, www.wsreformer.com

Research & Development

- **Fraunhofer ICT-IMM**, Reformer and Heat Exchanger, Carl-Zeiss-Str. 18-20, 55129 Mainz, Germany, Phone +49-(0)6131-9900, info@imm.fraunhofer.de,
www.imm.fraunhofer.de



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- **Deutsches Zentrum für Luft- und Raumfahrt (DLR) / German Aerospace Center**, Institute of Engineering Thermodynamics Energy System Integration, Pfaffenwaldring 38-40, 70569 Stuttgart, Germany, Phone +49-(0)711-6862-672, Fax -747, www.dlr.de/tt, www.dlr.de/tt

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H2-international – The e-Journal on Hydrogen and Fuel Cells

ISSN-Online: 2367-3931

Publisher: Hydrogeit Verlag, Sven Geitmann, Gartenweg 5, 16727 Oberkraemer, Germany, Phone +49 (0)33055-21322, Fax +49 (0)33055-21320

UID/VAT: DE221143829

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