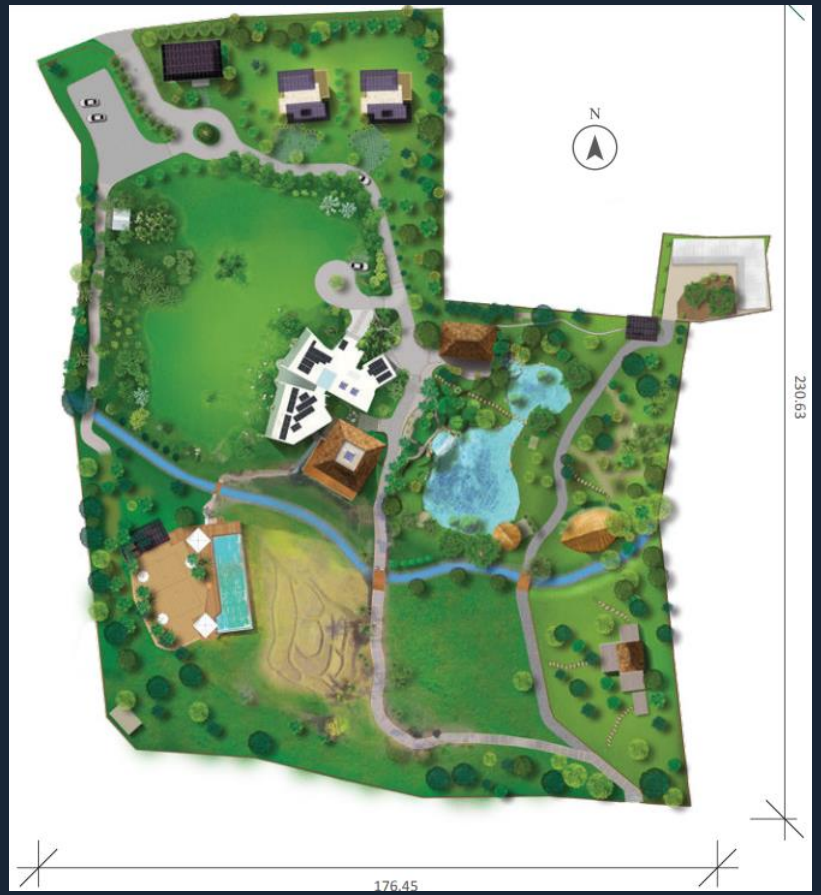
# Decentralising Hydrogen Globally: Enapter moves into Japan and China

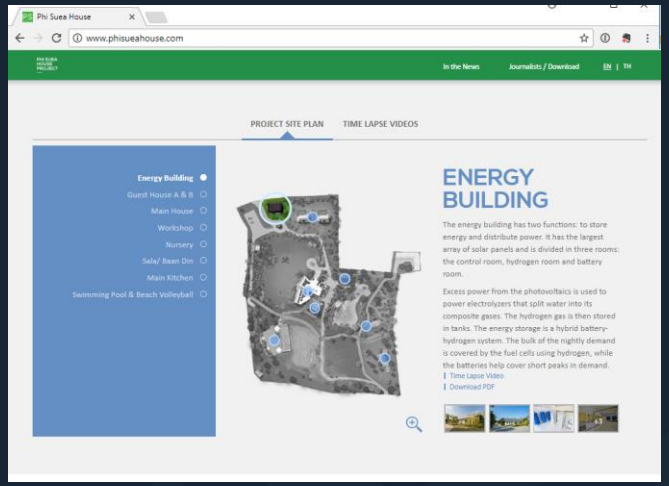
Sebastian-Justus Schmidt, Enapter

Handelskammer Hamburg - International Hydrogen Symposium

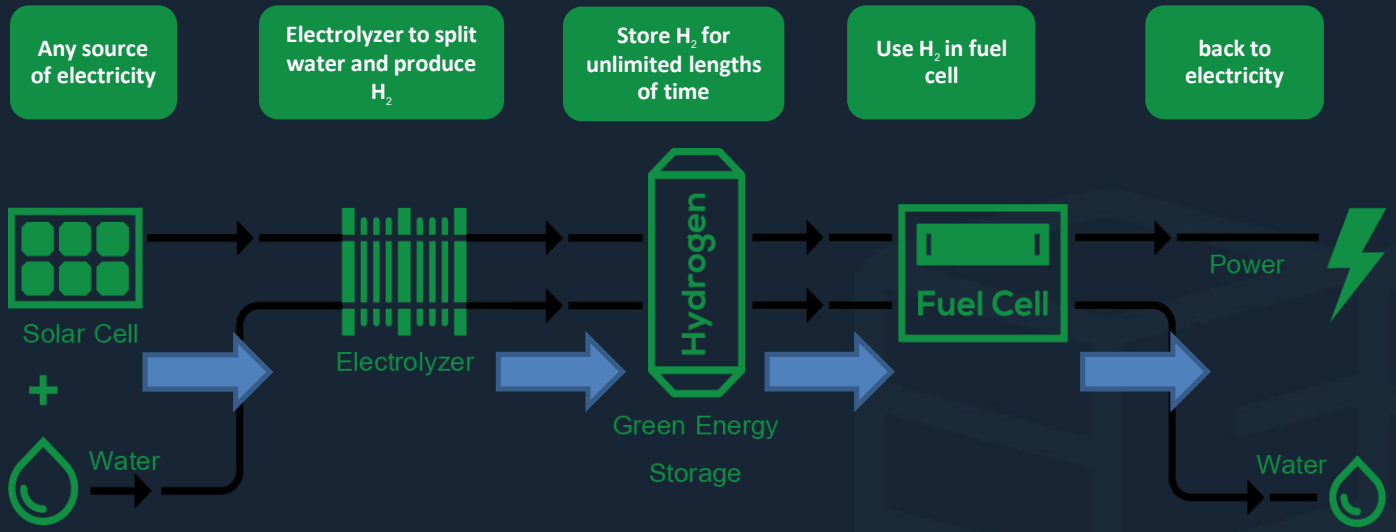
24th October 2019| Hamburg, Germany

…it all started here




**www.phisueahouse.com**


Any source of electricity
Electrolyzer to split water and produce $H_2$
Store $H_2$ for unlimited lengths of time
Use $H_2$ in fuel cell
back to electricity
Solar Cell
+
Water
Electrolyzer
Hydrogen
Green Energy Storage
Fuel Cell
Power
Water


AMERICAN PACIFIC INTERNATIONAL SCHOOL
Chiang Mai, Thailand
An outstanding place for
Living and learning

H2-international

The e-Journal on Hydrogen and Fuel Cells

H2

Home | About Us | e-Journal | Subscribe | Media Kit | Companies | Events | News

# Once Acta, now Enapter

June 5, 2018 by Hydrogeit

Sebastian-Justus Schmidt

So far, we've closely followed the developments unfolding at Berlin-based fuel cell supplier Heliocentris and the takeover of its locations in Germany (see H2-international, May 2017 and January 2018). We also reported about the comeback of FutureE and the spin-off of Home Power Solutions. And recently, we sat down with Sebastian-Justus Schmidt, owner of Enapter, to find out what happened to Heliocentris' subsidiary in Tuscany.

*Mr. Schmidt, the story is that it all started in Pisa, with an Italian business named Acta. First, please tell us what became of this company.*

Schmidt: Acta, which was later renamed Heliocentris Italy and is now Enapter, entered AIM, the Alternative Investment Market of the London Stock Exchange, in 2004. At the end of 2014, it lost a court case and was ordered to pay EUR 1.35 million. Since the company had already slipped into the red, it filed for "concordato preventivo," Italy's version of Chapter 11 bankruptcy protection in the United States. After all, it had burned through more than EUR 35.9 million in vital cash reserves from AIM gains and various other investments.

*What had Acta been working on?*

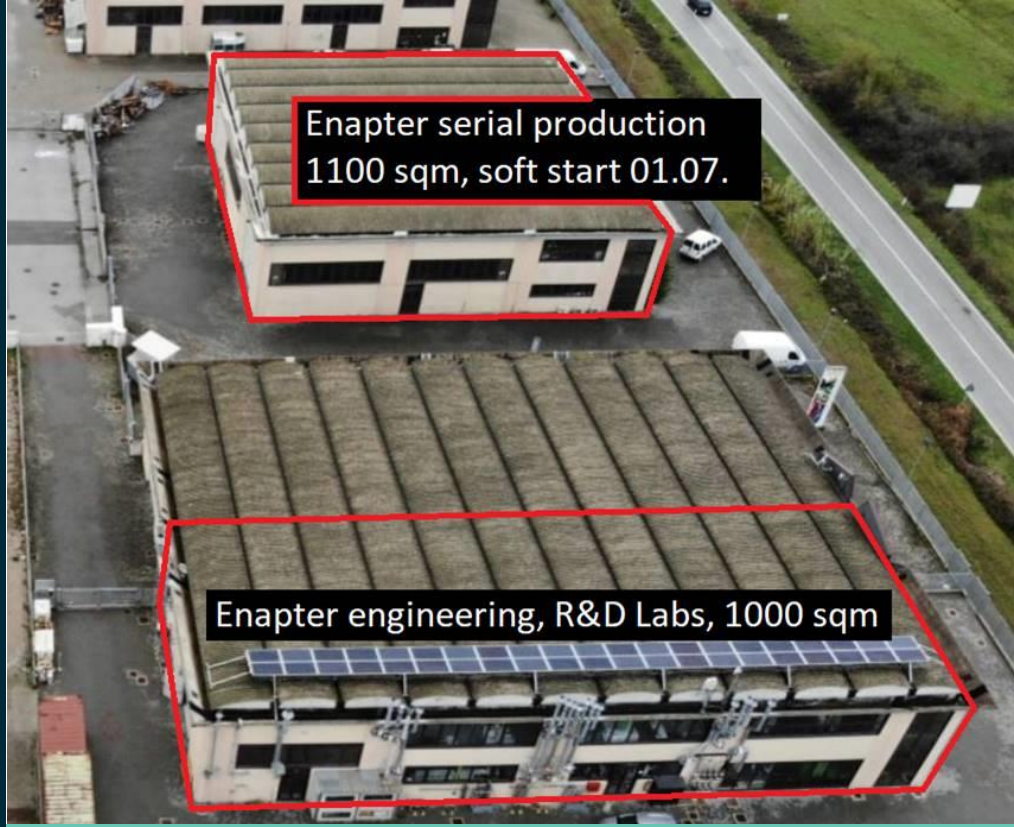
Schmidt: With a small team made up of chemical engineers, Acta had begun to develop fuel cells, but refocused its attention in 2007, turning instead to alkaline water electrolysis. Initial results looked promising, and in 2010, management decided to make electrolyzers the company's only line of business. One year later, Acta started delivering units to a few institutes and signed a distribution agreement with German supplier Heliocentris Energy Solutions.

Take over
November 2017

**Facts about**
**Enapter**

Employee numbers are rapidly growing
01.11.2017: 11 employees
01.05.2019: 59 employees
24.10.2019: 76 employees

Locations
Italy: R&D center and production.
Offices in Germany, Russia and Thailand



**Serial Fabrication ramp up 07/2019**


Shell NEW ENERGY CHALLENGE
Amsterdam - 14.10.2018


Winner Start Up Award German Energy Agency (dena)
Berlin - 08.04.2019

Enapter pitching at the World Energy Congress 2019. We met several high-level contacts such as the Energy Minister of UAE


Enapter speaking about hydrogen for mobility at the IAA

# …momentum helps


Forbes

EDITOR'S PICK | 2,385 views | Oct 15, 2019, 08:40am

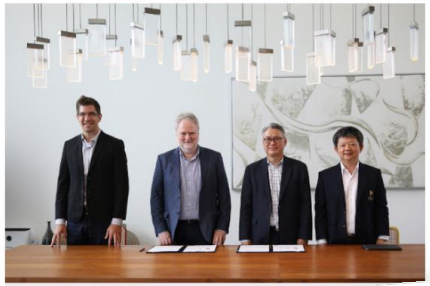
## Morals And Money Will Escalate The Pace Of The Hydrogen Economy

Ken Silverstein Senior Contributor
Energy
*I write about the global energy business.*

Forbes: Dedicated articles about Enapter as well as prominent mentions

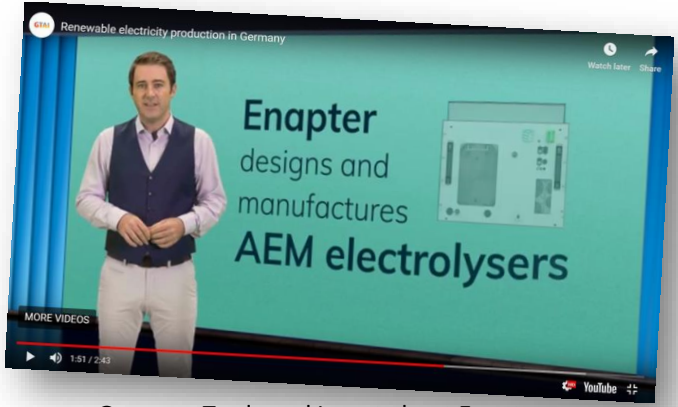

H2VIEW

HOME NEWS VIEWS MAGAZINE STUDY SUBSCRIBE


© Enapter

for giving H2 View your time. Could you tell us a little about your latest develo
ced, with EGAT in Thailand?
d Enapter have been discussing hydrogen in Thailand since the Phi Suea House proj
Mai was inaugurated. The modular hydrogen production capabilities caught EGAT ey
lop any kind of project with it. This is Enapter's speciality.

H2VIEW: Prominent coverage in industry news




Germany Trade and Invest about Enapter


Forbes Billionaires Innovation Leadership Money Business Small Business

EDITOR'S PICK | 8,905 views | Oct 8, 2019, 09:50am

## The Hydrogen Economy Is Within Grasp And Progressive Energy Companies Know It

Ken Silverstein Senior Contributor
Energy
*I write about the global energy business.*


Handelsblatt

Handelsblatt Zu teuer? Jetzt für 1 € umdenken

POWER-TO-X

## Start-up Enapter will Wasserstoff für jedermann machen

Wasserstoff-Start-ups erleben einen Boom. Die meisten setzen dabei auf Industrie-Anlagen. Enapter liegt eine andere Idee zugrunde, entstanden in Thailands Norden.

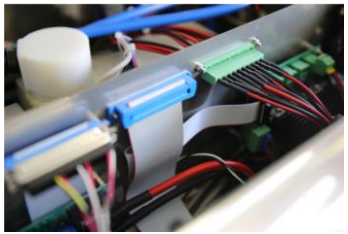
Kathrin Witsch

Enapter Interview in Handelsblatt Online and Print

# Enapter Electrolyser


## Key metrics

- **500 NL/hr** or 0.5 $Nm^3/hr$
- **35 bar** output pressure
- **99.95% - 99.999%** $H_2$ purity
- **<20 µS/cm** water purity input
- **High efficiency**: 4.8 kWh for 1 $Nm^3$ of $H_2$



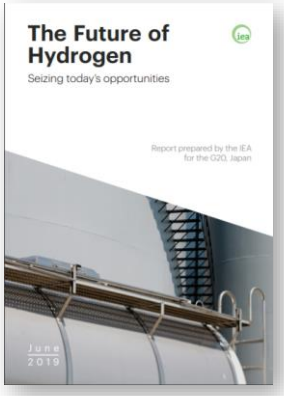

**IT Industry 1981**

**Electrolyser Industry 2019**


TIGER
POWER
TIGER
POWER


TOSHIBA
TOSHIBA
TOSHIBA


## Let's have a closer look to China, Japan and Korea




| | |
|---|---|
| **Japan** | Hosted the first Hydrogen Energy Ministerial Meeting of representatives from 21 countries, plus companies, resulting in a joint Tokyo Statement on international co-ordination. Updated its Strategic Roadmap to implement the Basic Hydrogen Strategy, including new targets for hydrogen and fuel cell costs and deployment, and firing hydrogen carriers in power plants. The Development Bank of Japan joined a consortium of companies to launch Japan H2 Mobility with a target to build 80 hydrogen refuelling stations by 2021 under the guidance of the Japanese central government's Ministerial Council on Renewable Energy, Hydrogen and Related Issues. The Cross-Ministerial Strategic Innovation Promotion Program (SIP) Energy Carriers initiative concluded its 2014–18 work programme and a Green Ammonia Consortium was launched to help support the next phase. |
| **Korea** | Published a hydrogen economy roadmap with 2022 and 2040 targets for buses, FCEVs and refuelling stations, and expressed a vision to shift all commercial vehicles to hydrogen by 2025. Provided financial support for refuelling stations and eased permitting. Announced that it would work on a technological roadmap for the hydrogen economy. |
| **China** | Announced that the Ten Cities programme that launched battery electric vehicles in the People's Republic of China ("China") would be replicated for hydrogen transport in Beijing, Shanghai and Chengdu, among others. Announced that Wuhan will become the first Chinese Hydrogen City, with up to 100 fuel cell automakers and related enterprises and up to 300 filling stations by 2025. Announced targets of 5 000 fuel cell electric vehicles (FCEVs) by 2020 and recommitted to the 2015 target of 1 million FCEVs by 2030, plus 1 000 refuelling stations. Exempted FCEVs (and battery electric vehicles) from vehicle and vessel tax. |

https://www.g20karuizawa.go.jp/assets/pdf/The%20future%20of%20Hydrogen.pdf

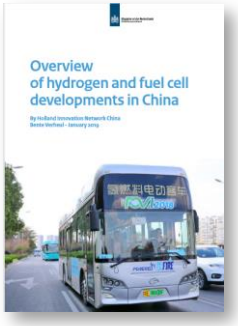
South China Morning Post

Companies

# China sets sight on leapfrogging US and Japan in fuel-cell vehicles with subsidies for buyers and incentives for charging stations

- Buyers in 17 provinces will get subsidies of up to 160,000 yuan per fuel-cell vehicle this year while local authorities in 10 cities will hand out incentives of up to 4 million yuan toward the construction of every refuelling station
- The Chinese government is aiming to put a million fuel-cell vehicles on the roads by 2030, from 50,000 in 2025 and last year's 1,791 units, more ambitious than plans outlined by Japan or in the US state of California

Eric Ng
Published: 7:30am, 4 Sep, 2019




**9th Five-Year Plan (1996-2000)** – $4.75 million USD (from 973) and $60,000 USD (from 863)

**10th Five-Year Plan (2001-2005)** – Additional $4.75 million USD invested, as well $3.48 million USD into hydrogen from solar power. The Ministry of Science and Technology (MOST) approved of $139 million USD funding to advance hybrid-electrics and FCVs. Although most funding went to hybrid and electric vehicles, $40 million USD was invested in the research of fuel cell technologies. Via the 973 Program, Tsinghua University received $5.6 million USD funding for research on production, storage material and transmission of hydrogen and fuel cell membranes and catalysts.

**11th Five-Year Plan (2006-2010)** – $28.88 million USD allocated via the advanced energy technology fund for hydrogen and fuel cell technology and $23.74 million USD for FCEVs.

**12th Five-Year Plan (2011-2015)** – During the 12th Five-Year Plan, the government gave strong incentives to companies for accelerating the NEV market. While the BEV market continues to grow rapidly, FCEVs are seen as the next logical step. The plan emphasized green development and included binding energy targets. In 2011, $15.8 million USD was made available (through the 863 program) specifically for hydrogen and fuel cell research projects. The 973 program received $11.1 million USD funding for the development of solid-oxide fuel cells (SOFCs) and platinum-free fuel cells. Platinum is used for the catalyst of the (PEM) fuel cell and due to its high cost hinders mass implementation of fuel cells applications.

**13th Five-Year Plan (2016-2020)** – In the guidelines of the strategic emerging sectors of the latest Five-Year Plan hydrogen and fuel cells are incorporated in Energy storage and distributed energy and New energy vehicles. Local companies are encouraged to acquire the technologies for hydrogen production, storage and fuel cell systems in order to achieve the large-scale deployment of HRS and other fuel cell applications. The aim is to achieve mass production of FCEVs by 2020 and, based on the success story of PHEVs and BEVs in China, it is likely that the ambitious targets will be reached.
Specifically

| | | 2020 | 2025 | 2030 |
|---|---|---|---|---|
| Overall objective | | Small scale public sector demonstration in selected areas (5,000 FCVs) | Large-scale development of FC passenger cars and service vehicles in urban areas (50,000 FCVs) | Large-scale commercial deployment of passenger cars and commercial vehicles (one million FCV's) |
| | | Fuel cell system production capacity >1,000 units per enterprise | Fuel cell system production capacity >10,000 units per enterprise | Fuel cell system production capacity >100,000 units per enterprise |
| Hydrogen fuel cell vehicles | Functional requirements | Cold start -30°C, power system structure optimisation, FCV cost close to all-electric vehicles | Cold start -40°C, small volume production, FCV cost similar to hybrid vechile | FCV overall performance comparable with traditional ICE vehicles – achieving competitive advantage |
| | Commercial vehicle | Cost ≥ RMB 1.5 million | Cost ≥ RMB 1.0 million | Cost ≥ RMB 600,000 |
| | Passenger car | Max speed ≥ 160km/h<br>Lifespan 200,000km<br>Cost ≥ RMB 300,000 | Max speed ≥ 170km/h<br>Lifespan 250,000km<br>Cost ≥ RMB 200,000 | Max speed ≥ 180km/h<br>Lifespan 300,000km<br>Cost ≥ RMB 180,000 |
| Hydrogen infrastucture | $H_2$ supply | Decentralised hydrogen production from renewable sources; industrial by-products such as coke-oven gas | | Decentralised $H_2$ production from renewable sources |
| | $H_2$ delivery | High pressure hydrogen storage and delivery | * Cryogenic liquid * hydrogen delivery | High density organic liquid hydrogen storage ** and delivery at normal pressure |
| | HRS | 100 stations | 350 stations | 1,000 stations |


G20

**Fuel-cell ambitions**

Number of FCVs on the roads

| | *2018* | *2025* | *2030* |
|---|---|---|---|
| **China** | 1,791 | 50,000 | 1 million |
| **Japan** | 2,926 | 200,000 | 800,000 |
| **South Korea** | 900 | 80,000 | 1.8 million |

Source: International Energy Agency, South Korea

TECHNOLOGY NEWS SEPTEMBER 26, 2019 / 4:34 PM / A MONTH AGO

# Toyota to develop hydrogen fuel cars with Chinese partners FAW, GAC

Yilei Sun, Norihiko Shirouzu 3 MIN READ

BEIJING (Reuters) - Toyota Motor plans to launch hydrogen fuel-cell car models with its China partners Guangzhou Automobile Group (GAC) and FAW Group [SASACJ.UL], as the Japanese automaker tries to boost its presence in the world's biggest auto market.


2018
长三角氢能燃料电池汽车科普巡游

Feichi FSQ6110FCEVG1

Yutong ZK6105FCEVG2

Yutong ZK6125FCEVG6

Yutong ZK6125FCEVG7

Feichi FSQ5080XXYFCEV

Feichi FSQ6120FCEVG

Aoxin JAX5080XXYFCEV1

Feichi FSQ6860FCEVG

Feichi FSQ6860FCEVGS

Foton BJ6851FCEVCH-1

Ankai HFF6850G03FCEV

Dongfeng EQ5080XLCTFCEV2

King Long XMQ6127AGFCEV

Feichi FSQ6700FCEVG

Foton BJ6852FCEVUH

Dongfeng EQ5080XXYTFCEV1

Skywell NJL6129FCEV

Feichi FSQ6110FCEVG

Dongfeng EQ6700LAFCEV

Zhongtong LCK5085XXYFCEVH9

7.5T fuel cell truck fleet in Shanghai for e-commerce companies


7.5T fuel cell truck fleet in Foshan, Guangdong

Exhibitions in China


Enapter
构建未来能源的基石
Enapter
用例


DRONES

# BShark's hydrogen-powered Narwhal 2 flies for 2 hours, and transmits nearly 20 miles

By Loz Blain
September 17, 2018

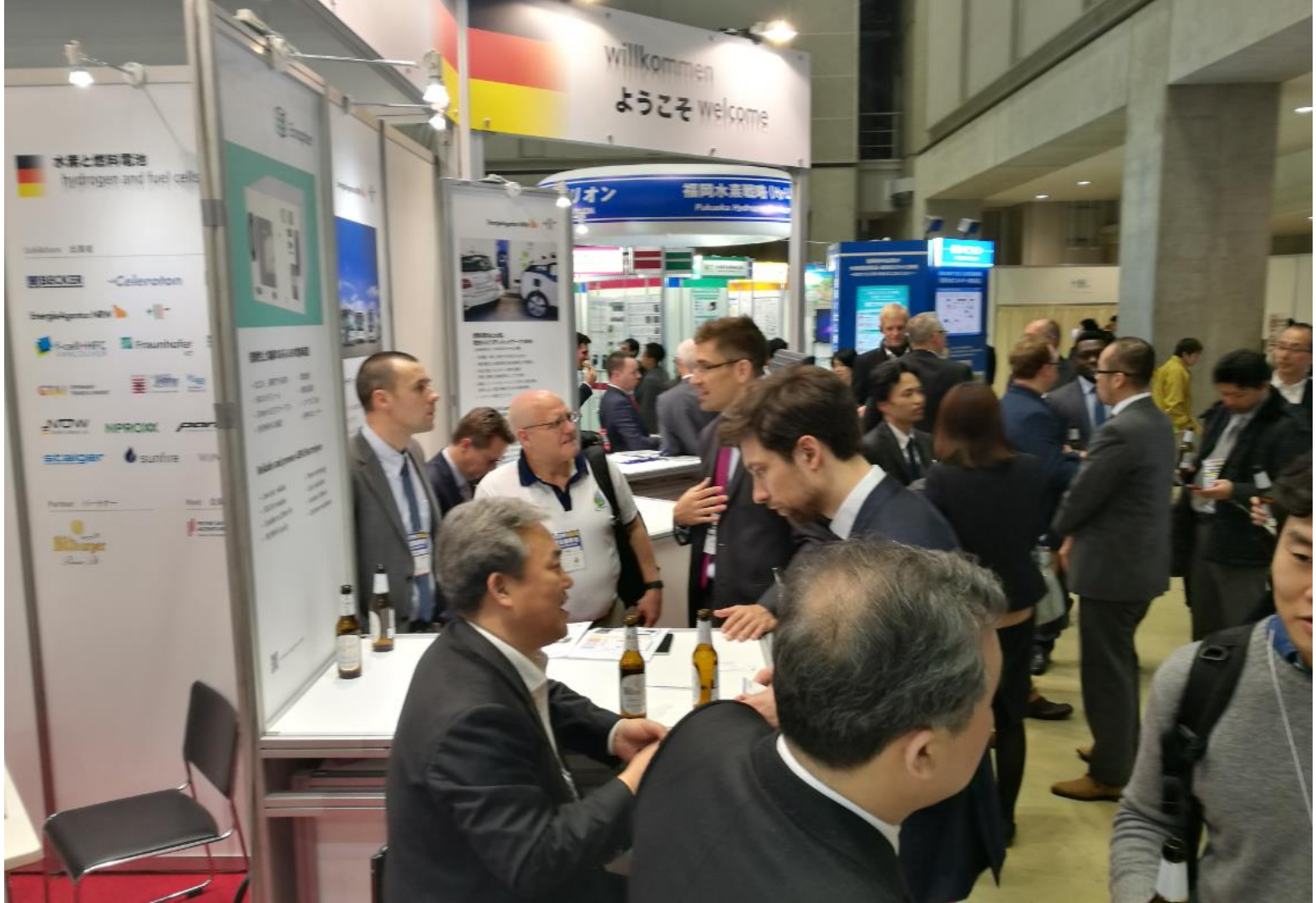
VIEW 3 IMAGES

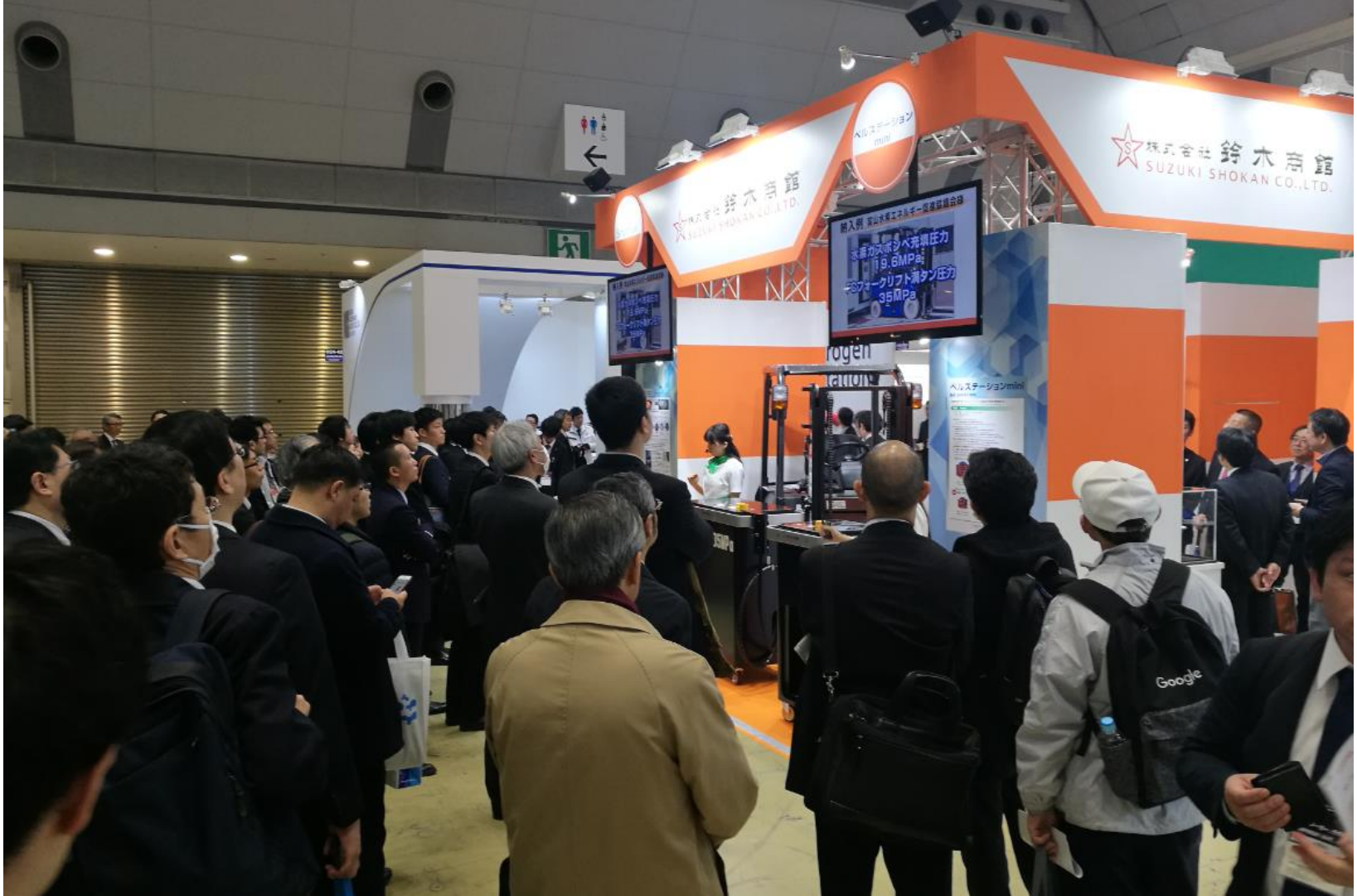
*BShark's Narwhal 2 offers two hours endurance and 30 km range for both control and video transmission* BShark

BShark has moved mountains to bring down the price of its long-range Narwhal 2 drone. Powered by a hydrogen fuel cell, this 6.6-kg (14.5-lb) monster flies for up to two hours, transmits up to 30 km (18.6 mi) away and costs just US$6,800, making it an attractive option for industrial inspection and surveillance applications.


Week は 年2回 開催!
ICE A YEAR AT OSAKA & TOKYO!
2020年 2月 東京
in Feb. 2020 at TOKYO BIG SIGHT
次回は110社増! 1,700社が出展
1,700 Exhibitors Gather! 110 Exhibitors Increased from Previous Show
次回 会場レイアウト図
FLOOR PLAN
国際 風力発電展 WIND EXPO 2020
国際 二次電池展 BATTERY JAPAN 2020
2F 南展示棟 South Halls
国際 太陽光発電展 PV EXPO 2020
SOLD
青海展示棟
1F 南展示棟 South Halls
国際 スマートグリッド EXPO
国際 バイオマス展
国際 リサイクル EXPO
会 期：2020年 2月26日[水]～28日[金]
Dates : February 26 (Wed) -28 (Fri), 2020
会 場：東京ビッグサイト 西・南・青海 展示棟
Venue : Tokyo Big Sight, West · South · Aomi Halls
主 催：リード エグジビション ジャパン(株)
Organised by : Reed Exhibitions Japan Ltd.
青海 展示棟


FULL-E
TROOW
Enapter
信頼性と実績のあるAEM電解装置
Reliable and proven AEM Electrolyser
EnergieAgentur.NRW


willkommen
ようこそ welcome
水素と燃料電池
hydrogen and fuel cells


株式会社鈴木商館
SUZUKI SHOKAN CO.,LTD.
水素ガスボンベ充填圧力
19.6MPa
フォークリフト用タンク圧力
35MPa
ヘルステーションmini
Google


SIN
HONDA
FUEL CELL


SHIPS


TOYOTA
FUEL CELL
YAMATO

## Thank you!

Sebastian@enapter.com

## …also some greetings from Martin Herrmann (sorry, only in German)


*Wasserstoff, Wasserstoff/ ich hoff und hoff auf Wasserstoff/*
*VW und Daimler sind zu doff/ für Wasserstoff!*
*Der Japaner ist schon da/ mit Wasserstoff bei Toyota/*
*Japan ist auf der richtigen Fährte/ bei uns fälscht man bloss die Abgaswerte/*
*sie fälschen bloss die Werte/ gefälschte Werte/ das ist doch die Härte:/*
*sind das jetzt die neuen deutschen Grundwerte?*
(wird noch überarbeitet)