

CLEAN ENERGY

01/2025



News

The Future of Energy Storage
and Solar Energy

Topics

Hydrogen Engines for Easyjet
AI for Reef Protection

Shows

Preview Intersolar San Diego
E-World 2025



Imprint:

CLEAN ENERGY Magazine is a publication of Wieshoff Verlag
www.verlag.wieshoff.de

Editor-in-chief and publisher:

Juergen Wieshoff, Am Giessbach 19, 78351 Bodman-Ludwigshafen

Phone: +49 (0)7773-93768-91, Fax -99

Editorial office: Juergen Wieshoff

Freelance editors: Ashley Brown, Eduardo Navarro, Kim Chung, Victoria Wieshoff

editor@CLEAN-ENERGY-Magazine.com

www.CLEAN-ENERGY-Magazine.com

Mediadata:

www.CLEAN-ENERGY-Magazine.com\Media

Advertising Rate Card 2025/26 Version 25.2 as of 20.02.2025.

All rights reserved. Reprinting, including excerpts, as well as photomechanical and electronic reproduction only with the permission of the publisher

Picture/source reference (page/source): longdan91/pixabay, u_wqqh87ok4g/Pixabay, Seatrium Ltd., Pavel Kapysh/Pixabay

Dear Readers,

It is with great pride and anticipation that I, alongside an enthusiastic international team, present to you the new edition of CLEAN ENERGY magazine. Our combined passions and expertise converge here to create a beacon of knowledge for those eager to understand and participate in the dynamic world of clean energy.

In the vast landscapes of our world, wind farms reach for the skies, and the oceans dance with the promise of wave energy. At CLEAN ENERGY magazine, we're committed to exploring these innovative ways to harness the power of the elements. As we journey deeper, the cutting-edge realm of energy storage emerges, revealing secrets that pave the way for a greener, more reliable grid.

For those who wear their green hearts on their sleeves, sustainability remains at our core. Our pages are filled with the latest eco-friendly innovations and stories of resilience that inspire action. And as roads of the future hum with electricity, we delve into the fascinating world of electric mobility, spotlighting designs and insights that champion an eco-conscious drive.

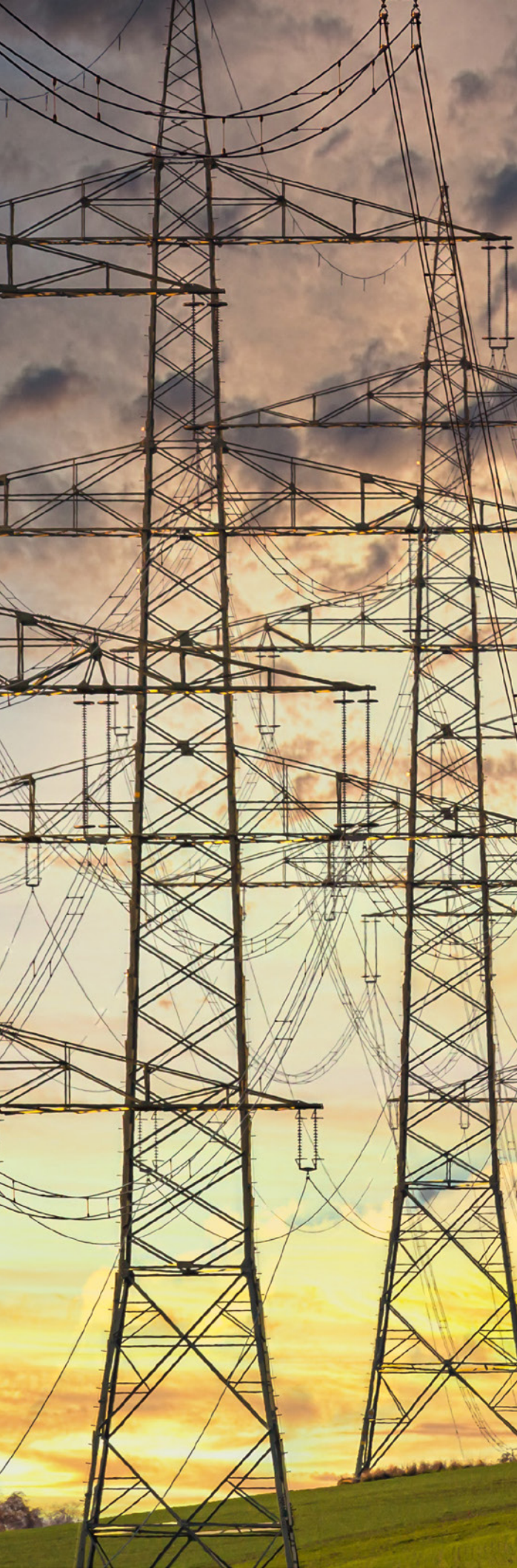
But the future isn't just green; it's smart. The evolution of smart grids showcases a revolution in how we think about distributing and managing power. They stand testament to a vision of efficiency, adaptability, and resilience. And as the world grows more interconnected than ever, the Internet of Things, or IoT, introduces a dimension where connectivity meets clean energy. Through our lens, witness how interconnected devices are refining the paradigms of energy consumption, management, and optimization.

We invite you to immerse yourself in these narratives, stories of progress and hope. And for those craving an even deeper dive, follow us on social media and subscribe to our magazine - free of charge, of course!

Here's to a shared journey towards a brighter, cleaner, and more sustainable world.

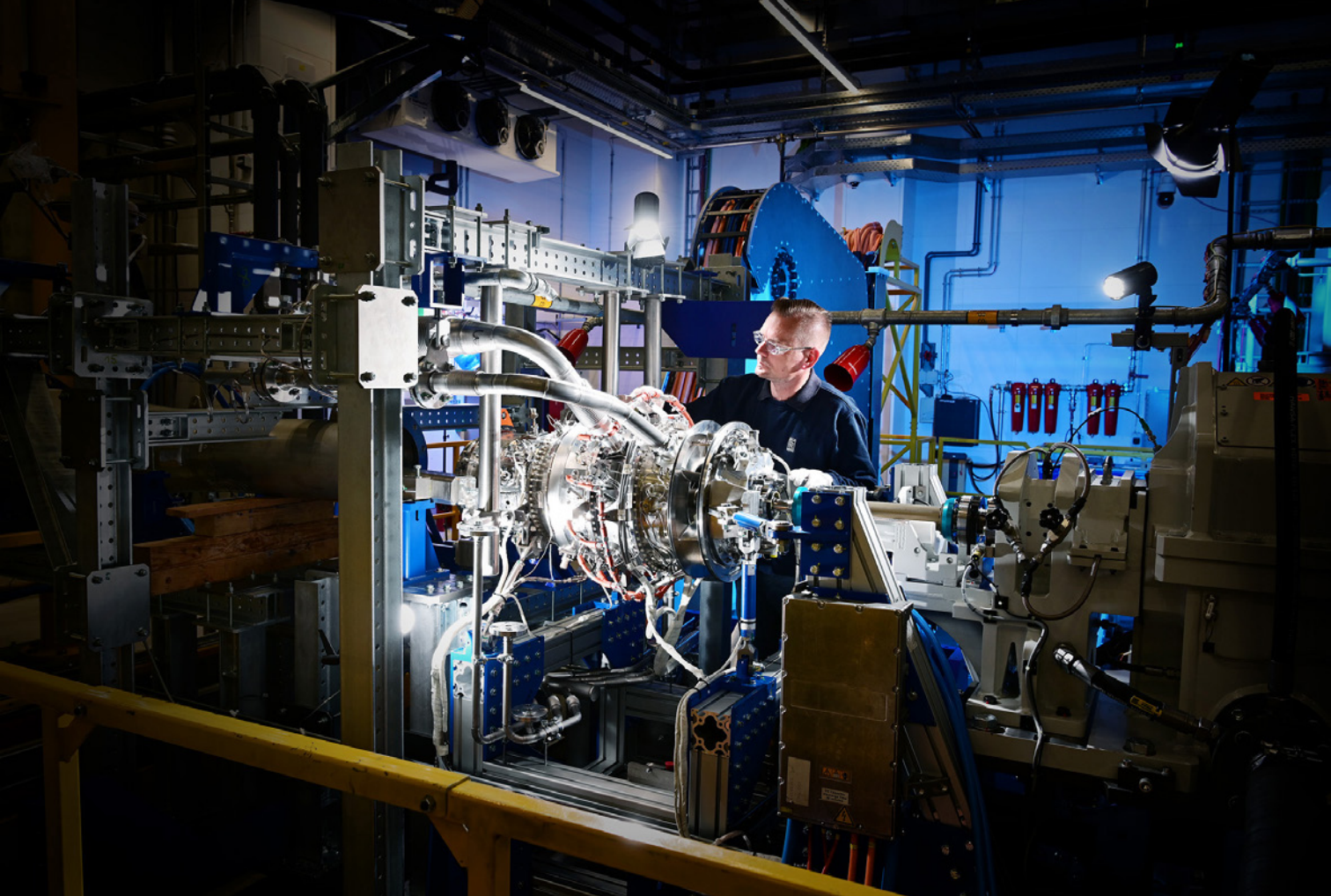
Warm regards,

Juergen Wieshoff
Publisher, CLEAN ENERGY Magazine



Index

Rolls-Royce hydrogen research project sets new world industry first with key milestone success	5
Global OTEC and UFRJ sign collaboration to advance ocean energy in Brazil	9
Cleantech Group Unveils the Global Cleantech 100	10
Construction of a hydrogen refuelling station in Hallstadt has been started by MorGen	11
Doosan has ordered fuel cell components from Alleima for mass SOFC production	11
First rules of the European Artificial Intelligence Act are now applicable.....	13
Comparing Energy Transition Trends in Europe and the United States: Key Developments and Priorities for 2025	14
Technology breakthroughs are unlocking geothermal energy's vast potential in countries across the globe.....	17
The Future of Energy Storage: Key Trends Shaping the Industry in 2025 and Beyond.....	19
Advancements in Floating Energy Storage: An Examination of Southeast Asia's Initiatives	22
Artificial intelligence for reef protection	24
Inspirational idea: Farm carbon	27
German start-up develops the world's first solid-state battery ready for series production	29
The Future of Solar Energy	31
E-world 2025 is Fully Booked: Record Space with Over 960 Exhibitors	34
Volkswagen Group Charging (Elli) Presents New Charging Products for E-Fleets and Companies	34
nexo Low Voltage Solutions	36
World's first DC meter in 4DU size launched by DZG Metering.....	37
Optimal connectivity: Kiwigrd tests and certifies systems.....	38
chargecloud presents software ecosystem	39
Show Special San Diego	40
Anza Expands One-of-a-kind Platform for Developers.....	43
Canadian Solar's e-STORAGE to Deliver 2 GWh of Energy Storage Systems	43
FranklinWH Announces General Availability of Whole Home Energy Management System	44
The Allure of San Diego: A Coastal Gem.....	46
A Whirlwind Tour: The Best of San Diego in 48 Hours.....	48
The Paradigmatic Shift in Utility Sector: Embracing Customer Service in the Digital Era .	52



Rolls-Royce hydrogen research project sets new world industry first with key milestone success

In October Rolls-Royce announced a further key milestone, a world industry first, has been achieved in its hydrogen research project. Both Rolls-Royce and its partner easyJet are committed to being at the forefront of the development of hydrogen combustion engine technology capable of powering a range of aircraft, including those in the narrow-body market segment, from the mid-2030s onwards.

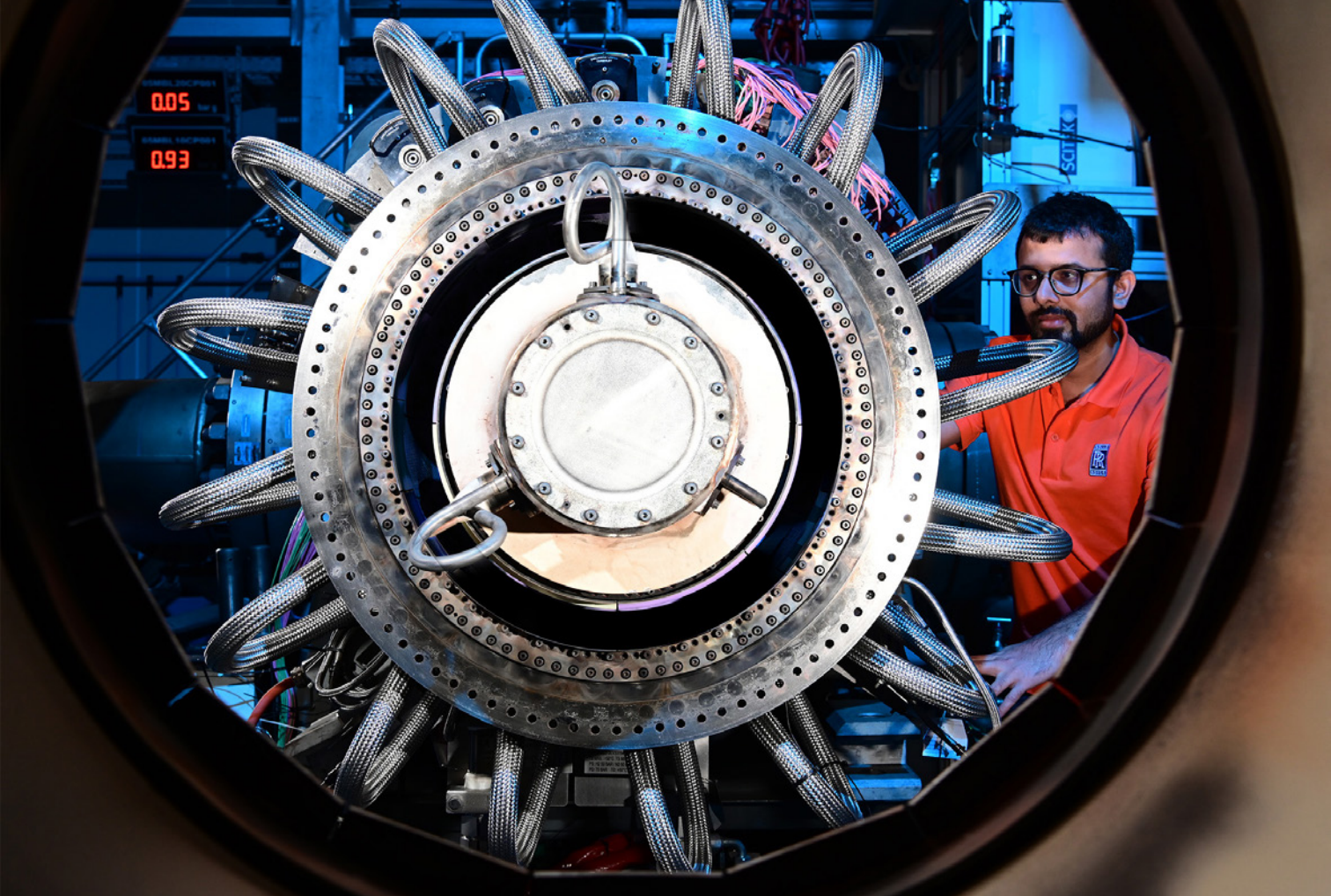
Now, working with Loughborough University in the UK and the German Aerospace Centre Deutsches Zentrum für Luft-und Raumfahrt (DLR), Rolls-Royce has proven a critical engine technology that marks another significant step in the journey to enabling hydrogen as an aviation fuel.

Tests on a full annular combustor of a Pearl 700 engine at DLR in Cologne running on 100% hydrogen have proven the fuel can be combusted at conditions that represent maximum take-off thrust.

Key to that achievement has been the successful design of advanced fuel spray nozzles to control the combustion process. This involved overcoming significant engineering challenges as hydrogen burns far hotter and more rapidly than kerosene. The new nozzles were able to control the flame position using a new system that progressively mixes air with the hydrogen to manage the fuel's reactivity. Rolls-Royce is pleased to confirm that combustor operability and emissions were both in line with expectations.

The individual nozzles were initially tested at intermediate pressure at Loughborough's recently upgraded test facilities and at DLR Cologne before the final full-pressure combustor tests took place at DLR Cologne. Last year, easyJet and Rolls-Royce also set a world first by successfully running a modern aero engine, an AE2100, on green hydrogen at Boscombe Down, UK.

These recent tests mean the combustion element of the hydrogen programme is now well understood, while work continues on systems to deliver the fuel to the engine and integrate those systems with an engine.



Grazia Vittadini, Chief Technology Rolls-Royce, said: „This is an incredible achievement in a short space of time. Controlling the combustion process is one of the key technology challenges the industry faces in making hydrogen a real aviation fuel of the future. We have achieved that, and it makes us eager to keep moving forward. I want to thank easyJet, Loughborough University and DLR for their dedication and support to reach this milestone.”

Johan Lundgren, CEO of easyJet, said:“We believe hydrogen is the future of short-haul aviation and the success of this test and progress being made demonstrates that this is becoming ever closer. We remain optimistic that it will play a critical role in helping us achieve the ambitious goals we set out in our net zero roadmap.”

Professor Dan Parsons, Pro Vice-Chancellor for Research and Innovation, Loughborough University, said:“In conjunction with its partners, the National Centre for Combustion and Aerothermal Technology (NCCAT) at Loughborough is delighted to have supported the landmark testing and development of advanced aerospace fuel spray nozzles utilising hydrogen fuel. This is a major advance towards net zero aviation.”

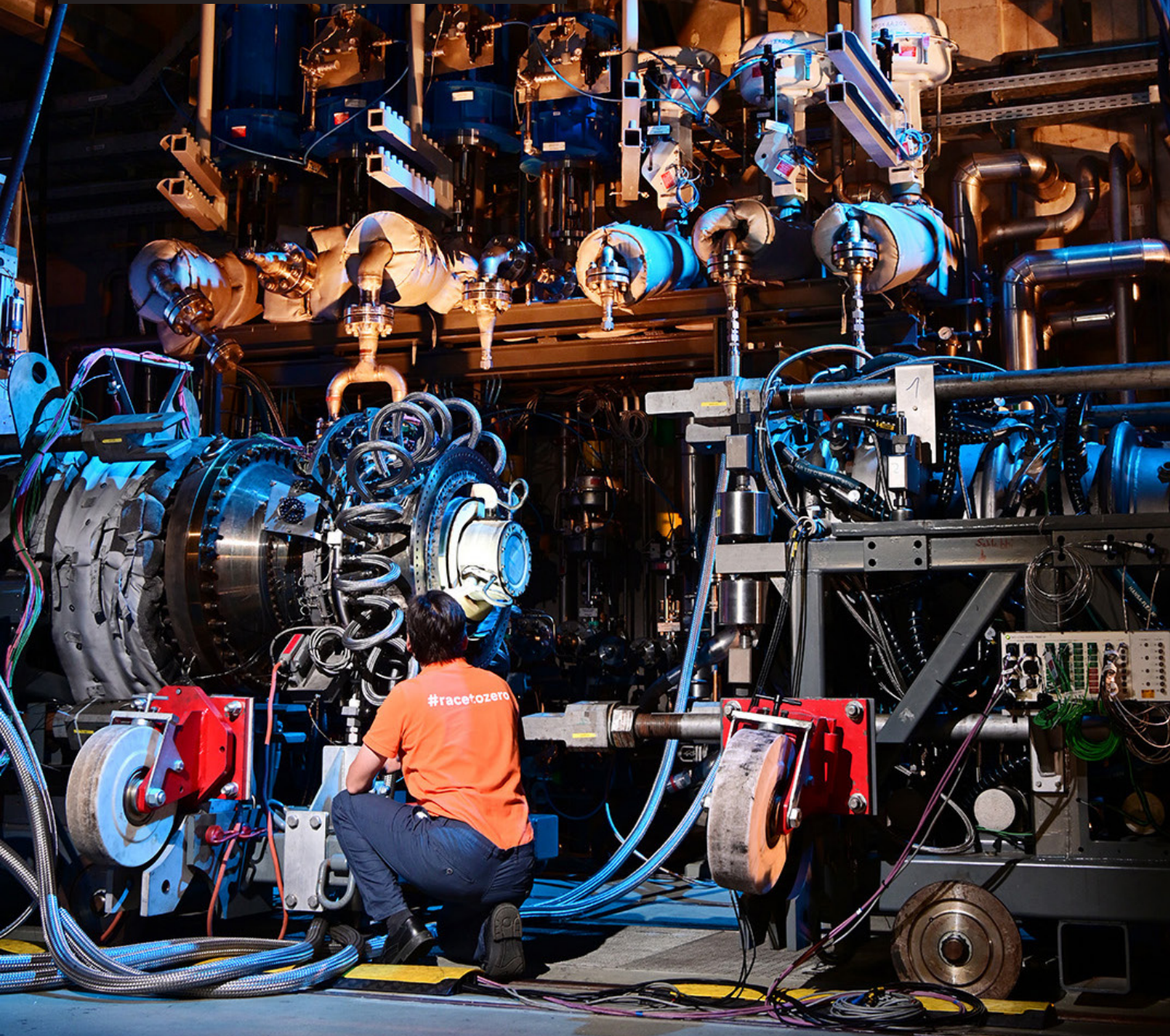
Markus Fischer, Divisional Board Member Aeronautics of DLR, said:“ This is an outstanding success story and we are more than happy to have contributed our hydrogen testing capabilities. It was very exciting supporting this technology journey and seeing the burner technology mature in various rigs at our Institute of Propulsion Technology. This underlines again DLR’s capabilities in complex applied research and the achievement, at such a high pace, was supported by our experience in real-scale testing of ground-based gas turbines.”

Hydrogen testing at DLR, Cologne

The technologies tested at Loughborough and DLR will now be incorporated into the learning from the Boscombe Down tests as Rolls-Royce and easyJet prepare for the next stage of testing – a full gas hydrogen ground test on a Pearl engine.

That will in turn lead to a full ground test on a Pearl engine using liquid hydrogen – both easyJet and Rolls-Royce have a shared ambition to then take the technology to flight.

Rolls-Royce receives support for hydrogen research through the UK's Aerospace Technology Institute HyEST programme, Germany's LUFO 6 WOTAN programme, and the European Union's Clean Aviation CAVENDISH programme. Loughborough is a partner in HyEST and CAVENDISH. DLR is a partner in WOTAN and CAVENDISH. easyJet has provided investment to support the development of hydrogen combustion engine technology for narrow-body aircraft.





FUTURE OF UTILITIES ENERGY TRANSITION SUMMIT

19 - 20 MARCH | SUGARFACTORY, AMSTERDAM

JOIN 1000+ LEADERS AT

Europe's most significant energy conference

SAVINGS AVAILABLE UNTIL 7 MARCH

**120+ SPEAKERS | 60% C-SUITE,
DIRECTOR, HEAD | 60% ENERGY
& ABOVE COMPANIES**

Hear from Vandebron, Vattenfall, Eneco, Expo, E.ON, Alliander, Scatec, Ellevio, RTÉ, ENGIE, National Grid, Orsted, SSE, OVO, Moeve, EDP, Octopus, Statnett, Uniper, TenneT, Luminus, Statkraft, A2A, Enel and more!



NEWS



Global OTEC and UFRJ sign collaboration to advance ocean energy in Brazil



20 January 2025, London, UK & Rio de Janeiro, Brazil – Brazil, a global leader in renewable energy with a significant potential for Ocean Thermal Energy Conversion (OTEC), is taking a major step forward in this sector. The Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia (COPPE/UFRJ) has just signed a Memorandum of Understanding (MoU) with UK-based Global OTEC, marking the beginning of a collaborative effort to drive the development of ocean renewable energy in the country. This collaboration aims to foster technological innovation, research and sustainable energy growth.

The two-year partnership will focus on joint research projects, knowledge sharing, and developments to demonstrate the viability and advantages of OTEC technology in Brazil. This cooperation is expected to lead to groundbreaking advancements in ocean renewable energy, contributing to global initiatives to combat climate change and promote clean solutions for power generation.

Professor Joel Sena Sales Junior, Coordinator of the Waves and Currents Laboratory (LOC/COPPE/UFRJ) welcomed the collaboration. “This partnership represents an opportunity for cooperation between an innovative company and the university. It will allow for the exchange of knowledge and ideas regarding the challenges and solutions surrounding the floating OTEC plants project”, commented.

Global OTEC is advancing ocean renewable energy through initiatives like PLOTEC, a project that involves designing and testing a storm-resistant floating platform for OTEC. The company has also developed the OTEC Power Module®, a proprietary self-contained skid that enables a lower-cost, modular approach for clean baseload power from the ocean, focused on powering offshore operations.

“This collaboration with COPPE/UFRJ marks a significant milestone for ocean thermal energy in Brazil,” said Dan Grech, Founder and CEO of Global OTEC. “Following our recent structural demonstration and the launch of the OTEC Power Module® at the Petrobras geothermal workshop, we are thrilled to explore the potential of working with local partners to lead the charge in renewable energy. Together, we aim to unlock the vast potential of OTEC, showcasing how the ocean can deliver clean, reliable power solutions while positioning Brazil at the forefront of this transformative innovation.”

About COPPE

The Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia (COPPE/UFRJ) is a renowned research and education institution at the Federal University of Rio de Janeiro, specialising in advanced engineering studies. Established in 1963, COPPE/UFRJ is recognised for its cutting-edge research, innovation, and contribution to the development of sustainable technologies, including ocean engineering and renewable energy. The institute is a leader in fostering scientific excellence and driving technological advancements to address global challenges.

About Global OTEC

Global OTEC was founded to provide clean, reliable and affordable energy from the ocean to power a diverse range of offshore applications and even entire countries, particularly Small Island Developing States (SIDS). The company’s technology builds on decades of process expertise and OTEC demonstrations validated around the world. Global OTEC has designed the first floating commercial OTEC system to transform how the world is powered and is also leading the EU-funded project PLOTEC.

About OTEC

OTEC is a renewable technology that harnesses the ocean’s thermal gradient to generate electricity. Warm surface seawater is used to vaporise a working fluid, driving a turbine to produce energy, while cold deep-sea water condenses the fluid, creating a continuous cycle. As the ocean surface remains warm year-round, OTEC can provide 24/7 electricity, positioning it as a great sustainable energy option for countries located in the tropical area of the ocean.

Cleantech Group Unveils the Global Cleantech 100

SAN FRANCISCO, CA — January 15, 2025

Cleantech Group, the leading authority on global cleantech innovation, proudly announces the release of the 2025 Global Cleantech 100. This annual list, now in its 16th year, showcases the most promising private cleantech companies making significant contributions to sustainable innovation.

The complimentary report will introduce you to the innovators advancing groundbreaking technologies and business models to enable us to act on the ever-increasing climate and environmental crisis. The cleantech theme is poised for pivotal milestones in 2025 as market forces intensify and innovation accelerates.

Continuing trends from 2024, including policy uncertainty, groundbreaking first-of-a-kind (FOAK) projects, and the surging demand for climate adaptation technologies, will emphasize the importance of product and project economics.

Companies that capitalize on organic demand—such as the growing needs of data centers—and prove their technologies in real-world environments without relying on favorable policy support, will find themselves in the best position to succeed. Economic viability will be the defining metric of success in 2025.

„This year’s Global Cleantech 100 reveals a shift in market sentiment,“ said Richard Youngman, CEO of Cleantech Group. „The bar has gone up for what kind of level of potential novelty, uniqueness, and cost improvements might be attractive.“

Key Milestones to Watch in 2025

Increased Exits for Hardware Companies.

Expect more acquisitions of hardware companies related to data center growth, energy resilience, and security. Advanced cooling systems for data centers, power conversion innovations, and grid hardening technologies are particularly attractive to demand owners seeking to secure intellectual property and offer solutions into newly power-hungry markets.

FOAK Projects Paving the Way for Fast Followers
2024’s success in launching FOAK projects has set the stage for scale. Companies transitioning to economic, nth-of-a-kind facilities will gain an edge, le-

veraging lessons learned from early adopters. This „free-rider“ effect will benefit fast followers, who can refine processes and avoid costly mistakes.

China’s Continued Influence

Despite featuring only two companies from China in the Global Cleantech 100, the nation remains a significant force in cleantech innovation. With its ongoing renewable energy and EV expansion, breakthroughs in long-duration energy storage, grid resilience, and nuclear advancements (both fission and fusion) are anticipated. However, reduced collaboration with global partners could limit visibility into these developments, creating both opportunities and challenges for international competitors.



Breakouts in Adaptation and Resilience.

Climate adaptation technologies are set for major breakthroughs. Innovations like wildfire prevention tools that reduce carbon emissions and protect resources illustrate the dual benefits of adaptation and mitigation. As markets embrace diverse success metrics—financial loss avoided, human safety, biodiversity preservation—adaptation technologies will see broader adoption across government, private-sector, utility, and even residential markets.

About Cleantech Group

Cleantech® Group is a research-driven company that helps corporates, public sector, investors and others, identify, assess, and engage with the innovative solutions and opportunities that are related to the world’s massive, and growing, environmental and climate challenges. Our insights and expertise are delivered to clients all over the world through our Research, Consulting, and Events.

Construction of a hydrogen refuelling station in Hallstadt has been started by MorGen

A new hydrogen refuelling station is being built in Germany, specifically Hallstadt, and the company conducting this project is MorGen Mobility. This project was kickstarted once it became official that the Bavarian State has been agreed to fund the project.



Throughout this project, the green hydrogen that is used will be sourced from regional production facilities. Further to this, it has been planned that the refuelling station will be based an estimated 167km south of the German hydrogen core network check-point, which is in Erfurt.

Within a press statement it was revealed that MorGen's planned network of hydrogen refuelling stations are due to be located across industrial areas, as well as commercial areas within Germany. It has also been suggested that there is a plan for there to be three additional locations added to this project, which will become operational by the end of 2025.

Once the refuelling station has been built, it will be designed to offer green hydrogen at both 350 and 700 bar pressure levels. These pressure levels will be available to service light and heavy-duty vehicles, buses and finally, passenger cars. Right now it is planned that the facility will open in Spring of 2025.

The Bavarian State Ministry for Economic Affairs, Regional Development, and Energy stated that they would, 'support MorGen's development at the Cleantech Innovation Park.' This site is based near to the A70 and A73 motorways.

Head of Supply Chain and Operations at MorGen Mobility, Werner Leitner, commented, "The state – the second in our network – will enable access to green hydrogen for the mobility of tomorrow."

Bavaria's Minister of Economic Affairs and Energy, Hubert Aiwanger, mentioned, "Hydrogen offers significant advantages for freight and passenger transportation, particularly over long distances. To fully harness this potential, we are committed to advancing the expansion of hydrogen infrastructure across Bavaria."

Doosan has ordered fuel cell components from Alleima for mass SOFC production

It has been agreed that Alleima will provide a critical component for the mass production of solid oxide fuel cells (SOFCs). Once complete, this critical component will be provided to South Korea's Doosan Fuel Cell.



This company, Doosan Fuel Cell, is an energy giant within Korea and is well-known as a leading global player, when it comes to hydrogen energy. Currently, the company is aiming to make its fuel cells suitable for both maritime and stationary applications. Due to this aim, it has been arranged that mass production of SOFC will commence in 2025 and this will take place in Korea, within a new production plant. To make this next step in the project possible, Alleima will provide Sanergy™ HT pre-coated material, which will be used for the interconnects. This is an important part of the project, because this material will become a key component in the stationary fuel cell.

Alleima is a leading manufacturer for high value-added products in advanced stainless steels and special alloys. Now the company has received an order from Doosan Fuel Cell, which requests that Alleima supplies their Sanergy™ HT pre-coated material

for interconnects. This high-temperature pre-coating material will be provided to Doosan because it will work in a complimentary fashion to the SOFC fuel cell, especially when it comes to working at the required high temperatures, which are necessary for the technology's high efficiency. It has been requested that this order be delivered in time for the upcoming mass production of fuel cell stacks. This order will last for two years and the planned deliveries will be due to start by the first quarter of 2025. It has been made clear that the total value of the order value comes to SEK 160 million.

The equipment of interest throughout this project, is a solid oxide fuel cell (SOFC), which is a system that converts the energy of hydrogen fuel into electrical power. This kind of fuel cell operates at high temperatures between 500-700 °C. This high temperature also allows it to be highly efficient and this high efficiency has caused it to gain an increase in interest as a significant and important enabler, when it comes to the shift to a sustainable energy system. So far, the equipment has been building a portfolio of use, with activities such as, 'providing primary and backup electrical power for data centers and buildings' another project involved, 'serving as an auxiliary power supply on ships to support maritime transport's efforts to reduce CO2 emissions.' Now that Doosan Fuel Cell has been placed at the forefront of this technology, the company aims to begin commercial production of SOFC in 2025.

Currently the project is under a SEK 160m deal and the deliveries to Doosan will start in Q1 2025 and these will continue for two years. It was back in 2020 when Doosan revealed their plans to build a 500MW mass-manufacturing facility, which would be based in South Korea.

EVP and Head of Strategy, at Alleima, Mikael Blazquez, commented, "We are pleased that Alleima has been given the opportunity to supply pre-coated material for use in interconnects with our unique mass production technique. Alleima provides material for a key component in the fuel cell industry, an end-market that aligns well with our growth strategy. We will through our innovations contribute and play an important role in the transition to more sustainable energy."

Global Chief Procurement Officer, DOOSAN Fuel Cell, added, "We are delighted with Alleima, which is based on leading materials technology, and sus-

tainable accompany for accelerating a decarbonized future."

General Manager for Surface Technology at Alleima, Henrik Fintling, mentioned, "This order is important for the Surface Technology business unit at Alleima as it shows that we are a reliable and long-term key partner for Doosan Fuel Cell on their journey into a fossil free energy system. It feels great to be an enabler in the green transition with this new design of SOFC technology."

A liquid hydrogen flight in 2027 has been planned by Stralis Aircraft and CQ University

A new plan to use hydrogen-electric technology to power a commercial route between Brisbane and Gladstone has been revealed. This plan is between Stralis Aircraft and CQ University and the aim is for the commercial route to take place in 2027.



Stralis Aircraft and CQ University which is based in Rockhampton, are both part of the Hydrogen Flight Alliance (HFA). This organisation was set up in 2023 through Australian aviation and green hydrogen players at Brisbane Airport.

So far, it has been agreed that the Brisbane-based company will collaborate with CQ University, with the intention of designing a heat management system, which would be suitable for a PEM fuel cell system, which functions at a high-temperature. The overall aim of this collaboration, is to integrate the PEM fuel cell system into the liquid hydrogen-powered aircraft.

Right now, the companies have formed a plan to test the hydrogen-electric propulsion system with the use of a Bonanza A36 aircraft. This plan will commence later on in 2025.

Support for this project is being provided by The Regional University Industry Collaboration (RUIC) Programme, plus on top of this, it will also receive funding from the Queensland Government. Also, the project will be delivered by Australia's national science agency CSIRO. This support from The RUIC initiative is incredibly important, because this initiative connects small to medium enterprises (SMEs) with regional universities. The purpose behind doing this, is to undertake collaborative research partnerships across Queensland.

CQ University's Professor in Hydrogen, Jonathon Love, said that the Centre for Hydrogen and Renewable Energy at the University will "help Stralis advance their innovative liquid hydrogen-fuelled HT-PEM fuel cell electric propulsion system towards their exciting first test flight."

Save the Date: Hydrogen Technology Expo North America 2025 – The Future of Hydrogen Innovation
The Hydrogen Technology Expo North America is set to return bigger and better than ever, taking place at the NRG Center in Houston, Texas, on June 25-26, 2025. As the premier conference and exhibition dedicated to advanced technologies in the hydrogen sector, this event is a must-attend for industry leaders, innovators, and policymakers looking to drive the hydrogen economy forward. With a new administration in place, the hydrogen sector faces fresh challenges and opportunities. Hydrogen Technology Expo North America provides a platform for the best and brightest minds in the industry to collaborate, share insights, and find



solutions to accelerate the global energy transition. For more information and to register, visit <https://www.hydrogen-expo.com/>

First rules of the European Artificial Intelligence Act are now applicable

As of Sunday, 2 February, the first rules under the Artificial Intelligence Act (AI Act) started to apply.

This includes the AI system definition, AI literacy, as well as a very limited number of prohibited AI use cases outlined in the AI Act that pose unacceptable risks in the EU.



To facilitate innovation in AI, the Commission will publish guidelines on AI system definition. This aims to assist the industry in determining whether a software system constitutes an AI system.

The Commission will also release a living repository of AI literacy practices gathered from AI systems' providers and deployers. This will encourage learning and exchange among them while ensuring that users develop the necessary skills and understanding to effectively use AI technologies.

To help ensure compliance with the AI Act, the Commission will publish guidelines on the prohibited AI practices that are posing unacceptable risks to citizens' safety and fundamental rights.

These guidelines will explain the legal concepts and provide practical use cases, based on stakeholder input. They are not binding and will be updated as necessary. The Commission has launched several initiatives to promote innovation in AI, from the AI innovation package supporting startups and SMEs to the upcoming AI Factories which will provide access to the massive computing power that start-ups, industry and researchers need to develop their AI models and systems.

More information: <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai>

Comparing Energy Transition Trends in Europe and the United States: Key Developments and Priorities for 2025

Europe and the United States are both undergoing rapid energy transitions, driven by technological innovation and policy initiatives aimed at decarbonization. By 2025, clean energy technologies have become mainstream, with renewables scaling up and new systems reshaping how power is produced and consumed.

This analysis compares key trends in Europe and the U.S., focusing on how technological advancements in 2025 are influencing renewable energy, digitalization of the grid, policy frameworks, market dynamics, energy storage, and electrification of industry and transport. While both regions share common goals, differences in policy and market approaches yield distinct trajectories in their energy transitions.

Innovations in Renewable Energy Technologies Solar and Wind:

Solar photovoltaics and wind power are the backbone of the renewable surge in both Europe and the U.S., but Europe has generally led in deployment. The European Union has aggressively expanded solar and wind power, particularly offshore wind in the North Sea, leveraging long-standing policy commitments. Wind energy growth in the U.S. has faced challenges due to supply chain bottlenecks and permitting delays, but the country is experiencing record levels of solar expansion, with capacity additions surpassing expectations in 2024.

Europe has pioneered large-scale offshore wind, with high-capacity turbines exceeding 14 MW each, while the U.S. has only recently begun its offshore wind development. Innovations in wind energy, such as floating offshore wind farms, are expected to gain momentum in both regions by 2025. While wind and solar technology improvements continue to drive costs down, Europe's early lead in adoption ensures that renewables form a larger share of its energy mix.

Hydrogen

Hydrogen is a crucial component of the energy transition, particularly for industrial decarbonization and long-distance transport. Europe has taken the

lead in green hydrogen, investing in large-scale electrolyzer deployment and infrastructure. The EU aims to install at least 40 GW of renewable-powered electrolyzers by 2030, with a focus on integrating hydrogen into the energy system.

The United States, on the other hand, has pursued a mixed strategy, investing in both green and blue hydrogen. Regional hydrogen hubs and substantial federal incentives are expected to accelerate hydrogen adoption in the coming years. Advances in electrolyzer efficiency and cost reductions will play a critical role in making green hydrogen more commercially viable.

Advanced Nuclear

Both Europe and the U.S. are exploring advanced nuclear technologies, particularly small modular reactors (SMRs), as part of their long-term energy strategies. European countries such as France and the UK are investing in next-generation nuclear reactors, while the U.S. supports SMR development through Department of Energy grants. While nuclear power remains controversial in some European countries, the technology is increasingly viewed as a necessary complement to intermittent renewables.

Digitalization, AI, and Smart Grids Grid Modernization

The increasing share of renewables requires a transformation of grid infrastructure. Europe is enhancing cross-border electricity interconnections to improve grid resilience, integrating smart meters and automation into energy management systems. The U.S., facing regulatory fragmentation, is focusing on state-level grid modernization projects, with utilities and tech firms leading digital transformation efforts.

Artificial Intelligence

AI and machine learning are revolutionizing energy management by improving forecasting, optimizing grid operations, and enabling predictive maintenance. AI-driven energy efficiency measures and smart grid technologies are expected to enhance economic value and reduce greenhouse gas emissions. The integration of AI with demand response mechanisms allows utilities to balance supply and demand in real time, increasing overall grid efficiency.



Policy Frameworks and Government Incentives

European Policy

The EU's Green Deal and "Fit for 55" package set legally binding emissions reduction targets, reinforcing the shift to renewables. Carbon pricing through the EU Emissions Trading System incentivizes clean energy investments, while renewable energy directives mandate increased renewable generation. European policies emphasize long-term planning and international cooperation to accelerate the transition.

U.S. Policy

The Inflation Reduction Act (IRA) of 2022 is the largest federal investment in clean energy in U.S. history, offering extensive tax credits and incentives for renewables, storage, and electrification. Unlike Europe's regulatory mandates, the U.S. approach focuses on financial incentives to drive market-based clean energy adoption. State-level initiatives play a crucial role, with progressive states like California and New York leading the charge in renewable deployment and emissions reductions.

Market Dynamics and Private Sector Innovation

Investment Trends

Global investment in clean energy reached record levels in 2024, with Europe and the U.S. both driving substantial growth. The EU remains a leader in offshore wind and renewable energy infrastructure, while the U.S. has seen a surge in domestic manufacturing of solar panels, batteries, and electric vehicles due to IRA incentives. Both regions are striving to build self-sufficient clean tech supply chains to reduce reliance on imports.

Private Sector Innovation

European firms have excelled in wind energy and smart grid technologies, while U.S. companies lead in AI-driven energy management and electric vehicle development. The U.S. clean tech sector has attracted substantial venture capital investment, with new startups focusing on battery chemistry, carbon capture, and advanced grid solutions. The competition between the EU and the U.S. in attracting clean tech manufacturing is expected to intensify as both regions aim to strengthen industrial competitiveness.

Energy Storage and Electrification

Grid-Scale Storage

Energy storage is becoming a crucial component of the energy transition. The U.S. has rapidly expanded utility-scale battery storage, particularly in California and Texas, while Europe is deploying long-duration storage solutions such as pumped hydro and green hydrogen. Innovations in flow batteries and solid-state batteries could further enhance storage capabilities, ensuring stable renewable energy integration.

Electrification of Transport

Electric vehicle (EV) adoption is accelerating in both Europe and the U.S., with record sales and expanding charging infrastructure. Europe's strict emissions regulations and bans on new gasoline car sales by 2035 have driven automakers to transition rapidly to EV production. In the U.S., tax incentives and investments in charging networks have spurred rapid growth, with EV sales surpassing expectations in 2024. Vehicle-to-grid (V2G) technology is being tested in both regions, allowing EV batteries to contribute to grid stability.

Industrial Electrification

Industries in Europe and the U.S. are transitioning to electric-powered processes, including electric arc furnaces for steelmaking and high-temperature industrial heat pumps. Europe's carbon pricing and hydrogen initiatives support industrial decarbonization, while the U.S. focuses on incentives for industrial carbon capture and electrification.

Key Trends for 2025

By 2025, several trends will shape the energy transition in both Europe and the U.S. Renewables will continue to expand, with solar and wind becoming dominant power sources. Energy storage deployment will reach new highs, addressing intermittency challenges. Electrification of transport and industry will drive increased electricity demand, requiring further grid enhancements.

Both regions are likely to intensify their industrial policies to secure clean tech manufacturing leadership. The role of AI and digitalization in energy optimization will expand, enhancing efficiency and resilience. While Europe maintains its regulatory-driven approach, the U.S.'s market-based incentives are accelerating private sector investment. Despite regional differences, the energy transition is progressing at an unprecedented pace, with 2025 marking

a milestone in global clean energy transformation.

Europe and the United States are on parallel yet distinct paths in the energy transition. While Europe leads in regulatory-driven renewable deployment, the U.S. is leveraging financial incentives to achieve rapid clean tech investment. As both regions navigate the challenges of grid modernization, storage expansion, and industrial decarbonization, their collective advancements will shape the global energy landscape. With sustained innovation and strategic policies, 2025 is set to be a defining year in the pursuit of a sustainable energy future.





Technology breakthroughs are unlocking geothermal energy's vast potential in countries across the globe

Largely untapped underground energy source can help meet world's rapidly growing demand for electricity, but cost reductions are needed to drive new generation of projects

With global electricity demand set to grow strongly, new technologies are opening up the massive potential of geothermal energy to provide around-the-clock clean power in almost all countries around the world, according to a new IEA report.

The report, *The Future of Geothermal Energy*, finds that geothermal energy could meet 15% of global electricity demand growth between now and 2050 if project costs continue to decline. This would mean the deployment of as much as 800 gigawatts of geothermal capacity worldwide, delivering annual output equivalent to the current electricity demand of the United States and India combined.

Geothermal energy offers abundant, highly flexible and clean electricity supplies that can support va-

riable renewable technologies such as wind and solar while complementing other low-emissions sources like nuclear. Today, geothermal meets about 1% of global electricity demand. However, based on a new first-of-its-kind country-level analysis, conducted in collaboration with Project InnerSpace, the IEA report shows that next-generation geothermal technologies have the technical potential to meet global electricity and heat demand many times over.

Importantly, geothermal energy can draw upon the expertise of today's oil and gas industries by using existing drilling techniques and equipment to go deeper under the earth's surface to tap into vast low-emissions energy resources.

"New technologies are opening new horizons for geothermal energy across the globe, offering the possibility of meeting a significant portion of the world's rapidly growing demand for electricity securely and cleanly," said IEA Executive Director Fatih Birol. "What's more, geothermal is a major opportunity to draw on the technology and expertise of the oil and gas industry. Our analysis shows that the growth of geothermal could generate investment worth \$1 trillion by 2035."

Conventional geothermal remains a location-specific, niche technology today with most of the installed capacity in countries that have either have volcanic activity or straddle tectonic fault lines, which make resources easier to access. Current leaders in the space include the United States, Iceland, Indonesia, Türkiye, Kenya and Italy. But new technologies are making the outlook for geothermal truly global, opening up the potential to benefit from it in nearly all countries.

The report highlights that more than 100 countries have policies in place for solar PV and onshore wind, but only 30 have such policies for geothermal. Moving geothermal up national energy agendas with specific goals, backed support for innovation and technology development, can go a long way to reducing project risk perception and unlocking new investment.

Clear, long-term regulatory visibility for investors will help mitigate risks in early-stage development and provide visibility on investment returns, which in turn will improve the cost competitiveness of geothermal projects. By doing so, the report finds that costs could fall by 80% by 2035 to around \$50 per megawatt hour (MWh). This would make geothermal the cheapest source of dispatchable low-emissions electricity on a par with existing hydropower and nuclear installations. At such price levels, geothermal would also be highly competitive with solar PV and wind paired with battery storage. The report finds that the total investment in geothermal could reach \$1 trillion by 2035 and \$2.5 trillion by 2050. If next-generation geothermal grows strongly in the coming years, employment in the overall geothermal sector could increase sixfold to 1 million jobs by 2030, according to the report.

The oil and gas industry can play a key role in making geothermal more competitive. Up to 80% of the investment required in geothermal involves capacity and skills that are transferrable from existing oil and gas operations. The oil and gas industry can also benefit from tapping the potential of geothermal energy. Not only is it an opportunity to develop new business lines in the fast-growing clean energy economy, but it can also serve as a hedge against commercial risks related to projected future declines in oil and gas demand.

At a time when the digital economy and artificial intelligence applications are growing strongly, the re-

port highlights geothermal's potential to help power the increasing number of large data centres that underpin the tech sector. With next-generation geothermal offering a stable and essentially inexhaustible power source, large technology companies are already signing power purchase agreements with new projects.

However, permitting and administrative red-tape are proving a major barrier to geothermal projects, which can take up to a decade to fully commission. The report suggests governments could simplify permitting processes by consolidating and accelerating the administrative steps involved. They could also consider dedicated geothermal permitting regimes separate from minerals mining. Policies and regulations enforcing robust environmental standards are critical for the sustainable development of geothermal projects.



The Future of Energy Storage: Key Trends Shaping the Industry in 2025 and Beyond

The rapid global transition toward renewable energy sources has placed energy storage at the center of discussions on grid stability, reliability, and sustainability. As solar and wind power deployment accelerates, the need for efficient, scalable, and cost-effective storage solutions has become more urgent than ever. The variability of renewable energy generation necessitates storage technologies that can bridge the gap between supply and demand, ensuring a consistent and dispatchable energy supply.

In recent years, advancements in battery chemistry, grid-scale storage solutions, and novel energy storage technologies have emerged to address these challenges. Meanwhile, evolving regulatory frameworks and increasing investment in storage infrastructure are driving the commercialization of next-generation storage systems. As the industry moves into 2025 and beyond, several key trends are shaping the evolution of energy storage, impacting both utility-scale and distributed energy applications.

The Rise of Advanced Lithium-Ion Battery Technologies

Lithium-ion batteries have long been the dominant technology in energy storage, primarily due to their high energy density, rapid response time, and declining costs. Over the past decade, the cost of lithium-ion batteries has decreased by more than 90 percent, a trend largely attributed to advances in manufacturing, economies of scale, and improvements in battery chemistry. However, the industry is now focusing on further optimizing lithium-ion technology by enhancing battery lifespan, safety, and recyclability.

Recent developments in solid-state lithium batteries are promising, offering higher energy density, improved thermal stability, and reduced risk of thermal runaway compared to conventional liquid-electrolyte lithium-ion cells. Solid-state batteries replace the liquid electrolyte with a solid conductor, which enhances the overall efficiency and longevity of the battery. Companies such as QuantumScape and Toyota are actively working toward the commercialization of solid-state batteries, with expectations of market entry within the next few years.

In parallel, advancements in lithium iron phosphate (LFP) batteries are making this chemistry a preferred choice for grid-scale applications. LFP batteries, compared to nickel-manganese-cobalt (NMC) variants, offer greater thermal stability, lower costs due to the absence of cobalt, and a longer cycle life. Major energy storage developers are increasingly adopting LFP batteries for stationary applications, driven by their improved safety profile and cost-effectiveness.

Expansion of Long-Duration Energy Storage Solutions

The growing penetration of renewables in the electricity mix has increased demand for long-duration energy storage (LDES) solutions capable of storing and discharging energy for periods extending beyond the conventional four-hour window provided by lithium-ion batteries. Technologies such as flow batteries, compressed air energy storage (CAES), gravity-based storage, and hydrogen-based systems are emerging as viable alternatives to address this need.

Flow batteries, particularly vanadium redox flow batteries (VRFBs), are gaining traction due to their ability to decouple power and energy capacity, offering extended duration storage with minimal degradation over time. Unlike lithium-ion batteries, which degrade after thousands of cycles, flow batteries exhibit a nearly unlimited cycle life, making them well-suited for applications requiring long-term energy shifting and grid stabilization.

Compressed air energy storage (CAES) is also witnessing renewed interest, with innovative projects deploying underground reservoirs to store excess energy in the form of compressed air, which is later released to generate electricity when needed. Companies such as Hydrostor are developing large-scale CAES facilities capable of providing storage durations of 10 hours or more, making this technology particularly attractive for balancing daily and seasonal fluctuations in renewable energy output.

Gravity-based energy storage, pioneered by companies such as Energy Vault, represents another novel approach to long-duration storage. These systems use excess renewable energy to lift heavy weights, which can later be lowered to generate electricity when demand increases.

This mechanical storage method is gaining attention for its potential to provide large-scale, cost-effective energy storage with minimal environmental impact.

Hydrogen-based storage is emerging as a key player in long-duration storage solutions, particularly in the context of power-to-gas technologies. Excess renewable energy can be used to produce hydrogen via electrolysis, which can then be stored and later converted back into electricity through fuel cells or combustion. The deployment of green hydrogen infrastructure is expected to accelerate in the coming years as production costs decline and efficiency improves.

Integration of Energy Storage into Grid Infrastructure

The increasing role of energy storage in grid infrastructure is transforming the way electricity is generated, transmitted, and consumed. Storage is no longer just a backup solution but is becoming an integral component of modern power grids, enhancing grid resilience, stabilizing frequency fluctuations, and enabling demand-response mechanisms. One of the most significant trends in this space is the rise of hybrid power plants, where energy storage is co-located with solar and wind farms to create dispatchable renewable energy resources. These hybrid systems are designed to provide firm capacity, mitigating the intermittency of renewables and enhancing grid stability. Governments and utilities are increasingly recognizing the value of hybrid renewables-plus-storage solutions, implementing policies and market mechanisms that incentivize their deployment.

Another key development is the proliferation of virtual power plants (VPPs), which aggregate distributed energy storage assets—such as residential batteries, commercial storage systems, and electric vehicle (EV) batteries—to provide grid services. VPPs leverage artificial intelligence and advanced energy management platforms to optimize energy dispatch, balance demand, and participate in wholesale energy markets. Companies such as Tesla and Sonnen are leading the way in deploying VPPs, demonstrating their ability to enhance grid flexibility and provide economic benefits to both consumers and utilities.

Policy Support and Market Growth in Energy Storage

Government policies and regulatory frameworks are playing a pivotal role in accelerating energy storage deployment. Many countries are implementing energy storage mandates, capacity market incentives, and tax credits to encourage investment in storage infrastructure. The United States, through initiatives such as the Inflation Reduction Act (IRA), has introduced tax credits for standalone energy storage projects, significantly enhancing the economic viability of storage investments. The European Union's Green Deal Industrial Plan is similarly driving storage deployment, with specific funding mechanisms to support innovation in long-duration storage solutions.

The global energy storage market is expected to grow exponentially over the next decade. According to market forecasts, global installed battery storage capacity could exceed 1,500 GWh by 2030, driven by increasing renewable energy penetration and declining storage costs. Investment in emerging technologies, research and development, and grid modernization will be crucial to ensuring the continued growth and integration of energy storage solutions.

The future of energy storage is poised for significant advancements, driven by technological innovation, increasing deployment of renewables, and supportive policy frameworks. Developments in lithium-ion and solid-state batteries, the rise of long-duration storage solutions, and the integration of storage into grid infrastructure are transforming the energy landscape. The expansion of hybrid power plants, virtual power plants, and industrial storage applications further highlights the crucial role of storage in the clean energy transition.

As the industry navigates these trends, collaboration between utilities, policymakers, technology providers, and financial institutions will be essential to unlocking the full potential of energy storage. With continued innovation and strategic investment, energy storage will serve as the cornerstone of a sustainable, reliable, and resilient global energy system, enabling the transition toward a carbon-free future.

YOU CAN'T SINK A RAINBOW

71 per cent of our planet is covered by water—the largest habitat! But in just a few decades, humans have turned it into a global crisis zone.

For over 40 years, Greenpeace has therefore been travelling on rivers and oceans with specially equipped ships to the very places where environmental crimes are being committed.

Come aboard with us!



GREENPEACE



Advancements in Floating Energy Storage: An Examination of Southeast Asia's Initiatives

In the realm of innovative energy storage, Southeast Asia has presented an unparalleled development with the impending launch of its maiden floating and stacked Energy Storage System (ESS) at Seatrium's Floating Living Lab (FLL) by 2024. This article delves into the technicalities, implications, and potential of this groundbreaking endeavor.

Addressing Land Scarcity: A Technical Solution

Singapore, despite its meteoric economic ascent, grapples with spatial limitations. The conception of Seatrium's floating ESS offers a robust solution. Technically, by transitioning to an aquatic platform, the deployment footprint reduces substantially, offering a 40% lesser spatial imprint compared to terrestrial ESS structures. An Energy Storage System, or ESS, functions analogously to a large-scale battery system. Its primary role is to store energy during periods of low demand and release it during

peak consumption times. Particularly vital for regions like Singapore, where solar energy is susceptible to meteorological inconsistencies, an ESS aids in regulating and stabilizing the energy output from such variable sources.

Collaborative Ventures and Technical Partnerships

This avant-garde project was realized through the collaboration between Seatrium and a consortium spearheaded by Unvers (formerly recognized as Envision Digital International Pte Ltd). It is worth noting that this strategic alliance is an offshoot of the broader S\$10 million partnership formulated in 2020 between EMA and Seatrium. The overarching objective is to foster marine-centric sustainable energy solutions.

Insights from Leadership

Mr. Ngiam Shih Chun, representing EMA, emphasized the necessity for Singapore to continually innovate within the energy infrastructure domain, given its geographic constraints. Echoing this sentiment, Mr. Chris Ong, CEO of Seatrium, highlighted the project as emblematic of Seatrium's dedication to leveraging technological advancements for the augmentation of energy efficiency.



Technical Specifications and Capabilities of the ESS

Beyond its mere floating attribute, the ESS at Seatrium's FLL boasts significant technical specifications. With a storage capacity of 7.5 megawatt-hour (MWh), it can theoretically cater to the electrical requisites of over 600 average-sized households in a singular discharge cycle. Embedded within this system is a suite of intelligent energy management functionalities. These include an advanced Smart Energy Management System fortified by artificial intelligence and machine learning algorithms. Such integrations aim to amplify operational efficacy and precision in energy dispatch. Furthermore, its design facilitates adaptability to regions with erratic power supplies, showcasing its potential for broader applications.

Seatrium's Historical and Technical Legacy

Tracing its lineage back to its inception as Sembcorp Marine Ltd and subsequent merger with Kepel Offshore & Marine Ltd, Seatrium stands as a paragon of engineering proficiency in the offshore, marine, and energy sectors. With a technical track record spanning six decades, the company has showcased expertise in myriad fields ranging from rig designs to ship constructions. In the contemporary context, Seatrium pivots towards sustainable energy solutions, emphasizing maritime decarbonization and cleaner energy transitions.

Conclusion

Seatrium's foray into floating ESS signifies more than just a technological marvel; it represents a confluence of engineering prowess and sustainable vision. With such initiatives, Southeast Asia is poised at the cusp of a transformative trajectory in the energy storage domain.

Artificial intelligence for reef protection

How international scientists are using cutting-edge technologies to protect and regenerate the Red Sea in Saudi Arabia





Coral reefs are among the most species-rich ecosystems in the world. But their population is suffering massively from climate change and ocean warming.

The reef formations in the Al-Wajh archipelago and the Amaala area on the northwest coast of Saudi Arabia are an example of a healthy and thriving coral reef ecosystem that has shown tremendous resilience to rising water temperatures. To ensure its continued conservation, Red Sea Global, the company behind sustainable tourism destinations The Red Sea and Amaala, employs scientists from around the world. The international team's approach: using a variety of traditional and modern tools to protect, study and regenerate corals.



From left to right: American scientist Dr Rhonda Suka, Colombian scientist Dr Carol Buitrago Lopez and Swiss scientist Dr Jessica Bouwmeester play leading roles in Red Sea Global's Conservation and Regeneration Department © Red Sea Global.

Together with an international team of marine biologists, American scientist Rhonda Suka is visiting more than 300 reefs in the Al Wajh Archipelago and Amaala area to assess the condition of coral reefs and fish populations. She and her colleagues have also set up a coral garden project, where thousands of corals are kept in nurseries under optimal conditions.

With her colleague Dr Carol Buitrago Lopez, Rhonda Suka monitors the coral nurseries. To do this, the team uses an approach called Structure from Motion (SfM), in which thousands of photos are taken to create three-dimensional models. Three-dimensional models are reconstructed by taking thousands of photos. These are later analysed by artificial intelligence (AI) to track the growth and health of the corals.

With the help of AI instruments, the scientists were able to measure a growth rate of about 1 per cent per month for the corals in the nursery, a higher growth rate than in a natural reef. To further accelerate the growth of the corals, Dr Buitrago Lopez and Dr Jessica Bouwmeester multiply the corals in the nurseries by separating a few small fragments of 5 centimetres in size from an adult colony.

These are maintained in the nurseries for about eight to twelve months until they reach an appropriate size to be returned to a natural reef. Propagation and monitoring of corals in both natural reefs and nurseries are an important strategy for reef improvement and regeneration.

To ecologically enhance the surrounding reefs, the team creates artificial reefs with different substrate materials. The artificial reefs can be used to relocate corals when needed and create habitat for fish and other marine life.

This project aims to identify the most appropriate methods for constructing artificial reefs and to make scientifically sound recommendations for larger projects in the region and internationally. Propagation and monitoring of corals in both natural reefs and nurseries are therefore an important Red Sea Global strategy for reef enhancement and regeneration, which, together with conservation measures aimed at sustainable fishing practices, will conserve invaluable coral reef ecosystem.

Global knowledge exchange between scientists is critical to the future health of coral species in the oceans and provides a framework to support their revitalisation and regeneration in the future.

[Red Sea Global](#)





Inspirational idea: Farm carbon **New approaches for sustainable farming of peatlands.**

Drained peat grasslands in Ireland emit up to eight million tonnes of carbon dioxide every year, representing one of the largest single sources of greenhouse gas emissions. At the same time, farm incomes are declining. The Irish Operational Group called 'Farm Carbon EIP', which is run by the Green Restoration Ireland cooperative, combined these threats and turned them into an opportunity. They are looking into the feasibility of results-based payments for farmed peatlands to diversify farmer revenues and support the rural economy as well have a significant impact on the environment.

"Peatlands may only comprise 3% of the earth's surface but studies have found that they hold nearly 30% of the world's terrestrial carbon stock," says Douglas McMillan, project manager. If peatlands are drained or not well maintained, the carbon is released into the atmosphere. In the EU, drainage-based agriculture on peatland soils accounts

for approximately 25% of all EU agricultural carbon emissions, giving rise also to water pollution, soil degradation and subsidence and loss of biodiversity.

This Operational Group wanted to address this challenge by looking into the opportunities of carbon farming. Carbon farming is the implementation of agricultural practices that improve the rate at which carbon dioxide (CO₂) is removed from the atmosphere and sequestered into plant material and soil organic matter. Restoration of peatlands and wetlands that reduces oxidation of the existing carbon stock and increases the potential for carbon sequestration is a key strand of the EU's Communication on Sustainable Carbon Cycles which is linked to the Farm to Fork Strategy.

In the case of Ireland, about 21% of the country's surface is covered in peat soils which contain an estimated 2.2 billion tonnes of carbon. In Ireland we also find 50% of western Europe's remaining raised bogs and 8% of the world's blanket bogs. Peatland habitats are at the heart of many Irish farms.

The Operational Group applies an approach based on ‘community and nature at the core’ and seeks to restore and give value to these habitats. In order to protect them, the water tables are raised on the peat grasslands that surround them, creating buffer zones.

In this project, the project partners teamed up with a voluntary group of just over 20 farmers of agricultural peatlands in the counties of Offaly, Laois and north Tipperary located in the centre of Ireland. This forms part of the ‘Just Transition’ region in Ireland where employment has suffered due to the closure of peat-fired power stations and harvesting of peat for horticultural products.

In the first part of the project, scientific studies were carried out by the participating farms. Data was collected on the carbon farming measures which can be applied in different peatland uses (pasture, forestry/woodland and cutover). Three main environmental parameters were studied: biodiversity, soil quality/greenhouse gas emissions and water quality. From the studies, a set of measures best suited to improve the habitats across the whole farms were proposed, ranging from rewetting peatland to hedge-laying and pond creation. A methodology was also developed from the available scientific evidence to predict emissions from peat grasslands based on average water table levels as the basis for an ‘Irish Community Peatland Code’[Open link in new window.](#)

The measures applied included some which are tried and tested and other more recent and innovative technologies and farm practices. Douglas explains: “With respect to peat pastures, a range of options is provided depending on the intensity of use, so mitigation measures can include partial re-wetting, full re-wetting and habitat restoration, or paludiculture (wetland agriculture).”

These integrated, regenerative, carbon farming practices generate cost savings through reduced inputs and offer new sustainable approaches to farming peatlands. This includes paludiculture trials testing multispecies swards, fruits (blueberry, chokeberry, cranberry and lingonberry), vegetables (brassicacae, celery, rhubarb), commercial timber (liquidambar, dawn redwood etc.) and raw materials for the bio-economy (cattails, common reed and Sphagnum).

This Irish Operational Group also developed a results-based, agri-environmental scheme that rewards farmers and land-owners for improving the environmental services of their farms by regenerating their farmed peatlands. These schemes will be refined as more data becomes available from measurement of the post-restoration effects. The 20 or so initial participating farms have received these payments and the aim is that the project will be incorporated into a larger future initiative to help meet national targets for rewetting.

Over the next few years, the project partners are also going to continue working on the eco-scheme for ‘peat-friendly’ farm produce and products from farms implementing these measures will be certified to improve visibility for consumers and add value for farmers.

Doug concludes: “Farm Carbon wanted to provide a comprehensive scalable framework to guide future policy that regenerates the land and provides environmental and economic sustainability for Irish peatland farms.”

<https://farmcarbon.ie/>



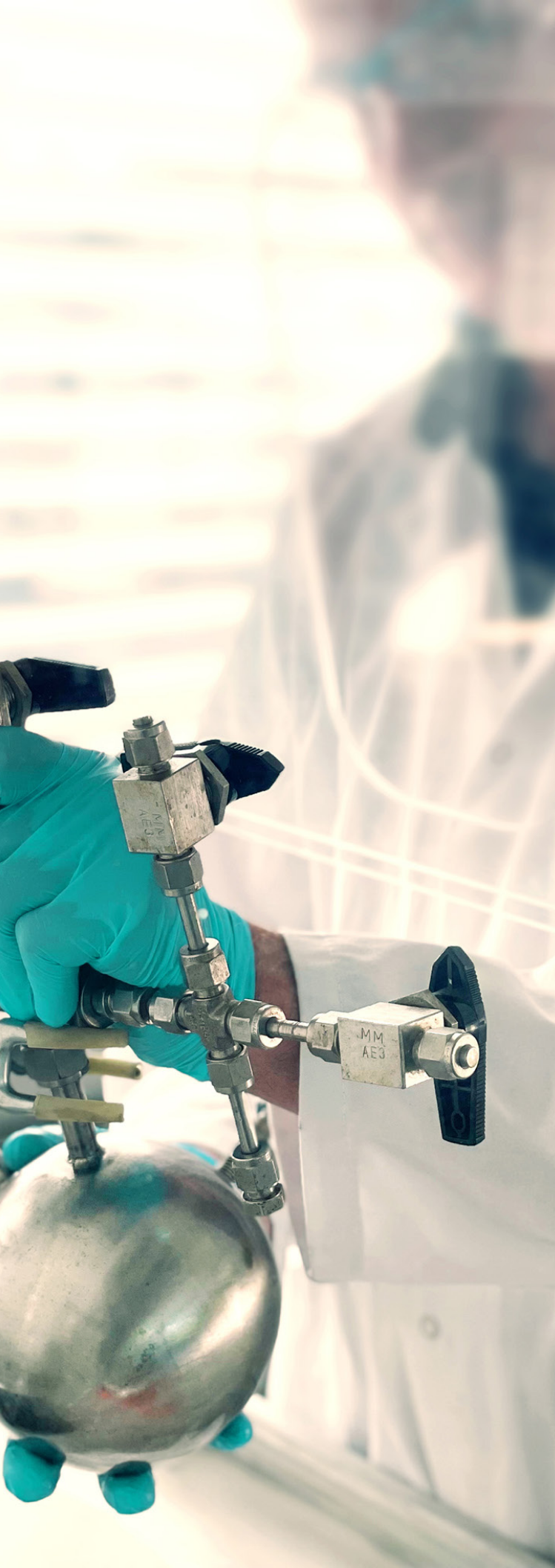


German start-up develops the world's first solid-state battery ready for series production

The Bonn-based company High Performance Battery (HPB) has achieved a decisive breakthrough in battery and storage technology: a team led by Prof. Dr. Günther Hambitzer has developed the world's first solid-state battery with outstanding properties to production readiness. The applications range from stationary storage for home and industrial use to charging infrastructures and the mobility segment – such as the automotive industry. “We are not only opening a new chapter in battery technology,” explains Sebastian Heinz, CEO of HPB, “but are also making a decisive contribution to the energy transition and climate protection worldwide”.

The data and properties measured so far show significantly better values and characteristics compared to the currently dominant lithium-ion batteries.

- **Longevity:** While conventional lithium-ion batteries have to be replaced after about 1,250 charging cycles – with hourly charging and discharging – the HPB solid-state battery currently has at least 12,500 charging cycles, with a comparable load. Since these cells have not yet reached the end of their life, this number will continue to increase steadily.
- **Safety:** The new HPB solid-state electrolyte is non-flammable and thus considerably safer than the flammable liquid electrolytes of conventional lithium-ion batteries.
- **Sustainability:** The HPB solid-state battery shows a 50 percent better environmental balance compared to current lithium-ion technology. This makes it the “green key to the energy and mobility revolution”.
- **For the automotive industry,** which develops its own high-performance rechargeable batteries, HPB provides its safe, robust and outstandingly conductive HPB solid-state electrolyte.
- **Conductivity:** Compared to the liquid electrolytes commonly used today, the HPB solid-state electrolyte has an enormously improved conductivity. This is decisive for the available power from the battery cell. The HPB solid-state electrolyte shows an absolutely higher conductivity at minus 40 °C than conventional liquid electrolytes at their optimum at plus 60 °C. These properties have been confirmed by independent partners and research institutes in the temperature range from minus 40 °C to plus 60 °C.



In this way, the HPB solid-state electrolyte ensures that sufficient power is available even at extreme temperatures. This eliminates the need to preheat the batteries in winter.

Overall, HPB solid-state batteries and HPB solid-state electrolyte make an important contribution to the energy and mobility transition and to reducing dependence on raw materials. While the annual demand for storage was still 180 gigawatt-hours in 2018, it is expected to exceed 2,000 gigawatt-hours by 2030.

The longevity of the HPB solid-state battery improves the economic efficiency of battery storage – across the board in all areas of application. Above all, the combination of individual applications on the same storage unit requires a long service life. This is a financially attractive approach that is often blocked to conventional lithium-ion technology. The energy transition is becoming affordable in the storage segment.

The longevity of the HPB solid-state battery means less raw material use, as the replacement cycles can be significantly extended. The primary materials used can be procured worldwide without any problems. This means that current geopolitical dependencies can also be overcome in the future.

HPB's licensing model is intended to allow a rapid market introduction of the new technology in many fields of application and regions of the world. HPB is in contact with a number of potential licensees. The interest is great: "We are already holding intensive talks – not only in Germany and Europe. In India, too, people are very open to implementing our technology," Heinz concludes: "In Switzerland, a gigafactory is already being planned that will cover the Swiss market and produce for further licensees."

<https://www.highperformancebattery.ch>

The Future of Solar Energy

The solar energy industry is experiencing an unprecedented period of growth, driven by technological innovations, evolving policy frameworks, and increasing global demand for sustainable energy solutions. As the sector matures, a range of transformative trends is emerging, reshaping the landscape of solar power generation, integration, and storage. These trends are not only accelerating the adoption of solar energy but also redefining the role of photovoltaics in global energy markets.

Over the past decade, the cost of solar energy has declined dramatically, making it one of the most competitive energy sources in the world. However, challenges related to energy intermittency, storage, grid integration, and land-use constraints remain critical issues. The industry's response to these challenges is reflected in the emergence of innovative solar technologies, enhanced energy storage solutions, and novel deployment strategies that optimize efficiency and economic viability. As we progress into 2025 and beyond, the following key trends will be instrumental in shaping the future trajectory of the solar energy sector.

Advancements in Photovoltaic Technology and Efficiency Gains

The continuous pursuit of higher efficiency and lower costs is driving advancements in photovoltaic (PV) technology. Silicon-based solar cells, which have dominated the market for decades, are approaching their theoretical efficiency limits, prompting researchers and manufacturers to explore alternative materials and cell architectures. One of the most promising developments in this area is the commercialization of perovskite solar cells, which offer a significantly higher theoretical efficiency than conventional silicon-based cells. Recent breakthroughs in tandem solar cells, combining perovskite with silicon, have demonstrated efficiencies exceeding 30 percent, positioning them as a viable candidate for next-generation solar modules. Another key innovation is the emergence of quantum dot solar cells, which leverage nanotechnology to enhance light absorption and electron transport properties. This approach enables improved energy conversion efficiencies while reducing manufacturing costs. At the same time, thin-film solar cells, including copper zinc tin sulfide (CZTS) and organic photovoltaics, are gaining attention for their potential to offer lightweight, flexible, and cost-effective solar solutions. These technologies are par-

ticularly promising for applications in building-integrated photovoltaics (BIPV), where solar panels are seamlessly integrated into architectural elements such as rooftops, facades, and windows.

Integration of Energy Storage Systems for Grid Stability and Resilience

The rapid expansion of solar power generation has underscored the need for effective energy storage solutions to address the inherent intermittency of solar energy. The declining cost of lithium-ion batteries, coupled with advances in solid-state battery technology, is enabling broader deployment of solar-plus-storage systems at both residential and utility scales. Recent developments in flow battery technology, which offers long-duration energy storage capabilities, are particularly relevant for grid-scale applications, where stability and reliability are paramount.

In parallel, the deployment of virtual power plants (VPPs) is gaining traction as a means of aggregating distributed solar-plus-storage systems to provide grid services. By leveraging artificial intelligence (AI) and real-time data analytics, VPPs enable more efficient energy distribution and demand-response capabilities. These innovations are facilitating the transition toward decentralized energy networks, where consumers and businesses can actively participate in energy markets through peer-to-peer trading and grid-balancing services.

The Expansion of Floating Solar Farms and Land Optimization Strategies

As land availability becomes a growing constraint for large-scale solar deployments, floating solar farms are emerging as a viable alternative. By installing solar panels on water bodies such as reservoirs, lakes, and irrigation canals, floating photovoltaics (FPV) offer several advantages over traditional land-based installations. The cooling effect of water enhances the efficiency of solar panels, mitigating performance losses due to high temperatures. Additionally, floating solar projects reduce land-use conflicts, making them particularly attractive for densely populated regions where land scarcity is a limiting factor.

The global installed capacity of floating solar has grown exponentially in recent years, with large-scale projects being developed in Asia, Europe, and North America. Market projections indicate that FPV could contribute significantly to global solar capacity expansion, particularly in regions with ab-

undant water resources. In parallel, the integration of agrivoltaics—where solar panels are installed above agricultural fields—is gaining momentum as an innovative solution to optimize land use. Research has demonstrated that certain crops benefit from partial shading provided by solar panels, leading to increased water retention and reduced heat stress. As a result, agrivoltaic systems are increasingly being considered as a dual-purpose solution for food production and renewable energy generation.

The Growth of Community Solar and Decentralized Energy Models

The expansion of community solar projects is democratizing access to renewable energy by allowing multiple consumers to share the benefits of a single solar installation. This model is particularly beneficial for individuals and businesses that lack the physical or financial capacity to install rooftop solar systems. Through regulatory frameworks that facilitate virtual net metering and community solar subscriptions, more consumers can access cost-effective solar energy without the need for direct ownership.

In many regions, community solar is emerging as a key driver of solar adoption, with utilities and private developers collaborating to establish scalable projects. The digitalization of energy services is further enhancing the accessibility of community solar, with platforms leveraging AI and blockchain technology to streamline enrollment, billing, and energy trading. As policy support for community solar continues to expand, this model is expected to play a critical role in broadening the reach of solar energy while enhancing grid flexibility.

Artificial Intelligence and Digitalization in Solar Energy Optimization

The integration of AI and machine learning is revolutionizing solar energy management by enabling predictive analytics, automated maintenance, and real-time grid optimization. AI-driven forecasting models can accurately predict solar energy generation based on weather patterns, allowing grid operators to balance supply and demand more effectively. Additionally, automated inspection technologies, including drones equipped with thermal imaging cameras, are improving the efficiency of solar panel maintenance by identifying defects and performance anomalies in real time.

Digital twin technology is also being deployed in large-scale solar farms to simulate and optimize energy generation processes. By creating virtual

replicas of physical solar assets, operators can test different scenarios and implement performance-enhancing strategies without disrupting actual operations. These digital advancements are contributing to the overall efficiency, reliability, and economic viability of solar energy systems.

Policy and Market Dynamics Driving Solar Growth

Government policies and market dynamics continue to play a crucial role in shaping the future of solar energy. The introduction of industrial policies aimed at strengthening domestic solar manufacturing is fostering investment in local supply chains, reducing dependency on imported components, and enhancing energy security. In the United States, for instance, the Inflation Reduction Act (IRA) has introduced tax incentives and subsidies to accelerate the deployment of solar energy and storage technologies.

Meanwhile, the European Union's REPowerEU initiative is driving ambitious solar expansion plans, with a focus on tripling solar capacity by 2030. China remains the dominant player in global solar manufacturing and deployment, accounting for more than 50 percent of newly installed solar capacity worldwide. However, trade policies and geopolitical considerations are influencing the restructuring of global solar supply chains, prompting diversification efforts among major economies.

The solar energy industry is entering a transformative phase, characterized by rapid technological advancements, increasing grid integration capabilities, and evolving policy landscapes. Innovations in photovoltaic efficiency, energy storage, floating solar, and agrivoltaics are expanding the possibilities for solar deployment across diverse environments. At the same time, digitalization and AI are optimizing solar energy management, improving reliability, and enhancing economic viability.

As industry professionals navigate this dynamic landscape, it is imperative to stay abreast of emerging trends and policy developments that will shape the future of solar energy. The sector's continued growth will depend on collaborative efforts among manufacturers, policymakers, utilities, and researchers to address existing challenges and unlock the full potential of solar power. With sustained innovation and strategic investments, solar energy is well-positioned to become the cornerstone of a sustainable and resilient global energy system.

SHOWS





E-world 2025 is Fully Booked: Record Space with Over 960 Exhibitors

The outlook is bright for Europe's leading trade fair for the energy industry: Over 960 companies, institutions and associations have registered for E-world 2025, taking place from February 11 to 13 at Messe Essen. This means the number of exhibitors for the upcoming E-world already surpasses the total from the previous event. Additional registrations from co-exhibitors, sharing booth space with main exhibitors, are still being added. In order to meet the high demand for exhibition space, an additional exhibition hall will be opened for E-world 2026.

Both managing directors of E-world GmbH are pleased with the developments. "The exhibition space for E-world 2025 is fully booked and we are once again on course for record numbers – what a strong signal from the energy industry! This shows how much exchange and collaboration are needed in these dynamic times," said Stefanie Hamm, Managing Director of E-world GmbH. Her colleague, Sabina Großkreuz, added: "By adding a new hall to E-world 2026, we are not only offering additional

options for our exhibitors, but also creating more space for new topics and exhibition focuses. Hall 6 will be another key attraction for our trade visitors."

The exhibition spaces for this year's E-world were already highly sought after during the rebooking phase. By summer, nearly 90% of the halls were booked, and the demand for large spaces continued. Therefore, the organizers decided early on to pursue a clear growth strategy. Registrations for next E-world, which will be held from February 10 to 12, 2026, are already underway. The debut of Hall 6 is generating significant interest among companies. Strategically located near the new Middle Entrance, which will also open for the first time at E-world 2026, the hall is expected to be a highlight. Registrations for E-world 2026 can also be made during this year's event at the rebooking office in Hall 4.

Volkswagen Group Charging (Elli) Presents New Charging Products for E-Fleets and Companies

"A key to success of the e-mobility transition in Europe is the fleet and corporate sector. Against this backdrop, businesses need charging solutions that implement operational electromobility quickly and



intelligently. This is where we come in. Elli offers in-house developed digital products and AC and fast charging solutions scaled and tailored to each customer. In addition, Elli gives businesses, logistics companies, and fleet operators access to one of the largest charging networks in Europe with over 750,000 charging points.”

Giovanni Palazzo, CEO Elli & SVP Volkswagen Charging & Energy

New collaboration model with Volkswagen Commercial Vehicles

At the IAA Transportation 2024, the Volkswagen Group brand Elli presented the integration of its charging services into the ConnectPro fleet tool developed by Volkswagen Commercial Vehicles. The integrated charging services make it possible to manage public charging cards, which is an important addition to comprehensive fleet management for electric vehicles. “Our solutions bundle important information from vehicle and charging data in one platform. Whether permanently assigned company cars or pool vehicles, our charging products are flexibly tailored to the requirements of different company fleets. Together with Volkswagen Commercial Vehicles, we are using ConnectPro to accelerate the comprehensive electrification of plant and company locations,” explains Michael Gotthelf, Vice President Elli Commercial.

A few months ago, Elli introduced “Charging Site Management”, which supports companies in setting up and managing charging infrastructure. This includes the planning, construction and installation of AC and DC charging stations, as well as the provision of software solutions so that corporate customers can efficiently manage their charging sites. Elli now offers software based, cross portfolio load management for this purpose, which can be set up and managed without any on-site effort.

Elli Charger 2 - Next generation charger for business customers

The Elli Charger 2 - made in Germany - combines state-of-the-art smart charging technology with a user-friendly design and is also celebrating its IAA trade fair premiere. With its smart charging features such like solar surplus charging and price optimized charging, the new charger was developed with a clear focus on the needs of customers from Elli’s 28 European markets. The Elli Charger 2 can be used with any electric vehicle equipped with a type 2 charging connection and will be available in four

versions including an Eichrecht calibration law version.

Thanks to the new load management feature, the new charger is also suitable for fleet customers with different usage scenarios - on company premises, in parking garages or at public charging stations.

Flexpole - DC charging at sites with limited grid capacity

In order to cover all charging needs and develop solutions that match the size of the infrastructure and grid capacity, Elli offers its own hardware (Elli Charger & Elli Flexpole) as well as solutions from third party providers, thus covering all charging scenarios. The cross manufacturer load management special feature distinguishes Elli's portfolio from the competition.

The Elli Flexpole sets new standards by making it possible to electrify locations with or without a limited grid connection. The fast charging Flex pole is easy to install and can be positioned flexibly without the need for grid expansion or costly construction work. At the same time, Flexpole charging stations enable a charging speed of up to 150 kW. Depending on the vehicle, up to 160 kilometers of range can be charged within 10 minutes thanks to the integrated battery system and connection to the low voltage grid. This opens up completely new possibilities for the expansion of charging infrastructure in places that were previously considered unsuitable. With this solution, Elli is underlining its commitment to promoting electromobility even in regions that are difficult to access. Against this backdrop, Volkswagen Group Charging (Elli) has received the "Ladeport Award 2024 for the Flexpole and its commitment to providing public and semi public charging infrastructure.

Ellis future vision towards smart energy

"We see the charging of electric vehicles on company premises as an important contribution to sustainable mobility. We are working on solutions that will link the energy and mobility domains even more closely in the future to create added value for corporate customers and reduce the costs of charging electric vehicles," Gotthelf continues. Storage systems, which help to stabilize and increase the efficiency of the power grid, play an important role in this. Charging electric fleets will therefore not only become more intelligent in the future, but will also be dynamically linked to the energy markets. For business customers, the integration of intelligent

charging technologies, the optimization and control of local consumers and generators and the introduction of dynamic energy tariffs will create conditions that optimize energy consumption across the entire business and reduce energy costs. With Elli, Volkswagen Group is the first automaker to launch electricity trading on the European Energy Exchange, enabling the purchase and sale of electricity in conjunction with scalable energy storage. For companies, local and decentralized storage and the so called Managed Battery Network will lead to a revolution in on site energy management, improving energy generation and consumption and paving the way for commercial vehicle to grid (V2G) applications.

nexo Low Voltage Solutions

Connectpoint presents solutions for the low-voltage grid. By combining nexo hardware with the nexo Low Voltage Cockpit for monitoring and analysis, precise and reliable grid control is enabled.



The increasing number of photovoltaic systems, electric mobility, and heat pumps leads to fluctuations and load peaks in the low-voltage grids. To ensure the grid's stability, grid operators may intervene under §14a EnWG and §9 EEG for control actions. A prerequisite for this control and identifying bottlenecks is the visibility of voltage in real-time and the automatic transmission of countermeasures to controllable units.

The Connectpoint Solution:

nexo Low-Voltage hardware uses Rogowski Coils (current collectors) to measure the voltage and current in the low-voltage lines. This measurement data from transformers, busbars, and feeders are converted into data and sent to the central system. There, they are processed and displayed graphically in real-time with the nexo Low Voltage Cockpit.

The software shows the current load and detects impending overloads based on predefined threshold values. Exceeding these thresholds triggers alarms that initiate measures such as temporarily dimming of particular appliances. These network-relieving actions can be triggered either manually or automatically by the software. The solution also considers the implementation of fairness rules for load reduction and automates regulatory reporting obligations.

nexo Low-Voltage hardware integrates seamlessly with the openKONSEQUENZ Low Voltage Cockpit (<https://www.openkonsequenz.de>). The openKonsequenz low-voltage cockpit is being developed by the cooperative consortium as a modular system that can be flexibly adapted to future requirements. As open-source software, it ensures integration of existing systems, high quality, scalability, and professional maintenance.

Connectpoint team will showcase samples, demos, and information about the functionality and potential applications at E-World in Hall 5, Booth 5A-121.

World's first DC meter in 4DU size launched by DZG Metering

For over a century, DZG Metering has stood as a pioneer in the field of electricity metering. Founded in 1901, the company has continually evolved, specializing in the development, production, and distribution of cutting-edge AC and DC meters. Adhering to the latest technical standards and stringent calibration regulations, DZG Metering actively supports the global push for a sustainable and efficient energy transition.

In the era of e-mobility, the need for precise and reliable electricity metering has become paramount. As part of its unwavering commitment to the energy revolution, DZG Metering has developed a range of DC and AC meters tailored to the demands of charging infrastructure expansion. These meters, ensure accurate energy measurement, whether for private wall boxes or public charging stations. With advanced features such as compensated energy calculation via line loss calculation of the charging cable or exact voltage measurements directly at the charging cable, DZG's solutions meet the high standards required by the growing e-mobility sector.

At the heart of this innovation is DZG Metering's latest product, the GSH4020. This compact, next-generation DC meter sets a new standard in the industry, combining high performance with space efficiency. Measuring just four division units in width, the GSH4020 is the world's first DC meter of its size capable of supporting a maximum output of 200 kW. Fully compliant with MID, MessEG/MessEV, and UL standards, this meter is designed to seamlessly integrate into modern charging station infrastructure while ensuring compliance with calibration laws.



The GSH4020 offers a host of advanced features that make it a standout choice for technical experts and system integrators. Its compact design enables straightforward installation even in confined spaces, while its robust construction—crafted from fiber-glass reinforced polycarbonate—ensures long-term reliability. The meter's high-precision measurement capabilities with accuracy class C are complemented by an optional cable loss compensation feature, enhancing its versatility in diverse applications. Integration is simplified through the REST API, and the use of industry-standard cable connections ensures compatibility and ease of use. The device's transparency and secure billing functionality are powered by the Open Charge Metering Format (OCMF), fully compatible with S.A.F.E. transparency software. For applications requiring calibration compliance, the GSH4020 can be paired with a DZG exclusive external display.

Technically, the GSH4020 is engineered for excellence. It operates over a wide voltage range of 40 to 1000 V and supports a maximum current of 200 A. Its auxiliary power supply spans from 9 V to 24 V DC, ensuring adaptability across various setups. Designed for extreme environments, the meter performs reliably in temperatures ranging from -40°C to +80°C.

With dual RS485 interfaces and compatibility with both DIN rail and screw mounting systems, the GSH4020 offers unparalleled flexibility. Additionally, its IP20-rated enclosure provides essential protection, while its compliance with rigorous standards—including MID 2014/32/EU, MessEG/MessEV, UL 61010-1, and CAN/CSA-C22.2 No. 61010-1-12—underscores its quality and reliability.

As the energy sector continues to evolve, the GSH4020 embodies DZG Metering's dedication to innovation and excellence. Its combination of compactness, precision, and advanced functionality positions it as a vital tool for the e-mobility and industrial sectors, meeting the most demanding requirements of modern energy systems.

Visitors to E-world Energy & Water 2025 are invited to experience the GSH4020 firsthand. DZG Metering will be showcasing this revolutionary product at Hall 5, Booth 5E116, from February 11 to 13 in Essen, Germany.

www.dzg.de

Optimal connectivity: Kiwigrad tests and certifies systems

As an expert in energy management, Kiwigrad connects and certifies manufacturer-independent systems consisting of inverters, heat pumps, storage systems, SMGWs and wallboxes. Among other things, use cases for consumption optimization are tested according to dynamic tariffs.

Installing a PV system, a heat pump or a wallbox is a major investment. The full potential can only be realized when devices from different manufacturers are intelligently networked with each other in a system. Systems that have been extensively tested and certified by Kiwigrad offer the highest reliability.

What is a system certified by Kiwigrad?

Kiwigrad is manufacturer-independent. This means that Kiwigrad's energy management system (EMS) is basically compatible with the hardware of many different manufacturers and with dynamic tariffs from various tariff partners. All compatible devices and tariffs can theoretically be freely combined with each other. In practice, however, connectivity is somewhat more complex due to sometimes unpredictable interactions between devices. To prevent these potential compatibility problems, Kiwigrad has pre-certified a number of systems.

These certified systems consist of devices from particularly reliable manufacturers with a high market penetration or a correspondingly high potential.

How are systems certified?

The systems are certified in special test laboratories. Systems with components such as inverters, electricity storage systems, EV chargers, heat pumps and smart meter gateways are set up there and tested in conjunction with the EMS. Among other things, use cases for maximizing self-consumption and optimizing energy consumption according to dynamic tariffs will be tested.



The hardware is provided by partners and customers and Kiwigrad takes care of the end-to-end testing. In the case of complex or innovative products, commissioning is often carried out jointly with the partners. The tests also check whether the devices are controllable – both in terms of power consumption (Section 14a EnWG) and feed-in (Section 9e EEG). Regulation commands from distribution network operators (DSOs) are simulated for this purpose. As soon as all tests have been successfully passed and the test documentation has been created, a system is considered validated.

The test duration is approximately one week, provided that connectivity has been established in advance. Only devices that meet certain approval criteria (e.g. housing, contact protection, technical documentation) are eligible for validation.

Advantages of certified systems

Certified systems offer numerous advantages. Thanks to the testing and validation carried out in advance, Kiwigrad can guarantee that the devices will work together smoothly as a system in practice. The certified systems also only contain devices that meet Kiwigrad's high quality standards.

End customers benefit from smooth connectivity of the devices in their household without having to worry about the configuration and compatibility

themselves. Hardware manufacturers ensure proof of compatibility in accordance with §14a EnWG through validation, while hardware resellers can offer compatible systems in a targeted manner, which minimizes sources of error and simplifies installation.

Five different certified systems are currently available from Kiwigrad. The systems are designed for different use cases and expansion stages. Each of these systems connects different hardware components and links them with dynamic tariffs.

About Kiwigrad

Kiwigrad is Europe's leading IoT company for energy management and energy optimization. Software and hardware solutions from Kiwigrad connect energy generators and energy consumers in buildings. Intelligent energy management enables locally generated solar power to be utilized in the best possible way, thereby reducing the load on the power grid and saving grid fees and electricity costs. KiwiOS provides customer companies with an IoT platform to quickly and inexpensively launch products to control and optimize decentralized energy, thereby advancing the energy transition. Kiwigrad is based in Dresden and employs more than 160 people. The IoT company is a leader in sector coupling in the home, working with Solarwatt, SpotmyEnergy, EKD, enviaM and E.ON, among others.

<https://www.kiwigrad.com>

chargecloud presents software ecosystem

chargecloud GmbH offers a comprehensive software platform for managing charging points and billing charging processes for charging infrastructure operators and companies in the e-mobility sector. As a SaaS solution, the ecosystem including the Charge Point Management System (CPMS) can be flexibly expanded and enables the future-proof operation of charging infrastructure.

At the E-World, chargecloud will be presenting its modular software ecosystem at its stand in Hall 4, Booth C107. In addition to managing charging infrastructure, the main functions include the billing of ad hoc and contract customers, the charging management of electric fleets and the support of location partners. In addition, chargecloud provides a variety of add-ons, such as APIs for seamless integration with third-party systems, a B2B portal, a white label app and consulting services.

Live demo: Driver App and B2B Portal

In a live demo, the e-mobility experts will present the system's scope of services and introduce trade fair visitors to the new Driver App and the B2B Portal. Technical and graphical improvements have been implemented in both add-ons, ensuring intuitive use as well as long-term stability and future viability.



B2B Portal: With the white label platform, chargecloud users can provide their B2B customers (e.g. location partners or employers with company car fleets) with a powerful web application. The web app enables uncomplicated management of their e-mobility use cases with a wide range of functions. Well-organized dashboards provide transparency and live information about the managed charging points.

Driver App: The white label app enables chargecloud customers to offer their customers - electric car drivers - a user-friendly app in their corporate design. This allows users to charge at any time at the current contract conditions, navigate to the nearest charging point and manage their account.

The chargecloud 360° software platform has established itself as the market-leading solution for managing charging infrastructure in Germany thanks to its range of functions and flexibility. In 2024 alone, more than 10 million charging processes were carried out via the system. Security plays a central role here: the application is certified in accordance with ISO 27001 and ISO 9001 and is GDPR-compliant.

www.chargecloud.de/en-de/

Show Special San Diego Intersolar & Energy Storage North America





The Intersolar & Energy Storage North America (IESNA) conference and exhibition is set to take place from February 25 to 27, 2025, at the San Diego Convention Center in California. As a premier event in the clean energy sector, IESNA offers a comprehensive platform for professionals to explore the latest advancements in solar, energy storage, and electric vehicle (EV) charging infrastructure.

Event Overview

IESNA 2025 aims to deliver a nationwide perspective on solar, storage, EV charging infrastructure, and manufacturing at both federal and state levels. The event is designed to provide attendees with forward-looking insights from industry leaders and innovators through a comprehensive conference program.

Conference Highlights

The conference will feature 24 sessions that delve into policy, technology, and market developments across various sectors, including solar, storage, clean energy systems integration, and EV charging infrastructure.

Notable sessions include:

Beyond the Meter: How Fortune 50 Companies Measure Solar Health: Presented by Rogér Balyon from Amazon and James Nagel from Heliovolta, this session will discuss asset management strategies and the limitations of metered energy data.

Electric Utility Barriers to Energy Storage: Presented by Joshua Hotvet of Agilitas Energy, this session will explore challenges faced by electric utilities in integrating energy storage solutions.

Exhibition and Networking Opportunities

The exhibit hall will showcase over 550 exhibitors spanning solar, storage, and EV charging infrastructure. Industry-leading companies such as Canadian Solar, Enphase Energy, LONGi, and SolarEdge will be present, providing attendees with the opportunity to explore best-in-class products, solutions, and services.



In addition to the exhibition, IESNA 2025 will offer dynamic networking and professional development activities, including:

- Port of San Diego Tenth Avenue Marine Terminal Site Tour: A pre-conference tour on February 24, showcasing sustainable maritime innovations such as microgrids and zero-emission cargo equipment.
- Networking Luncheon: Scheduled for February 25, this luncheon provides a platform for meaningful conversations and professional connections.
- Powerful Perspectives Luncheon: On February 26, participants can gain key insights and connect across disciplines.
- Solar Battle of the Bands: Also on February 26, this official after-party features a live music competition, combining networking with entertainment.

Registration and Passes

- Attendees can choose from various pass options to tailor their experience:
- Full Conference Pass: Includes access to conference sessions, keynotes, luncheons, and the exhibit hall.
- Exhibit Hall Only Pass: Grants access to the exhibit hall, keynotes, and special features like the Solar Games.
- Workshop Passes: Options for full-day or half-day workshops on February 24, providing technical training with actionable takeaways.

Discounted rates are available for students, government employees, nonprofits, and groups. Early registration is encouraged to secure the best rates and ensure participation in ticketed activities.

Venue and Accommodation

The event will be held at the San Diego Convention Center, a modern facility located along the waterfront in downtown San Diego, offering scenic views and proximity to the vibrant Gaslamp District. Discounted rates at selected San Diego hotels have been secured for attendees through the official housing partner, onPeak.

Why Attend?

- IESNA 2025 provides a unique opportunity to: Gain forward-looking insights from industry leaders.
- Explore innovative products and solutions from leading exhibitors.
- Participate in dynamic networking and professional development activities.
- Experience live demonstrations and competitions showcasing the latest in solar and energy storage technology.

Whether you're an installer, developer, utility professional, technology provider, policymaker, or stakeholder in the clean energy sector, IESNA 2025 offers valuable resources and connections to drive your success in the evolving energy landscape.

Special Features



A highlight of the event is the Solar Games, a live competition where installation teams from across North America build residential solar and storage systems. The winning team will receive \$10,000 and the title of Solar Games Champion.

For more information and to register, visit the official IESNA website: <https://www.intersolar.us>

Anza Expands One-of-a-kind Platform for Developers

Anza, a leading solar and energy storage development and procurement platform, announced expanded platform capabilities to enable developers, IPPs, EPCs, and utilities to quickly and confidently select and or purchase domestic solar modules for their projects. As the only platform capturing more than 95% of the module supply market, developers using the Anza platform now have real-time visibility into domestically made solar modules and cells from 10 manufacturers for 2025-2026 delivery, with an additional nine suppliers being tracked in that time frame. As the module market becomes more dynamic due to tariffs, product availability, and supply chain constraints, it's more important than ever that developers and procurement teams have a full line of sight into real-time data that can help them minimize risk and make the right investment and purchasing decisions to increase project profits – particularly given the limited supply of U.S.-made content.

Anza's expanded platform features enable real-time updates on the availability of new domestic modules. The Anza platform also provides data-backed insights to determine if a domestic content module is worth the price premium and if it is advantageous to blend domestic and international products. Besides capitalizing on this existing opportunity, Anza clients will have their finger on the pulse of when new domestic modules are available, giving them a significant advantage over competitors in a supply constrained market.

„Developers are racing to secure domestic content as more U.S. manufacturers offer competitive pricing and faster delivery timelines,“ says Mike Hall, CEO and co-founder of Anza. „The challenge is the supply isn't infinite. With access to real-time insights on domestic content through the Anza platform—including pricing, inventory, delivery timelines, and total lifetime value—our clients will now have a significant advantage in procuring domestic content ahead of the market.“

To date, Anza's procurement service, Pro Procure, has advised clients on more than 1 GW of domestic content modules, helping developers and buyers efficiently access and evaluate U.S.-made module options in a shifting landscape.

„Anza provided access to a wide range of domestic solar module options that would have been difficult to source elsewhere,“ says Ed Kent, COO of Radial Power. „Across more than a dozen projects, Anza effectively balanced domestic and international module supplies to minimize CapEx while meeting IRS domestic content requirements. They provided the financial modeling so that we could easily analyze the effect of optimizing the unique mix of domestic racking and inverters tailored for every project. As timelines shifted, having real-time data and insights centralized in one digital location proved invaluable in guiding our procurement strategy and ensuring the best customer outcome.“

www.anzarenewables.com

Canadian Solar's e-STORAGE to Deliver 2 GWh of Energy Storage Systems

Canadian Solar Inc. today announced that e-STORAGE, which is part of the Company's majority-owned subsidiary CSI Solar Co., Ltd. („CSI Solar“), has signed contracts with Copenhagen Infrastructure Partners (CIP), through its flagship fund CI IV.



The contracts cover the delivery of 2 GWh DC of battery energy storage systems for two landmark projects in Scotland: the 1 GWh DC Coalburn 2 Project, situated in South Lanarkshire, adjacent to the existing Coalburn 1 Project, and the 1 GWh DC Devilla Project, located in Fife near Kincardine, north of Edinburgh. Each site will have a two-hour energy storage dispatch capability.

Coalburn 2 and Devilla are both scheduled to start construction in 2027. e-STORAGE, a tier 1 global provider of energy storage solutions, will supply and integrate approximately 450 SolBank 3.0 battery containers during the construction of both projects. e-STORAGE will also support the long-term facility performance and operational management of the projects under a long-term service agreement with

CIP. The 2 GWh capacity delivered by the projects will provide enough energy to power approximately 250,000 homes for a full day, based on average UK electricity consumption. These transformative initiatives will play a pivotal role in stabilizing the grid, reducing carbon emissions, and driving the UK's clean energy transition.

Coalburn 2 and Devilla are expected to collectively displace approximately 4.57 million metric tons of CO2 emissions during their lifespan, making a significant contribution to combating climate change. The projects will enable the efficient transmission of renewable energy across the country, support offshore wind generation, and include environmental measures such as tree planting and habitat creation to enhance biodiversity.

www.canadiansolar.com.

FranklinWH Announces General Availability of Whole Home Energy Management System

FranklinWH Energy Storage Inc. (FranklinWH), a leader in whole-home energy management, today announced the general availability of its next-generation whole home energy management solutions, including the aPower 2, a lithium iron phosphate (LFP) home battery featuring an impressive 15 kWh capacity and 10 kW continuous output power, as well as its enhanced aGate, an intelligent management device that supports home loads by integrating energy sources and FranklinWH batteries, and the user-friendly FranklinWH App.

„We are proud to begin delivering our next-generation whole-home energy management system to homeowners at such a critical time,“ said Gary Lam, Co-Founder and CEO of FranklinWH. „In addition to a seamless connection with PV inverters, these upgrades demonstrate our commitment to constant improvement and providing consumers with peace of mind amid rapidly growing energy demand and extreme weather events.“

FranklinWH's whole home system is available via its growing installer network, composed of more than 2,000 installation companies located across the U.S., including Puerto Rico. Domestic Content compliant versions of the aPower 2 are expected to be available to customers in Q2, 2025.



New enhancements to the FranklinWH whole home solution were made to further meet homeowner needs. Along with an increased warranty of 15 years or 60 MWh throughput, FranklinWH's upgraded system provides even greater reliability and return on investment for homeowners. Whole home backup can be achieved, in most cases, with a single aPower 2 due to its robust 15 kWh capacity, 10 kW discharge rate, 8 kW charge rate, and support for up to 5-ton AC units. For larger applications, the aPower 2 can be stacked up to 225 kWh or 15 aPowers per aGate. Enhanced black start capabilities and a more efficient low-power mode make the system the ideal solution in backup power situations – ensuring power is available when a homeowner needs it most.

FranklinWH's solutions can endure almost any climate and, by using fan-less convection with whisper-quiet operation, it is significantly quieter than industry-standard fan cooled batteries. The FranklinWH App has been enhanced with revamped visuals, a smart voice assistant for hands-free commands, enhanced energy data analysis, and more customized scheduling options so homeowners can take further control over their energy usage.

To learn more about how FranklinWH is empowering consumers to take control of their energy management solutions and gain whole home energy freedom, visit www.franklinwh.com.

Destination San Diego





The Allure of San Diego: A Coastal Gem

Nestled along the majestic Pacific coast, San Diego, often dubbed America's Finest City, unfolds a captivating narrative of nature, history, and vibrant urban life. The city's geographical blessings are immediately apparent to anyone who has witnessed a sunset over its tranquil beaches or explored the rugged beauty of its coastal trails. The natural splendor of San Diego acts as a perennial lure for those seeking a blend of outdoor adventures and serene beach life.

As you delve into the city's neighborhoods, each tells a tale of cultural diversity and historical richness. The quaint streets of Old Town transport you back to the early days of California, offering a glimpse into a bygone era. Meanwhile, a stroll through Little Italy immerses you in a lively atmosphere where the aroma of fresh pasta and the sound of laughter fill the air.

San Diego's historical tapestry extends beyond its neighborhoods to landmarks like the Cabrillo National Monument and the USS Midway Museum. Each historical site serves as a portal to different epochs of the region's past, providing a tangible connection to the narrative of San Diego.

As the day transcends into night, the city dons a new persona. The Gaslamp Quarter, with its old-world charm, morphs into a hub of modern urban nightlife. The lively buzz in the streets is palpable as locals and visitors alike revel in the diverse array of bars, restaurants, and nightclubs.

San Diego's artistic heart beats strongly in the halls of its museums and the performances in its theaters. Balboa Park, the cultural epicenter, is a testament to the city's dedication to the arts and creativity. The park, with its Spanish-Renaissance architecture and verdant gardens, houses an array of museums and performing arts venues that celebrate human creativity and the quest for knowledge.

The culinary scene in San Diego is as varied as its cultural landscape. The city's close proximity to Mexico influences its culinary palette, offering some of the best Mexican cuisines north of the border. The fresh seafood, caught daily from the Pacific, and the burgeoning craft beer scene add another layer to the gastronomic adventure awaiting visitors.





A unique aspect of San Diego's appeal lies in its opportunities for wildlife encounters. The renowned San Diego Zoo and Birch Aquarium provide ethical and educational settings for visitors to learn about and appreciate the diverse species that share our planet.

The friendly and relaxed demeanor of San Diegans enhances the city's welcoming aura, making any trip here a pleasant endeavor. Moreover, San Diego's strategic location serves as a gateway to other Southern California attractions, making it a convenient base for broader explorations.

In essence, San Diego is more than just a city; it's a narrative of how nature's splendor, historical roots, and modern urban life coalesce to create a destination that enchants every visitor. Each day in San Diego unfolds a new chapter in this captivating narrative, inviting travelers to become a part of its ongoing story.

A Whirlwind Tour: The Best of San Diego in 48 Hours

San Diego, often referred to as the birthplace of California, embodies a delightful blend of modernity and history. Nestled along the Pacific coastline, this vibrant city presents a rich tapestry of experien-

ces, from its lush natural landscapes to its colorful cultural heritage. Here's how you can dive into the essence of San Diego in just two days.

Day 1: From Wild Encounters to Historical Walks

Morning: The San Diego Zoo

Embark on an early morning exploration of the [San Diego Zoo](#), one of the most prestigious zoological parks globally. Home to over 3,700 animals of more than 650 species, this zoo is famed for its pioneering open-air, cageless exhibits that replicate natural habitats. As you meander through the trails, witness the Giant Pandas munching on bamboo leaves, and the majestic lions lounging in the sun. Don't miss the aerial tram for a bird's eye view of the zoo's lush landscape.

Afternoon: La Jolla Cove

Venture towards the coastal jewel of [La Jolla Cove](#). Encased by towering cliffs, this small beach is a sanctuary for snorkelers, divers, and wildlife enthusiasts. The pristine waters offer a glimpse into an abundant marine life, while the shores often have seals and sea lions basking under the sun.



La Jolla Beach



Evening: Gaslamp Quarter

As twilight descends, step into the historic [Gaslamp Quarter](#). With its Victorian-era buildings and cobblestone streets, this district brims with old-world charm. Explore a myriad of boutiques, art galleries, and eateries. As night falls, the area buzzes with life as the vibrant nightlife scene takes over.

Day 2: A Dive into Culture and Scenic Beauty

Morning: Coronado Island

Begin your day with a ferry ride to [Coronado Island](#). The serene beaches, the historic Hotel Del Coronado, and the quaint downtown area offer a peaceful retreat from the city hustle. Stroll along the Coronado Beach, known for its golden sands, and enjoy a leisurely breakfast with a view of the Pacific.

Afternoon: Balboa Park

Post-lunch, set forth to the cultural heart of San Diego, [Balboa Park](#). This urban oasis houses 17 museums, numerous beautiful gardens, and the iconic San Diego Natural History Museum. Wander through the Spanish-Renaissance architecture, discover the rich botanical collections, and delve into the local art scene.

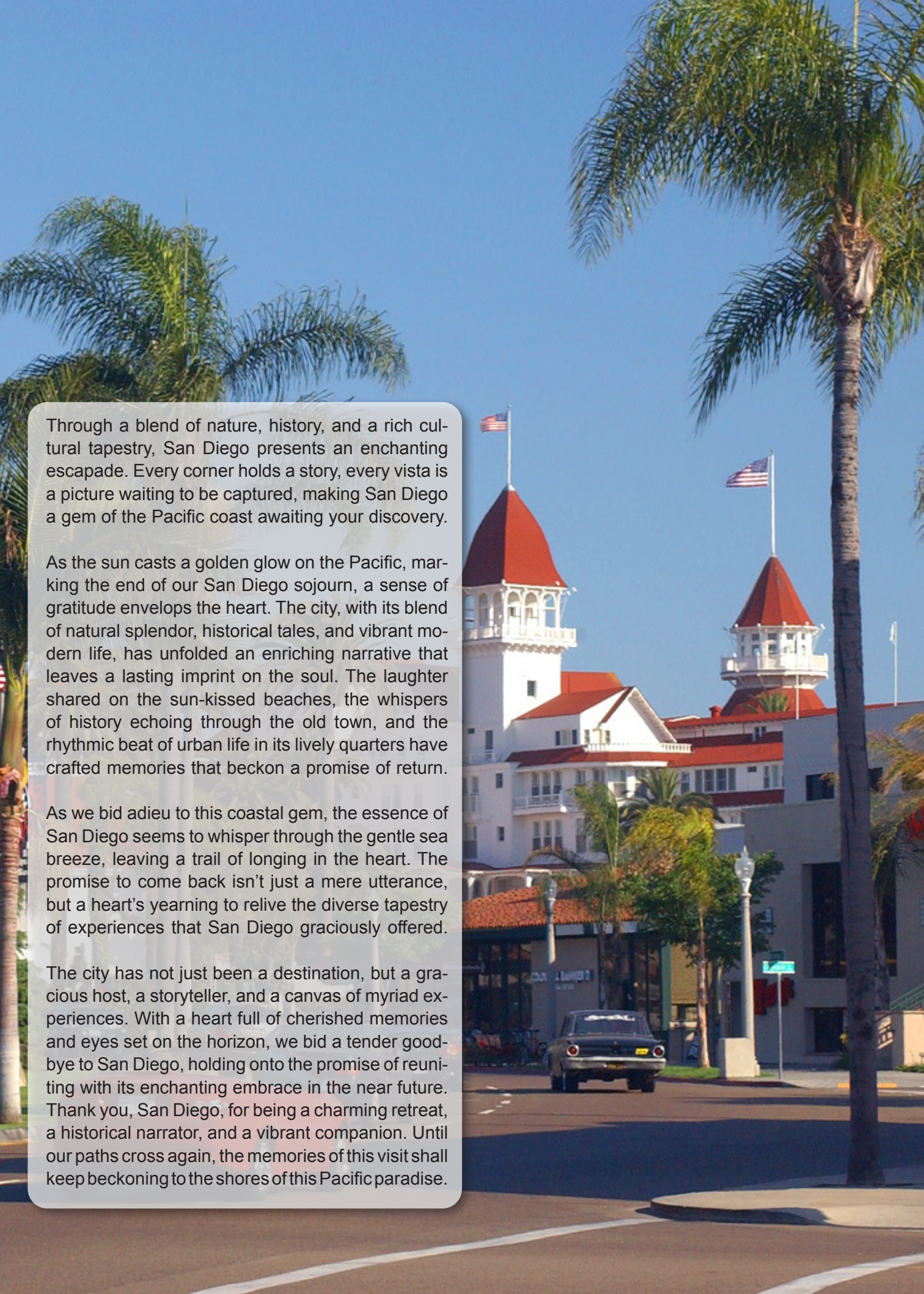
Late Afternoon: Old Town San Diego

Step back into history at [Old Town San Diego](#). As a living history museum, it echoes the lives of early settlers through restored Victorian homes and historic sites. The vibrant Mexican marketplaces offer a plethora of crafts, while the aroma of authentic Mexican food wafts through the air.

Evening: Little Italy

Conclude your adventure in [Little Italy](#), a bustling neighborhood that holds the essence of Italian culture. Saunter through its lively streets lined with charming cafes, Italian eateries, and boutique shops. As you relish a slice of Italy in San Diego, the memories of this eclectic city are sure to etch a permanent spot in your heart.





Through a blend of nature, history, and a rich cultural tapestry, San Diego presents an enchanting escapade. Every corner holds a story, every vista is a picture waiting to be captured, making San Diego a gem of the Pacific coast awaiting your discovery.

As the sun casts a golden glow on the Pacific, marking the end of our San Diego sojourn, a sense of gratitude envelops the heart. The city, with its blend of natural splendor, historical tales, and vibrant modern life, has unfolded an enriching narrative that leaves a lasting imprint on the soul. The laughter shared on the sun-kissed beaches, the whispers of history echoing through the old town, and the rhythmic beat of urban life in its lively quarters have crafted memories that beckon a promise of return.

As we bid adieu to this coastal gem, the essence of San Diego seems to whisper through the gentle sea breeze, leaving a trail of longing in the heart. The promise to come back isn't just a mere utterance, but a heart's yearning to relive the diverse tapestry of experiences that San Diego graciously offered.

The city has not just been a destination, but a gracious host, a storyteller, and a canvas of myriad experiences. With a heart full of cherished memories and eyes set on the horizon, we bid a tender goodbye to San Diego, holding onto the promise of reuniting with its enchanting embrace in the near future. Thank you, San Diego, for being a charming retreat, a historical narrator, and a vibrant companion. Until our paths cross again, the memories of this visit shall keep beckoning to the shores of this Pacific paradise.



The Paradigmatic Shift in Utility Sector: Embracing Customer Service in the Digital Era

In the contemporary landscape of the energy sector, utility companies find themselves at the cusp of a monumental transition. The erstwhile model of merely providing energy is undergoing a metamorphosis, driven by an amalgam of technological advancements, burgeoning consumer expectations, and a palpable shift towards a more sustainable world. The onus is now on these entities to transcend the traditional boundaries and morph into customer-centric service providers. This transition, though imperative, calls for the adept integration of intelligent technologies and an accelerated pace of digitalization, aspects that the sector has found challenging to embody hitherto.

The impetus to transition from mere energy providers to service-oriented entities emanates from a confluence of factors. Foremost among these is the modern-day consumer, whose discernment and demands have escalated, driven by a global awakening towards sustainability and efficiency. They now seek not just energy, but intelligent solutions that enable them to optimize consumption, reduce wastage, and contribute to a greener planet. This discerning consumer outlook mandates utilities to metamorphose from transactional entities to relational partners.

Central to this metamorphosis is the adoption of intelligent technologies. The quintessence of modern utility service lies in leveraging technologies like smart grids, smart meters, and data analytics to facilitate a two-way interaction with consumers. Such technologies hold the promise of empowering consumers with real-time insights into their energy consumption patterns, enabling them to make informed decisions. Moreover, on the utility's end, these technologies allow for enhanced grid management, demand forecasting, and seamless integration of renewable resources. However, the pace of adopting such intelligent technologies has been somewhat sluggish, engendering a gap between consumer expectations and the services rendered.

Digitalization is the linchpin that can potentially bridge this gap. A robust digital interface, encompassing user-friendly apps and online portals, is indispensable for modern utilities. Through these digital channels, utilities can engage with consumers, provide them with tailored energy solutions, and foster a relationship that transcends the transactional nature of the past. Yet, the pace of digitalization in the sector leaves much to be desired.



The requisite infrastructure and expertise for a full-fledged digital transformation are often found wanting, thereby impeding the pace at which utilities can transition into the digital era. This sluggish pace of digitalization is in stark juxtaposition to the swift evolution of consumer expectations, thus creating a chasm that utilities must bridge posthaste.

The exigency to accelerate the pace of change is palpable. Unlike other sectors, utility companies enjoy a unique position of trust among consumers. This trust is a legacy of their long-standing relationship with the community, often seen as reliable providers of a fundamental need. It's a level of trust that is extraordinary in the consumer world, thus placing utilities in a vantage position to lead the charge towards a more customer-centric, efficient, and sustainable energy landscape. However, to leverage this trust and fulfill the evolving consumer expectations, utilities must expedite their pace of change, embracing digitalization and intelligent technologies with alacrity.

The journey ahead, though laden with challenges, is also replete with opportunities. By accelerating the pace of digitalization and integrating intelligent technologies adeptly, utilities can not only meet the burgeoning consumer expectations but also foster a sustainable and efficient energy landscape. The transformation from mere energy providers to customer-centric service providers is not just a commercial imperative but a societal one. As utilities navigate this transition, they have the unique opportunity to redefine their relationship with consumers, contribute to a greener planet, and carve a sustainable path forward in the ever-evolving energy landscape.

In conclusion, the exigencies of the modern-day consumer and the global shift towards sustainability mandate a paradigmatic shift in the utility sector. As they transition into customer-centric service providers, utilities are not merely selling energy; they are selling a service, an experience, and a partnership. This transition, though imperative, calls for an expedited pace of digitalization and the adept integration of intelligent technologies. With a unique position of trust among consumers, utilities have the opportunity to lead the charge towards a more sustainable, efficient, and customer-centric energy landscape.

Ashley