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Schneider Electric

page 40

Accelerating Sustainability through Digital Transformation in the Water and Wastewater Industry

SIEMENS's

AI-Powered Solutions Combat Non-Revenue Water Challenge page:13

How IoT is Revolutionizing the Energy Transition page:46

Net Zero: Mapping the Route to Carbon Neutrality in the Water Sector page:10

Bridging the Water-Energy Divide: AI-Enabled Sustainable Solutions for Companies page:43

Six of the Key Countries Leading Green Hydrogen in Africa page:54

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From The Editor

Embracing Digital Transformation Shapes Our Global Future

July 2024 Aqua Energy Expo Magazine Issue

Mohamed Khalifa

Founder and CEO

In this digital age, the interplay between water and energy has become a central focus for industries and policymakers alike. As we navigate the complexities of sustainable resource management, the need for innovative solutions and cross-disciplinary collaboration has never been more pressing.

This issue of Aqua Energy Expo Magazine delves into the transformative power of digital technologies in revolutionizing the way we approach water and energy challenges. From the integration of smart sensors and real-time data analytics to the optimization of energy-efficient water systems, the articles within these pages showcase the remarkable advancements that are reshaping the landscape of our industries.

At the heart of this digital transformation lies the recognition that the traditional siloed approach to water and energy management is no longer sufficient. By embracing the interconnectedness of these vital resources, we can unlock new opportunities for greater efficiency, resilience, and environmental stewardship.

One of the key areas explored in this issue is the role of digital technologies in enhancing water treatment processes. Through the integration of advanced sensors and predictive analytics, water utilities can now monitor and optimize their operations in real-time, reducing energy consumption, minimizing waste, and ensuring the delivery of high-quality water to communities. This not only improves the overall sustainability of water management but also contributes to the broader goal of energy efficiency, as water treatment and distribution are significant energy-intensive activities.

Similarly, the integration of digital technologies in the energy sector is transforming the way we generate, distribute, and consume power. From smart grid technologies that enable demand-side management to the integration of renewable energy sources, the digital revolution is paving the way for a more resilient and decarbonized energy system. This, in turn, has a direct impact on water usage, as energy production is a major consumer of water resources.

Beyond the technical innovations, this issue also delves into the importance of data-driven decision-making and the role of collaboration in driving digital transformation. By leveraging the power of data analytics and fostering cross-sector partnerships, water and energy stakeholders can make more informed decisions, optimize resource allocation, and develop comprehensive strategies to address the complex challenges at the water-energy nexus.

As we continue to navigate the ever-evolving landscape of water and energy, this issue serves as a testament to the power of innovation and the transformative potential of digital technologies. I invite you to dive into these pages and discover the cutting-edge solutions that are paving the way for a more sustainable and resilient future, where the synergies between water and energy are harnessed to drive progress and improve the lives of people around the world.

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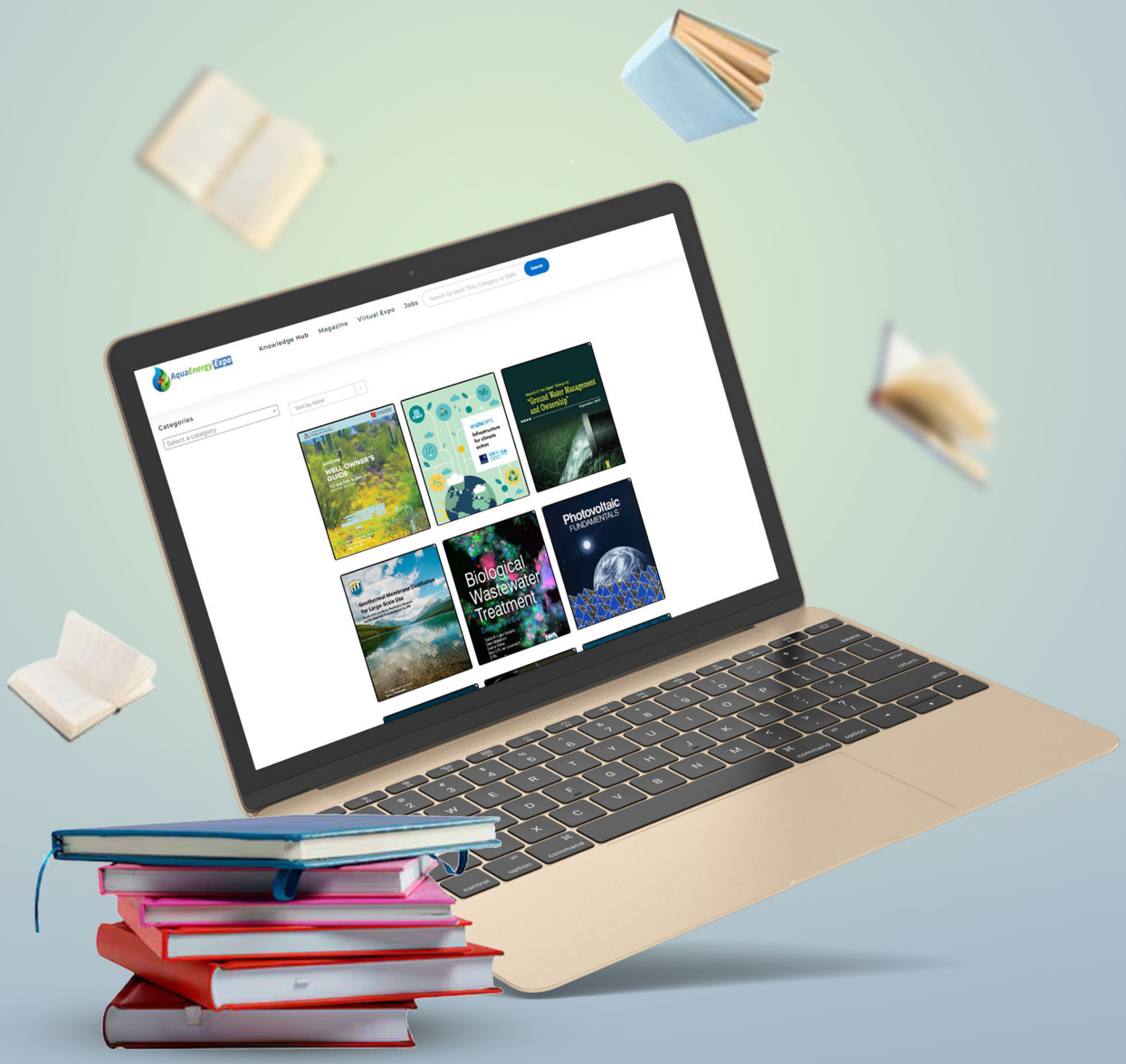

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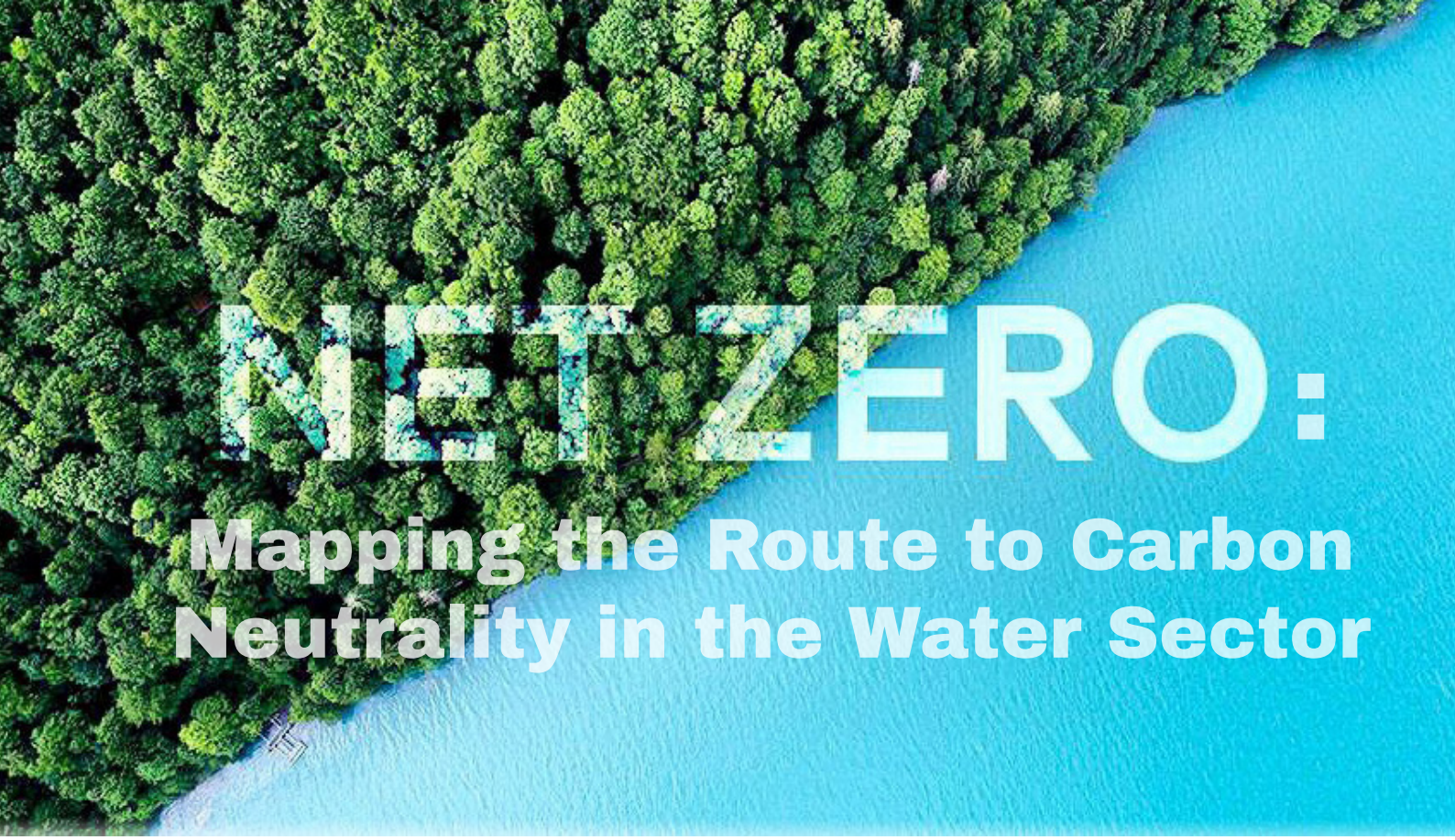


NET ZERO: Mapping the Route to Carbon Neutrality in the Water Sector

As a major emitter of greenhouse gases, the water sector is uniquely positioned to drive rapid decarbonization. Water utilities, long stewards of essential infrastructure, can significantly cut emissions at low to no cost through innovative technologies and cross-sector collaboration. By transforming into net-zero entities and adopting a circular water management model, the sector can become a blueprint for others, championing the transition to a sustainable future.

Why is Net Zero A Priority for the Water Sector?

In November 2020, the UK water industry launched the ambitious Net Zero 2030 Routemap, a groundbreaking commitment to achieve net zero water supply for customers by 2030, two decades ahead of the government's target. Responsible for almost a third of UK industrial and waste process emissions, the sector aims to play a proactive role in mitigating climate change by aligning with the UK's net-zero goal and going even further. The initiative acknowledges the water industry's significant environmental impact and the need to take responsibility. By committing to net zero, the sector aims to lead by example and demonstrate its dedication to a green and resilient recovery. This sector-wide commitment anticipates a reduction of 10 million tonnes in greenhouse gas emissions through a 10-point decarbonization plan that balances emission reduction with measures to protect customer bills, minimize investment costs, and contribute to economic recovery.

The Imperative of Net Zero in Water Utilities

Water utilities increasingly recognize the need to transform into net-zero entities. This transition is vital for environmental stewardship and sustainable water resource management. The path to net-zero involves integrating renewable energy, improving energy efficiency, and refining water treatment and distribution. Achieving this goal requires a comprehensive approach encompassing all aspects of water management, from resource extraction to waste treatment. The industry collaborates to make this a reality. Here is how the industry is working together to get there:

- Unified industry commitments drive emissions reductions

Despite the water industry's noble intentions to achieve net zero, it faces significant challenges, including managing nitrous oxide (N2O) emissions from wastewater treatment. N2O is a potent greenhouse gas produced during these processes, and it is crucial for utilities to monitor and mitigate these emissions effectively to meet their net zero targets. Accurately quantifying N2O emissions requires advanced monitoring technology and an understanding of the complex microbial processes involved. Implementing strategies to reduce or capture N2O adds an extra layer of complexity, as utilities must balance efficient treatment with emission mitigation. Collaboration between utilities, regulators, and researchers is essential to developing and implementing effective strategies to address this challenge and progress towards net zero goals.

- The time is now for efficiency innovation

The push towards Net Zero has spurred a wave of innovations in water utilities, from wastewater treatment to energy-efficient processes. Waste-to-value biogas and renewable energy are becoming integral to this transition.

" Notable technologies included QLM's LiDAR gas sensor for continuous autonomous monitoring and VorTech's high-efficiency aerator that recovers up to 20% of power input. I-PHYC's algal reactor also presented a novel biological system for nutrient, COD, and pollutant removal, with potential for monetizing the produced algal biomass. "

These cutting-edge solutions are enabling water utilities to integrate renewable energy, enhance efficiency, and refine water management practices, driving them towards a more sustainable future.

• The Overlooked Affordable, High-Efficiency Technologies Solutions

Readily available technologies are an important and affordable part of the roadmap in the race to zero, combined with changes in process, policy, and practice. Assessments by Xylem and their partners indicate that global water utilities could cut GHG emissions in half, at low to no cost, with existing high-efficiency technologies.

> ***" About 50% of energy-related emissions from the wastewater sector can be abated with existing technologies, with 95% of this impact achievable at zero or negative cost "***

Innovative utilities, like EWE WASSER GmbH, are leading the charge, using digital twins to optimize operations, reduce aeration energy use by 30%, and save 1.1 million kWh annually. Other approaches include remote monitoring, intelligent pump stations, and renewable power generation from waste. However, utilities need support from the broader ecosystem, including policymakers, regulators, financiers, and technology partners, to remove hurdles and enable rapid adoption.

Championing the Transition to Clean Energy

The water sector is energy-intensive, with its energy consumption equivalent to all the energy used by Australia. By 2040, energy use in the sector is expected to double due to increased desalination, large-scale water transfers, and rising demand for wastewater treatment, as well as higher levels of treatment. The energy used for water supply and wastewater treatment is responsible for around 3–8% of global greenhouse gas emissions. With global water demand projected to increase by 55% by 2050, a business-as-usual scenario will see emissions rising by 50% in the same timeframe.

Integrating renewable energy sources, such as hydropower generators and solar panels, into facilities can power processes with fewer emissions. Alternatively, directly purchasing renewable energy from providers is another solution.

• Fully on Track to Net Zero: Anglian Water

Anglian Water is "fully on track" to generate 45% of its energy from renewable sources by 2025 and become a net zero carbon business by 2030. The installation of the solar system at Anglian Water's Jaywick, Essex Water Recycling Centre, is part of the utility's broader goal.

> ***" Comprising 3,312 solar panels, the scheme will generate 36% of the site's energy consumption and reduce carbon emissions by over 300 tons annually "***

At peak operation, the site will be capable of powering 200 homes. The utility is also managing and reducing emissions by installing monitoring equipment, decarbonizing its electricity supply and vehicle fleet, and procuring green electricity. It is also exploring nature-based solutions, such as creating wetlands that naturally filter and clean wastewater before it's returned to rivers. This not only improves water quality but also enhances biodiversity. Additionally, Anglian Water is using wastewater as a source of heat and electricity to power its treatment works. The utility recognizes its responsibility to tackle emissions, given the water sector's significant energy demands, particularly in Anglian Water's rural and flat region.

Turn on the Lights by Embracing Digital Solutions

Digital solutions and data analytics can significantly improve utilities' visibility and situational awareness of their sewer systems in real-time. This enhanced visibility can be further augmented through digital twin technology, providing an accurate virtual representation of the real system. By harnessing this information, utilities can optimize processes, saving money, reducing energy consumption, and minimizing the need for costly new infrastructure. At the Kaohsiung Linhai Wastewater Treatment Plant in Taiwan, various digital technologies, including augmented reality, were applied across multiple systems during construction and operation. Skill development and training programs are crucial for the successful implementation of these new technologies in the water sector.

Overall, the adoption of digital solutions and data analytics is transforming how utilities manage their sewer systems, leading to more informed decision-making and sustainable operations.

Going further: from treatment to resource recovery

Decarbonization offers an opportunity to reimagine water management, shifting from viewing wastewater as waste to a valuable resource. The "water resource recovery" model transforms treatment facilities into energy production engines, efficiently refining a range of products to meet community needs. By applying circular economy principles, the sector can leverage the full value of treated water.

> ***" Early adopter Thames Water generates 140 million cubic meters of green biogas from sewage, using it to produce renewable electricity and heat, with surplus power fed to the grid "***

As part of its net-zero plan by 2030, the company also reduces fossil fuel use and adopts renewable energy. Beyond biogas, the water sector can extract value from co-digestion, fertilizer, and resources like cellulose and biopolymers. For smaller plants, pyrolysis or gasification can produce biochar and syngas from sludge, with the biochar absorbing pollutants and the syngas generating electricity.

Scottish Water: Net Zero in Action

Scottish Water has developed a routemap that outlines how the water company will achieve net zero emissions by 2040 onwards. The routemap outlines a new approach that fully embraces a low-carbon future in delivering water and wastewater services, as well as a commitment to running a fully emissions-free vehicle fleet. Already, the water company has taken significant steps towards achieving these goals.

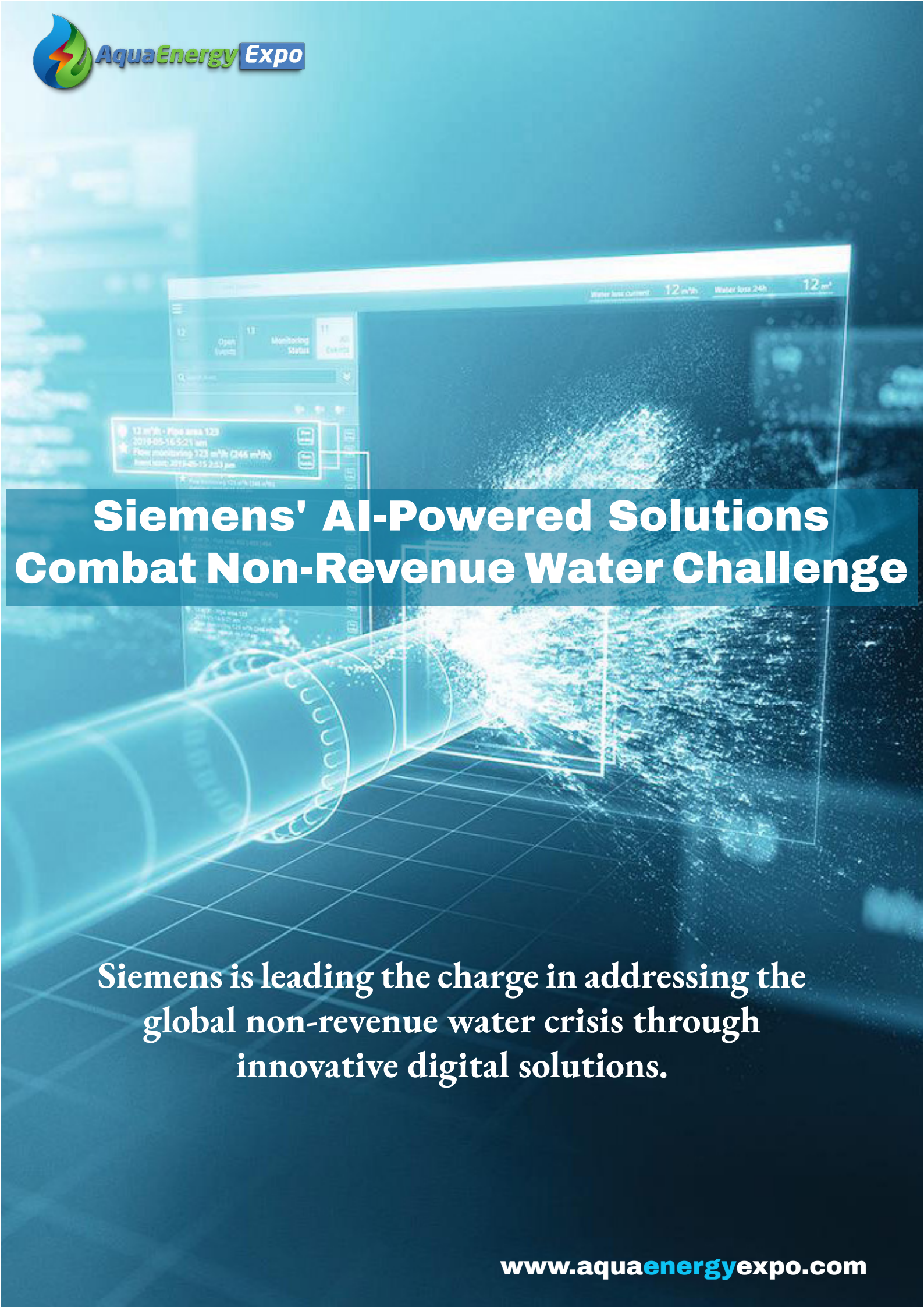
Scottish Water has implemented a range of renewable and low-carbon energy technologies, including:

- 8 MW of solar PV power at over 42 sites, generating 6.3 GWh annually.
- They have also installed 5.5 MW of hydropower capacity at over 28 assets, with plans to add 2.2 MW more.
- The company has 18 small-scale wind schemes and an anaerobic digestion facility that can process 30,000 tons of food waste, generating 8 GWh of renewable energy per year.
- Scottish Water also operates Combined heat and power (CHP) plants at wastewater treatment sites and has facilitated the UK's first heat recovery from wastewater scheme, supplying a college campus.
- Scottish Water has implemented waste-to-value biogas initiatives, generating 1.5 million cubic meters per day and removing 1 million cubic meters of wastewater, reducing emissions by 217,000 tons in 2022/23.

Through these diverse solutions, Scottish Water is making significant progress towards reducing its carbon footprint and increasing its use of renewable energy.

Conclusion

The water sector's commitment to net zero is a pivotal step in the global fight against climate change. By transforming into sustainable, decarbonized entities, water utilities can become a blueprint for other industries. Through innovative technologies, renewable energy integration, and circular economy principles, the sector is driving emissions reductions at low to no cost. Leading utilities like Anglian Water and Scottish Water demonstrate the path forward, leveraging digital solutions, nature-based approaches, and waste-to-value initiatives. With the water sector's outsized environmental impact, this transition can have far-reaching consequences, championing the shift towards a more sustainable future.



Siemens' AI-Powered Solutions Combat Non-Revenue Water Challenge

Siemens is leading the charge in addressing the global non-revenue water crisis through innovative digital solutions.

Water is the most important resource; it should be affordable for everyone and stay that way. One of the most daunting challenges they face is managing non-revenue water. Water utilities experience a loss of revenue due to unaccounted water, primarily because of commercial losses such as metering errors. To tackle this challenge, Siemens has developed a suite of self-service digital solutions that leverage advanced AI. These tools, requiring no specialized skills, empower water utilities to quickly implement powerful technologies and address their most pressing operational problems. Siemens' innovative SIWA apps help optimize efficiency, reduce losses, and enable predictive maintenance, enabling the industry to enhance sustainability and resilience in water systems.

The Issues and Challenges of Non-Revenue Water

Globally, non-revenue water is a major challenge for water and wastewater utilities, amounting to 126 billion cubic meters annually. Leaks, inefficient infrastructure, and poor management practices are the primary causes, with some regions losing over 50% of processed water during pipeline transport. This not only leads to water shortages but also significant wasted energy and increased greenhouse gas emissions.

> ***" Estimates show energy loss due to non-revenue water ranges from 0.3 to 1 kWh/m3, representing 20-50% of total energy consumed for pumping, treatment, and distribution "***

The associated CO2 emissions can vary from 0.05 to 0.3 kg $CO2/m^3$ of water produced and distributed, depending on the utility's energy mix and efficiency. Addressing this issue is crucial for sustainable water management and reducing the environmental impact of water systems.

Increasing Efficiency and Cutting Costs Drive Digitalization Efforts

To achieve a circular water economy, the industry must connect demand and supply data on an integrated platform, focusing on optimizing energy consumption, reducing non-revenue water through leak detection, and improving capacity management. Digitalization is key to increasing efficiency in water/wastewater treatment, distribution, and collection while streamlining user communication. Digital solutions enable cost savings through better infrastructure monitoring and demand-driven operation, helping ensure compliance with strict regulatory requirements. By integrating process, engineering, and operational data into a digital twin, the entire water system can be optimized, with advanced data analysis enabling better response to unusual events. These integrated, data-driven solutions are available today, empowering the water industry to enhance sustainability and resilience.

Riding the digital wave

The water and wastewater industry faces a complex landscape of legacy operational (OT) and information technologies (IT), making it challenging to deploy new digital solutions.

Recognizing this, Siemens has developed a series of self-service solutions to address three key issues: reducing non-revenue water, preventing sewer pollution, and ensuring treatment asset reliability. These solutions leverage advanced AI while requiring no specialized skills. The five principles underlying the solutions promote easy adoption:

- Seamless sensor connectivity to the cloud.
- Automated AI training and deployment.
- Cybersecure design.
- Pre-built integrations with other IT systems.
- Typical payback in under 36 months.

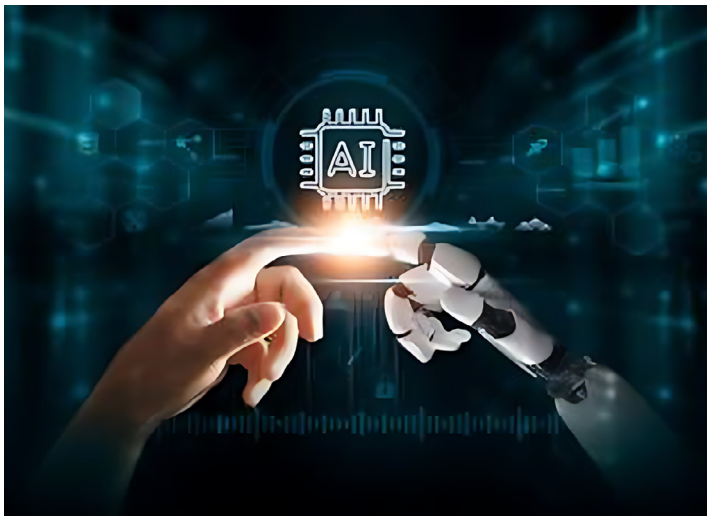
This approach aims to make it simpler for water utilities to implement powerful digital technologies and tackle their most pressing operational challenges effectively.

Siemens' AI-Powered Leak Detection Solution

Siemens provides new digitalization solutions with pre-integrated hardware and software, enabling water utilities to leverage AI-based analytics applications, particularly for non-revenue water reduction. The SIWA Leak Finder solution leverages existing investments in sensors and hydraulic models to reduce non-revenue water in drinking water networks, typically with a return on investment of less than 36 months. SIWA Leak Finder enables faster and more accurate leak detection, reducing non-revenue water by up to 50% and saving money. It precisely locates leaks within 200 meters using flow data and hydraulic modeling. Optimal meter placement further enhances leak pinpointing accuracy. The solution integrates seamlessly with any flow meter, but Siemens Mag8000-4G meters offer automated integration, with data appearing in Leak Finder within 2 hours of installation. SIWA Leak Finder can even identify small leaks under 1 liter per second, which are typically difficult and costly to find, by targeting the specific pipe location.

Artificial Intelligence helps VA Syd to detect leaks

Swedish water supplier VA SYD operates around 5,000 km of pipelines, including 2,000 km for drinking water. Pinpointing leaks was complex until they implemented an AI-based leakage detection solution, SIWA Leak Finder, in a 5,000-consumer proof-of-concept. The AI algorithm is trained on historical flow and pressure data to identify and classify network anomalies. This enabled VA SYD to detect leaks as small as 0.5 liters per second, reducing non-revenue water from 10% to 8%. The collaborative approach with Siemens and BuntPlanet was crucial, as VA SYD required an on-premises installation. This tailored solution is believed to be the first of its kind in Sweden. The proof-of-concept's success has led other municipalities, like NSVA, to adopt the leakage detection system, establishing VA SYD as a best practice example.



Reducing Non-Revenue Water by Analyzing Meter Data

SIWA Meter Data Management empowers utilities and consumers with insights into meter performance and customer leaks, combining advanced data analysis and AI algorithms in on-premises, hosted, or software-as-a-service (SaaS) solutions. It can identify over 60 types of anomalies, including leaks, hardware issues, and protecting vulnerable customers. The solution can detect customer-side leaks as small as 1 l/h and identify backflows and pipe malfunctions, enabling quick responses.

" By using meter data to calculate measurement errors and identify underperforming meters, SIWA Meter Data Management helps utilities find the best ROI for their smart metering programs, typically within 3-24 months "

This is achieved by optimizing meter repair and replacement strategies, improving CAPEX efficiency, and increasing revenue without the need to raise rates. The solution's ability to comprehensively monitor water usage patterns and detect a wide range of issues empowers utilities to enhance operational efficiency, reduce losses, and deliver enhanced customer service.

Siemens Data Platform helps Northumbrian Water to tackle Household Leaks

Siemens Grid Software has secured a contract with Northumbrian Water Group (NWG) to deploy its EnergyIP® MDM X data management platform. NWG is connecting over 1 million smart meters to the Siemens SaaS solution by 2030, enabling analysis of hourly consumption data to identify household leaks. This will help NWG, which serving 4.5 million customers, meet UK regulator Ofwat's targets for reducing leakages and per capita consumption. Siemens closely collaborated with NWG to design, develop, test, and launch the meter data management solution, which is the largest implementation of its kind for the water industry in Europe. EnergyIP® MDM X is part of Siemens Xcelerator, the company's digital business platform, accelerating customers' digital transformation.

Siemens Industry Suite: Smart Apps for A Smarter Water Future

The water industry of the future will control and manage plants and infrastructure in a smart and energy-efficient manner. To support this vision, Siemens has developed the Siemens Industry Suite for the water and wastewater industry. Through the comprehensive and flexible analysis of plant data in the virtual MindSphere environment, this offering increases information availability over the entire plant lifecycle. The suite also includes the Siemens Water (SIWA) apps developed specifically for the water and wastewater industry. These apps help operators optimize energy efficiency, reduce non-revenue water, prevent overspills, and enable preventive maintenance. The benefits include better security of supply, reduced energy consumption, and lower operational costs. The applications and digital services of the Siemens Industry Suite enable greater transparency and help identify efficiency and savings potential while safeguarding supply security .

Conclusion

Siemens is leading the charge in addressing the global non-revenue water crisis through innovative digital solutions. Their SIWA suite of smart apps leverages advanced analytics and AI to help water utilities optimize energy efficiency, reduce losses, and enable predictive maintenance. Siemens' SIWA Leak Finder and Meter Data Management platforms have been successfully deployed, delivering significant reductions in non-revenue water and rapid returns on investment. By partnering with forward-thinking utilities like VA SYD and Northumbrian Water, Siemens is empowering the industry to tackle this critical challenge and transition towards a more sustainable, circular water future.

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Digital Twin Earth: A Game-Changer in Predicting Water-Based Natural Disasters

Water-based natural disasters such as floods and droughts continue to affect millions of lives but remain difficult to predict. Now, scientists have developed a digital twin of the Earth, which enables them to simulate terrestrial water cycles to look into worst-case scenarios, assess risks, and warn about natural disasters. Digital Twin Earth (DTE) models offer a groundbreaking solution by integrating Earth observation, in-situ data, and high-resolution modeling with AI and high-performance computing. This article provides an overview of the DTE Hydrology project, showcasing how the integration of high-resolution satellite data and cutting-edge modeling can enable a detailed digital representation of the hydrological cycle .

DTE Hydrology: A Pioneering Model for the Future

Climate change is increasing the frequency and severity of extreme water-related events, including floods, droughts, and landslides, causing substantial impacts. Addressing this challenge requires advanced decision-support systems that can accurately predict and monitor these disasters, as well as manage water resources. Recent advances in Earth observation, in-situ monitoring, machine learning, and computational power have enabled the development of high-resolution (< 1 km, < 1 day) hydrological modeling systems.

Digital Twin Earth (DTE) models offer a ground-breaking solution to monitor and simulate Earth processes with unprecedented spatial and temporal resolution. By integrating high-resolution Earth observation data, advanced modeling, artificial intelligence, and high-performance computing, DTE models can provide digital replicas of the terrestrial water cycle. This allows for more accurate prediction and monitoring of water-related disasters, as well as optimized management of water resources.

Building the DTE Hydrology Datacube

The DTE Hydrology project is a groundbreaking initiative that aims to develop a high-resolution Digital Twin Earth (DTE) of the terrestrial water cycle. At the core of the project is the creation of a 4-dimensional datacube that integrates advanced Earth observation (EO) satellite data and hydrological modeling to reconstruct key water cycle variables, including soil moisture, precipitation, evaporation, and river discharge. The project's initial focus was on the Po River Basin in Italy, where the team successfully incorporated satellite-derived products into a high-resolution (1 km, 1 hour) hydrological modeling system. To fully realize the potential of this DTE for hydrology, the project team has identified several key challenges that need to be addressed. By addressing these challenges, this DTE Hydrology system can now be leveraged for a range of applications, such as flood and landslide forecasting, precision agriculture, and water resources management.

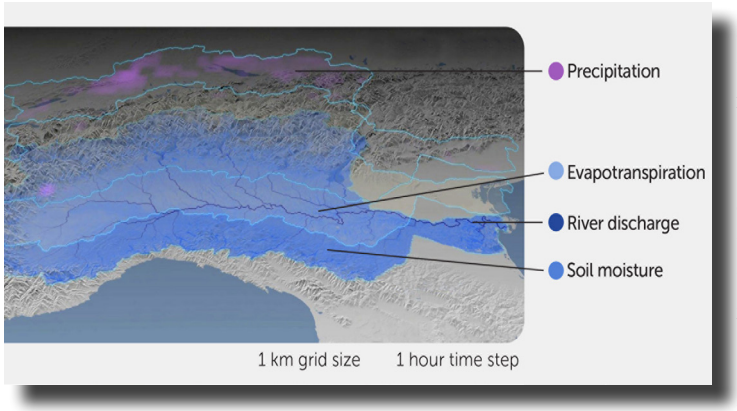
The Development of the DTE Hydrology Tool Involved A Four-Step Process

• Creating a high-resolution (1 km, daily/hourly) 4D DTE Hydrology datacube, which is an Earth observation and modeling-based dataset.

• Developing a high-resolution modeling system that utilizes the 4D DTE Hydrology datacube, such as for input data, parameterization, and data assimilation, to provide a 4D reconstruction of the terrestrial water cycle.

• Integrating the modeling system into a cloud-based DTE Hydrology simulation and visualization tool.

• Exploiting the DTE Hydrology tool to create user-oriented case studies and what-if scenarios focused on flood and landslide hazard mapping as well as water resources management.



Visualization of the Digital Twin Earth (DTE) Hydrology datacube over the Po River Basin, Italy.

Challenges and limitations of EO-based datasets

To scale up the implementation of a DTE for hydrology, several challenges need to be addressed to enhance the reliability and usability of this high-resolution representation of the terrestrial water cycle. Artificial intelligence and machine learning techniques will play a vital role in addressing these challenges.

• Quality Assessment of EO Products

Accurately assessing the quality of high-resolution EO products, especially for variables like soil moisture and evapotranspiration, is crucial. The lack of ground-based validation data at the appropriate scale has necessitated the use of innovative techniques, such as triple collocation analysis, to quantify the uncertainties in these datasets.

• Integration of Compatible Data and Models

Ensuring the compatibility of the various EO datasets and hydrological models within the DTE Hydrology framework is a significant challenge. This requires careful attention to the spatial and temporal resolutions, as well as the underlying assumptions and parameterizations of the different components.

• Uncertainty Management

Effectively managing the uncertainty inherent in both the EO data and the hydrological models is essential for providing reliable and actionable information to end-users. This includes developing robust techniques for propagating and visualizing uncertainty through the DTE Hydrology system.

• Computational Capacity

The high spatiotemporal resolution of the DTE Hydrology datacube places significant demands on computational resources and storage capacity.

Addressing these challenges requires the implementation of a scalable, cloud-based processing environment that leverages the latest advances in high-performance computing and data management.

Challenges Remain, But Innovation Forges Ahead

Recent years have witnessed a rapid development of new artificial intelligence (AI) and machine learning techniques, which are expected to improve the outcomes of the DTE Hydrology project and will be tested and improved in future developments. Beyond the standard applications of AI/machine learning in the hydrological sciences, a few opportunities are particularly relevant in the context of the DTE:

• Improved parameter estimates

AI/ML can enhance Earth observation data retrieval and assimilation by interpreting complex land-observation interactions and by blending real and simulated data to improve performance in data-scarce regions for the Digital Twin Earth.

• Toward robust predictions

Hybrid machine learning combines physical principles with data-driven approaches, enabling the discovery of latent functions and driving forces for computationally efficient, interpretable, and robust models to enhance the Digital Twin Earth implementation.

• IEmulating costly models

Emulators, which are essentially machine learning algorithms that provide fast approximations to complex physical models, can be used as surrogate models or metamodels, opening the door to more advanced biophysical parameter estimation methods.

• Explainability and counterfactuals

Explainable AI (XAI) can unlock deeper insights by interpreting model learning, formulating hypotheses, assessing causality, and enabling scenario simulations to enhance the Digital Twin Earth implementation for hydrological applications like climate change impact assessment.

Future Developments and Global Expansion

Looking ahead, the DTE Hydrology project aims to expand the scope of its high-resolution water cycle representation beyond the initial Mediterranean Basin focus. Several planned satellite missions will further facilitate this global expansion, providing even more detailed observations of the terrestrial water cycle.

> ***" The upcoming Copernicus Expansion missions, such as the Passive Microwave Imaging Mission (CIMR) and the Hyperspectral Imaging Mission (CHIME), will enhance the retrieval of soil moisture, snow depth, and evapotranspiration at high spatial resolutions "***

Additionally, the NASA-ISRO Synthetic Aperture Radar (NISAR) mission will offer unprecedented radar observations for monitoring soil moisture, surface water, and land deformation at a global scale.

By integrating the data from these upcoming satellite missions, the DTE Hydrology project can further refine and expand its 4D datacube, ultimately enabling a comprehensive digital twin of the terrestrial water cycle that can be deployed worldwide. This global DTE Hydrology System will empower decision-makers, water resource managers, and disaster response agencies to better predict, monitor, and manage water-related environmental challenges in the face of a rapidly changing climate.

Pursuing a Fully Functional Digital Twin Earth

Developing a comprehensive Digital Twin Earth (DTE) of the terrestrial water cycle faces significant challenges. Ensuring high-quality, high-resolution observational data on precipitation, evaporation, soil moisture, river discharge, and snow is critical. Accurately representing physical processes like infiltration, runoff, and groundwater dynamics at high resolutions while accounting for human impacts such as irrigation and reservoir management requires close collaboration between experimentalist hydrologists and modelers.

Designing an interoperable, cloud-based infrastructure adhering to FAIR principles and investing in computational capabilities are essential to enabling seamless data and model access for users. Addressing these challenges is crucial to realizing a fully operational DTE for the terrestrial water cycle, which can unlock valuable research and operational opportunities for understanding and managing the world's most precious resource - water.

Conclusion

The pioneering DTE Hydrology project integrates high-resolution Earth observation and advanced modeling to create a digital twin of the terrestrial water cycle. By addressing key challenges, this transformative approach has demonstrated immense potential, from flood forecasting to precision agriculture. As new satellite missions enhance observational capabilities, DTE Hydrology aims to expand globally, empowering decision-makers to better predict, monitor, and manage water-related challenges in a changing climate. This project represents a significant step towards realizing the full potential of digital twins for understanding and managing the world's most precious resource - water.

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WATER NEWS BRIEF

JULY 2024

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Antofagasta Minerals and Almar Water Solutions sign $1.5B water supply contract for Centinela

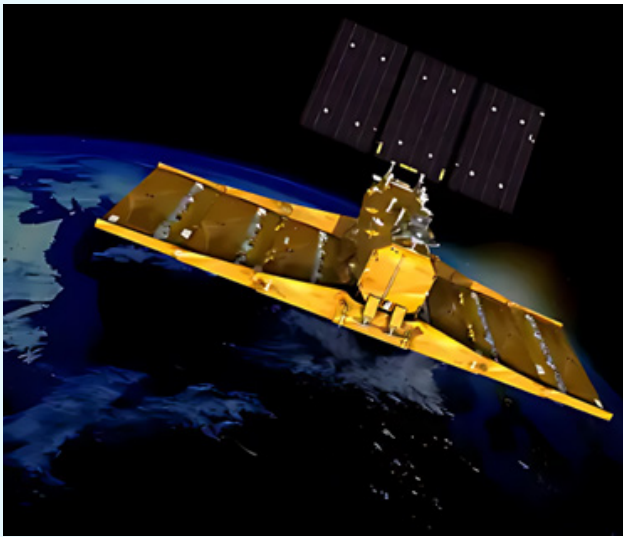
Antofagasta Minerals and a consortium of Almar Water Solutions and Transelec have announced a US$1.5 billion agreement to expand the water transportation system for Antofagasta's Centinela mining operation in Chile. The initiative will double the current supply of seawater by improving the existing 144km pipeline and constructing a new parallel 144km pipeline with a capacity of 650 lps. This expansion will support the planned expansion of the Centinela mine, which aims to increase copper, molybdenum, and gold extraction. The project will not use continental water or involve desalination, aligning with sustainability goals. The water system operation will be managed by the Aguas Norte y Desarrollo (Nordes) consortium. This strategic partnership marks a milestone for Almar Water Solutions and consolidates Transelec's position as a provider of water infrastructure for large-scale mining in Chile.

Acwa Power sells 30pc stake in Rabigh utility project for $225m

Saudi-listed ACWA Power, the world's largest private water desalination company, has signed an agreement with Hassana Investment Company to sell a 30% stake in its Rabigh Arabian Water & Electricity Company (RAWEC) for SAR 844 million (US$225 million). RAWEC is an Independent Water, Steam, and Power Producer that supplies essential utilities to Petro Rabigh under a long-term contract. The transaction marks a strategic partnership between ACWA Power and Hassana, aiming to strengthen RAWEC's market position and contribute to its future growth. ACWA Power sees this as part of its capital strategy to introduce valuable partners at the project level. Hassana views the investment as aligned with its long-term strategy to acquire stable, high-performing infrastructure assets with attractive cash flows.

SUEZ to provide satellite surveillance for Anglian Water's wastewater network

SUEZ, a leader in digital and circular solutions, has signed a new contract with Anglian Water to provide satellite surveillance of their water recycling network. This follows a successful trial in 2023, initially focusing on identifying potential exfiltration points near watercourses, with plans to expand the scope. This partnership builds on SUEZ's existing collaboration with ASTERRA, which has saved Anglian Water 10 megaliters per day through satellite leak detection on the drinking water side. Aging sewer infrastructure and climate change have increased infiltration and exfiltration issues, leading to more overflows and flooding. Satellite surveillance offers a cost-effective, non-invasive solution to identify leaks, prioritize maintenance, and support regulatory compliance. This contract demonstrates the effectiveness of satellite technology in sustainable wastewater management.



SUEZ wins three new water projects in Asia.

At the Singapore International Water Week (SIWW), SUEZ announced the launch of three significant projects in Asia. These ventures, located in Singapore, China, and the Philippines, underscore SUEZ's dedication to addressing water challenges through digital innovations, desalination, and water reuse. In Singapore, SUEZ has been contracted by PUB to implement a Smart Water Grid Analytics Platform to enhance operational efficiency. In the Philippines, SUEZ and JEMCO will design and build a large-scale seawater desalination plant in Metro Iloilo, producing 66,500 cubic meters of drinking water daily. In China, SUEZ is developing an industrial wastewater treatment plant in Jining, transforming high-salinity wastewater into reusable industrial water. These initiatives aim to bolster community resilience against climate impacts through strategic partnerships and circular solutions.

Saudi's NWC awards $148mln O&M contract to Aguas de Valencia for Taif STP plants

NWC signs $148 million, 15-year contract with Spain's Aguas de Valencia to rehabilitate, operate and maintain two sewage treatment plants (STPs) in Taif, with a levelized tariff of $0.18/m3. This is part of NWC's strategy to attract private investment in the water sector through innovative partnership models. NWC plans to offer 113 existing treatment plants with 2.4 million m3/day capacity as investment opportunities starting 2024, aiming to spur economic growth, create long-term local and international partnerships, and facilitate technology transfer. These contracts are seen as attractive to both local and global water sector operators, supporting Saudi Arabia's goals of expanding and modernizing its water infrastructure.

WEF appoints Ralph Erik Exton as its new Executive Director

The Water Environment Federation (WEF) has appointed Ralph Erik Exton as its new Executive Director, effective July 15, 2024. Exton joins WEF from Grundfos, where he served as water utility vice president and chief marketing officer. With nearly three decades of experience in the water sector, including roles at Suez, Veolia, and GE Water & Process Technologies, Exton has also been a key WEF volunteer for over a decade, serving on the Board of Trustees and various committees. As the new Executive Director, Exton aims to reinforce WEF's position as a leader in the water sector, focusing on sustainable solutions, partnerships, and innovative technologies to achieve WEF's vision of a "life free of water challenges."

Biden-Harris Admin Pledges $700M for Colorado River Conservation

The U.S. Department of the Interior announced a $700 million investment from President Biden's Investing in America agenda for long-term water conservation projects in the Lower Colorado River Basin. This funding has the potential to save over 700,000 acre-feet of water in Lake Mead, supporting the basin's drought and climate resilience. The projects include water distribution structures, advanced metering, farm efficiency, canal lining, turf removal, groundwater banking, desalination, and water recycling. The Colorado River Basin provides water for over 40 million people, powers hydroelectricity, and supports agriculture across the West. Despite recent hydrology improvements, a historic 23-year drought has led to record-low water levels in the basin's reservoirs. The Biden administration's investments aim to strengthen the stability and sustainability of the Colorado River System through short-term water management and long-term conservation efforts, building resilience for the communities that rely on this critical water source.

Singapore and the World Bank Group launch the Singapore Water Center

Singapore and the World Bank Group have launched the Singapore Water Center on the opening day of the Singapore International Water Week (SIWW) and CleanEnviro Summit Singapore (CESG). Located within the World Bank Group's Singapore office, the Center will leverage Singapore's expertise in urban water management to support the water sector in the region and beyond. Through training, joint research, and pilot studies, the Center will enhance capacity building and serve as a thought leader on water resource management. The launch was announced by Singapore's Minister Grace Fu and World Bank's Managing Director Anna Bjerde. This partnership aims to foster the exchange of best-in-class knowledge and co-create solutions to address the world's water challenges, aligning with the UN Sustainable Development Goal 6.

ENOWA and Nanostone Water partner to advance brine mining in NEOM

ENOWA and Nanostone Water, Inc. (NSW) have signed an agreement to collaborate on the application of Ceramic Ultrafiltration Membrane for Brine Mining in NEOM, Saudi Arabia. The partnership marks a significant step towards advancing sustainable water solutions and transforming desalination brine waste into valuable resources. The MoU outlines the collaborative efforts to develop and implement Ceramic Ultrafiltration (CUF) technology for brine mining, an important component of ENOWA's circular economy strategy. The one-year pilot testing of CUF membranes aims to harvest minerals and metals from desalination and cooling tower blowdown brine, creating a revenue stream while developing an environmentally sustainable method of managing desalination waste. Successful pilot results will pave the way for scaling up the design for commercial facilities. This partnership underscores ENOWA's commitment to sustainable water management and innovative solutions with global impact.

Egypt declared home to the world's largest water treatment facility

The New Delta Irrigation Water Treatment Plant, constructed by a joint venture comprising Orascom Construction, Hassan Allam Construction, Arab Contractors, and Metito, has been declared the world's largest water treatment facility by the Guinness World Records (GWR). The plant secured four GWR global records, including the world's largest water treatment facility, the most capacious and operationally robust water treatment plant, the largest area for epoxy coating in structures, and the biggest sludge treatment plant globally. These accolades were celebrated in an official ceremony attended by representatives from the JV companies and government officials. The plant has a remarkable production capacity of 7.5 million m3/day of agricultural drainage water, which plays a crucial role in the reclamation and development of 2 million acres in the western Delta region. This project stands as one of the most significant sustainability initiatives worldwide, incorporating state-of-the-art sustainable technologies and solutions.

Thames Water appoints new Technical Partner for Oxfordshire reservoir proposal

Thames Water partners with Arup Binnies to deliver SESRO, a new reservoir that will provide secure water supply to 15 million customers by 2040. Without the reservoir, the South East's water supply is at risk due to population growth and climate change, with Thames Water forecasting a need for an extra 1 billion liters daily by 2050. After a procurement process, Thames Water selected Arup Binnies, which has extensive experience in major infrastructure projects, to provide technical services for the SESRO project. If approved, Arup Binnies will help Thames Water secure the necessary Development Consent Order, with construction planned to start in 2029. The partnership aims to deliver a world-class, sustainable water infrastructure project that will benefit communities, the economy, and the environment.

Capture6 and Veolia announce global partnership for industrial-scale carbon removal

Capture6, a water-positive carbon removal company, and Veolia Water Technologies & Solutions have announced a global collaboration to deploy carbon dioxide (CO_2) removal facilities with integrated water management systems. The IPCC states that permanently removing CO_2 is essential to limit global warming below 1.5°C. Capture6's direct air capture (DAC) technology requires saltwater, which the partnership will leverage to recover freshwater from desalination waste brine while capturing CO_2 and reducing waste. Veolia's century-long expertise in advanced water treatment technologies will enable Capture6 to scale its process quickly and contribute to combating the climate crisis. The integration of DAC into water treatment offers a promising path to carbon removal globally. Capture6 is developing projects in multiple regions to provide megaton-scale CO_2 removal and co-benefits like freshwater production. Both companies are committed to providing innovative solutions to address climate change and meet net-zero targets.

Jacobs (J) Wins Contract From PUB to Develop Kranji WRP

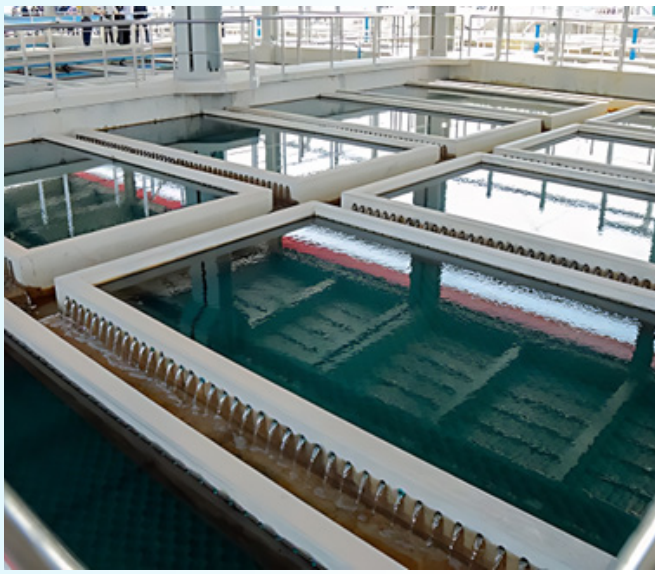
Jacobs awarded contract by Singapore's PUB to provide engineering services for new Kranji Water Reclamation Plant (WRP), a crucial part of Singapore's strategy to meet increasing water treatment demands in the rapidly developing northern region. The plant will have an initial capacity of 120 million imperial gallons per day (mgd) and a 50 mgd NEWater Factory, complementing existing facilities to secure Singapore's long-term water needs. Jacobs' scope includes engineering design, construction supervision, and commissioning, with a focus on sustainable and innovative water treatment technologies, smart operations, and resource recovery solutions to minimize environmental impact. The project, situated in an ecologically diverse area, will adhere to strict sustainability standards as Jacobs leverages its expertise in sustainable water projects through this collaboration with PUB.

Grundfos joins top 1% of sustainable companies globally with EcoVadis' platinum medal rating

Grundfos, a global leader in advanced pump solutions and water technology, has achieved a platinum medal rating from EcoVadis, placing it in the top 1% of companies rated for sustainable business practices. The assessment across four key areas - environment, labor and human rights, ethics, and sustainable procurement - recognizes Grundfos' commitment to social and environmental responsibility. Since the last gold rating, Grundfos has implemented additional measures, including progressing towards net-zero emissions by 2050 and ensuring sustainable procurement across its value chain. Highlights include enabling customers to save 1.6 billion m^3 of water, reducing water withdrawal by 48%, and cutting CO2 emissions by 11.7% since 2020, with plans to meet a 50% reduction target by 2025.

World Bank Allocates US$145M to Enhance Cambodia's Water Supply Infrastructure

A new $145 million World Bank-supported project is set to benefit over 113,000 people in Cambodia by improving water security, agricultural productivity, and climate resilience. The Cambodia Water Security Improvement Project aims to address the country's water management challenges, including seasonal and regional rainfall variations that strain water resources and impact food production and economic growth. The 5-year project will enhance water resource management through expanded monitoring, updated policies, climate-informed planning, and strengthened water authorities. It will also rehabilitate and upgrade household and irrigation water systems, train farmer communities, and support the adoption of climate-smart agricultural technologies. By investing in climate resilience, infrastructure, and capacity building, the project lays the foundation for Cambodia's long-term sustainable water service delivery.



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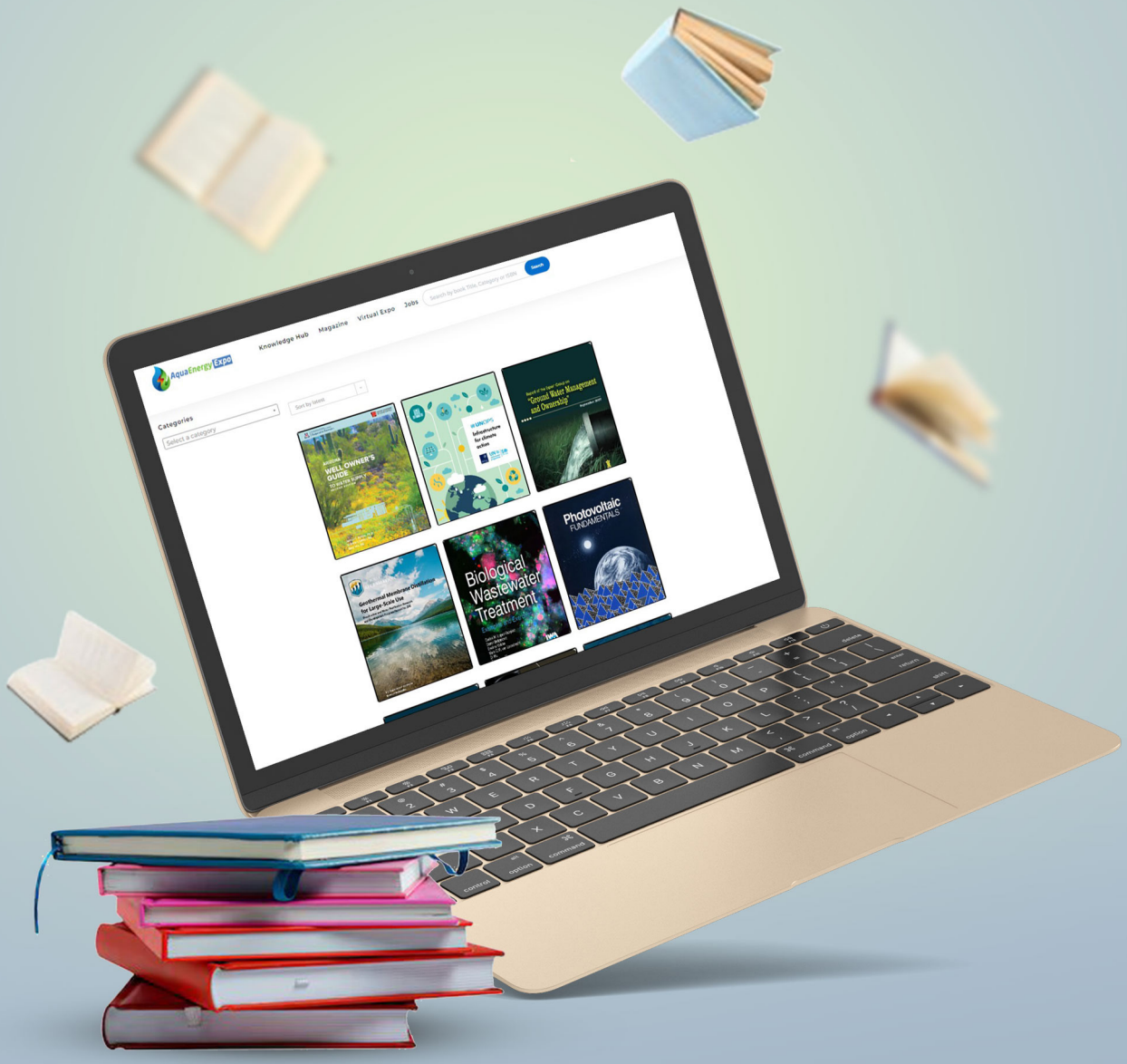

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Webinars

Meet our Experts at Aqua Energy Expo Weekly Webinars

Dr. Khadija Ayari

Dr. Mahmoud Fathy Mubarak

Eng. Mohamed Ghonaim

Dr. Mohammad A. Hasan

Dr. AlSayed Refaay AlSayed

Dr.Eng. Ahmed El-Zayat

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OPEN ONLINE WEBINAR

"Introduction to Desalination of Seawater and Brackish Water"

WEBINAR TOPICS:

- Understand the Characteristics of Saline Waters
- Become Familiar with Thermal and Membrane Desalination Processes
- Understand the Environmental Impacts of Desalination

Dr. Khadija Ayari

Date: Saturday, July 6th
Time: from 9 PM to 11 PM
(Saudi Arabia Time)

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WEBINAR

"Exploring Nanomaterials Characterization Skills in Water Treatment: Chemical Composition and Morphology"

(Part One)

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- Understanding Nanomaterials.
- Predicting Applied Properties of Nanomaterials.
- Mastering Electron Microscopy Characterization.
- Evaluating Nanomaterial Preparation Method.
- Estimating Purity and Bonding of Prepared Nanomaterials.

Dr. Mahmoud Fathy Mubarak

Date: Friday, July 12th
Time: from 08:15 PM to 10:15 PM
(Saudi Arabia Time)

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OPEN ONLINE WEBINAR

"Continuous Filtration Technology"

Webinar Topics:

- Processes, Systems and Technologies of Drinking Water Treatment
- The Filtration Process and It's Various Applications
- Continuous Filtration Technology, Theory and Design
- The Different Designs of Continuous Filtration Technology
- The Advantages and Disadvantages of Using Continuous Filtration Technology

Eng. Mohamed Ghonaim

Date: Saturday, July 13th
Time: 9 to 11 PM
(Saudi Arabia Time)

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OPEN ONLINE WEBINAR

"Safety in Chemistry Laboratories" (Part 1)

WEBINAR TOPICS:

- Safety rules in chemistry laboratories.
- Personal Protective Equipment.
- WorkPlace Measurements.

Dr. Mohammad A. Hasan

Date: Friday, July 19th
Time: from 5:30 to 7:30 pm
(Saudi Arabia Time)

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OPEN ONLINE WEBINAR

"Groundwater and How Can We Achieve Sustainable Development"

WEBINAR TOPICS:

- Types and Potentially of Groundwater Aquifers in Egypt
- Chemical Properties of Groundwater
- Ways of Extraction and Its Cost
- Comparison between Some Projects Have Been Achieved in the Latest Years, Is It Achieved the Goal or Not?

Dr. AlSayed Refaay AlSayed

Date: Saturday, July 20th
Time: from 7 to 9 pm
(Saudi Arabia Time)

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EMG

OPEN ONLINE WEBINAR

"RO Water Desalination Plants Performance Assessment"

Webinar Topics:

- Basics of Reverse Osmosis
- Factors Affecting Reverse Osmosis and Nanofiltration Performance
- RO Plant Performance Calculations
- Membrane Fouling
- RO Plant System Performance Assessment
- RO Data Trending and Normalization

Dr.Eng. Ahmed El-Zayat

Date: Friday, July 26th
Time: from 09:30 PM to 11:30 PM
(Saudi Arabia Time)

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OPEN ONLINE WEBINAR

"Biological Wastewater Treatment: The Role of Biodegradation and Biosorption"

Date: Saturday, July 27th
Time: from 7 to 9 pm
(Saudi Arabia Time)

Dr. Basma Basim Albadry

WEBINAR TOPICS:

- What is the Biological Treatment?
- How Does Biodegradation Differ from Biosorption?
- Which Approach of the Above Results in Better Treatment Efficiency?
- Dyes as a Model Pollutant: How Effective is the Biological Treatment in the Removal of Dyes from Dye-containing Wastewater
- The Future of Biological Treatment and Its recent Advances.

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Global Water Events

Water & Wastewater Equipment, Treatment & Transport Show

Date: From 24 to 26 Jan 2024
Location: Indianapolis, Indiana

The Water & Wastewater Equipment, Treatment & Transport Show (WETT) was a showcase of the latest innovations within the wastewater industry. The show brings together industry experts, technologies and services. It provides 90+ expert-led courses, live show demonstrations, hundreds of interactive booths and networking opportunities.

Website: wwettshow.com

BRITISH WATER Micropollutants Conference

Date: From 8 February 2024
Location: Leeds, UK

British Water continued the conversation on how micropollutants affect the water sector in the third BW Micropollutants Conference. Our speakers covered the latest topics on current legislation and ongoing initiatives about the environmental risks associated with micropollutant emissions and treatment approaches.

Website: www.britishwater.co.uk

AOAP Conference and Exposition & NDPA Water Safety

Date: From 12 to 14 Feb 2024
Location: The Grand Sierra Resort and Convention Center in Reno, Nevada

The AOAP Conference and Exposition & NDPA Water Safety Conference was an opportunity for professionals from around the world to earn about the latest trends, legislation, and issues facing our industry. Education, networking & professional development opportunities during the conference are one of a kind.

Website: ndpa.org

WEF/AWWA Utility Management Conference 2024

Date: From 13 to 16 February 2024
Location: Portland, Oregon

The 2024 WEF/AWWA Utility Management Conference offered 6 pre-conference workshops and 36 technical sessions focused on a wide variety of topicsrelated to water and wastewater utility management.

Website: www.wef.org

WEX Global

Date: From 4 to 6 March 2024
Location: Madrid, Spain

WEX Global was a three-day event which brings together the sector's leading experts to discuss water sustainability.

Website: wex-global.com

Membrane Technology Conference

Date: From 4 to 7 March, 2024
Location: West Palm BEeach, Florida

The AMTA/AWWA Membrane Technology Conference explored the latest developments in membrane technology, as it affects water and wastewater treatment. The conference reveals new directions in water and wastewater treatment technologies, desalting and membrane bioreactor applications.

Website: www.awwa.org

The Collection Systems Conference and Stormwater Conference 2024

Date: From 9 to 12 April, 2024
Location: The conference will be hosted at the Connecticut Convention Center in Hartford, CT.

The Collection Systems Conference and Stormwater Conference 2024 was an exhibition focused on the design and operations of wastewater collection systems, as well as wet weather control and stormwater management.

Website: www.wef.org

Texas Water Conference

Date: From 9 to 12 April, 2024
Location: NEC, Birmingham, B40 1NT, UK

The conference was celebrating it's 28th year as the Largest Regional Water Conference in the U.S.© Itcaters to professionals in the wastewater and water industry, including water quality engineers, treatment plant technicians and scientists. Also government officials, regulatory agency personnel, manufacturers and their agents, libraries, universities and groups and individuals concerned with protecting public health and the environment.

Website: www.txwater.org

MACH Exhibition

Date: From 15 to 19 April, 2024
Location: NEC, Birmingham, B40 1NT, UK

MACH 2024 was a five-day event where key manufacturing buyers, engineers and manufacturers go to find, specify and purchase new equipment.

Website: www.machexhibition.com

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Schneider Electric™

Accelerating Sustainability through Digital Transformation in the Water and Wastewater Industry

Water scarcity is a growing global crisis, exacerbated by industries' heavy water use. Digitalization offers immense potential to transform the water and wastewater sectors, enabling real-time visibility, predictive maintenance, and wastewater reuse. Leading companies like Schneider Electric are empowering water utilities and industrial users to optimize their operations, boost efficiency, and achieve sustainability goals through innovative digital solutions. By breaking down organizational silos and leveraging data-driven insights, these digitalization initiatives are paving the way for a more resilient and environmentally responsible water management future.

The Drive Towards Digital Transformation

Water shortages are a growing global problem, with half the world's population facing water scarcity by 2025 and 700 million potentially displaced by intense scarcity by 2030. This issue is exacerbated by industries' heavy water use, as the fashion industry consumes 4% of global freshwater, and the production of steel and electronics requires substantial amounts (250,000 liters per ton of steel, 32 liters per chip). Up to 90% of new mines are built in water-stressed regions, while 50-60% of existing mines face water shortages, and California's oil and gas operations consume over 1 trillion gallons annually. Ineffective water management can have major impacts, so industries must optimize use and address wastewater discharge. Digitalization and innovation are crucial to enable water reduction, reuse, and zero discharge within a circular model, preventing shortages and pollution through new technologies and infrastructure.

Innovating for Efficiency: How Digital Transformation Can Benefit the Water Sector?

Digital transformation offers immense potential to help the water and wastewater industries navigate challenges.

" Smart meters provide real-time usage visibility, with global unit shipments expected to grow 12.2% annually to 52.6 million by 2025 "

Digital technology is being leveraged to minimize carbon emissions, manage infrastructure, and increase energy efficiency. Next-gen technologies like leak detection, AI, and digital twins can enhance asset management, while mobile solutions and remote access meet the expectations of digital-native workers. Digitalization also enables a customer-centric approach by integrating operational and customer-focused systems. Leveraging digital innovations is crucial to transforming the water and wastewater industries.

Schneider Electric Introduces the Future of Sustainability

Schneider Electric drives resilience and sustainability for water utilities through strategic digitalization initiatives, as the global market for digital water solutions is expected to expand by 23.5% annually until 2025, and Schneider Electric is at the forefront of this digital evolution. Leveraging technologies like digital twins, machine learning, and the Industrial IoT, Schneider Electric provides data transparency and actionable insights to drive water use reduction. For example, its Normandy plant used IoT sensors, cloud analytics, and AI to reduce water use by 64%, material waste by 17%, and CO2 emissions by 25% through holistic digital transformation. Proactive asset management through connected technologies also shifts operations from reactive to predictive, providing visibility into aging or faulty equipment that may be leading to leaks or losses. Water sustainability strategies rely on this infrastructure, which enables data transparency and actionable insights.

Schneider Electric Unlocks the Path to Efficient Zero Water Discharge

After reducing water consumption, the critical challenge is achieving zero water discharge by treating and reusing wastewater. In industrial sectors, effective water and wastewater treatment is essential to provide the right quality for processes and remove harmful substances. Digital technologies enable the reuse of wastewater, greywater, and recycled water, helping conserve scarce freshwater resources. For example, Brazil's Aquapolo wastewater treatment plant, powered by Schneider Electric's EcoStruxure, recycles sewage to meet industrial demand, saving drinking water and reducing production costs by 15%. Connecting data and analysis is key to maximizing water availability and reusability, delivering clear environmental and financial benefits.

Barriers to Successful Digital Transformation

While smart water operations hold transformational potential, significant barriers hinder their success. Funding is a major challenge, as many utilities lack cash reserves and prioritize maintaining operations over implementing new technologies. Securing investments is difficult in the current weak economy, leading to increased customer hardships. Quantifying the return on investment for new technologies is problematic due to limited guidance and evidence. To counter this, utilities must focus on collaboration and information sharing to make critical success factors visible. Short-term thinking, reactivity over proactivity, and conservative mindsets further impede digital transformation. Moreover, the increased vulnerability to cyberattacks due to the use of digital networks and devices, coupled with a lack of IT security expertise, hampers the ability to implement comprehensive protection strategies. Achieving change at scale remains a significant challenge.

Building a solution

Despite the significant challenges, utility operators and industrial users should not dismiss digital transformation projects as "too hard." By collaborating with a trusted advisor who can integrate new solutions with existing infrastructure, they can accelerate their digital transformation journey. One such trusted advisor is Schneider Electric, offering a suite of smart water solutions across automation, analytics, and enterprise operations. Global water-management utilities are seeking to maximize investment in their systems by increasing the amount of water that is actually paid for.

> ***" Schneider Electric solutions that can help companies meet this goal include EcoStruxure™ Automation Expert, EcoStruxure™ Water Advisor, and AVEVA™ Unified Operations Center (UOC) "***

Iot-Enabled Solutions that Drive Operational and Energy Efficiency

EcoStruxure is Schneider Electric's open, interoperable, IoT-enabled system architecture and platform, delivering enhanced value around safety, reliability, efficiency, sustainability, and connectivity. It leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity, with deployments in 480,000+ sites, supported by 20,000+ system integrators and developers, and connecting over 1.6 million assets through 40+ digital services.

> ***" EcoStruxure's IoT-enabled connected products provide embedded intelligence for better decision-making, while its edge control capabilities enable real-time, mission-critical solutions "***

Its interoperability enables a breadth of agnostic Applications, Analytics, and Services for seamless enterprise integration.

How EcoStruxureTM for Water & Wastewater optimizes Water Treatment Processes and Energy Consumption?

Veolia was contracted to build a water treatment facility on the Sorrento coast in Italy. The situation was serious, with over half the population discharging waste directly into the sea. Veolia designed a sustainable solution, aiming to treat wastewater and reuse the recovered material. To ensure operational reliability, they partnered with Schneider Electric, whose EcoStruxure platform provided solutions for both process and energy efficiency. The automation architecture, advanced control room interface, and intelligent electrical system enabled efficient system management, electricity distribution, and preventive maintenance.

" Implementing EcoStruxure resulted in 15% annual energy savings and 20% improvement in production efficiency, as well as enhanced service continuity through predictive and corrective maintenance "

Digital Solutions Elevate East Water's Operational and Energy Efficiency

East Water, the largest supplier of untreated water for industrial use in eastern Thailand, faced multiple challenges in managing its 500 km water pipeline network, including pumping, energy costs (40% of expenses), droughts, leaks, and interdepartmental coordination. To address these, East Water implemented Schneider Electric's EcoStruxure Water Advisor and AVEVA Unified Operations Center solutions. These digital tools enabled efficient water management, optimized operations, and enhanced coordination.

" The results were a 30% increase in operational efficiency, a 15% reduction in energy costs, and more sustainable and cost-effective operations for East Water "

Shielding Water Utilities from Cyber Threats Comprehensively

Cyber-attacks pose serious threats to water and wastewater organizations, jeopardizing their reputation, finances, and even lives. To increase cyber defense, Schneider Electric collaborates with a network of world-class partners to provide the right technology and services tailored to customer environments.

They leverage this ecosystem to integrate leading cybersecurity solutions, offering vendor-agnostic protection from an OT perspective across various industries, including water and wastewater.

Key steps to improve cybersecurity posture include regular assessments, network segmentation, backups, and employee training. Schneider Electric can guide organizations towards cyber confidence, drawing on industry-leading OT cybersecurity standards, services, and solutions. By taking a proactive approach, water and wastewater providers can mitigate the devastating impacts of cyber threats and safeguard their critical operations.

Conclusion

In the journey of digital transformation, maintaining digital continuity across the entire infrastructure lifecycle is essential. Operators seek long-term partnerships with solution providers that can guide them towards operational excellence. A holistic, tailored approach across the water cycle is critical for both municipal and industrial users. With its diverse portfolio, open solutions, and deep industry expertise, Schneider Electric is well-positioned to support utilities and industrial users through their digital transformation journey, addressing challenges like cybersecurity and local support through its specialized ecosystem.

Bridging the Water-Energy Divide: AI-Enabled Sustainable Solutions for Companies

The deep interdependence between energy and water is poised to intensify, with far-reaching implications for their respective securities. Rising demands, constraints, and climate change are straining both resources globally. This article examines how energy is used to ensure reliable water supply, especially in water-stressed regions like the Middle East. It also explores the water-energy-climate nexus and highlights technologies and policies that can create beneficial synergies between these critical resources. The article further explores the potential of AI in enhancing water and energy efficiency for companies worldwide.

Energy and Water: A Matter of Interdependence

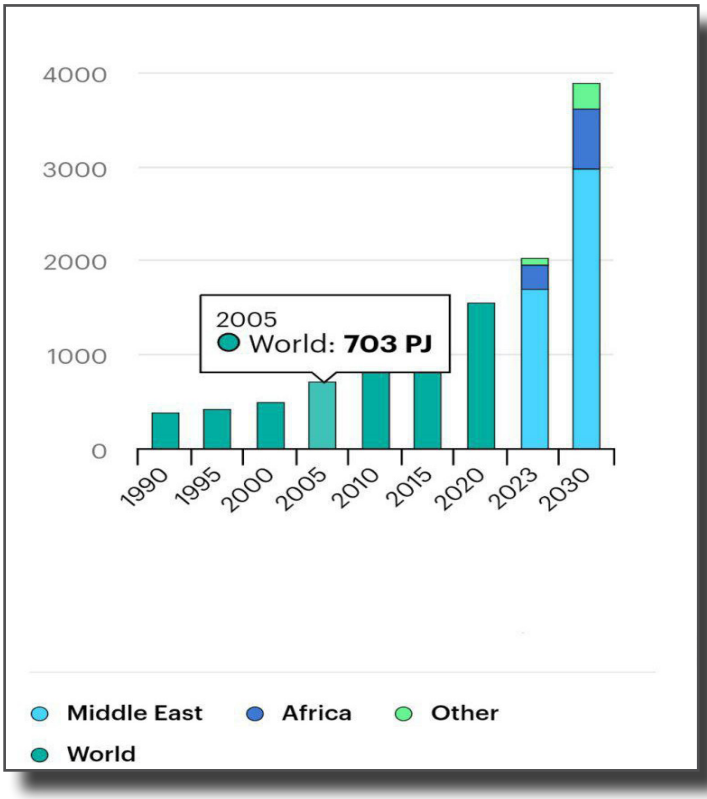
The relationship between water and energy is a crucial topic that deserves attention, as these two resources are closely interconnected. Thermoelectric power plants require vast amounts of water for cooling, while water sourcing, treatment, and distribution systems are big energy consumers, accounting for over 12% of national energy use. Hydroelectric power and large-scale irrigation for biofuels are obvious connection points.

In the oil and gas sector, millions of gallons of water are consumed in each hydraulic fracturing well, which also produces substantial amounts of wastewater. Downstream refining operations and other industrial processes also demand substantial water inputs. Ignoring these connections can lead to inefficiencies, resource depletion, and environmental degradation. However, the scale of the issue presents significant opportunities for innovators to make progress and address the interdependence between water and energy.

Desalination: A Future Energy Demand Driver

As water stress increases, the use of energy-intensive desalination to meet demand has grown rapidly. Global energy demand for desalination has nearly doubled since 2010 and is projected to double again by 2030. Over 21,000 desalination plants operate in 150 countries, with half the capacity in the Middle East and North Africa. The IEA estimates that by 2040, 15% of the total final energy consumption in the Middle East region will be desalinated.

Desalination requires over 1 kWh per cubic meter, with 95% of this energy coming from fossil fuels. Projections indicate the energy needed for Middle East desalination could reach 80 billion cubic meters of natural gas by 2030, revealing the significant energy and environmental impacts of this water scarcity solution. Addressing the nexus between water and energy is critical to ensuring sustainable management of both resources.

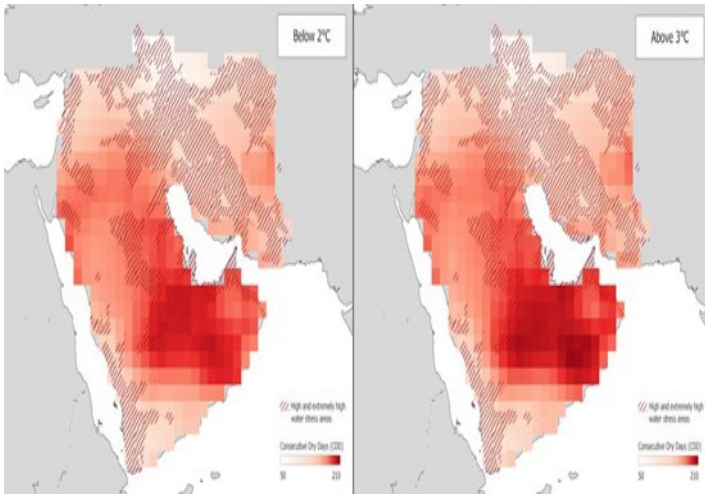


Climate Change Exacerbates Energy-Water Nexus Challenges

Climate change exacerbates water stress, with changing precipitation patterns, sea-level rise, and increasing temperatures challenging water management. Energy infrastructure may no longer be reliable as extreme weather events become more common. Projections indicate growing strain from climate change will result in higher energy consumption for water supply, including more energy-intensive desalination plants. However, cleaner technologies like membrane-based and solar-powered desalination can help stop this vicious cycle.

" In 2018, the world's first large-scale solar-powered desalination plant with a capacity of 22 billion liters per year was completed in Saudi Arabia "

The region has also been doubling water reuse projects every decade since 1990, aiming to use water resources more efficiently and reduce the environmental impact of water scarcity solutions.



Water stress and consecutive dry days in the Middle East by scenario, 2040-2060

Energy and Water Stewardship Should Go Hand in Hand

Energy and water are closely linked resources foundational to economic development, food production, environmental sustainability, and human well-being. Ensuring reliable, affordable, and sustainable access to energy and water is critical for societal advancement, prosperity, and stability. Policies, partnerships, and cooperation are key, with governments replacing unnecessary subsidies and encouraging efficient use to lower emissions. An integrated approach can reduce risks, as clean technologies used for electricity can also provide water access, and the shift from fossil fuels to renewables can lower energy's water requirements. Measures to save and reuse water can ease demand for energy, while extractive industries can reduce their water needs. This holistic, collaborative management of energy and water resources is essential for sustainable development.

Optimizing Sustainability: The Impact of AI on the Water-Energy Nexus

AI plays a significant role in optimizing the water-energy nexus.

AI systems, with advanced analytics and machine learning capabilities, are adept at processing complex data, resulting in more accurate forecasting of water and energy demands and the identification of inefficiencies. In water management, AI optimizes distribution, predicts demand, and quickly detects leaks, conserving water and reducing energy used in treatment and distribution. In energy management, AI helps balance demand with supply, improves power grid efficiency, and facilitates the integration of renewable energy sources. This not only boosts energy efficiency but also minimizes dependence on water-intensive energy sources, thereby enhancing the sustainability and resilience of both water and energy systems.

AI could help the water industry curb its thirst for energy

Water and wastewater treatment plants consume 30-40% of the total energy used by governments.

" Improving energy efficiency at these plants can reduce costs by 15-30%, with quick payback periods. AI-driven optimization algorithms and digital twins can help leaders optimize treatment processes, adjust aeration, and minimize energy-intensive operations to cut energy consumption "

Advanced digital twins coupled with generative AI can develop and test their own hypotheses, offering suggestions to managers on system optimization. The true value of digital twins lies in accessing vast amounts of information and insights, merging operational data to accurately depict the system's current state and operation, enabling detailed analysis, and identifying potential performance enhancements.

• United Utilities' Pioneering AI Integration in the UK Water Industry

In 2018, United Utilities, a leading UK water company, successfully integrated AI into its operations, partnering with Canadian firm EMAGIN. This marked the first large-scale AI implementation in the UK water industry. The initiative, following a trial in Oldham, Greater Manchester, led to a notable 22% reduction in energy usage. EMAGIN's AI platform, HARVI, analyzes diverse data, including weather, water demand, and electricity prices, to optimize pump operations and detect issues like pipe bursts. This trial's success prompted United Utilities to plan a region-wide rollout across the North West. The implementation underscored the potential for AI to enhance efficiency and reduce operational costs in the water sector, aligning with United Utilities' commitment to lower customer bills by 10.5% from 2020.

Leading Companies Utilizing AI to optimize Energy Consumption

AI is increasingly being used to predict energy demand and supply. Some of the top companies adopting AI in energy management include:

• IBM

IBM's AI platform, Watson, is used to predict energy demand and supply. It employs machine learning algorithms to analyze historical data and forecast future energy needs, enabling energy companies to optimize operations and reduce costs.

• Google's DeepMind

DeepMind has created an AI system that can predict wind power output 36 hours ahead, allowing energy grids to better plan wind power integration into their operations.

• Schneider Electric

Schneider Electric leverages AI technology to optimize energy usage within buildings. Their EcoStruxure platform examines data from diverse sources, offering insights to enhance energy efficiency.

• GE Renewable Energy

GE Renewable Energy employs AI to optimize the performance of wind turbines. Their Digital Wind Farm technology utilizes AI to analyze data from individual wind turbines, optimizing their operation to boost energy generation.

• Siemens

Siemens employs AI technology to optimize the performance of gas turbines. Their AI system can forecast when maintenance is necessary, minimizing downtime and enhancing efficiency.

• EnVision Energy

Envision Energy utilizes AI to manage its renewable energy assets. Their EnOS platform leverages AI to analyze data from wind turbines, solar panels, and energy storage systems, optimizing their operation and enhancing energy production.

• AutoGrid

AutoGrid employs AI to forecast, optimize, and regulate energy flow within the grid. Their Energy Internet platform utilizes AI to analyze data from diverse sources and offer insights on enhancing energy usage.

• C3.ai

C3.ai offers AI software for digital transformation. Their AI Suite employs machine learning algorithms to predict energy demand and supply, assisting energy companies in optimizing their operations.

• Veritone

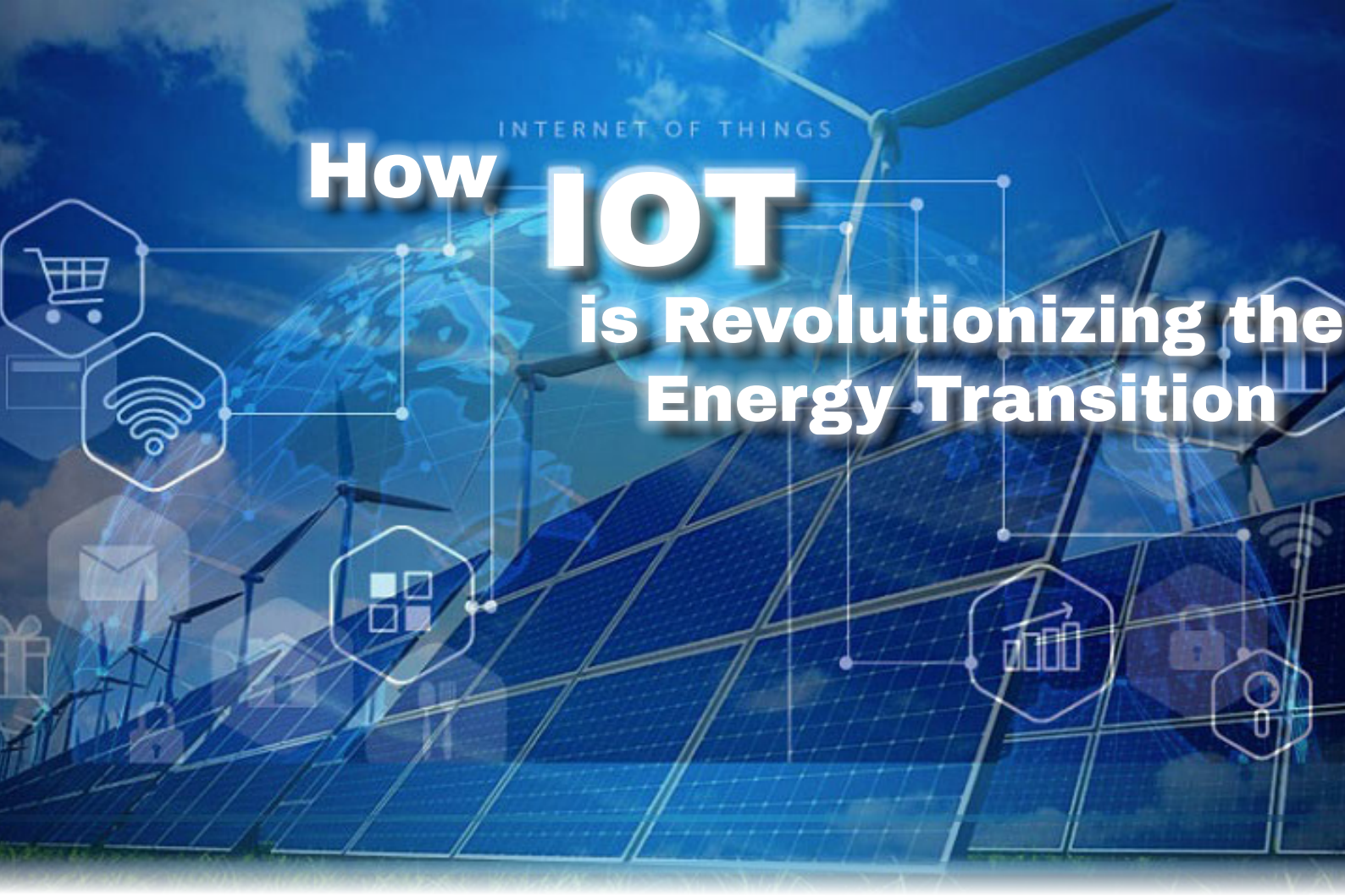
Veritone's AI platform leverages machine learning to forecast energy supply and demand, supporting utilities in optimizing operations and reducing costs.

• ABB

ABB employs AI to optimize power grid operations. Their ABB Ability platform uses AI to analyze grid data and provide insights for enhancing efficiency and reliability.

Conclusion

The growing interdependence between energy and water presents significant challenges but also opportunities for innovative solutions. Addressing this nexus is critical for ensuring sustainable management of both resources, especially as climate change exacerbates pressures. Technological advancements, such as AI-powered optimization and clean desalination, offer promising pathways to boost efficiency, reduce emissions, and unlock beneficial synergies. Integrated policies, partnerships, and holistic stewardship of energy and water resources are essential to advancing societal prosperity and environmental sustainability.



How IOT is Revolutionizing the Energy Transition

The energy landscape is undergoing a profound transformation as the world strives to transition towards a more sustainable and efficient future. At the heart of this transition is the rapidly evolving Internet of Things (IoT) technology, which is playing a pivotal role in reshaping the way we produce, distribute, and consume energy. The integration of IoT into the energy sector has unlocked a new era of unprecedented efficiency, allowing for the seamless coordination and optimization of various components within the energy ecosystem. From power generation to distribution and consumption, IoT-enabled devices and systems are revolutionizing the way we approach the energy transition. The intermittent nature of renewables creates complications for the industry, but the Internet of Things offers security through forecasting and predictive maintenance.

How IOT works in the power sector

IOT is an umbrella term used to describe the use of connected sensors and actuators to control and monitor the environment, the things that move within it, and the people that act within it."

In the power sector, these connected devices offer predictive maintenance and accurate measurements to better manage energy distribution and offer security. Sensors are the most common example of IoT devices in power. When combined with predictive machine learning models and AI analysis, sensors can monitor and anticipate energy production, offering distributional efficiency across the grid.

" Ed Ross, Technical Director at gridIMP, explained: "IoT devices can help monitor and control energy demands and energy storage in batteries. Monitoring is especially important to gain insights into site demand and generation profiles, needed for real-time control and forecasting "

Secure and Efficient Energy Systems with IoT

Secure connectivity is essential in today's energy systems, providing the backbone for reliable and resilient energy management. IoT technology augments this foundation by facilitating safe, real-time monitoring and data collection from various distributed energy resources. This secure data transit is crucial for protecting systems against cyber threats while ensuring that energy operations are efficient and adaptable to real-time conditions.

Furthermore, IoT's impact extends significantly to optimizing renewable energy sources such as solar power. Through IoT-enabled devices, energy providers can perform real-time monitoring and predictive maintenance, which are vital for minimizing downtime and improving grid stability. These systems utilize advanced analytics to forecast energy output and adjust grid operations dynamically, enhancing the integration of renewable resources like solar and wind. Despite the cybersecurity challenges and the complexity of achieving seamless interoperability among diverse technologies, the robust capabilities of IoT provide a solid foundation for overcoming these hurdles and maximizing the efficiency of solar energy solutions.

Using IOT to streamline the energy transition

Connected to the cloud, IoT devices are used by transmission system operators and hardware manufacturers. When incorporated with new digital twin technology, these devices – sensors in particular – enable companies to build current and regularly updated models of physical assets for monitoring.

These models enable the optimization of asset performance through periodic or continuous equipment monitoring. Monitoring performance through connected IoT devices reduces the risk of service interruptions by flagging anomalies earlier; the increased security enables the energy transition by safeguarding national grids from potential disruption.

This is particularly important as providers struggle to modernise with inadequate or aging assets.

> ***" Ross explained: "We see IoT most commonly deployed where traditional SCADA (Supervisory Control and Data Acquisition) technology is lacking, especially in developing markets like South Africa or historic buildings in the UK. gridIMP, for example, is working with South African partners to deploy IoT monitoring and control to help consumers and the grid cope with load-shedding (rolling planned blackouts to cope with insufficient generation)."***

Leaders and laggards

As The trend towards decarbonization grows stronger, all companies will need to digitalize to reduce emissions and break into cleaner energy markets. As renewable energy sources become increasingly popular, the need for a resilient grid that can respond to peaks and troughs in generation grows. Generation companies need to be able to predict which assets to use."

It is notable that Duke Energy, EDF, Enel, Engie, E.ON, Ørsted, and NextEra Energy, as leaders in the implementation of IoT, investing in digitalisation.

Ørsted has also made notable steps in IoT, having partnered with Vodaphone to digitally connect its offshore wind farm in Scotland through 4G. A partnership with Microsoft means that Ørsted now uses cloud technology to store the farm's data, which is analysed for predictive maintenance.

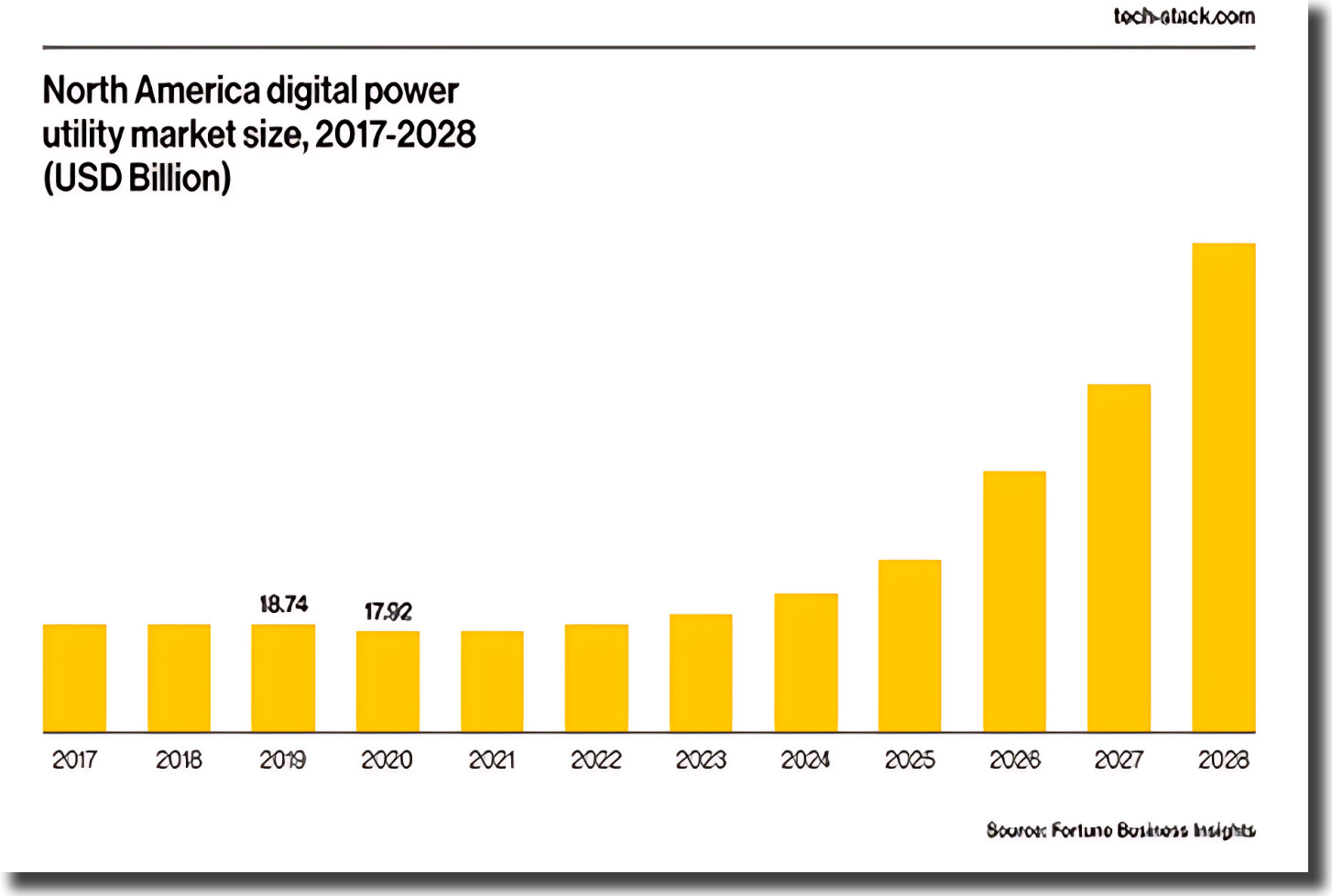
For businesses, power is their fourth largest expense, yet most do not have dedicated staff to manage their energy consumption. As the economic and environmental costs of energy increase, organisations that have people and systems in place to monitor their power, waste, and renewables will have a competitive advantage.

Navigating Challenges and Seizing Opportunities

While IoT introduces transformative potential for the energy sector, it also brings challenges, particularly in cybersecurity and data privacy. These concerns are paramount as energy systems become increasingly interconnected and reliant on digital infrastructure. However, the strategic implementation of IoT can address these challenges by enhancing system security and reliability through continuous monitoring and advanced cybersecurity protocols.

The opportunities for growth and improvement are vast. IoT technologies not only enhance operational efficiencies but also support crucial sustainability goals by more effectively integrating renewable energy sources into the grid. Moreover, they enable predictive maintenance capabilities that reduce downtime and operational costs, all while improving the reliability and lifespan of energy equipment.

As the energy sector continues to evolve, integrating IoT technologies will play an increasingly vital role in shaping a sustainable future. IoT is at the heart of the energy transition by enhancing grid stability, optimizing renewable integration, and empowering consumers. For energy stakeholders, investing in IoT is a technological upgrade and a strategic move towards a resilient, efficient, and sustainable energy framework, promising a brighter future for global energy systems.



The Catalysts of Digital Transformation in the Energy Sector

Industry forecasts suggest that the global digital power utility market will grow to $239.38 billion in 2028 from $55.02 billion in 2021. The key drivers are:

• Increasing demand for resources:

Population growth and increased urbanization have led to a higher global energy demand. To meet this demand, companies are turning to digital solutions to optimize asset monitoring, energy production, and delivery.

• High pollution levels:

Traditional energy production methods create higher pollution. IoT-enabled networks and smart grids work together to monitor and adjust production processes to reduce emissions.

• Environmental regulation:

Governments have enforced tighter environmental, social, and governance (EGS) laws regarding emissions. Digital solutions help meet these standards by enabling the adoption of more eco-friendly energy sources.

• Government initiatives:

The WEF's 2023 Fostering Effective Energy Transition report reveals that investments in renewable energy sources have surpassed investments in fossil fuels. Governments are providing incentives for a transition to low-carbon energy to meet the net-zero emissions target by 2050. With digital transformation, energy organizations can capitalize on this financial aid.

• The IT sector is a major source of pollution:

Software alone may account for around 14% of the global CO_2 footprint by 2040.

Digital transformation can lead to significant reductions in the energy used during manufacturing, operations, and software development. A 2021 survey from Accenture reported that 48% of companies saw increased

revenue and returns on investments after adopting sustainability technologies.

• A large influx of actionable data:

Modern energy systems generate massive amounts of data from sensors, cameras, and transaction records. Companies are implementing big data solutions and analytics to turn all this raw data into actionable insights.

• Branding opportunities:

Commitment to renewable energy and being environmentally friendly brings financial benefits. A 2022 IBM study suggests that 49% of customers are willing to pay more for sustainable and socially responsible products.

• Operational risks:

Organizations face a constant risk of accidents, equipment failures, and environmental disasters. Equipping sites with sensors that monitor a wide range of parameters (pressure, temperature, etc.) and cameras with AI-driven image recognition enables better threat mitigation.

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Powering the Future: Exploring the Latest Sustainable Battery Innovations in Green Energy Storage

Innovations in sustainable batteries enhance green energy storage

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In today's push towards a greener future, the development of sustainable battery innovations has become more crucial than ever. As the demand for renewable energy sources continues to rise, finding efficient ways to store this energy is essential. Enter green energy storage and recent advancements in battery technology. These innovations are revolutionizing the way we harness and utilize green energy. In this article, we will explore the current challenges in energy storage, the latest sustainable battery innovations, and how they contribute to a more sustainable future. Stay tuned to discover how these advancements are shaping the future of green energy storage.

Current Challenges in Energy Storage

Conventional energy storage technologies, such as lithium-ion batteries, have played a significant role in powering our modern world. However, these technologies face a range of challenges that must be addressed to accelerate the transition towards a greener future.

One of the primary concerns is the limited energy density of current battery technologies. This constrains the range and performance of electric vehicles as well as the scalability of grid-scale energy storage systems. Increasing energy density while maintaining safety and reliability is a crucial engineering challenge that researchers and manufacturers are striving to overcome.

Furthermore, the ethical and environmental impacts associated with the extraction and processing of battery materials, such as lithium and cobalt, have raised concerns. The mining and refining of these critical raw materials can have detrimental effects on local communities and the environment, underscoring the need for more sustainable and ethically sourced battery materials.

The high costs of battery technologies, particularly in the context of large-scale energy storage applications, also present a barrier to wider adoption. Reducing manufacturing costs and improving the overall affordability of energy storage solutions is essential to enabling widespread accessibility and integration into the energy system.

Additionally, the end-of-life disposal and recycling of batteries pose significant challenges. The improper disposal of batteries can lead to the release of hazardous materials, posing risks to human health and the environment. Developing efficient and environmentally-friendly battery recycling processes is crucial to creating a more circular and sustainable battery ecosystem.

The Latest Developments in Battery Technology

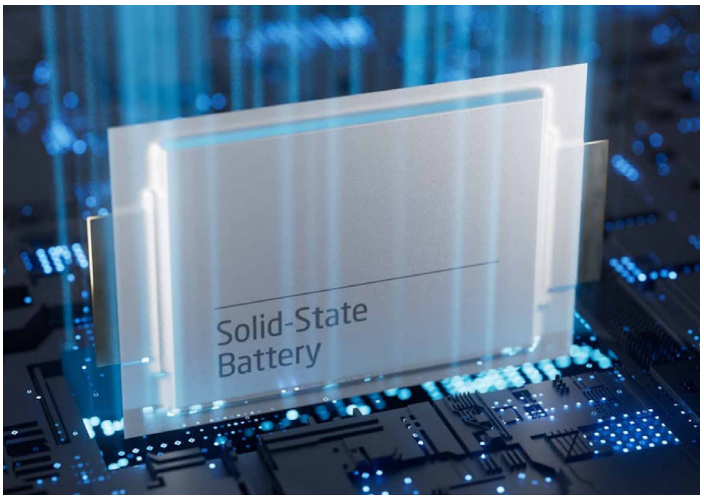
While full commercialization of new devices entering the market is still some way off, some noteworthy advances have been made in the field of sustainable battery technology. Over the past few years, radical rethinks of technology have been necessary to improve sustainability.

• Solid-state batteries

Solid-state batteries are one breakthrough that promises to improve the sustainability of energy storage. Rather than using a liquid electrolyte like in a conventional lithium-ion battery, solid-state devices use solid materials such as polymers and ceramics. Solid-state batteries pack more energy into a smaller space, potentially allowing electric vehicles to possess more range before having to be recharged.

Shorter charging times are also facilitated by faster charge movement. Furthermore, reduced flammability of solid electrolytes means that these devices are safer.

As mentioned above, the battery industry is concerned about the scarcity of lithium. One potential alternative that has piqued researchers' interest is the sodium-ion battery.

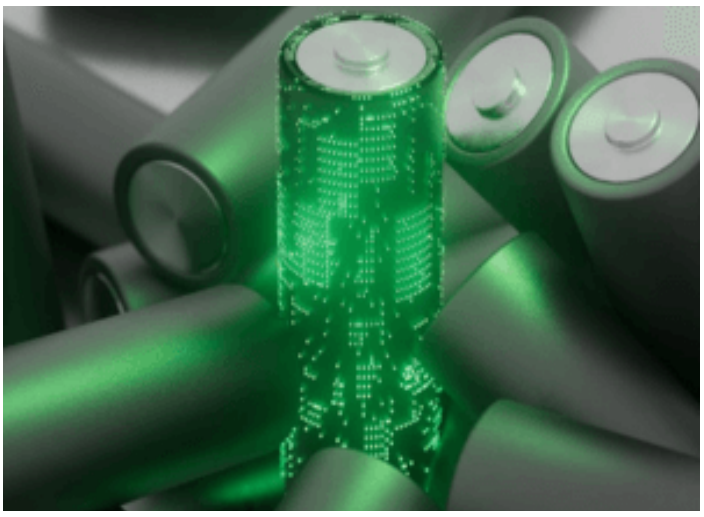


• Sodium-ion batteries

Sodium-ion batteries have a similar design to lithium-ion devices. While they offer little in the way of a performance boost, sodium is a far more abundant and cheaper element than lithium. However, concerns over whether they could meet the energy demands of sectors such as electric vehicles have led companies to initially target less demanding applications, such as e-scooters.

• Lithium-sulfur batteries

Lithium-sulfur batteries have also been a focus of research, as well as innovative iron-air batteries. Even completely metal-free platforms are being explored. Clearly, it can be seen that the field of sustainable battery research is producing some potentially game-changing technologies.



Harnessing the Untapped Power of Physics

While new developments in "traditional" Li-ion battery technologies are important and necessary, some changemakers are thinking outside the box for completely different ways of storing pure energy. By replacing traditional liquid or gel electrolytes with different sources, these batteries could add to the increasing suite of battery options available to tackle each unique energy storage challenge.

• Green Gravity

Australian start-up Green Gravity is harnessing the untapped power of physics to store excess renewable power in the form of gravitational potential energy. In brief, heavy weights are suspended in a disused mine shaft, attached to a generator that creates electricity when the weights are lowered into the shaft. When local supply of renewable power outstrips demand, the excess energy is used to raise the weights to the top of the mine shaft. When demand is higher, the weights are lowered, winding the generator and supplying green energy to the grid.

It is a remarkably simple system, yet it holds massive potential. One of the main issues holding back the mass rollout of renewables is the unpredictable nature of their generation: wind power and solar power are subject to massive peaks and troughs in their output from weather changes. Systems, like gravitational potential energy storage, that can respond with speed and agility to surges in demand or generation go a long way toward mitigating this issue and stabilising the grid, making renewables more viable in the long term.

" While the technology is still in the development stage, Green Gravity CEO Mark Swinnerton said "The company is completing technology development through the next 18 months, beyond which we expect to develop our first commercial-scale energy storage system for the grid"

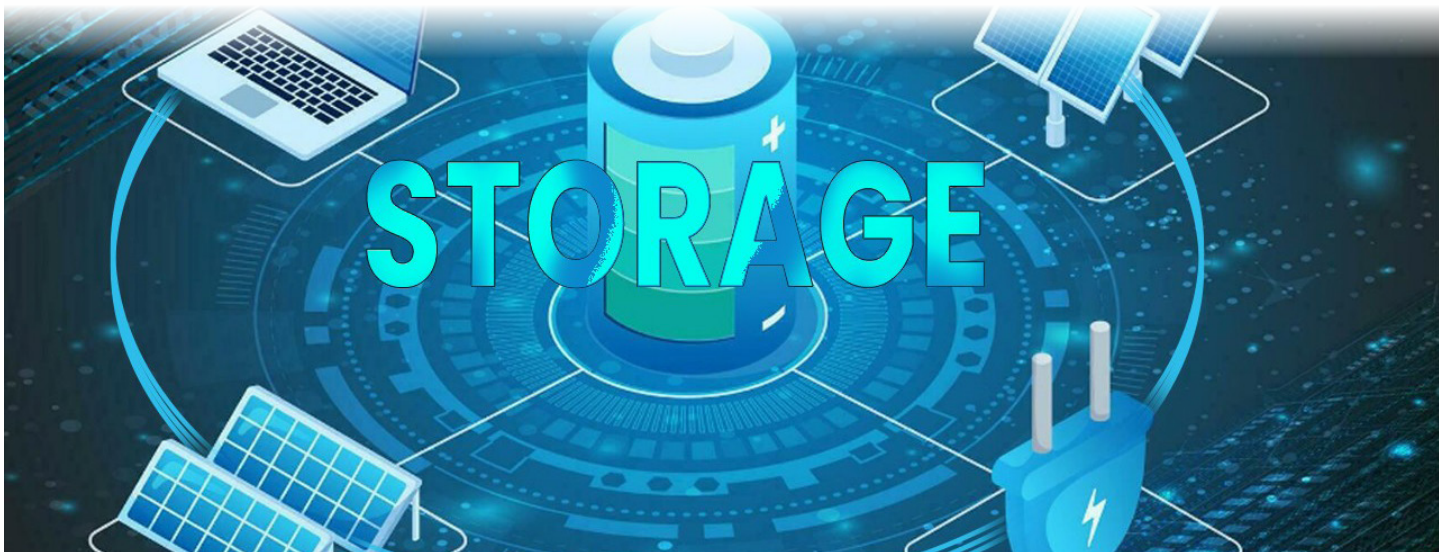
• Polar Night Energy

Another unusual technological development comes from Finland, where the vast variability in seasonal weather and the long, dark Nordic winters present an additional challenge for the stability of renewable energy supply. Given this geographical disadvantage, Finland-based start-up Polar Night Energy looked to a most peculiar source: It's sand.

At the Vatajankoski power plant, 168 miles north-west of Helsinki, sits the world's first commercial-scale sand battery. Here, 100 tonnes of sand deemed too low-grade for building purposes is superheated to 600 °C using renewable electricity, mostly from wind turbines and solar panels.

This sand stores energy in the form of heat; when full, it can hold around eight megawatt-hours of thermal energy. When demand rises, the battery can immediately discharge around 200 kW of power – enough to support heating and hot water for around 100 homes and a local swimming pool.

Sand has multiple advantages over Li-ion as a source of battery energy storage. The material is easier and more sustainable to source than many of the hard-to-mine minerals Li-ion batteries rely on. Sand can also store energy for a longer duration of time, in addition to not degrading over time. However, the downside is that it is only suitable for heat generation, not electricity. Still, every system has its pros and cons, and sand energy storage could well form part of the suite of solutions that keep our grids running smoothly.



The Rapid Pace of Change

What is perhaps most exciting about the BESS industry at this moment is the pace at which new developments across technology, policy, and deployment have come about. The "explosive" growth of the sector is a reflection of "a growing awareness that storage resources, particularly long-duration storage resources, are critical for decarbonization", says Gabe Murtaugh, director of markets and technology at the Long-duration Energy Storage Council.

A report released by RenewableUK in December 2023 showed that the pipeline of operational, under-construction, or planned energy storage projects in the UK has increased by more than two-thirds in capacity since 2022, from 50.3 GW to 84.8 GW. According to Eva Zimmermann, lead for flexible energy at Aurora Energy Research, the European BESS market shows the same trend, with "22 GW of battery storage in the pipeline until 2026 alone." She notes that even countries that don't have any installed capacity at this moment will soon "go from zero to hero."

"What is most interesting is the momentum for battery storage that is created through the appetite for battery projects on the developer and investor sides, together with the increasingly strong political will of European governments to booster battery storage, as seen by Polish or Spanish support through the capacity markets, the BESS auctions in Greece, or the upcoming storage strategy in Germany," Zimmerman says

Many of the world's largest energy companies_TotalEnergies, RWE, and Vattenfall, to name a few_ are quickly getting on board as well. Vattenfall has recently invested significant effort into BESS development, including the creation of several BESS projects in the UK, the most recent of which was brought online in October 2023.

Agreeing with Zimmerman's prospects for the industry, Sebastian Gerhard, director of batteries at Vattenfall, said: "The speed, scale and ramp-up of the stationary storage industry are impressive. It happens at every value chain step: development, production, construction, and operations."

As Murtaugh puts it, we have seen an "explosive development of storage, innovative new ways to accommodate storage in existing markets, and exciting conversations around compensation mechanisms for storage resources for broader future participation in organised markets" in recent years.

Conclusion

Developing sustainable battery innovations is crucial as renewable energy demand rises. Current challenges include limited energy density, environmental impacts of materials, high costs, and disposal issues. Promising advances include solid-state, sodium-ion, and lithium-sulfur batteries that offer improved safety, cost, and sustainability. Innovative solutions like gravity-based and sand-based energy storage also show potential. The battery energy storage sector is seeing "explosive growth" with rapidly expanding project pipelines, driven by growing awareness of storage's importance for decarbonization. Major energy companies are increasingly investing in battery storage, signaling the rapid pace of change in this space.

Six of the Key Countries Leading Green Hydrogen in Africa

Africa is becoming a key player in the development of large-scale green hydrogen projects

Africa is becoming a key player in the development of large-scale green hydrogen projects by utilizing platinum group metals, a crucial component in the global drive towards net-zero emissions. The Africa Green Hydrogen Alliance, established in 2022, is a testament to Africa's renewable energy potential. Africa will have a green hydrogen generation capacity of more than 50 million tons per year by 2035. jThis output is expected to be economically sustainable at under €2 per kilogram by 2030, making it highly competitive with world oil prices, which are currently at €90 per barrel. Here are the major green hydrogen projects in Africa:

Mauritania is Pursuing A Megaproject for Green Hydrogen

Mauritania is home to the largest green hydrogen development on the continent. Because of its proximity to European markets and its established infrastructure, including the Nouadhibou deepwater port, Mauritania has become a very appealing market for green hydrogen. The $40 billion Aman project, which is powered by 30 GW of solar and wind energy and has an electrolyzer of 15 GW, was created by renewable project developer CWP Global. The facility has a 1.7 million-ton annual capacity (mtpa). The 1.2 mtpa Nour Electrolyzer project and the 1.36 mtpa Masdar-Infinity-Conjuncta green hydrogen project, each with a potential for up to 10 GW of electrolysis.

Namibian Green Hydrogen Takes Off

DWEER is an innovative ERD that directly exchanges energyNamibia is advancing with its inaugural hydrogen megaproject, aiming for an annual production of 300,000 tons of green hydrogen. The Namibian government has partnered with Hyphen Hydrogen Energy, a preferred bidder for the $10 billion initiative. The facility is designed to produce 2 million tons of green ammonia annually, targeting regional and international markets. The venture is expected to generate 300,000 tons of green hydrogen annually, catering to both local consumption and export demands. Full-scale production is expected to commence before 2030.

South Africa Leads Project Developments

South Africa, like Namibia, is well positioned to develop a green hydrogen economy, with a number of initiatives already underway. Key projects include Hive Hydrogen's $4.6 billion Green Ammonia Plant and a €15 million grant from Germany for the HySHIFT sustainable hydrogen project.

Egypt is at the forefront

Egypt now has 21 green energy projects in the works as the country seeks to use its strategic location at the crossroads of Africa, Europe, and Asia to become a global energy hub. Major developments include the signing of an agreement between renewable power producer Scatec and the Egyptian government for the development of a 3 mtpa green ammonia facility; a 4 GW electrolyzer plant at the Suez Canal Economic Zone (SCZONE) developed by Masdar and Hassan Allam Holding Group; a 3.6 GW electrolyzer project developed by Globeleq; the 400,000 tons per annum (tpa) ACME green ammonia project; the 300,000 tpa Fortescue-Egypt-gH2 project; and the 200,000 tons per annum (tpa).

Morocco's Ambitious Green Hydrogen

Morocco has a number of large-scale green hydrogen technologies planned in close coordination with multinational corporations.

> ***" The largest is the 900,000 tpa Amun project, which was created by CWP Global with the engineering, construction, and project management firm Bechtel "***

Additionally, Total Eren, an independent power producer (IPP), is developing a 710,000 tpa green hydrogen project, the Guelmim-Oued Nour project, while other projects in the pipeline include the 31,000 tpa Hevo Ammonia Morocco project, the 8,400 tpa Masen Green Hydrogen project, and the 125 tpa Ben Guerir project.

Djibouti Joins Green Hydrogen Race

Djibouti has also entered the green hydrogen race, with CWP Global planning to build a 10-GW green hydrogen hub. IPP Fortescue Future has also entered into a cooperation with the government to perform feasibility studies on green hydrogen at two sites in the country: Goubet and Obock. According to McKinsey, Africa's energy consumption may quadruple by 2050 due to population growth, emphasizing the importance of transitioning to more efficient and greener technology.

As the continent develops its hydrogen infrastructure, the opportunities for economic growth and sustainable development are tremendous. With the appropriate combination of legislative backing, investment, and public awareness, the continent's abundant hydrogen resources might power a more sustainable tomorrow. And Africa's commitment to renewable energy for hydrogen generation establishes it as a rapidly expanding energy frontier in the global market.

Conclusion

Africa is emerging as a key player in large-scale green hydrogen projects, leveraging its abundant renewable energy resources and platinum group metals. The Africa Green Hydrogen Alliance, formed in 2022, aims to develop over 50 million tons of annual green hydrogen generation capacity by 2035 at costs below €2 per kilogram. Major projects are underway in countries like Mauritania, Namibia, South Africa, Egypt, and Morocco. Mauritania's $40 billion Aman project will have 15 GW of electrolysis capacity, while Namibia's $10 billion venture targets 300,000 tons of annual green hydrogen. South Africa, Egypt, and Morocco also have multiple gigawatt-scale initiatives in the pipeline. With Africa's energy demand projected to quadruple by 2050, the continent's transition to green hydrogen presents significant economic and sustainable development opportunities. Supportive policies, investments, and public awareness will be crucial to realizing Africa's potential as a global green hydrogen hub.

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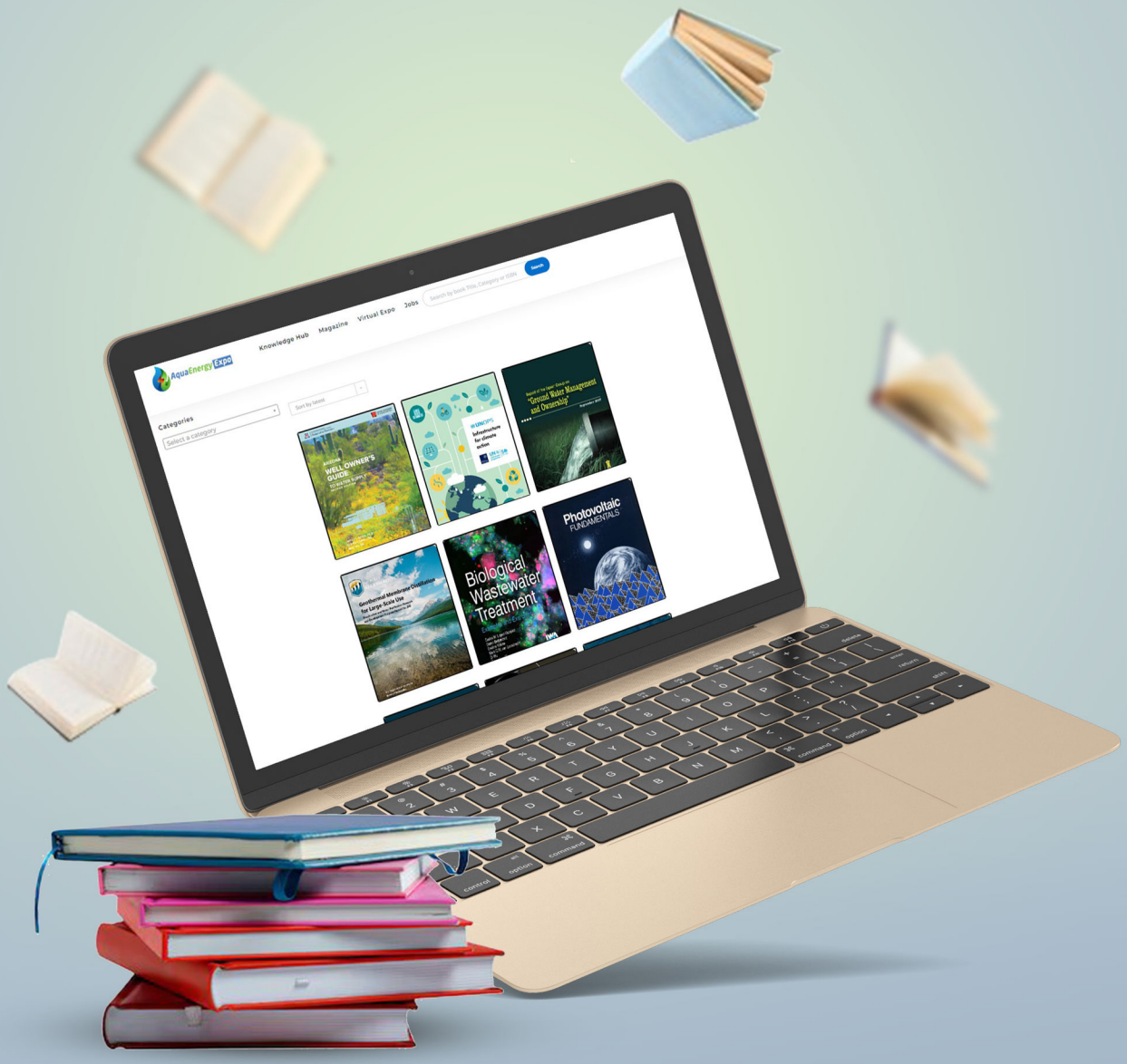

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INEOS and NextEra Energy announce solar groundbreaking

INEOS Olefins & Polymers USA and NextEra Energy Resources have announced a groundbreaking new 310 MW solar project in Bosque County, Texas, USA. This significant milestone follows a renewable power purchase agreement with NextEra, the world's largest generator of renewable energy from wind and sun, and a leader in battery energy storage. The entire output of this cutting-edge solar project will be dedicated to INEOS O&P USA, aiming to cover the net purchased electricity load for all 14 of its manufacturing, fractionation, and storage facilities in the US. Expected to produce 730,000 MWh of clean energy annually, equivalent to the power usage of over 68,000 homes, the project will significantly reduce greenhouse gas emissions by approximately 310,000 tons per year. INEOS O&P USA's CEO stated this is a crucial step in the company's efforts to reduce its carbon footprint, while NextEra commended INEOS for pioneering the decarbonization of the petrochemical industry. The project is scheduled to begin commercial operation by December 2025.

Equinor and Oceanex receive feasibility licenses for Novocastrian Wind

Novocastrian Wind Pty Ltd has been shortlisted for feasibility licenses for offshore wind projects off the coast of Hunter, New South Wales. The proposed projects could deliver 2 GW of renewable electricity, power 1.2 million homes, and create around 3000 jobs during construction. The Offshore Infrastructure Registrar received 8 applications across the 1854 km2 zone. The final decision on feasibility licenses in the Hunter is subject to consultation processes with license applicants and First Nations groups. The feasibility license stage includes consultation with First Nations groups, stakeholders, and environmental assessments and management plans. Offshore wind offers a large-scale, secure, reliable, and clean energy source for Australia's electricity network.

RWE launches Welsh BESS consultation

RWE is advancing proposals to develop a battery energy storage system (BESS) on its land adjacent to Pembroke Power Station, as part of the Pembroke Net Zero Centre. BESS plays a crucial role in integrating renewable energy sources into the power grid, allowing excess renewable energy to be stored and fed into the grid when needed. The RWE Pembroke Battery, located on a 5.1 ha. area south of the current power station, would comprise 212 Battery Containers, 106 Power Conversion Systems (PCS) enabling connectivity to the grid, and associated infrastructure. The battery would have a maximum charge/discharge power of 350 MW and connect via underground cables to the grid at the adjacent National Grid 400 kV substation. Once fully operational, the Pembroke Battery would be capable of storing enough electricity to meet the average daily domestic energy needs of over 72,000 typical UK homes.

Vestas gains order from RWE for 660MW German offshore wind project

Vestas has secured an order from RWE for the 660MW Nordseecluster A offshore wind project in Germany. The company will supply 44 V236-15.0 MW wind turbines for the first phase, overseeing their supply, delivery, and commissioning. Vestas will also enter a five-year service agreement and an operational support agreement to maintain the turbines post-completion. Delivery of the wind turbines is set for 2026. The Nordseecluster project is located 50km north of Juist in the German North Sea. RWE offshore wind chief operating officer Thomas Michel expressed satisfaction with the execution phase of the Nordseecluster A project and expressed excitement about future cooperation. Vestas is also preparing to deliver and commission ten V162-7.2 MW wind turbines for the Holtsee wind energy project in Schleswig-Holstein, Germany.

Hitachi Energy's EconiQ tech to upgrade TenneT Netherland substation

Hitachi Energy is partnering with TenneT to upgrade its Maasbracht substation in the Netherlands with its 380kV EconiQ gas-insulated lines (GIL). The upgrade will ensure electricity reliability and reduce the use of sulphur hexafluoride (SF6) gas in the transmission network. The installation of EconiQ GIL will prevent 70,000kg of SF6 from entering the transmission network. TenneT Netherlands grid field operations associate director Frank Wester praised the investment in the energy infrastructure in the region. The EconiQ GIL will modernize the substation, extending over 7km and contributing to TenneT's environmental objectives. Christian Ohler, head of Hitachi Energy's switchgear, expressed excitement about the partnership and its potential benefits to TenneT, the environment, and society.

Iberdrola secures environmental permit for 274MW project in Portugal

Iberdrola has secured the final environmental permit from the Portuguese government for a 274MW wind farm project in Portugal, which will share the grid connection with the Tâmega pumped storage hydro complex. The project, which will be built in Vila Real and Braga, will be the country's largest hybrid clean energy scheme. The project will benefit from shared infrastructure, including substations, and have a reduced environmental impact. Iberdrola will apply for a production license to the Portuguese Directorate General of Energy and Geology, starting work in early 2025. The Tâmega hydroelectric project comprises three power plants: the 160MW Alto Tâmega, the 880MW Gouvães pumped storage, and the 118MW Daivões plants. The €1.5bn Tâmega hydroelectric complex has an installed capacity of 1.16GW and can store 40 million kilowatt hours of energy, sufficient to power 11 million people for one day.

Entergy and NextEra Energy plan 4.5GW of solar and storage projects

Entergy and NextEra Energy Resources have signed a five-year joint development agreement for 4.5GW of new solar and energy storage projects in the US. The agreement aims to expand Entergy's renewable energy portfolio and provide low-cost, renewable energy to customers in the US. CEO Rebecca Kujawa expressed excitement about the agreement, stating that the power sector is at an inflection point and growing electricity demand will be met by low-cost, renewable generation and storage. Entergy Texas has already sought approval for two advanced natural gas power plants, Legend and Lone Star, which will be operational by 2028. The Legend power station, a 754MW facility in Port Arthur, Texas, will provide sustainable energy to 190,000 homes and contribute to the southeast Texas power grid's capacity while minimizing environmental impact. The Lone Star power station, a 453MW facility near Cleveland, Texas, will generate affordable energy for 110,000 homes. Entergy has three million customers across Arkansas, Louisiana, Mississippi, and Texas, while NextEra Energy Resources operates across 41 US states and in Canada.

RWE to build 800MW hydrogen-ready CCGT power plant at Werne, Germany

RWE, a German energy company, has announced plans to construct a hydrogen-ready combined cycle gas turbine (CCGT) power plant at its Gersteinwerk power plant in Werne. The plant will operate on a fuel mix containing at least 50% hydrogen, with plans to transition to 100% hydrogen. The project is part of RWE's plans to construct hydrogen-ready gas-fired power plants for a successful coal phase-out by 2030. The project is being planned by a consortium comprising Ansaldo Energia from Italy and Tecnicas Reunidas from Spain. The plant is expected to begin electricity generation by 2030 and will operate with a fuel mix containing at least 50% hydrogen. RWE Generation CEO Nikolaus Valerius stated that the construction of the new power plant will contribute to green security of supply and secure the coal phase-out by 2030. The German government's power plant strategy will establish a regulatory framework for tendering hydrogen-ready gas-fired power plants, and RWE intends to bid on these tenders.

JinkoSolar Supplied Residential Storage Solutions to SolarToday

JinkoSolar Holding Co., Ltd., a leading solar module manufacturer, has partnered with SolarToday to supply high voltage residential storage solutions for use in the DACH and Benelux regions starting in June 2024. The partnership aims to further realize JinkoSolar's growth ambitions in the PV and ESS markets. The CEO of SolarToday, Tom Engbers, expressed his pride in the strategic collaboration on ESS markets, stating that JinkoSolar is a key partner in their Pan-EU distribution model and their joint ambition to make a real difference in the solar energy market. The CEO expects Jinko to apply the technological leadership demonstrated in the move to TOPCon in the module sector to energy storage solutions. The collaboration is expected to lead to more collaboration in the future, aiming to achieve desired successes in the rapidly growing sectors of the PV industry.

LONGi Announces the New World Record Efficiency of 30.1% for the Commercial M6 Size Wafer-Level Silicon-Perovskite Tandem Solar Cells

LONGi Green Energy Technology Co., Ltd. has set a new world record efficiency of 30.1% for the commercial M6 size wafer-level silicon-perovskite tandem solar cell at the 2024 Intersolar Europe in Munich, Germany. This achievement comes less than a week after LONGi announced a new world record of 34.6% tandem solar cell efficiency at the 2024 SNEC EXPO in Shanghai. The new world record efficiencies represent a significant advancement in pushing the efficiency limits of silicon-perovskite tandem cell prototypes and a milestone in the commercial viability of this technology. LONGi's Central R&D Institute boasts a vibrant research team exceeding 5000 members, focusing on advancing crystal silicon-perovskite tandem solar cell technology and promoting industrialization of emerging photovoltaic technologies.

Canadian Solar Launches First FIP Projects in Japan, Signs 20-Year PPA with Toyota Tsusho

Canadian Solar Inc. has launched its first portfolio of feed-in premium (FIP) PV projects in Japan, starting commercial operation in June 2024. The projects, located in Ibaraki Prefecture and Tottori Prefecture, are equipped with CS7N-660W bifacial modules and will generate additional revenue through Non-Fossil Certificates (NFCs). Under a 20-year PPA, Toyota Tsusho Corporation will purchase 100% of the PV power and NFCs generated by the projects. Toyota Tsusho, part of the Toyota Group and an electricity retailer, will supply this power and the associated NFCs to its corporate customers. Since launching its Japan PV development business in 2012, Canadian Solar has focused on FIT due to the growing demand for clean energy. As of March 31, 2024, the company's project development business in Japan totaled 240 MWp and 1.675 GWh for solar and energy storage, respectively.

ACEN taps Energy Vault for 200MW New England Battery

Energy Vault has been appointed to lead the construction of ACEN Australia's 200MW/2-hour New England Battery Energy Storage System (BESS) in New South Wales, set to commence this year and be operational by 2026. The battery is co-located with ACEN Australia's inaugural project, New England Solar, a significant generator in the National Electricity Market (NEM). Once completed, it will be one of the nation's largest co-located solar and battery energy storage facilities, providing stored energy to the grid when needed. The battery will use advanced grid-forming inverter technology to provide system stability services that coal, hydro, and gas generators currently provide. Energy Vault chairman and CEO Robert Piconi expressed excitement about joining forces with ACEN Australia in their shared mission to create a sustainable future. The appointment follows the signing of a cooperation agreement between ACEN Australia and Marubeni Asian Power Singapore in March this year.

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Global Energy Events

2024 Intersolar North America and Energy Storage North America

Date: From 16 to 19 Jan 2024
Location: San Diego Convention Center 111
Harbor Dr.San Diego, CA 92101

Intersolar North America and Energy Storage North America highlight the latest energy technologies, services, companies, and organizations striving to create a positive impact on climate change and support our planet's transition into a more sustainable energy future.

Website: www.intersolar.us
Registeration: www.xpressreg.net

Electrical Energy Storage and Technologies Conference

Date: From29 to 30 Jan 2024
Location: San Diego San Diego, US

EESAT has been the leading technical forum for showcasing advancements in energy storage technologies and applications since 2000. It is currently sponsored by the IEEE Energy Storage and Stationary Battery (ESSB) Committee.

Website: www.cmte.ieee.org
Registeration: www.cmte.ieee.org

Hydrogen Live 2024

Date: From 7 to 8 February 2024
Location: Titanic Hotel, Rum Warehouse, Liverpool United Kingdom

Foresight Hydrogen Live 2024 is a premier event focusing on the hydrogen value chain. Taken place on February 7 and 8 at the Titanic Hotel in Liverpool, it offers a valuable opportunity for industry leaders, innovators, policymakers, and investors to collaborate and influence the future of hydrogen.

Website: www.decarbonisationtechnology.com
Registeration: www.decarbonisationtechnology.com

Egypt Energy Show

Date: From 19 to 21 February 2024
Location: Cairo

The EGYPES 2024 Conferences help shape the future energy agenda to unlock the potential of the energy transition and drive sustainable production and climate-conscious practices. The EGYPES strategic dialogue focuses on the need for a new global energy system that reduces reliance on single energy sources and supports supply and demand cycles globally.

Website: www.egypes.com

Go Hydrogen Business Summit 2024

Date: From 21 to 22 February 2024
Location: Antwerp Belgium

Go Hydrogen is a business summit focused on practicality, covering important projects, production, and emerging technologies in the hydrogen economy. The summit aims to provide a meeting platform for project owners and off-taker companies to network and conduct business together.

Website: www.decarbonisationtechnology.com
Registeration: www.decarbonisationtechnology.com

Wind Energy Asia 2024

Date:From 6 to 8 March 2024
Location: Taiwan

Wind Energy Asia is the only wind industry focused tradeshow in Taiwan. Thanks to its knowledge and vast connections into the local supply chain, allied with its international reputation, Wind Energy Asia provides great business opportunities by gathering international and local players on the best networking platform for the wind industry in Taiwan.

Website: www.windenergy-asia.com

Waterpower Week

Date: From 13 to 15 March 2024
Location: Capital Hilton in Washington, D.C.

Waterpower Week 2024 has support opportunities that fit the needs of your budget and will help you surpass your company's marketing goals.

Website: www.waterpowerweek.com
Registeration: www.edgereg.net

International Conference on Renewable Energy and Sustainable Energy (ICRESE-2024)

Date: From 25 to 27 March 2024
Location: Paris, France

The conference offers a dynamic blend of expert keynotes, interactive workshops, unparalleled networking opportunities and fostering collaborations that will shape the course of Renewable Energy and Sustainable Energy technology.

Website: www.conference2go.com
Registeration: www.renewableenergy.com

26th World Energy Congress

Date:From 22 to 25 April 2024
Location: Rotterdam Ahoy, Rotterdam, the Netherlands

The 26th World Energy Congress was a critical turning point for leadership on clean and inclusive energy transitions worldwide and an opportunity to spring forward in redesigning energy for people and the planet.

Website: worldenergycongress.org
Registeration: www.worldenergycongress.org

Solar & Storage Live Story

Date: From 1 to 2 May 2024
Location: Brisbane Convention & Exhibition Centre

Solar & Storage Live is the world's largest series of trade shows and conferences organised globally by Terrapinn Limited in the UK, USA, South Africa, Egypt, Saudi Arabia, Philippines, Thailand and Vietnam etc..., and coming to Brisbane, Australia in May 2024.

Website: www.terrapinn.com
Registeration: www.secure.terrapinn.com

CLEANPOWER 2024 Conference & Exhibition

Date: From 6 to 9 May 2024
Location: Minneapolis, MN | Minneapolis Convention Center

CLEANPOWER® is the clean energy industry's premier event, bringing policy leaders, industry experts, and major players together for a week of learning, networking and innovation.

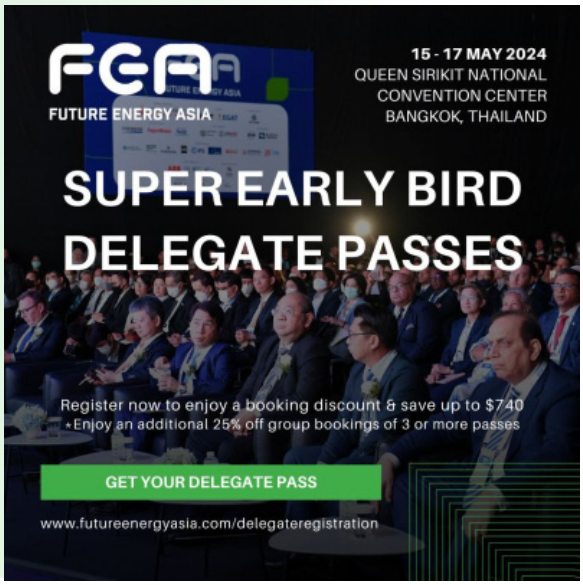
Website: www.cleanpower.org
Registeration: www.xpressreg.net

Future Energy Asia

Date: From 15 - 17 May 2024
Location: In Asia

In 2024, Future Energy Asia will host international ministers, Energy CEOs, policymakers, and technical experts to analyze energy trends, drive innovations for the transition to net zero, and build partnerships for accessible, secure, and affordable energy for all.

Website: www.futureenergyasia.com
Registeration: www.futureenergyasia.com



PV ModuleTech USA

Date:From 21 to 22 May 2024
Location:Napa, USA

This event will address the module landscape that is expected to unfold for U.S. buyers in the coming years; in particular new domestic manufacturing. Special attention will be given to the module offerings, full value-chain traceability and the financial health of the companies currently supplying the market.

Website: www.pv-tech.org
Registeration: www.moduletechusaenergyevents.com

Energy Powering Opportunity

Date:From 11 to 13 June 2024
Location: BMO Centre at Stampede Park - Calgary, Canada

The Global Energy Show Canada is the largest B2B exhibition and conference engaging with industry buyers and sellers, CEOs ,young professionals ,stakeholders and partners together to share knowledge and fuel innovation in the ever-changing energy landscape.

Website: www.globalenergyshow.com
Registeration: www.globalenergyshow.com

Hydrovision International

Date: From 15 to 18 July 2024
Location: Denver, Colorado, USA | Colorado Convention Center

The conference and exhibit provide an unparalleled platform for learning and procurement that addresses every facet of hydropower, spanning Operations and Maintenance, Environmental Issues and Water Management, Equipment and Technology, Industry Trends and Analysis, and New Development.

Website: www.hydroevent.com
Registeration: www.hydroevent.com

2024 World Battery & Energy Storage Industry Expo (WBE 2024)

Date: From 8 to 10 August 2024
Location: Guangzhou, China

WBE has developed into a professional exhibition with the largest number of exhibitors in battery enterprises and the highest participation of professional visitors and foreign buyers. Relying on its worldwide influence and thousands of overseas buyers.

Website: www.en.battery-expo.com
Registeration: www.en.battery-expo.com

ICBR 2024 International Congress for Battery Recycling

Date:From 10 Sep to 12 Sep 2024
Location: Basel, Switzerland

ICBR 2024 is the global platform for addressing challenges in the battery recycling industry. For 29 years, ICBR has united experts and decision makers from the entire battery recycling value chain, including recyclers, manufacturers, collection organizations, OEM's, policymakers, materials and services providers, and more.

Website: www.events.icm.ch
Registeration: www.events.icm.ch

WindEnergy Hamburg 2024

Date: From 24 to 27 September 2024
Location: Hamburg, Germany

WindEnergy Hamburg is one of the world's biggest and most important wind business platforms for exchanging news and views, building networks and closing major deals. National and international wind industry associations cooperate with WindEnergy Hamburg and encourage their members to attend.

Website: www.windenergyhamburg.com
Registeration: www.windenergyhamburg.com

The Energy Event of Finland

Date: From 22 to 24 October 2024
Location: Tampere

The largest energy event in Finland brings together energy production, power transmission and storing, energy users, environmental and circular economy and real estate decision makers under the same roof in October. The event will showcase sustainable, smart, productive, and modern solutions to the energy transition.

Website: www.energiamessut.expomark.fi
Registeration: www.energiamessut.expomark.fi

HYDRO 2024

Date: From 18 to 20 November 2024
Location: Messe Congress Graz (MCG), Austria

The HYDRO 2024 Technical Exhibition will showcase the most active and innovative companies in the hydropower and dams industry worldwide. Click on the button below to see the latest list of exhibitors, or to book a stand.

Website: www.hydropower-dams.com
Registeration: www.hydropower-dams.com

6th Annual International Summit and Exhibition Balkan's Power

Date:From 4 to 5 December 2024
Location:Sarajevo, Bosnia and Herzegovina

6th Annual International Summit and Exhibition: Balkan's Power is a professional platform, bringing together chief ministers, major investors, decision-makers of the leading hydro, wind and solar power plants and investment project initiators, as well as regulators, to consolidate efforts focused on efficient implementation of key projects for the construction and reconstruction of power plants across Balkan region.

Website: www.balkanspowersummit.com
Registeration: www.balkanspowersummit.com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