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Latest Developments Shaping the Energy Sector

Hello & Welcome to energyHQ's October 2025 issue!

The global energy sector is entering a pivotal phase of transformation, driven by rapid technological innovation and ambitious climate goals. From breakthroughs in industrial solar to the rise of green hydrogen and offshore wind, the industry is redefining how economies power growth while pursuing sustainability.

In this issue of energyHQ we spotlight the developments shaping this dynamic landscape. You'll find insights on next-generation solar technologies, floating wind farms, and energy storage solutions that address intermittent challenges. We also explore how nations and industries are accelerating decarbonization strategies amid supply chain constraints and critical mineral demands.

Looking ahead, 2026 is expected to be a defining year for energy transition. The coming year promises both opportunities and challenges, with technology acting as a catalyst for sustainable growth. From industrial solar breakthroughs to cross-sector decarbonization strategies, the energy industry is poised to redefine global economic and environmental trajectories. It is expected that with global investments flowing into renewables, smart grids, and energy storage, businesses will have an unprecedented opportunity to align with sustainability goals while enhancing operational efficiency. Collaboration between governments, technology providers, and investors will be key to overcoming challenges and unlocking new growth avenues.

In This Issue!

energyHQ's October 2025 issue covers the most recent developments and events pertaining to the energy industry, as well as including valuable insights, details and spec sheets / peer reviews related to latest technologies, innovations, products, services, and projects of relevance to the industry and its audience.

- Article on page 12 talks about renewable energy policies
- Article on page 32 focuses on nuclear energy policy
- Article on page 52 sheds the light on Thailand energy transition

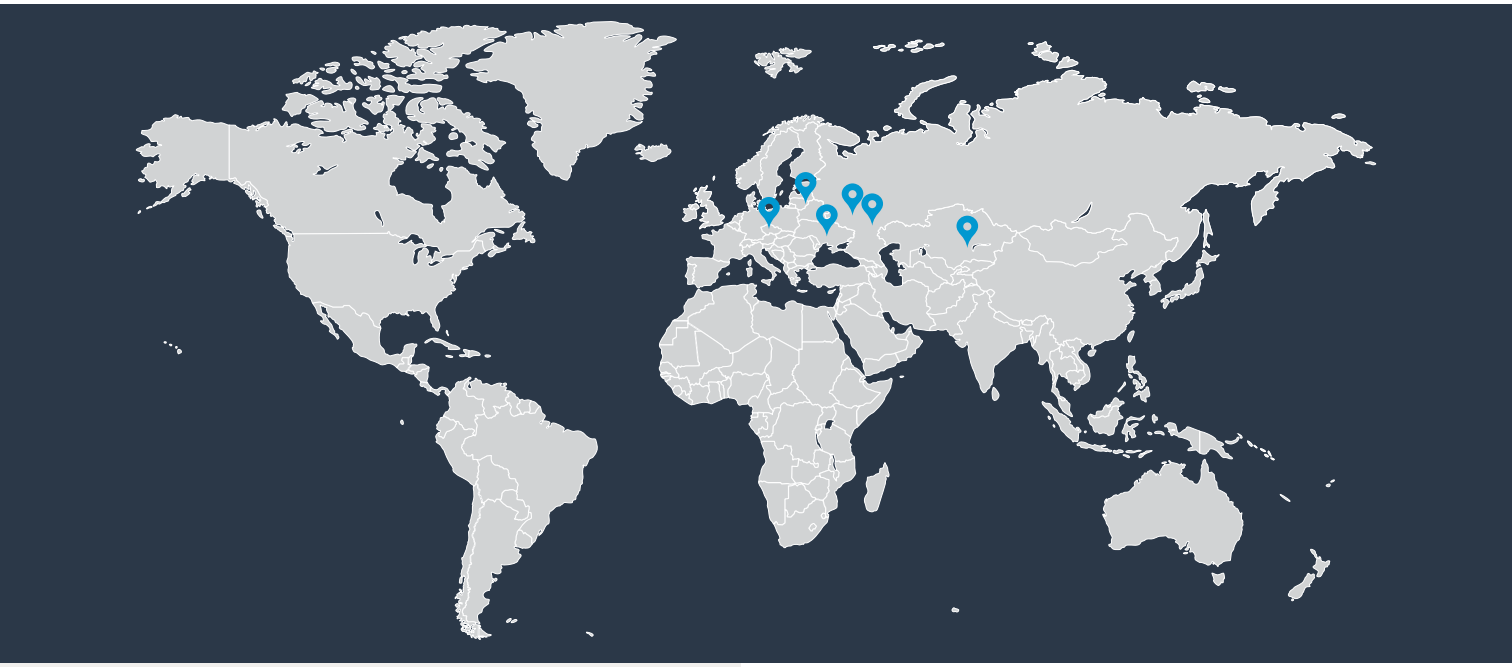
Additional content is also available covering the latest activities of manufacturers, importers, and exporters – worldwide!

We hope you benefit from this issue's content and find it useful & actionable for your business. For any comments, suggestions, or feedback please don't hesitate to contact me.

Best Wishes,

Mohamad-Rabih Chatila
CEO - Editor-in-Chief
rabih@1world.xyz

Energy World Digest



USA

Government Shutdown Impacts Healthcare Subsidies and FDA Approvals

The U.S. healthcare sector faced disruptions in October 2025 due to a prolonged government shutdown. Key issues include uncertainty over ACA premium tax credits, which may expire by year-end, potentially doubling insurance costs for millions. The FDA reported a slowdown in drug approvals, with rates falling to 73%, attributed to staffing cuts and leadership turnover. Analysts warn these disruptions could affect pharmaceutical innovation and patient access to critical medications.

Germany

Mandatory Electronic Patient Records Rolled Out Nationwide

Starting October 1, 2025, Germany mandated the use of electronic patient records (ePA) across its statutory health system. This move aims to improve care coordination and reduce redundant tests. While 93% of practices are connected, technical challenges remain, particularly with uploading older medical data. The reform is part of Germany's broader digital health strategy, which also includes telemedicine expansion and hospital reimbursement restructuring.

Japan

Healthcare Expo Showcases AI and Digital Transformation

MEDICAL JAPAN 2025 TOKYO held October 1–3, highlighted innovations in AI diagnostics, robotic surgeries, and pharmacy automation. The event attracted over 18,000 visitors and 650 exhibitors, underscoring Japan's commitment to digital healthcare transformation. Concurrently, regulatory reforms accelerated drug approvals, with 43 new therapies expected this year, including gene therapies and oncology treatments.

South Africa

Africa's First End-to-End Vaccine Manufacturing and AI Adoption

South Africa achieved a milestone by manufacturing an oral cholera vaccine entirely within the country, marking a leap toward vaccine self-reliance. Clinical trials began in November under SAHPRA approval. Additionally, the Healthcare Innovation Summit Africa (Oct 22–23) emphasized AI-driven solutions for improving patient outcomes and reducing hospital admissions, with 91% of professionals confident in AI's transformative potential.

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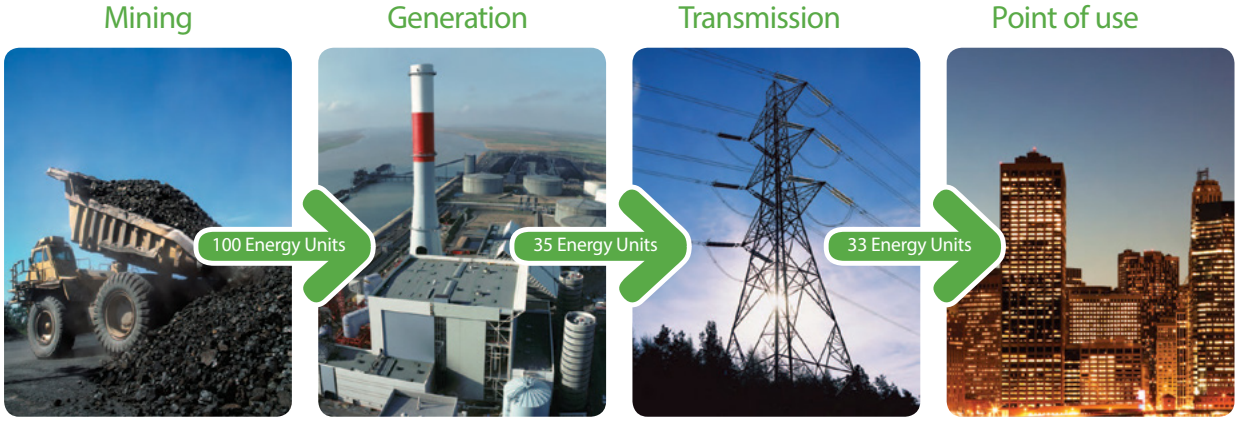
Issue Contents

The only good watt is a negawatt



Due to intrinsic inefficiencies, 33 units of energy consumed at the point of use require 100 units of primary energy

What's a negawatt? The one you didn't use.

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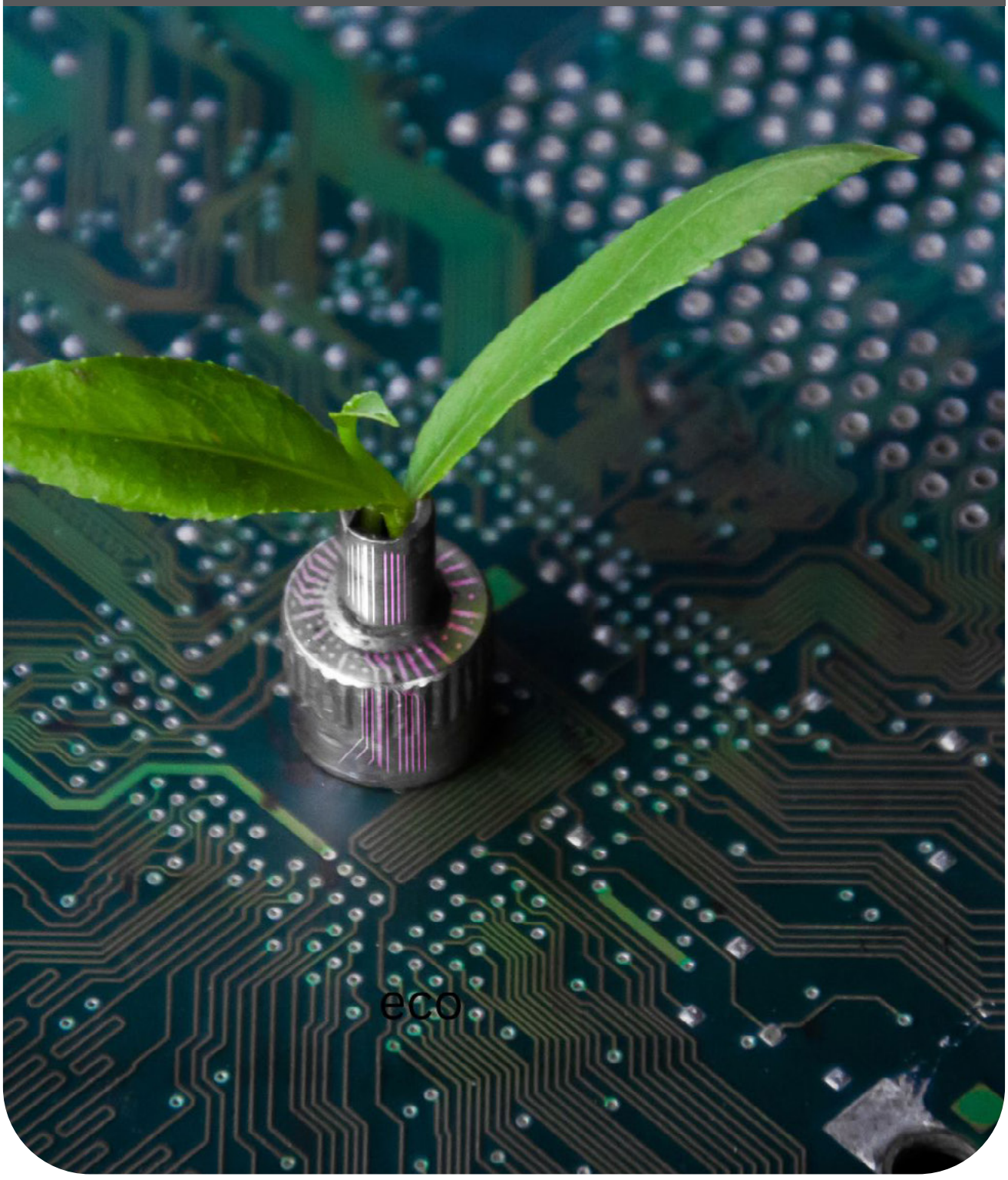
*Source: W orld Energy Outlook 2009, IEA/OECD

Sustainability & Decarbonization

07 International Climate Cooperations



Global Climate Cooperation: Driving Sustainability and Decarbonization in the Energy Industry

Figure 1. Global climate cooperation is reshaping the energy transition through finance, innovation, and shared action.

The global energy industry stands at the center of the world's climate ambitions, serving as both the largest emitter of greenhouse gases and the sector with the greatest potential to enable deep decarbonization. As countries intensify efforts to meet the Paris Agreement targets and honor their net-zero commitments, international cooperation has become the defining driver of progress. No single nation can tackle the climate challenge alone; instead, multilateral collaboration, cross-border financing, technology-sharing initiatives, and private-sector alliances are collectively reshaping the global energy landscape.

At the multilateral level, COP30 in Belém, Brazil marked a turning point for global climate diplomacy, reinforcing the shift from broad pledges to concrete implementation. Delegates from nearly 200 nations adopted an ambitious package designed to dramatically scale climate finance and accelerate global climate action. Central to the outcomes was a landmark commitment to mobilize $1.3 trillion annually by 2035 for climate-related initiatives—a major step forward in bridging the financing gap that has long hindered developing economies. Countries also agreed to triple adaptation finance by 2025, signaling a deeper understanding that resilience is as critical as mitigation, particularly for vulnerable regions facing intensifying climate impacts.

Beyond these large multilateral frameworks, bilateral and regional partnerships are increasingly influential in advancing industrial decarbonization. A leading example is the EU–India Industrial Transition Accelerator (ITA)—a collaboration designed to help one of the world's

fastest-growing economies develop low-carbon solutions for hard-to-abate sectors like steel, cement, and chemicals. By integrating the EU's expertise in carbon markets and regulatory frameworks with India's vast renewable energy potential and expanding clean-tech capacity, the ITA underscores how economic growth and emissions reduction can be mutually reinforcing, rather than mutually exclusive. Such partnerships demonstrate the transformational potential of pairing financial support and advanced regulatory experience with emerging-market innovation and scale.

Equally significant is the rising role of private-sector coalitions, which are becoming essential to driving global decarbonization. Initiatives such as the Alliance for Industry Decarbonization, coordinated by IRENA, bring together companies across energy-intensive value chains to devise practical strategies aligned with net-zero objectives. These alliances encourage knowledge exchange, accelerate adoption of best practices, and promote collective action on solutions such as green hydrogen, renewable electrification, and carbon capture. Given that industrial activities account for over 30% of global greenhouse gas emissions, private-sector engagement is not merely beneficial—it is indispensable. These partnerships enable companies to share risks, mobilize investment at scale, and align on technical standards that make industrial transitions more feasible.

Yet, despite progress, significant barriers remain, particularly in terms of equitable financing. Climate-related investments continue to be heavily concentrated in advanced economies. According to IRENA, 90% of renewable energy investment in 2024 flowed to developed countries, highlighting the persistent divide that could undermine global decarbonization efforts. Emerging and developing economies—where energy demand is growing fastest—often face higher capital costs, limited access to concessional financing, and weaker regulatory frameworks, slowing the deployment of renewable energy and low-carbon technologies. Without targeted financial support and risk-mitigation mechanisms, these regions risk being left behind in the energy transition.

Against this backdrop, the future of international climate cooperation must focus on three essential pillars:

1. Scalable Finance

To achieve global climate goals, investment must shift toward inclusivity and accessibility. This means mobilizing affordable capital for developing nations through blended finance, multilateral development bank reform, debt-for-climate swaps, and risk-sharing instruments that can lower the cost of capital. For the energy transition to be truly global, financing must be both abundant and equitable.

2. Technology Transfer

Breakthroughs in hydrogen production, battery storage, smart grids, and carbon capture are advancing rapidly but remain unevenly distributed. Effective climate cooperation requires mechanisms that ensure these innovations reach all markets, not only wealthier ones. Technology transfer partnerships—including joint research programs, cross-border pilot projects, and shared intellectual property models—will enable countries to scale clean energy solutions efficiently.

3. Policy Alignment

Fragmented regulations and inconsistent standards slow down global progress. Aligning policies—such as carbon pricing mechanisms, emissions reporting standards, and renewable energy frameworks—helps create predictable environments for investment and accelerates deployment. Harmonized policies also reduce trade frictions and enable the formation of global markets for clean technologies, such as green hydrogen and critical minerals.

Ultimately, the transformation of the energy industry is not optional—it is an urgent imperative. With coordinated global action, inclusive financing, and technological cooperation, the sector can lead the world toward a resilient and low-carbon future. The next decade will determine whether climate ambition can translate into tangible results, and international collaboration will remain the cornerstone of that effort.

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International Renewable Energy Agency (IRENA).

COP30 sets ambitious climate finance roadmap amid global energy transition

Figure 1. COP30 delivers historic finance pledges, but implementation will define its legacytients and accelerate homecare adoption

COP30 concluded with a landmark agreement to mobilize $1.3 trillion annually by 2035 for climate action, signaling a new era of global cooperation. Delegates endorsed measures to double adaptation finance by 2025 and operationalize the loss and damage fund, reinforcing commitments under the Paris Agreement.

The summit launched two major initiatives—the Global Implementation Accelerator and the Belém Mission to 1.5°C—to drive rapid deployment of clean technologies and strengthen national climate plans. UN Climate Chief Simon Stiell hailed the outcome as “a turning point for climate ambition,” urging nations to integrate climate action into economic policymaking.

With global temperatures surpassing 1.5°C for the first time in 2024, COP30’s decisions underscore the urgency of scaling renewable energy and accelerating decarbonization. The challenge now lies in implementation—ensuring that pledged resources translate into real-world impact across both advanced and developing economies.

EU and India launch Industrial Transition Accelerator to decarbonize hard-to-abate sectors

Figure 1. EU and India team up to decarbonize heavy industry ahead of COP30.

The European Union and India have unveiled the Industrial Transition Accelerator (ITA), a strategic initiative aimed at decarbonizing heavy industries ahead of COP30. The ITA will facilitate the adoption of green technologies and secure financing for sectors such as steel, cement, and chemicals—traditionally considered hard-to-abate.

EU Counsellor Bartosz Przywara emphasized that the partnership reflects a "new implementation phase" in climate cooperation, aligning with India's sustainability agenda and the EU's success in decoupling economic growth from emissions. The collaboration builds on the EU-India Clean Energy and Climate Partnership, active since 2016, and leverages the EU's experience with carbon markets to accelerate India's green transition.

Industry experts highlight India's competitive advantage in renewable energy costs and innovation capacity, positioning the country as a global leader in industrial decarbonization. The ITA serves as a blueprint for international cooperation, demonstrating that climate ambition and economic prosperity can be mutually reinforcing.

DataVault AI and Wellgistics Health Announce Blockchain-Enabled Smart Contracts for Prescriptions

Figure 1. Uniting industry and innovation to decarbonize heavy sectors and accelerate the net-zero transition.

The Alliance for Industry Decarbonization, coordinated by the International Renewable Energy Agency (IRENA), announced new partnerships to accelerate net-zero ambitions across energy-intensive sectors. With industry accounting for over 30% of global greenhouse gas emissions, the Alliance aims to foster dialogue and implement decarbonization strategies aligned with the Paris Agreement.

Siemens Energy, EMSTEEL, and knowledge partner Roland Berger are among the key stakeholders driving this initiative. Focus areas include hydrogen hubs, carbon capture technologies, and electrification of industrial processes. The Alliance operates as a global platform for sharing best practices, enabling members to overcome systemic barriers such as financing and infrastructure gaps. Recent engagements at COP30 highlighted the urgency of industrial transformation, with calls for collective action to prevent emissions from rising in tandem with growing energy demand. By uniting public and private actors, the Alliance underscores the critical role of partnerships in achieving a sustainable, low-carbon future.

Renewable Energy

12 Renewable Energy Policies & Incentives

Renewable Energy Policies & Incentives: Catalysts for a Global Energy Shift

Figure 1. Governments worldwide are accelerating clean energy adoption through robust policies and incentives.

Renewable energy has rapidly evolved from a niche sector to the backbone of global climate strategies. Around the world, governments are intensifying efforts to meet net-zero targets, reduce dependence on fossil fuels, and build resilient energy systems capable of supporting future growth. According to the International Energy Agency (IEA), renewable energy capacity is projected to increase by nearly 50% by 2030—a surge driven largely by policy frameworks that incentivize clean energy deployment at unprecedented scale. This shift reflects not only environmental urgency, but also economic opportunity, as nations position themselves to benefit from the rapidly expanding global clean-energy market. To turn climate ambition into tangible action, countries are adopting a mix of regulatory measures, market-based mechanisms, and strategic investments. These policies aim to accelerate renewable energy adoption, foster innovation, and ensure the energy transition remains inclusive and economically viable. The emerging global policy landscape is complex but unmistakably geared toward a cleaner, more sustainable energy future.

Key Incentive Mechanisms Driving Growth

Incentives remain central to expanding renewable energy deployment. They reduce financial barriers, stimulate private investment, and provide predictable revenue streams that increase project bankability. Several policy tools have proven particularly effective:

Feed-in Tariffs (FiTs)

Feed-in Tariffs guarantee renewable energy producers a fixed price for every kilowatt-hour of electricity generated and fed into the grid. This system has been particularly influential in Europe and Asia, providing long-term revenue certainty that encourages both large utility-scale investments and smaller community-driven projects. FiTs have historically played a crucial role in accelerating solar and wind adoption, especially during the early stages of the clean energy transition.

Tax Credits

Tax incentives are widely used in major markets such as the United States, where investment tax credits (ITC) and production tax credits (PTC) significantly reduce upfront costs for developers. These credits help level the playing field between renewables and fossil fuels, stimulating large-scale deployment while supporting domestic manufacturing of clean energy technologies. For consumers, tax rebates on solar panels, heat pumps, and electric vehicles drive broader participation in the transition.

Green Bonds and Subsidies

Green bonds have emerged as an essential financing mechanism, channeling trillions of dollars into climate-aligned infrastructure projects. By offering lower risk profiles and attractive terms, they draw institutional investors into the renewable energy market. Meanwhile, targeted subsidies—from capital cost reductions to interest rate buy-downs—enable large-scale developments such as offshore wind farms, solar parks, and battery storage facilities.

Carbon Pricing

Carbon markets and taxes serve as powerful tools for incentivizing low-carbon technologies. By placing a cost on greenhouse gas emissions, carbon pricing mechanisms encourage industries to switch to cleaner processes, improve efficiency, and invest in renewable alternatives. While adoption varies globally, regions such as the EU and China are expanding their carbon pricing systems to cover more sectors and strengthen emissions reduction commitments. Collectively, these incentives create a stable and attractive investment environment that enables long-term planning, drives innovation, and accelerates the global energy transition.

Regional Highlights: EU, US, China, and Emerging Markets

The global push for renewable energy is shaped by region-specific policies and strategic priorities. While the level of ambition varies, the general trajectory is consistent across major markets: deeper decarbonization, expanded clean energy capacity, and a shift toward more sustainable economic models.

Emerging Markets

Countries across Africa and Latin America are increasingly turning to renewable auctions and concessional financing to expand clean energy access. These strategies reduce investment risk, attract foreign capital, and help build foundational infrastructure. Many emerging markets view renewables not only as a climate imperative but also as a pathway to energy security, job creation, and inclusive economic development.

Challenges and Opportunities Ahead

Despite impressive momentum, several challenges continue to slow the pace of the global energy transition. Grid integration remains a major hurdle, as aging infrastructure struggles to manage intermittent generation from solar and wind. Permitting delays often stall project timelines, while supply chain disruptions—particularly for critical minerals and components—create uncertainties for developers. As governments strengthen climate commitments and global cooperation deepens, renewable energy is poised to play an even more transformative role. The path from ambition to action is becoming clearer, and the world is steadily moving toward a cleaner, more sustainable energy future.

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REN21 Global Status Report,
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EU Accelerates Clean Energy Transition with REPowerEU

Figure 1. EU Accelerates Clean Energy Transition with REPowerEU

The European Union has unveiled its REPowerEU plan, designed to reduce dependence on fossil fuels and accelerate renewable energy deployment. The initiative complements the Fit for 55 package, which targets a 55% reduction in greenhouse gas emissions by 2030. Key measures include streamlined permitting for wind and solar projects, increased funding for energy efficiency, and incentives for green hydrogen production.

The EU aims to double solar capacity by 2025 and expand offshore wind projects across member states. Financial support will come through grants and low-interest loans under the Recovery and Resilience Facility. These policies are expected to attract significant private investment and create thousands of jobs in the clean energy sector.

DataVault AI and Wellgistics Health Announce Blockchain-Enabled Smart Contracts for Prescriptions

Figure 1. India's PLI Scheme Supercharges Domestic Renewable Manufacturing for 2030 Targets

India is accelerating its clean energy transition by strengthening domestic manufacturing through its Production-Linked Incentive (PLI) scheme. Designed to boost local production of solar modules, advanced batteries, and other renewable energy components, the PLI program offers direct financial incentives to companies that scale up manufacturing capacity and meet performance benchmarks. This approach not only supports India's ambitious goal of achieving 500 GW of renewable energy capacity by 2030, but also reinforces national efforts to develop a resilient and self-sustaining clean energy ecosystem. A core objective of the PLI scheme is to reduce India's dependence on imported solar and battery technologies, which have historically created vulnerabilities in project timelines and pricing. Industry analysts expect the scheme to attract substantial foreign direct investment, spur innovation in next-generation technologies, and generate thousands of jobs across manufacturing hubs. As global demand for clean energy infrastructure rises, India is positioning itself as a major player in the international renewable energy market. Through strategic industrial policy and rapid deployment, the PLI scheme is shaping the future of India's green economy while contributing to global decarbonization efforts.

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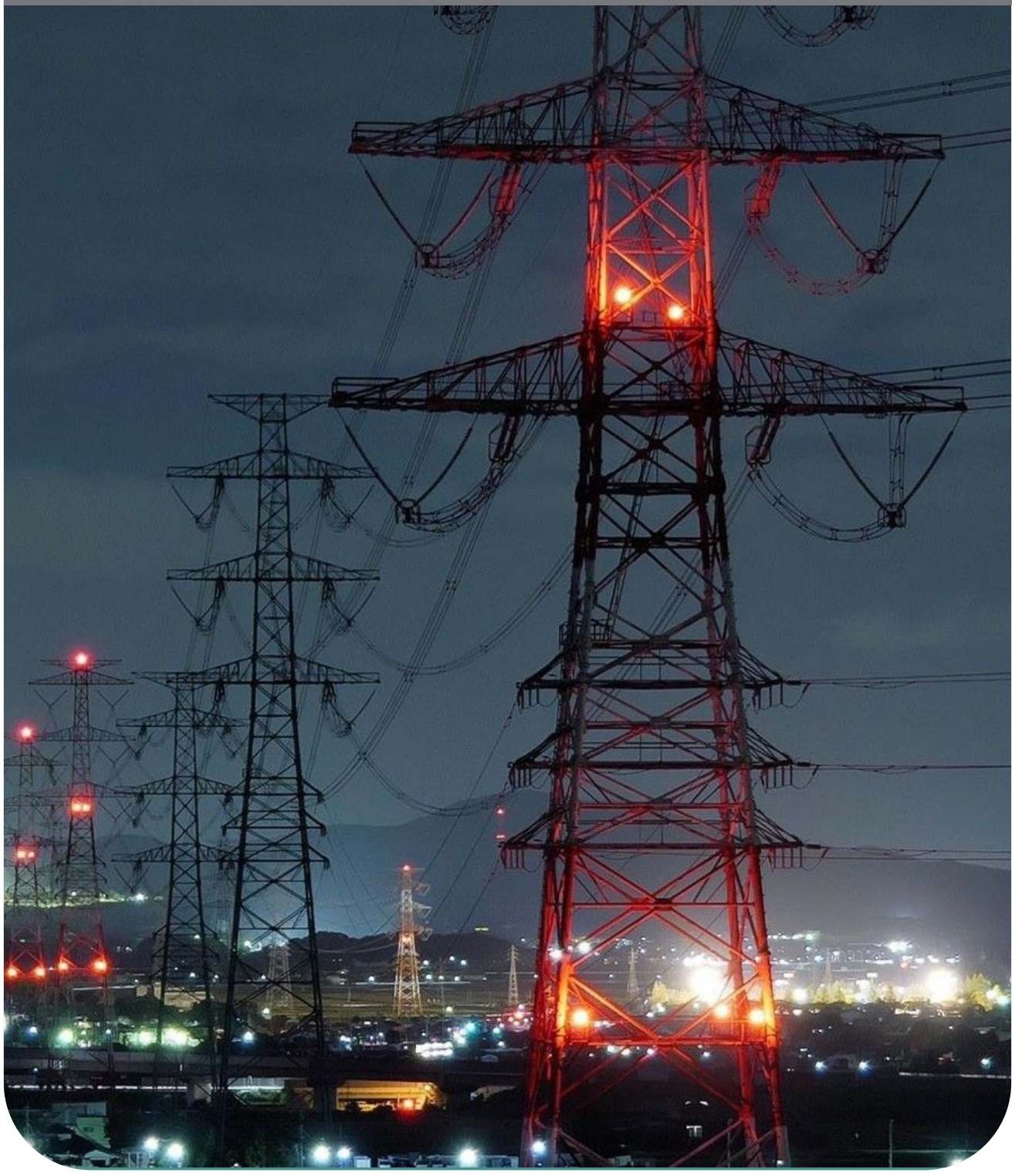
Energy Storage & Grids

17 Innovations in Grid Management



Latest Developments in Smart Grid Technologies

Figure 1. Global climate cooperation is reshaping the energy transition through finance, innovation, and shared action.

Smart grids represent the backbone of modern energy systems, enabling efficient, reliable, and sustainable electricity delivery. As renewable energy adoption accelerates and electrification expands, traditional grids face challenges in managing variability and distributed resources. Recent innovations in smart grid technologies—such as AI-driven demand forecasting, IoT-enabled smart meters, and predictive maintenance—are transforming grid management and resilience. This article explores these developments and their role in integrating renewables and enhancing operational efficiency.

AI-Driven Demand Forecasting

Artificial Intelligence (AI) has become a critical tool for predicting electricity demand with unprecedented accuracy. By analyzing historical consumption patterns, weather data, and socio-economic factors, AI algorithms enable utilities to anticipate fluctuations and optimize generation schedules. This capability reduces reliance on fossil-fuel-based peaking plants and supports renewable integration. Advanced forecasting also facilitates demand response programs, allowing consumers to adjust usage during peak periods and contributing to overall grid stability.

IoT-Enabled Smart Meters

The Internet of Things (IoT) is revolutionizing grid visibility through smart meters and connected devices. These meters provide real-time data on energy consumption, voltage levels, and power quality, empowering utilities and consumers alike. IoT-enabled systems support dynamic pricing models, encouraging energy efficiency and cost savings. Furthermore, granular data from smart meters enhances outage detection and accelerates

restoration efforts, improving customer satisfaction and reducing operational costs.

Predictive Maintenance and Grid Resilience

Predictive maintenance leverages sensors, thermal imaging, and machine learning to monitor the health of grid assets continuously. By identifying anomalies before they escalate into failures, utilities can schedule proactive repairs, minimizing downtime and extending equipment lifespan. This approach not only reduces maintenance costs but also enhances grid resilience against extreme weather events and cyber threats. Predictive analytics are increasingly integrated into asset management platforms, enabling holistic oversight of transmission and distribution networks.

Integration of Energy Storage Systems

Energy storage systems (ESS) play a pivotal role in stabilizing grids with high renewable penetration. Coupled with smart grid technologies, ESS enables load shifting, frequency regulation, and emergency backup during outages. Innovations in battery chemistry and management software are improving storage efficiency and reducing costs, making ESS a cornerstone of modern grid architecture. Utilities are deploying large-scale storage projects to complement renewable generation and ensure uninterrupted power supply.

Role of Cloud and Edge Computing

Cloud and edge computing solutions are enhancing the scalability and responsiveness of smart grid operations. Cloud platforms facilitate centralized data analytics and remote monitoring, while edge devices enable real-time decision-making at the grid's periphery. This combination supports advanced applications such as virtual power plants (VPPs), which aggregate distributed resources into a single controllable entity. By leveraging these technologies, utilities can optimize energy flows and maintain grid stability under dynamic conditions.

Cybersecurity Imperatives

As grids become increasingly digital, cybersecurity emerges as a critical concern. Smart grid infrastructures are vulnerable to cyberattacks that can disrupt operations and compromise sensitive data. Utilities are adopting multi-layered security frameworks, including encryption, anomaly detection, and blockchain-based authentication, to safeguard digital assets. Regulatory bodies are also mandating compliance with stringent cybersecurity standards, ensuring resilience in an era of heightened digitalization.

Conclusion

The latest developments in smart grid technologies underscore the energy sector's commitment to innovation and sustainability. AI-driven forecasting, IoT-enabled metering, predictive maintenance, and advanced storage solutions are redefining grid management. These innovations not only enhance operational efficiency but also accelerate the transition to a low-carbon future. As utilities embrace digitalization, smart grids will continue to evolve, delivering reliable, resilient, and sustainable energy systems worldwide.

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Envision Energy Partners with GES to Deploy Advanced Storage Solutions

Figure 1. Envision-GES Alliance: Charging Europe's Grid with Smart Storage and Wind Power.

Envision Energy announced a strategic partnership with GES to accelerate the deployment of Energy Storage Systems (BESS) Battery and wind power projects across Spain and Europe. The collaboration focuses on integrating digital tools for grid connection and project optimization, ensuring greater flexibility and resilience in renewable energy networks.

The initiative aims to support Europe's clean energy targets by enabling large-scale storage capacity and improving grid stability. Envision Energy emphasized that the partnership will leverage AI-driven forecasting and smart grid technologies to optimize energy flows and reduce curtailment.

Industry experts believe this collaboration will set a benchmark for future projects, combining advanced storage solutions with renewable generation to create a more sustainable and reliable energy ecosystem.

SolarEdge Expands Commercial Storage Solutions for European Market

Figure 1. SolarEdge's Storage Surge: Powering Europe's Decentralized Energy Revolution.

SolarEdge Technologies has launched its CSS-OD commercial battery systems in Germany, targeting self-consumption and peak-shaving applications for commercial and industrial customers. The new solution integrates photovoltaic (PV) systems with advanced storage capabilities, enabling businesses to reduce energy costs and enhance grid flexibility.

The company highlighted that the system supports dynamic load management and real-time monitoring through its proprietary software platform. SolarEdge expects this innovation to play a key role in Europe's transition to decentralized energy systems.

By combining PV generation with intelligent storage, SolarEdge aims to empower businesses to achieve sustainability goals while maintaining operational efficiency.

SolarEdge Expands Commercial Storage Solutions for European Market

Figure 1. Huawei's Grid-Forming Leap: Stabilizing Renewables at Dubai's FusionSolar Summit.

Huawei Digital Power unveiled its latest grid-forming energy storage systems during the FusionSolar Technical Innovation Summit in Dubai. The technology integrates AI-driven lifecycle optimization and advanced control algorithms to stabilize grids with high renewable penetration.

Huawei emphasized that these solutions will help utilities and developers manage intermittency challenges while improving system reliability. The company plans to expand deployments across the Middle East and Africa, supporting regional energy diversification strategies.

This innovation reflects Huawei's commitment to advancing smart grid technologies and enabling a sustainable energy future through cutting-edge digital solutions

EQORE Secures $1.7M to Scale Smart Storage for Industrial Facilities

Figure 1. EQORE's $1.7M Boost: Charging Industrial Resilience with Smart Batteries.

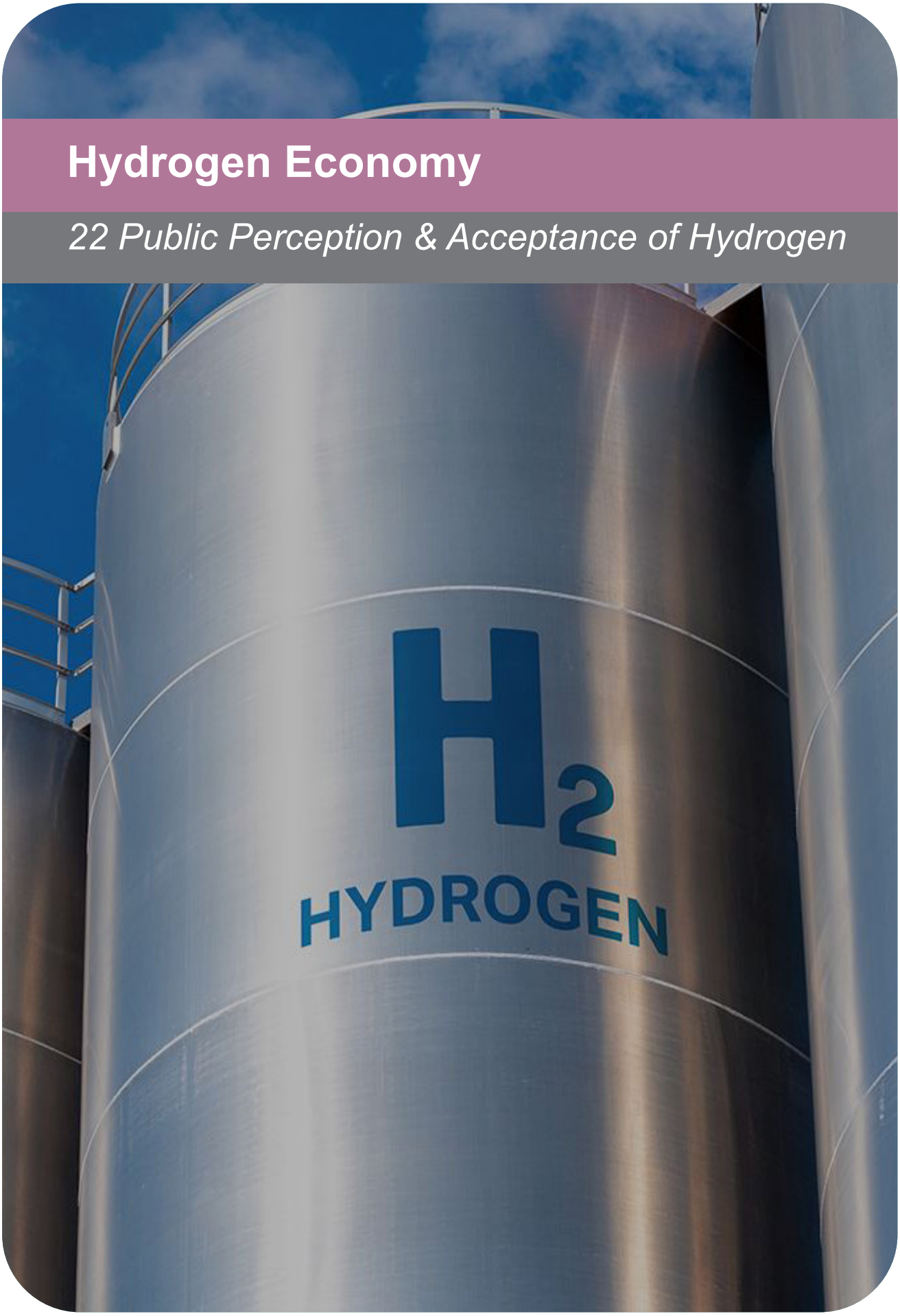
EQORE, a U.S.-based energy tech startup, announced it has raised $1.7 million in funding to scale its distributed battery storage solutions for industrial customers. The company's platform uses autonomous software to enable real-time load shifting, peak demand reduction, and cost optimization.

EQORE's CEO stated that the funding will accelerate product development and expand operations across North America. The solution is designed to integrate seamlessly with existing infrastructure, offering a cost-effective path to energy resilience and sustainability.

Industry analysts predict that EQORE's approach will help industrial facilities reduce energy costs and improve reliability, marking a significant step toward smarter energy management.

Hydrogen Economy

22 Public Perception & Acceptance of Hydrogen



Latest Developments in Smart Grid Technologies

Figure 1. Social acceptance is key to unlocking hydrogen's role in the global energy transition.

Hydrogen is increasingly recognized as a cornerstone of the global clean energy transition. Its potential to decarbonize hard-to-abate sectors—such as heavy industry, aviation, shipping, and long-haul transport—positions it as a critical tool for achieving net-zero targets. Unlike electricity, which is challenging to store and transport at scale, hydrogen can be used as both an energy carrier and a feedstock, enabling flexibility across energy systems. However, the technology's technical readiness alone is insufficient. Widespread adoption of hydrogen depends heavily on public perception, trust, and understanding. Communities must be confident in hydrogen's safety, affordability, and environmental benefits for it to gain acceptance and attract the necessary investment.

Public perception influences everything from policy support to market growth. Even with government incentives and industrial backing, if communities harbor doubts about hydrogen's risks or question its environmental value, adoption can slow. This makes communication, education, and transparency essential components of the hydrogen economy. For hydrogen to fulfill its promise, stakeholders must actively manage both factual knowledge and public sentiment.

Awareness Gaps and Common Misconceptions

Despite its growing prominence, hydrogen remains poorly understood by the general public. Surveys and studies consistently highlight awareness gaps and misconceptions that can hinder adoption. One of the most prevalent concerns is safety. Hydrogen is highly flammable, and past industrial accidents involving hydrogen in unrelated contexts have amplified fear. While modern storage and handling technologies are designed to mitigate these risks, the perception of danger can strongly influence public attitudes toward infrastructure such as hydrogen refueling stations or pipelines.

Another misconception revolves around environmental impact. Many people assume that hydrogen is inherently green, without recognizing that the environmental footprint depends on how it is produced. "Grey" hydrogen, generated from fossil fuels without carbon capture, contributes to greenhouse gas emissions, whereas "blue" hydrogen involves fossil fuels with carbon capture, and "green" hydrogen is produced via renewable-powered electrolysis.

Confusion over these distinctions can lead to skepticism about whether hydrogen truly aligns with climate goals.

Limited exposure to hydrogen technologies also contributes to misunderstanding. Most communities have little direct contact with hydrogen applications, making abstract fears more influential than technical facts. Without visible examples of safe, effective use, misinformation can easily take root. These awareness gaps can delay policy implementation, slow investment flows, and inhibit infrastructure development, highlighting the importance of education and clear communication.

Emerging Markets

In many emerging markets, awareness of hydrogen remains very low. Communities are largely unfamiliar with its benefits, and adoption is often contingent on affordability and visible local advantages. Without clear communication of how hydrogen can reduce energy costs, enhance energy security, or create jobs, acceptance is limited. Outreach strategies in these regions often focus on demonstrating practical applications—such as hydrogen-powered transport or mini-grid solutions—and providing evidence of safe operations to build credibility. Affordability and local relevance are key to ensuring hydrogen is not seen as a distant or elitist technology.

Building Trust and Community Engagement

Effective engagement with communities is critical to overcoming barriers to acceptance. Governments and industry players are increasingly investing in outreach programs designed to demystify hydrogen and showcase its practical benefits. Safety demonstrations, facility tours, and pilot projects help communities see first-hand that hydrogen technologies can be operated safely. For example, fuel cell buses and hydrogen refueling stations in urban areas provide tangible proof of reliability and safety.

Transparency is another essential element. Clear labeling of hydrogen's origin—green, blue, or grey—helps consumers and stakeholders understand the environmental implications of different production methods. Public campaigns that highlight hydrogen's role in reducing emissions, improving air quality, and supporting economic growth can shift perception from skepticism to support.

Finally, media and communications strategies play a vital role. Accurate reporting, clear visuals, and consistent messaging help counter misinformation and misconceptions. By making hydrogen tangible, safe, and beneficial in everyday terms, stakeholders can accelerate acceptance and create an environment conducive to rapid scaling.

Conclusion

Hydrogen holds immense promise as a versatile, low-carbon energy carrier capable of decarbonizing some of the most challenging sectors. However, its success depends as much on public perception as on technology and policy. Awareness gaps, misconceptions, and regional differences in understanding can delay adoption and investment, underscoring the importance of proactive communication and community engagement. Through safety demonstrations, transparent labeling, educational programs, and meaningful partnerships with local communities, governments and industry can build trust, foster acceptance, and accelerate the growth of the hydrogen economy. By aligning technological readiness with public confidence, hydrogen can realize its full potential as a cornerstone of the global energy transition.

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SpringerLink: Social Challenges of Green Hydrogen Economy

Cranfield University Study on Hydrogen Homes, UK

International Energy Agency (IEA)

FASTECH Global Public Perception Report

Study Reveals Knowledge Gap in Hydrogen Awareness

Figure 1. Study Reveals Public Knowledge Gaps on Hydrogen Energy: Experts Call for Targeted Education to Boost Awareness and Acceptance

A recent study published in MDPI underscores a substantial knowledge gap regarding hydrogen energy among the general public. While hydrogen is widely recognized as a promising clean energy solution capable of decarbonizing hard-to-abate sectors such as transport and heavy industry, the study reveals that misconceptions about its safety and production methods remain prevalent. Many people continue to associate hydrogen with flammability risks, while others are unsure about the environmental impact of different production types, including green, blue, and grey hydrogen. These misunderstandings can influence public acceptance, slow policy implementation, and deter investment in hydrogen infrastructure. Initiatives such as public demonstrations, accessible online resources, and school programs can help demystify hydrogen technology and build trust. By addressing public concerns proactively, these efforts can foster wider acceptance, accelerate adoption, and ultimately strengthen hydrogen's role in the global energy transition.

UK Research Finds Trust Key to Hydrogen Adoption

Figure 1. Trust and Transparency Key to Hydrogen Adoption in Homes, Cranfield Study Finds

Cranfield University's latest research highlights the critical role of public trust in technology and institutions for the adoption of hydrogen in residential applications. The study explored attitudes toward hydrogen-powered homes and found that acceptance is heavily influenced by perceptions of safety, transparency, and effective communication. While many recognize hydrogen's potential to support decarbonization and reduce carbon emissions, concerns about safety and unfamiliarity with the technology remain significant barriers. Researchers recommend that policymakers and industry stakeholders prioritize community engagement programs, public education, and transparent communication strategies as part of the UK's transition to net-zero. By addressing public concerns and building trust in hydrogen infrastructure, these initiatives will be essential for scaling residential adoption, fostering societal support, and ensuring the success of the broader hydrogen economy.

Global Survey Shows Strong Support for Hydrogen Energy

Figure 1. Global Survey Shows Rising Public Support for Hydrogen, but Safety and Cost Concerns Persist

FASTECH's recent global survey highlights increasing public support for hydrogen as a key clean energy solution. Conducted across Europe, Asia, and North America, the survey shows that many respondents view hydrogen positively, particularly for its potential to decarbonize transport, heavy industry, and other hard-to-abate sectors. The findings suggest that public enthusiasm for hydrogen is growing alongside awareness of its environmental benefits, signaling an encouraging trend for policymakers and industry stakeholders.

At the same time, the survey identified persistent concerns that could influence adoption. Safety remains a top priority, as many people associate hydrogen with flammability risks despite advances in technology and strict safety standards. Industry leaders and governments are therefore encouraged to develop outreach programs that clearly convey hydrogen's benefits, safety measures, and cost-effectiveness. By addressing public concerns proactively and offering accessible, reliable solutions, stakeholders can maintain momentum in hydrogen adoption, strengthen market confidence, and accelerate the global transition to a low-carbon energy system.

Social Challenges Identified for Green Hydrogen Deployment

Figure 1. SpringerLink Report Highlights Social Barriers to Green Hydrogen Adoption

A recent report published by SpringerLink highlights the social challenges hindering the widespread deployment of green hydrogen. While the technology is recognized for its potential to decarbonize hard-to-abate sectors, the study notes that public awareness remains limited, and skepticism about hydrogen's environmental benefits persists. Many individuals are unfamiliar with distinctions between green, blue, and grey hydrogen, which can create confusion and slow acceptance of hydrogen infrastructure.

Media campaigns are also identified as a powerful tool for building trust, highlighting hydrogen's safety, environmental advantages, and role in creating a resilient energy system. By addressing misconceptions proactively, policymakers and industry stakeholders can foster public confidence, stimulate adoption, and attract investment. Ultimately, these social strategies are as important as technological and economic measures, ensuring that hydrogen fulfills its promise as a central pillar of the global clean energy transition.

Oil & Gas

27 Geopolitical Factors in Oil & Gas

Latest Developments in Smart Grid Technologies

Figure 1. eopolitical Oil Storm: Navigating Volatility in a Shifting Energy World.

The global oil market has always been a barometer for geopolitical tensions, economic cycles, and technological shifts. In the past six months, the interplay between geopolitics and energy security has intensified, reshaping supply-demand dynamics and influencing investment strategies worldwide. The International Energy Agency's (IEA) latest medium-term outlook provides a comprehensive lens through which to examine these developments. This article explores how recent geopolitical strains—particularly in major producing regions—are impacting oil markets, OPEC+ strategies, and global energy transitions.

Geopolitical Flashpoints Driving Market Uncertainty

Several geopolitical flashpoints have emerged as critical drivers of oil market volatility. The Middle East continues to be a focal point, with tensions affecting production and export routes. Disruptions to pipelines and maritime security concerns have raised risk premiums across global markets. Beyond the Middle East, Russia's ongoing confrontation with Western nations remains a defining factor. Sanctions on Russian crude and refined products have forced Moscow to redirect exports to Asia, particularly China and India, at discounted rates. This reconfiguration of trade routes has implications for freight costs, insurance premiums, and refining margins globally.

OPEC+ Strategy Amid Volatility

OPEC+ has responded to geopolitical uncertainty with cautious production management. In November 2025, the group extended voluntary cuts totaling 2.2 million barrels per day (mb/d) into early 2026. These cuts aim to stabilize prices amid weak demand growth and geopolitical risk premiums. However, the IEA projects that non-OPEC supply—led by the United States, Brazil, and Guyana—will continue to expand, challenging OPEC+'s ability to maintain market balance. The delicate dance between OPEC+ and non-OPEC producers underscores a structural shift: while geopolitical shocks can cause short-term price spikes, long-term fundamentals increasingly favor diversified supply sources outside traditional power centers.

Demand Outlook: Slowing Growth Meets Energy Transition

According to the IEA, global oil demand is expected to plateau by the end of this

decade, reaching approximately 105 mb/d before declining. This slowdown is driven by accelerated adoption of electric vehicles, efficiency gains, and policy measures aimed at decarbonization. However, geopolitical instability can delay these transitions by reinforcing energy security concerns and prompting governments to prioritize fossil fuel reliability over climate goals. Emerging markets remain the primary engines of demand growth, particularly in Asia and Africa. Yet, these regions are also vulnerable to price volatility, which can strain fiscal budgets and exacerbate inflationary pressures.

Investment Trends: Risk Premiums and Diversification

Geopolitical risk has historically influenced capital allocation in the oil and gas sector, and recent events are no exception. Investors are increasingly factoring in risk premiums when evaluating upstream projects in politically sensitive regions. At the same time, there is a noticeable pivot toward infrastructure diversification—such as LNG terminals and strategic storage facilities—to mitigate supply disruptions. Financial markets have also responded to geopolitical uncertainty with heightened volatility in oil futures. Hedging strategies, including options and swaps, have gained traction among traders seeking protection against sudden price swings triggered by geopolitical shocks.

Case Study: Market Reaction to Regional Tensions

Recent disruptions to key pipelines and export routes in major producing regions have demonstrated how geopolitical risks translate into market volatility. For example, temporary closures of strategic pipelines in the Middle East and North Africa caused Brent crude prices to spike by nearly 10% in mid-2025. Although prices stabilized after diplomatic interventions, the episode highlighted the fragility of global energy supply chains and the outsized role of perception in market behavior.

Policy Implications: Energy Security vs. Climate Goals

Governments face a dual challenge: ensuring energy security while advancing climate commitments. The recent geopolitical turbulence has prompted several nations to revisit strategic petroleum reserves and diversify import sources. In the United States, policy debates around offshore drilling expansion reflect this tension, as energy independence narratives gain traction amid global instability. Conversely, the European Union continues to accelerate its green transition, partly as a hedge against geopolitical risk. By reducing reliance on imported hydrocarbons, the EU aims to insulate its economy from external shocks strategy that could serve as a blueprint for other regions.

Conclusion

The IEA's medium-term outlook underscores a critical reality: while the energy transition is reshaping long-term demand patterns, geopolitics remains a powerful force in the oil market. From sanctions-driven trade realignments to OPEC+ production strategies, geopolitical strains will continue to influence pricing, investment, and policy decisions. For industry stakeholders, navigating this complex landscape requires a blend of agility, risk management, and strategic foresight.

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Saudi Aramco Reinforces Supply Security Amid Geopolitical Volatility

Figure 1. Aramco's Shield: Fortifying Oil Supply in a Geopolitical Storm.

Saudi Aramco announced new measures to strengthen global supply security as geopolitical tensions continue to impact energy markets. The company confirmed investments in additional storage capacity and pipeline infrastructure to ensure uninterrupted crude deliveries to key markets.

"Energy security is a top priority for our customers," said Aramco's CEO. "We are expanding strategic reserves and enhancing flexibility in our supply chain to mitigate risks from regional disruptions."

The announcement comes as global oil prices experience heightened volatility due to sanctions, maritime security concerns, and shifting trade routes. Aramco emphasized its commitment to maintaining production stability and supporting global energy demand during uncertain times.

Rosneft Secures Asian Market Share Amid Sanctions Pressure

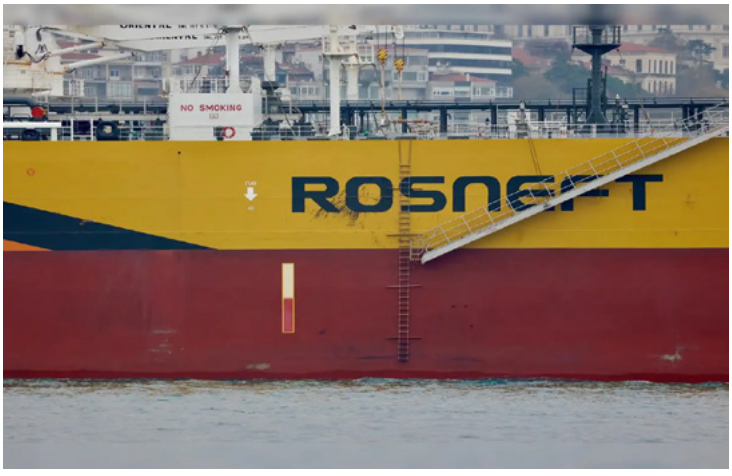

Figure 1. Rosneft's Asian Gambit: Defying Sanctions to Secure Energy Dominance.

Rosneft has strengthened its position in Asian markets by signing long-term supply agreements with refiners in China and India. The move follows continued Western sanctions that have reshaped global oil trade flows.

The company highlighted its ability to adapt to geopolitical challenges by leveraging alternative shipping routes and competitive pricing strategies. «Our partnerships in Asia ensure stable demand and reinforce Russia's role as a key energy supplier,» Rosneft stated.

Industry analysts note that these agreements could influence global pricing dynamics and increase competition among major producers. Rosneft's strategy underscores the growing importance of Asia in global energy security amid geopolitical uncertainty.

Petrobras Expands Offshore Investments to Offset Global Supply Risks

Figure 1. Petrobras' Deep Dive: Offshore Surge Against Geopolitical Tides.

Brazil's Petrobras announced a $10 billion investment plan to accelerate offshore oil production in the pre-salt fields. The initiative aims to strengthen Brazil's role as a reliable supplier amid global geopolitical disruptions.

«Diversifying supply sources is critical for market stability,» said Petrobras' CEO. «Our offshore projects will help meet rising demand and reduce dependence on politically sensitive regions.»

The company's expansion aligns with broader industry trends favoring non-OPEC producers as geopolitical tensions persist. Analysts predict that Brazil's increased output could help balance global supply and reduce price volatility.

TotalEnergies Accelerates LNG Projects to Enhance Energy Security

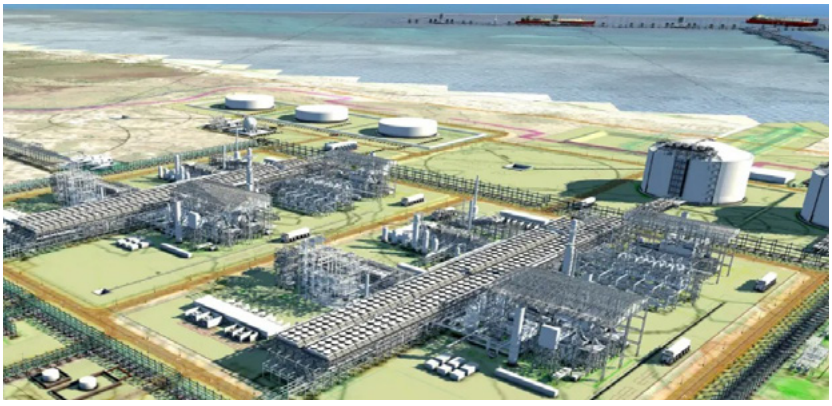

Figure 1. TotalEnergies' LNG Leap: Fueling Security in a Volatile World.

TotalEnergies announced the fast-tracking of several LNG projects in Africa and the Middle East to address growing concerns over energy security. The company aims to provide flexible and cleaner energy solutions amid geopolitical uncertainty affecting oil supply chains.

«Our LNG strategy is designed to offer resilience and sustainability,» said TotalEnergies' CEO. «By diversifying sources and investing in infrastructure, we can support global energy needs while advancing the transition to lower-carbon fuels.»

The move reflects a broader industry shift toward LNG as a hedge against geopolitical risks in traditional oil markets. TotalEnergies expects these projects to come online by 2027, reinforcing its position as a global energy leader.

Nuclear Energy

32 Policy & Public Perception of Nuclear Energy

Nuclear Energy Policy & Public Perception: Balancing Promise and Public Trust

Figure 1. Global nuclear revival faces policy momentum and social acceptance challenges.

Nuclear energy is regaining prominence as nations seek reliable, low-carbon power to achieve climate targets while ensuring energy security. Unlike intermittent sources such as wind and solar, nuclear provides stable baseload electricity, making it a vital complement to renewable generation. According to the International Atomic Energy Agency (IAEA), global nuclear capacity could more than double by 2050, supported by over 63 reactors currently under construction worldwide. Leading nuclear nations—such as China, France, and the United States—are expanding existing fleets, while emerging economies, including India, Türkiye, and Egypt, are investing heavily in new plants and small modular reactors (SMRs) to meet growing energy demand.

Recent policy initiatives highlight strong international commitment to nuclear power. At COP30, 33 countries pledged to triple nuclear capacity by 2050, signaling recognition of nuclear as a cornerstone of clean energy strategies. Financial institutions, including the World Bank, have resumed funding nuclear projects, reflecting increasing confidence in its climate mitigation potential and resilience in national energy systems. Governments are also exploring regulatory frameworks to streamline approvals, encourage private sector participation, and integrate nuclear with renewable-based grids to optimize energy flexibility.

Public Perception: Challenges and Emerging Support

Despite clear policy momentum, public acceptance remains a central challenge for nuclear energy expansion. Historical accidents such as Chernobyl and Fukushima continue to influence public attitudes, creating lingering skepticism around safety and radioactive waste management. Studies indicate that trust in nuclear power is shaped by three key factors: perceived safety, net societal benefits (including affordable electricity and reduced carbon emissions), and fairness in policy implementation.

Encouragingly, recent surveys show a gradual shift toward more favorable perceptions. In the United States, 72% of respondents now support nuclear energy, a significant increase compared to previous decades. Pew Research highlights bipartisan growth in support for expanding

nuclear power, largely driven by concerns over climate change and energy security. Globally, however, misconceptions persist, particularly regarding radiation risks and long-term waste storage. These insights underscore the importance of transparent communication and proactive community engagement to complement policy and technological progress.

Emerging Markets

Countries entering the nuclear sector, such as Rwanda and Senegal, prioritize education, capacity building, and public engagement to address societal concerns. For these nations, nuclear represents an opportunity to expand energy access, reduce emissions, and foster local technical expertise. Social acceptance is being cultivated through training programs, transparent project planning, and visible safety measures that reassure communities of nuclear's benefits and reliability.

Building Trust: Policy and Engagement Strategies

Experts argue that adaptive policy frameworks and stakeholder engagement are critical for sustained public support. Continuous monitoring of public sentiment, coupled with transparent risk communication, helps governments respond to evolving societal concerns. Participatory decision-making processes—including community consultations, stakeholder forums, and public hearings—enable citizens to feel included in shaping nuclear projects, reducing resistance and increasing legitimacy.

Practical engagement initiatives can further enhance trust. Safety demonstrations, tours of operational plants, and visual communication of nuclear's low-carbon benefits make abstract risks tangible and understandable. Clear labeling of nuclear-generated electricity, alongside education campaigns emphasizing environmental and economic benefits, can help dispel myths and align public perception with scientific realities.

The integration of social considerations into policy design is essential. Adaptive frameworks that address local values, respect community input, and transparently communicate risks and benefits help bridge perception gaps. In combination with technological innovation and financial support, these strategies position nuclear energy as a resilient, low-carbon solution capable of supporting the global energy transition.

Conclusion

Nuclear energy is poised to play a central role in achieving climate and energy security objectives worldwide. While policy frameworks and international commitments demonstrate strong momentum, public perception remains a critical factor in adoption. Safety concerns, historical accidents, and waste management challenges continue to influence acceptance, though surveys indicate increasing support in key markets.

By combining adaptive policy, transparent communication, and proactive community engagement, governments and industry can build public trust and foster societal acceptance. Regional strategies tailored to local contexts—from Europe's climate-focused debates to Asia's post-Fukushima safety concerns and emerging markets' educational efforts—highlight the importance of social dynamics in nuclear deployment. With coordinated efforts across technology, policy, and public engagement, nuclear energy can become a reliable, low-carbon pillar of the global energy transition.

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Global Pledge to Triple Nuclear Capacity by 2050 Gains Momentum

Figure 1. Global Commitment to Nuclear Growth: COP30 Declaration Gains Industry Support

At COP30 in Belém, Brazil, Rwanda and Senegal joined 31 other nations in endorsing the Declaration to Triple Nuclear Energy by 2050, signaling a growing global commitment to nuclear power as a cornerstone of net-zero and energy security strategies. The pledge highlights the critical role of enabling policies, resilient supply chains, and robust financing mechanisms in accelerating nuclear deployment worldwide. By aligning governments, industry, and financial institutions, the initiative aims to create a coordinated framework for scaling nuclear energy safely and efficiently.

Over 140 companies and major financial institutions have expressed support for the declaration, reflecting strong industry alignment and confidence in nuclear power's potential to meet growing electricity demand while reducing carbon emissions. The declaration represents a major milestone in international efforts to expand nuclear energy as part of a diversified, low-carbon energy mix. By combining policy support, technological innovation, and industry collaboration, the global community aims to unlock the full potential of nuclear power to meet climate and energy security goals by mid-century.

Survey Shows U.S. Public Support for Nuclear Energy at 72%

Figure 1. Historic Support for Nuclear Power in the U.S., But Perception Gaps Remain

The 2025 National Nuclear Energy Public Opinion Survey reveals that support for nuclear energy in the United States has reached a historic high, with 72% of Americans expressing favorability. This marks a significant increase from previous decades, reflecting growing recognition of nuclear power as a reliable, low-carbon solution to meet energy demand while addressing climate change. Support is broadly distributed across demographic groups, with respondents citing climate concerns, energy security, and affordable electricity as primary motivations for backing nuclear energy.

Despite this overall positive trend, the survey identifies a notable perception gap. Many individuals who support nuclear power assume that their communities are less favorable toward it. By reinforcing accurate information and showcasing the role of nuclear power in reducing emissions, stakeholders can strengthen public confidence and foster community acceptance. These efforts are critical for ensuring that nuclear energy continues to play a central role in the U.S. clean energy transition, helping the country achieve its climate goals while maintaining a resilient and secure energy system.

Saudi Aramco Reinforces Supply Security Amid Geopolitical Volatility

Figure 1. Perceived Safety, Fairness, and Benefits Key to Public Acceptance of Nuclear, Researchers Find

A recent study conducted by TNO and NRG PALLAS emphasizes the importance of adaptive nuclear policies that reflect evolving societal values and public expectations. The research highlights that public trust in nuclear energy is shaped by three main factors: perceived safety, fairness in policy implementation, and tangible net benefits, including affordable electricity and effective climate mitigation. Without addressing these elements, even well-designed nuclear projects may face resistance or delays. Recognizing that each community has unique perspectives, the researchers recommend tailored engagement programs for populations living near nuclear facilities. Initiatives such as safety demonstrations, facility tours, workshops, and open forums help demystify nuclear technology and provide transparent information about operational practices and benefits. By integrating adaptive policy frameworks with continuous engagement, nuclear energy can gain broader societal support, ensuring both safe deployment and alignment with climate and energy goals.

Rosneft Secures Asian Market Share Amid Sanctions Pressure

Figure 1. Radiation and Waste Misconceptions Hinder Nuclear Acceptance, Experts Say

A recent report by the OECD Nuclear Energy Agency (NEA) highlights persistent public misconceptions surrounding nuclear energy, particularly concerning radiation risks and radioactive waste management. Despite nuclear power's proven reliability and low-carbon profile, these misunderstandings often dominate public discourse, creating barriers to acceptance and policy support. Many individuals remain unaware of advances in reactor safety, modern waste storage solutions, and stringent regulatory frameworks designed to mitigate risks. Experts note that addressing these misconceptions is not merely an informational challenge but a strategic necessity for global climate goals. Public support influences investment decisions, regulatory approvals, and the pace of deployment for new nuclear projects. Integrating educational campaigns, community outreach, and media engagement into nuclear policy frameworks is therefore critical for ensuring that nuclear power can fulfill its role as a central pillar in the global clean energy transition.

Efficiency & Electrification

37 Smart Grids & Digitalization

AI to Power the Next Phase of Clean Energy Transition: Smart Grids and Digitalization Driving Efficiency & Electrification

Figure 1. AI Ignites Clean Energy: Smart Grids Power Electrification's Future.

The global energy landscape is undergoing a profound transformation, driven by the twin imperatives of decarbonization and electrification. As renewable energy sources proliferate and electrification accelerates across industries, the need for smarter, more resilient grids has never been greater. Digitalization—powered by artificial intelligence (AI), advanced analytics, and cloud-based platforms—is emerging as the cornerstone of this transition. Recent industry reports and technology launches underscore how smart grids and digital tools are enabling efficiency, reliability, and sustainability in modern power systems.

The Role of Digitalization in Electrification

Electrification is central to achieving net-zero targets, but it introduces complexity into grid operations. Traditional grids were designed for one-way power flows from centralized plants to consumers. Today's grids must accommodate distributed energy resources (DERs), electric vehicles (EVs), and variable renewable generation. Digitalization bridges this gap by providing real-time visibility, predictive capabilities, and automated control. According to **Siemens**' Infrastructure Transition Monitor, 74% of energy executives identify smart grids and grid software as critical enablers of electrification. Digital platforms allow utilities to forecast demand, optimize asset utilization, and integrate renewables without costly infrastructure upgrades. This shift is not merely technological—it represents a strategic pivot toward data-driven energy ecosystems.

Cybersecurity: The Silent Imperative

As grids become more digital, they also become more vulnerable to cyber threats. Recent industry discussions, including **GE Vernova**'s whitepapers at DISTRIBUTECH 2025, emphasize the need

for robust cybersecurity frameworks. AI-driven anomaly detection and blockchain-based authentication are emerging as key tools to safeguard digitalized grids against malicious attacks.

Case Study: Schneider Electric's One Digital Grid Platform

In November 2025, **Schneider Electric** launched it's One Digital Grid platform, an AI-enabled solution that integrates grid planning, outage restoration, and customer engagement. The platform allows utilities to modernize operations without expensive hardware upgrades, making it particularly attractive for regions with aging infrastructure. By leveraging real-time analytics and automated workflows, Schneider's solution reduces outage restoration times and improves customer satisfaction.

Policy and Market Drivers

Global policy frameworks are accelerating digitalization. The International Renewable Energy Agency (IRENA) and the **World Economic Forum** have identified digital power systems as decisive enablers of electrification. Initiatives like **UNEP** and **IEA**'s 3DEN Phase II, launched at COP30, aim to scale digital solutions for grid modernization in emerging markets. These programs focus on integrating renewables, enhancing resilience, and reducing carbon footprints through smart technologies.

Benefits for Utilities and Consumers

Digitalization across the energy value chain enhances efficiency and sustainability by enabling utilities to optimize assets, cut operational costs, improve reliability, and meet decarbonization goals; it empowers consumers with greater transparency, dynamic pricing, and faster outage restoration for better service quality; and it strengthens markets by facilitating higher renewable integration, reducing curtailment, and optimizing energy flows to lower overall system costs.

Challenges and the Road Ahead

Despite its promise, digitalization faces hurdles such as high upfront costs, interoperability issues, and workforce skill gaps. Utilities must invest in training and adopt standardized protocols to ensure seamless integration of digital tools. Moreover, regulatory frameworks need to evolve to incentivize digital investments and safeguard consumer data privacy. Looking ahead, the convergence of AI, IoT, and cloud computing will further enhance grid intelligence. Autonomous grids capable of self-healing, real-time optimization, and predictive decision-making are no longer a distant vision—they are becoming a reality.

Conclusion

Smart grids and digitalization are not optional; they are essential for the next phase of the clean energy transition. By harnessing AI, advanced analytics, and integrated platforms, utilities can achieve unprecedented levels of efficiency, reliability, and sustainability. As electrification accelerates globally, digitalization will remain the linchpin that enables a resilient, low-carbon energy future.

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Saudi Aramco Reinforces Supply Security Amid Geopolitical Volatility

Figure 1. Mitsubishi Electric unveils AI-powered Grid Management System to optimize renewable integration and drive carbon-neutral energy transitions

Mitsubishi Electric has introduced its AI-powered Grid Management System, designed to optimize power distribution and support large-scale renewable integration. The system uses machine learning algorithms and real-time analytics to predict demand fluctuations and adjust grid operations dynamically.

The platform also incorporates digital twin technology, enabling utilities to simulate grid performance under various scenarios and improve resilience against outages. Mitsubishi Electric emphasizes that this innovation will help utilities reduce operational costs, enhance flexibility, and accelerate the transition to carbon-neutral energy systems.

This initiative further demonstrates Mitsubishi Electric's global leadership in smart grid innovation. By pioneering advanced AI and digital twin technologies, the company is shaping future energy ecosystems that prioritize sustainability, reliability, and efficiency across international markets.

Schneider Electric Launches One Digital Grid Platform to Modernize Utilities

Figure 1. Schneider Electric's One Digital Grid Platform revolutionizes utilities with AI-powered modernization, enabling seamless electrification and sustainability without major infrastructure costs.

Schneider Electric has introduced its groundbreaking One Digital Grid Platform, an AI-enabled solution designed to help utilities modernize their networks without costly infrastructure overhauls. The platform integrates planning, operations, and asset management into a unified digital ecosystem, enabling real-time outage restoration and predictive maintenance.

As global energy systems face rising demand from electrification and AI, Schneider Electric's One Digital Grid Platform delivers greater efficiency, resilience, and cost savings. Using advanced analytics and machine learning, it optimizes grid performance and integrates renewables seamlessly. Schneider Electric stresses that digitalization is now essential for utilities to meet sustainability and regulatory goals. By offering actionable insights and automated workflows, the platform enables data-driven decisions that boost reliability and customer satisfaction. This launch underscores Schneider Electric's commitment to accelerating the energy transition with smart technologies, bridging traditional infrastructure and next-generation digital grids.

IRENA Declares Digital Power Systems "Essential" for Global Energy Transition

Figure 1. IRENA's report declares digital power systems essential for the global energy transition, urging AI and smart tech to triple renewables by 2030.

IRENA's latest report, Digitalisation and AI for Power System Transformation, positions digitalization as a "decisive enabler" of electrification and decarbonization. The study identifies five priority areas: smart sensors, AI-enhanced forecasting, operational optimization, demand-side automation, and transparency through digital platforms.

The report warns that without modern digital grids, countries risk losing out on affordable renewable energy and failing to meet COP28's goal of tripling renewable capacity by 2030. It calls for accelerated investments in distributed energy resource management systems, virtual power plants, and digital substations, alongside regulatory reforms to support innovation.

IRENA's guidance provides a strategic roadmap for governments and utilities worldwide, reinforcing the role of digital technologies in building resilient, efficient, and sustainable power systems.

Survey Shows U.S. Public Support for Nuclear Energy at 72%

Figure 1. Hitachi Energy expands Lumada portfolio with AI and IoT solutions to enhance grid performance and drive global electrification

Hitachi Energy has announced the expansion of its Lumada Asset Performance Management and Grid Automation portfolio, designed to help utilities accelerate electrification and integrate renewable energy sources. The solutions leverage AI-driven analytics, IoT sensors, and cloud-based platforms to optimize grid performance and reduce downtime.

The company emphasizes that digitalization is essential for meeting rising energy demand while maintaining reliability and sustainability. Lumada's predictive maintenance capabilities allow operators to anticipate failures and optimize asset life cycles, reducing operational costs and improving resilience.

Hitachi Energy's latest offerings also include real-time monitoring and dynamic load balancing, enabling utilities to manage distributed energy resources efficiently. This initiative reinforces the company's commitment to building smarter, greener grids that support global decarbonization goals.

AI-Powered Smart Grids Reshape Global Utility Infrastructure

Figure 1. Velox Consultants reveal AI smart grids driving $600B global investments, reshaping utilities for net-zero reliability and electrification.

Velox Consultants' latest industry insight highlights a historic surge in utility investments aimed at modernizing grid infrastructure through AI-powered smart grids. Global utilities are channeling unprecedented capital flows into renewable generation, grid automation, and digital backbone upgrades, driven by climate imperatives and electrification demands.

The report notes that electricity grids require $600 billion annually through 2030 to align with net-zero scenarios, nearly double current spending rates. Europe alone will invest €160 billion in renewables and grid expansion in 2025, while China and India are executing multi-billion-dollar programs to enhance grid flexibility and resilience. Velox emphasizes that AI-driven smart grids are central to this transformation, enabling predictive analytics, dynamic load balancing, and real-time optimization of distributed energy resources. These capabilities are essential for managing surging demand from EVs, data centers, and industrial electrification. The analysis concludes that utilities embracing digitalization and AI will lead the next era of energy reliability, sustainability, and cost efficiency.

Ericsson Showcases Role of 5G and AI in Energy Digitalization

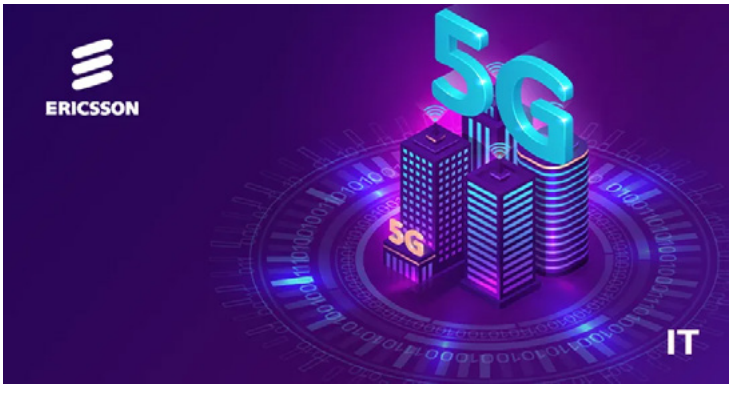

Figure 1. Ericsson's 5G and AI tech revolutionizes energy digitalization, enabling real-time grid management and sustainable electrification for heavy industries.

Ericsson highlights the transformative potential of 5G connectivity and artificial intelligence (AI) in optimizing grid management and electrifying heavy industries. The company's latest insights reveal how digitalization can create a data-driven energy ecosystem, enabling real-time monitoring, predictive analytics, and enhanced operational efficiency.

By leveraging ultra-low latency and high-speed connectivity, 5G networks facilitate seamless communication between distributed energy resources, smart meters, and control centers. Combined with AI-driven analytics, these capabilities allow utilities to balance supply and demand dynamically, integrate renewables effectively, and reduce carbon emissions. Ericsson emphasizes that cross-sector collaboration is essential to unlocking the full benefits of digitalization. The company is working closely with energy providers to develop scalable solutions that address the challenges of electrification and sustainability. As industries worldwide seek to decarbonize, Ericsson's vision underscores the critical role of digital technologies in shaping the future of energy. Through innovation and partnership, the company aims to accelerate the transition toward smarter, greener power systems.

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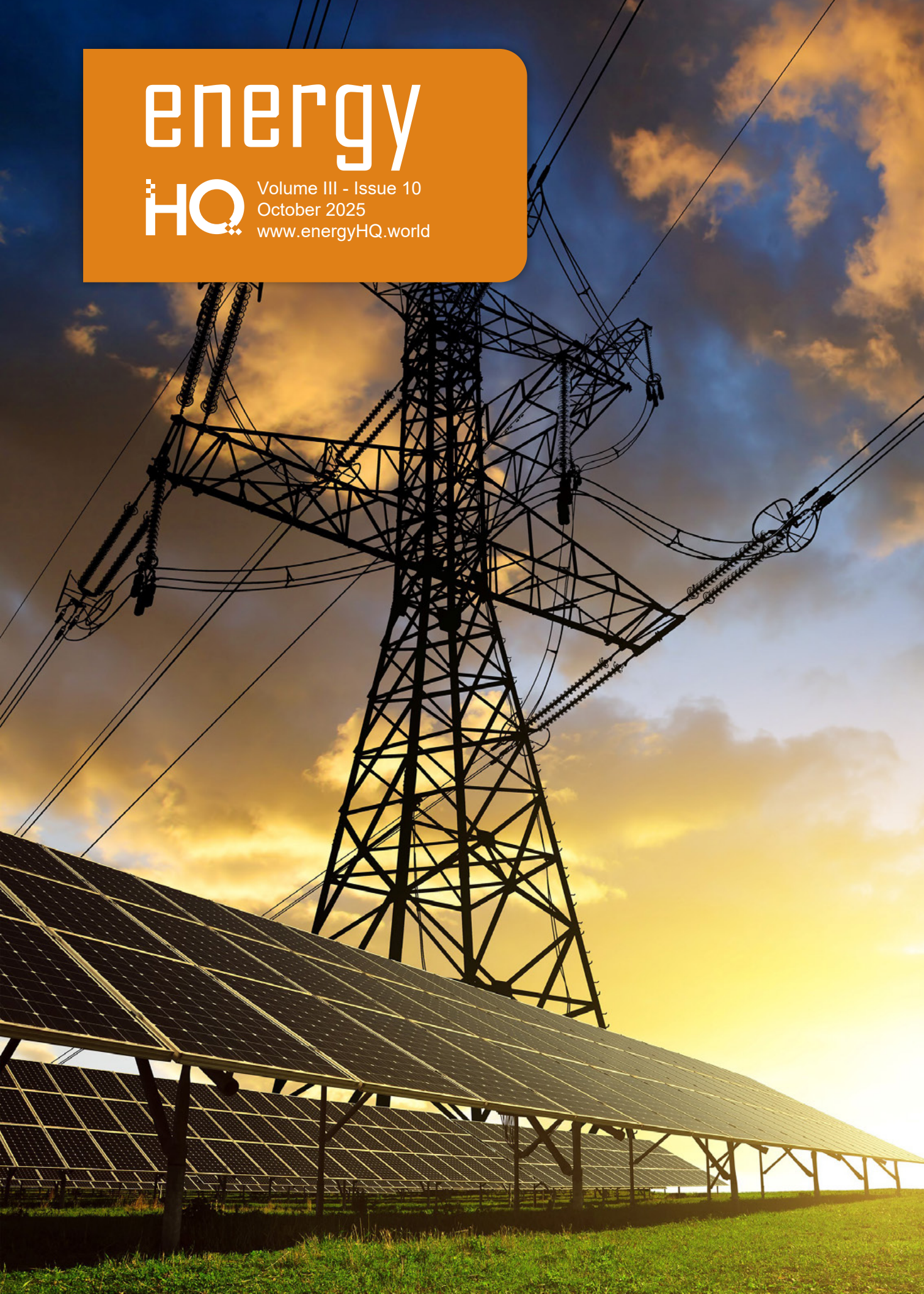


Reimagining Global Energy Systems:
Driving progress with solar, wind, and clean power for a greener tomorrow.

Renewables Overtake Coal: A Pivotal Moment in the Global Energy Revolution

Figure 1. Renewables Eclipse Coal: Dawn of a Clean Energy Era.

In the first half of 2025, renewable energy sources—led by solar and wind—generated more electricity globally than coal for the first time. The milestone, highlighted by the World Economic Forum's mid-October brief drawing on Ember's global electricity analysis, marks a structural shift in power markets rather than a passing surge. It reflects record solar deployment, steady wind growth, falling costs, and expanding storage—alongside policy targets and investment flows that, while uneven across regions, are resetting expectations for utilities, investors, and policymakers worldwide. Yet the transition is far from complete: grid congestion, permitting delays, and supply-chain realignments (especially in wind and batteries) pose tangible risks to pace and affordability, and emerging economies still face financing and infrastructure barriers. The next phase of the "renewables revolution" will be defined by grid modernization, storage integration, resilient supply chains, and policy continuity—with new economics increasingly favoring clean, firm power.

1. The Milestone: What 'Renewables Surpass Coal' Really Means

The headline achievement—renewables overtaking coal in global electricity generation—captures both long-term structural trends and short-term dynamics. According to the World Economic Forum's roundup, drawing on Ember's H1-2025 electricity market analysis, global demand rose ~2.6% year-on-year; solar output jumped ~31% and wind ~7.7%, covering the lion's share of incremental load. Coal's share fell, and renewables' share rose to roughly 34.3% of global generation, with coal at 33.1%—a symbolic tipping point underscoring the direction of travel. Behind the data is a decade of cost declines: the levelized costs of utility solar and onshore wind have fallen dramatically, with solar module prices hitting fresh lows in 2025, even as supply chains and tariffs inject volatility. The International Energy Agency's Renewables 2025 forecasts 4,600 GW of renewable capacity additions between 2025 and 2030—double the prior five-year period—with solar PV accounting for ~80% of expansion and distributed PV ~42% of PV growth.

2. Drivers: Technology, Economics, and Policy

Technology innovations such as bifacial solar panels, AI-optimized wind siting, and rapid advances in battery chemistries are raising capacity factors and reducing balance-of-system costs. Grid-scale storage deployments—forecast to exceed 50 GW of new capacity in 2025 alone—are critical to smoothing intermittency and augmenting system reliability. The economic case strengthens as renewables undercut fossil fuels in many markets on a levelized basis, and as energy productivity gains from electrification begin to compound. Post-COP28 commitments to triple global renewable capacity by 2030 have catalyzed national targets, but targets still lag pathway needs, particularly for wind and hydro, according to Ember's November 2025 assessment.

3. The Grid Imperative: From Constraint to Enabler

With renewables crossing the coal threshold, the grid becomes the limiting reagent. The IEA and WEF emphasize unprecedented needs for modernization, flexibility, and digitalization—including reconductoring, advanced interconnectors (HVDC), dynamic line rating, and grid-forming inverters—to handle high shares of variable generation. As solar and wind climb, grid congestion and curtailment risk eroding project economics unless transmission planning and distribution upgrades keep pace.

Beyond physical upgrades, the grid's evolution hinges on integrating intelligence. Advanced forecasting, AI-driven dispatch, and real-time monitoring are becoming essential to balance variability and optimize asset utilization. Coupling these with demand-side flexibility—such as dynamic pricing and distributed energy resources—can transform the grid from a passive conduit into an active system orchestrator. Without this digital backbone, even expanded transmission capacity risks underperforming in a world of decentralized, intermittent generation.

4. Regional Landscape: Momentum and Headwinds

China continues to dominate manufacturing and installations—projected to add ~250 GW of solar in 2025—with robust offshore wind pipelines and massive transmission investments. The United States faces policy uncertainty and tax credit adjustments in 2025, yet renewables still accounted for many capacity additions through September. Europe sees strong solar rooftop growth and corporate PPAs drive distributed additions; India's mega-projects and ASEAN's distributed PV illustrate scale ambitions; Latin America and Africa advance mini-grids and distributed renewables for energy access.

Despite this momentum, regional disparities in grid readiness, financing, and permitting remain critical headwinds. In mature markets, interconnection delays and local opposition to transmission lines slow deployment, while emerging economies grapple with currency risks and limited access to concessional finance. Supply chain concentration—particularly in polysilicon and rare earths—adds vulnerability, amplifying geopolitical tensions. These structural challenges underscore that scaling renewables is not just about generation capacity but about synchronized progress in infrastructure, policy stability, and cross-border collaboration.

5. Markets & Investment: Risk Repricing and Capital Flows

The IEA's World Energy Investment 2025 shows clean energy investment continuing to outpace fossil investment, with expanding slices for grids and storage. Corporate portfolios increasingly blend renewables, storage, and grid

technologies. Auction undersubscriptions underscore the importance of price signals and contract structures that reflect inflation and supply-chain realities.

Capital allocation is increasingly shaped by risk repricing as interest rates, supply-chain volatility, and permitting delays alter project economics. Investors are pivoting toward hybrid models—pairing renewables with storage or flexible gas—to hedge intermittency and secure revenue stability. Sovereign funds and climate-focused private equity are accelerating entry into grid modernization and digital infrastructure, signaling that value creation now extends beyond generation assets. Meanwhile, green bond issuance and sustainability-linked loans continue to surge, but uneven policy signals risk fragmenting global capital flows.

6. Technology Stack: From Variable Renewables to Clean Firm Systems

As variable renewables scale, system integration becomes central: storage, digitalization, AI forecasting, green hydrogen pilots, and nuclear SMRs complement renewables to ensure reliability.

The shift toward clean firm systems is redefining technology priorities. Long-duration storage—spanning advanced batteries, pumped hydro, and emerging thermal solutions—anchors reliability, while AI-driven forecasting and grid orchestration platforms minimize imbalance costs. Green hydrogen and synthetic fuels are gaining traction as seasonal storage and industrial decarbonization vectors, complemented by nuclear SMRs and geothermal for baseload resilience. Together, these technologies form a layered architecture that moves beyond variability management toward a fully integrated, dispatchable clean energy ecosystem.

7. Supply Chains & Geopolitics: Resilience Over Just-in-Time

Global clean-tech supply chains remain concentrated, with China holding significant shares in PV, batteries, and wind components. Tariffs and critical mineral strategies are reshaping procurement and logistics.

Resilience is emerging as the new supply-chain mantra, replacing decades of just-in-time efficiency. Diversification strategies—such as nearshoring battery production, securing alternative PV suppliers, and investing in critical mineral recycling—are accelerating as trade frictions and resource nationalism intensify. The race for lithium, cobalt, and rare earths is prompting strategic stockpiling and bilateral agreements, while technology alliances aim to reduce dependency on single-source manufacturing. These shifts signal that energy security in the clean era will be as much about supply-chain sovereignty as generation capacity.

8. Emerging Markets: Inclusion, Affordability, and Scale

Mini-grids, distributed PV, and pay-as-you-go models expand access, spur SMEs, and reduce diesel dependence. Development finance institutions play a critical role via guarantees and concessional tranches.

Scaling these models require more than technology, it demands innovative financing and policy frameworks. Blended finance structures, carbon credit monetization, and mobile-enabled payment systems are unlocking affordability for low-income households while attracting private capital. Yet, challenges persist in currency volatility, regulatory uncertainty, and limited grid infrastructure can stall progress. Strategic partnerships between DFIs, local banks, and tech providers are proving pivotal to

bridge these gaps, ensuring that energy inclusion becomes a cornerstone of global decarbonization rather than an afterthought.

9. Risks & Realities: What Could Slow the Momentum?

Permitting delays, auction design flaws, grid inadequacy, and policy whiplash remain key risks. Streamlined processes and durable frameworks are essential.

Beyond procedural bottlenecks, macroeconomic and geopolitical shocks could further slow momentum. Rising interest rates and tightening credit conditions strain project financing, while trade disputes and resource nationalism threaten supply-chain continuity. Cybersecurity risks in increasingly digitalized grids add another layer of vulnerability. These realities highlight that accelerating the energy transition requires not only technological innovation but also institutional resilience—anchored in predictable policies, robust risk-sharing mechanisms, and coordinated international frameworks.

10. Strategic Implications for Decision-Makers

Utilities should prioritize grid flexibility investments and digital operations; developers should pursue multi-technology portfolios; policymakers must anchor grid investment roadmaps and reform auctions; investors should focus on integrated platforms and resilience metrics.

The convergence of technology, policy, and capital signals a new strategic calculus: resilience and optionality matter as much as scale. Utilities that embed flexibility and digital intelligence will secure operational advantage, while developers embracing hybrid portfolios can mitigate volatility and capture premium markets. Policymakers must move beyond incremental reforms toward integrated planning that aligns transmission, storage, and permitting. For investors, the winners will be platforms that combine generation, grid services, and data-driven optimization, anchored in transparent ESG metrics and adaptive risk frameworks.

Conclusion: Renewables Surpass Coal: The Launchpad for Energy Transformation

The milestone of renewables overtaking coal in global electricity generation marks not an endpoint but the start of a systemic redesign of energy markets. Over the next year, success will depend on integrating storage, digitalization, and resilient supply chains while aligning policy and permitting reforms to ensure reliable, affordable, and inclusive power systems. Markets that synchronize investments across generation, grids, and flexibility assets will lead, while laggards risk stranded assets and rising curtailment. This tipping point signals a new era where adaptability and collaboration define global energy leadership.

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Country Reports

Vaisala lowers transformer risks with enhanced monitoring technology

Figure 1. Exploring Libya's upstream resurgence and renewable ambitions in 2025

Libya's Energy Landscape in 2025

Libya's energy sector is entering a period of renewed momentum in 2025, characterized by a gradual but tangible revival in upstream activity and a measured shift toward diversification. After a decade of political volatility, institutional fragmentation, and chronic underinvestment, the country is once again positioning itself as a serious player in global energy markets. Central to this re-emergence is the National Oil Corporation's (NOC) decision to launch its first oil and gas licensing round in 17 years—an ambitious move designed to rebuild investor confidence, stimulate exploration, and lift national production capacity. This renewed push aligns with Libya's broader objective to raise crude output from its current average of around 1.4 million barrels per day (bpd) to 2 million bpd by 2025. With more than 40 billion barrels of proven crude reserves—the largest in Africa—and substantial natural gas deposits, Libya possesses the geological endowment to support this aspiration if political and fiscal conditions stabilize.

Upstream Resurgence

The 2025 licensing round marks a major step in revitalizing Libya's core hydrocarbon sector. It offers 22 exploration blocks—equally divided between 11 onshore and 11 offshore—located across highly prospective basins including Sirte, Murzuq, and Ghadames. These basins have historically accounted for the majority of Libya's output, making the round particularly attractive to international oil companies (IOCs) seeking growth opportunities in underexplored but resource-rich territories.

This round also introduces the Enhanced Production Sharing Agreement V (EPSA

V), a modernized contractual framework with improved fiscal terms, streamlined taxation, and clearer profit-sharing mechanisms. Recent discoveries are also reinforcing optimism. In 2025 alone, six new oil and gas finds were reported across various basins. Among them, Sonatrach's major discovery in the Mumniyat region stands out—estimated at 122 million barrels of recoverable oil and 47 billion cubic feet of natural gas. These discoveries, though still modest compared to Libya's existing reserves, contribute to the sector's long-term production stability and appeal to future investors.

Natural Gas and Infrastructure

Natural gas development is increasingly central to Libya's long-term energy strategy. Recognizing both global demand trends and the need to reduce domestic dependence on oil for power generation, the government and NOC have been accelerating gas-focused projects.

Priority initiatives include the Bouri Gas Utilization Project and the Sabratha Platform Compression Project—both designed to curb gas flaring, boost offshore processing capacity, and extend the life of legacy fields. The resumption of production at the Bahr Essalam field by Mellitah Oil & Gas, one of Libya's largest gas suppliers, further supports the country's ability to meet domestic energy needs while sustaining pipeline exports to Europe via the Greenstream pipeline.

These efforts align with the broader global shift toward cleaner energy sources, positioning Libya to maintain relevance as international markets gradually transition away from oil. Although natural gas still falls within the hydrocarbon spectrum, its lower emissions footprint makes it a critical bridge fuel for Libya's economy.

Renewable Energy Ambitions

Despite the dominance of hydrocarbons, Libya is making cautious steps toward diversifying its power mix with renewable energy. The government has set a target for renewables to account for 20% of national electricity generation by the end of 2025—a bold target considering that renewables today contribute less than 1% of total supply. While promising, the renewable transition faces several structural barriers. Fuel subsidies—estimated at nearly 30 billion LYD annually—undermine the competitiveness of solar and wind projects by artificially lowering the cost of diesel-generated electricity. Financial constraints, governance gaps, and limited grid modernization further complicate implementation.

Investment Climate and Risks

Libya's renewed licensing activity and modernized agreements signal an important step toward creating a more transparent and investor-friendly environment. However, underlying vulnerabilities remain significant. Persistent political division between rival administrations, inconsistent regulatory enforcement, and periodic security flare-ups continue to deter long-term capital commitments. The IMF has voiced concerns about fiscal imbalances driven by high public sector spending and subsidies, underscoring the need for unified budgeting, subsidy reform, and institutional consolidation.

Outlook

Libya stands at a pivotal moment. Its dual-track strategy—revitalizing the hydrocarbon sector while expanding renewable energy capacity—offers substantial opportunities for investors, technology providers, and energy companies. If governance reforms, security stabilization, and infrastructure upgrades progress in tandem, Libya could become a diversified energy hub with strong regional influence. Yet the pathway forward is heavily dependent on political cohesion and sustained international cooperation. For now, the country remains poised for growth but must navigate its lingering structural challenges carefully to unlock its full energy potential.

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Libya Launches 2025 Bid Round

Energy Giants Drive Libya's Upstream Transformation

Libya Reports 6 New Oil & Gas Discoveries

Libya Targets Over 20% Renewable Energy

Libya Opens First Oil & Gas Licensing Round in 17 Years

Figure 1. Libya Opens First Oil & Gas Licensing Round in 17 Years

Libya has launched its first oil and gas licensing round since 2007, marking a major milestone in revitalizing its energy sector. The 2025 bid round offers 22 exploration blocks—11 onshore and 11 offshore—across resource-rich basins including Sirte, Murzuq, and Ghadames. The initiative introduces a modernized contractual framework (EPSA V) designed to attract foreign investment through improved fiscal terms and streamlined processes.

The National Oil Corporation (NOC) aims to boost crude output from 1.4 million barrels per day to 2 million by 2025, leveraging Libya's position as Africa's largest holder of proven oil reserves. International oil majors such as Shell, BP, ExxonMobil, TotalEnergies, and Eni have expressed interest, signaling renewed confidence in Libya's upstream potential. It also underscores the country's commitment to transparency and competitiveness in global energy markets. The bid round is expected to conclude ahead of the Libya Energy & Economic Summit in early 2026, setting the stage for new partnerships and investment flows.

Libya Accelerates Renewable Energy Drive with Landmark Solar Projects

Figure 1. Libya energy circle

Libya is advancing its renewable energy ambitions with a target to generate 20% of its electricity from solar and wind by the end of 2025. This strategic shift aims to preserve oil and gas for export while reducing carbon emissions and enhancing energy security. Recent milestones include the completion of Libya's first-ever 1 MW solar plant in Kufra by Infinity Libya, delivering 2,182 MWh annually and cutting diesel use by 545,000 liters. In parallel, TotalEnergies is finalizing the 500 MW Sadada Solar Project, expected to commence operations in 2026. progress, challenges remain. Fuel subsidies and liquidity constraints continue to hinder large-scale renewable adoption. However, Libya's vast solar potential—averaging 3,200 sunshine hours annually—positions the country as a future leader in clean energy across North Africa. These projects reflect Libya's commitment to diversifying its energy mix and attracting international investment for sustainable growth.

Thailand's Energy Transition: Balancing Growth and Sustainability

Figure 1. hailand accelerates clean energy adoption while reinforcing energy security

Thailand stands at a pivotal moment in its energy transition, navigating the dual imperatives of sustaining economic growth while meeting ambitious climate commitments. The country has pledged to achieve carbon neutrality by 2050 and net-zero greenhouse gas emissions by 2065—targets that are reshaping national energy strategy from fuels to infrastructure. Central to this shift are the Power Development Plan (PDP) and the Alternative Energy Development Plan (AEDP), which together outline a pathway for transforming the national power mix. Under these frameworks, Thailand aims to increase renewables to more than 50% of total generation capacity by 2037, compared to roughly 36% today, signaling a major acceleration in clean-energy investment.

Natural gas continues to dominate Thailand's electricity generation, supplying roughly one-third of total output. However, declining domestic reserves and rising LNG import costs expose vulnerabilities in energy security. These pressures have pushed policymakers to diversify the energy portfolio through large-scale solar, biomass, hydropower, and emerging areas such as green hydrogen, grid-scale storage, and smart-grid technologies. The strategic intent is clear: reduce import dependence while building a more resilient, low-carbon energy system capable of supporting Thailand's industrial expansion and regional competitiveness.

Renewable Energy Expansion

Thailand's renewable energy sector is gaining significant traction, driven by government initiatives that combine climate ambition with socioeconomic development. Among the flagship programs is Quick Big Win, which targets rapid deployment across three segments: 1,500 MW of community solar farms, 1,600 MW of floating solar installations on reservoirs and dams, and extensive rooftop solar incentives for more than 90,000 households nationwide.

Collectively, these initiatives are expected to reduce millions of tonnes of CO_2 emissions annually, create thousands of green jobs, and attract up to 700 billion baht in investment—supporting Thailand's strategy to stimulate rural economies and broaden energy ownership.

A critical pillar of the renewable rollout is the Electricity Generating Authority of Thailand (EGAT), which is spearheading a series of hydro-floating solar hybrid projects.

The private sector is also emerging as a force in Thailand's renewable expansion. Global Power Synergy Public Company Limited (GPSC), a PTT Group subsidiary, recently delivered two EPC solar projects totaling 21 MW to Toyota Motor Thailand—an example of how industrial players are mobilizing for cleaner operations under corporate sustainability commitments. Likewise, SENA Development has partnered with Japan's Macnica to pilot perovskite solar cell technology, which offers improved efficiency and flexibility under Thailand's subtropical climate. These innovations reflect the private sector's growing role in accelerating clean-energy adoption and advancing next-generation technologies.

Policy and Investment Climate

Thailand's policy environment has become increasingly supportive of renewable investment. The Board of Investment (BOI) offers some of the most competitive incentive packages in Southeast Asia, including corporate tax exemptions of up to eight years, import duty waivers on machinery, and preferential treatment for public-private partnerships. These incentives are shaping a strong pipeline of solar, biomass, waste-to-energy, and smart-grid projects across the country.

A major recent reform is the Thailand FastPass mechanism, approved in 2024, which aims to unlock more than $13 billion in stalled clean-energy and data center projects by reducing approval timelines by up to 50%. This move directly addresses long-standing bureaucratic delays that have often hampered Thailand's energy sector.

Another landmark development is the introduction of Direct Power Purchase Agreements (PPAs). These allow large electricity consumers—especially data centers, industrial parks, and multinational corporations—to buy renewable electricity directly from producers, bypassing the traditional state-utility model. Direct PPAs are expected to drive foreign investment, expand corporate renewable sourcing, and accelerate Thailand's transition to a liberalized power market.

Challenges Ahead

However, Thailand faces structural challenges that could slow the momentum of its energy transition. The country's grid infrastructure—designed primarily for centralized thermal power plants—requires extensive modernization to accommodate variable renewable energy. Bottlenecks related to grid access, connection fees, transmission capacity, and land-use policy remain major constraints for project developers.

Outlook

Thailand's energy transformation is accelerating, supported by clear policy direction, growing investor confidence, and strong industrial participation. With innovative solar-hydro hybrids, expanding community energy programs, and strategic advances in CCS and green hydrogen, the country is positioning itself as a regional leader in clean-energy development. Yet long-term success will depend on modernizing the grid, maintaining regulatory transparency, and ensuring continuous investment. Achieving this balance will be essential for Thailand's ability to strengthen energy security while fulfilling its commitments to sustainability and climate action.

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Thailand Renewable Energy Expansion
BOI Incentives for Renewable Energy
EGAT Floating Solar Projects

Thailand Launches Community Solar Program Under Quick Big Win

Figure 1. 1,500 MW solar capacity to empower local communities

Thailand's Ministry of Energy has approved a community-based solar initiative targeting 1,500 MW of capacity nationwide. Under the program, small ground-mounted solar farms (up to 10 MW each) will supply power to local communities at a fixed feed-in tariff of THB 2.25/kWh under 25-year contracts. Provincial and Metropolitan Electricity Authorities will act as offtakers, ensuring affordable electricity for consumers.

The initiative, part of the government's Quick Big Win policy, aims to reduce energy costs, enhance local energy security, and cut carbon emissions. More than 300 communities are expected to participate, with private developers selected based on technical readiness and community consent. The program complements other renewable efforts, including rooftop solar incentives for households and floating solar projects on dams.

Scheduled to begin commercial operations within 18 months of PPA execution, the scheme underscores Thailand's commitment to decentralized clean energy and inclusive growth. By empowering communities and leveraging private sector expertise, the government seeks to accelerate its transition toward carbon neutrality by 2050 and net-zero emissions by 2065

EGAT Expands Floating Solar Hybrid Projects to Boost Clean Energy

Figure 1. planned capacity across 9 dams by 2030

The Electricity Generating Authority of Thailand (EGAT) is scaling up its hydro-floating solar hybrid projects as part of the country's renewable energy roadmap. Following the successful commissioning of a 24 MW system at Ubol Ratana Dam in 2024, EGAT plans to deploy 16 similar projects across nine reservoirs, totaling 2,725 MW by 2030.

These hybrid systems integrate solar PV, hydropower, and battery storage to ensure stable generation and optimize reservoir space utilization. The initiative is expected to reduce over 800,000 tonnes of CO_2 annually while enhancing grid flexibility and energy security. EGAT's long-term vision includes expanding floating solar capacity to 10,000 MW, reinforcing Thailand's position as a regional leader in clean energy innovation.

The projects align with Thailand's Power Development Plan (PDP) and Alternative Energy Development Plan (AEDP), which target a 51% share of renewables in total generation capacity by 2037. By combining renewable generation with advanced storage solutions, EGAT aims to address intermittency challenges and support the country's carbon neutrality goal by 2050.

Norway's Energy Sector: Navigating Transition While Sustaining Leadership

Figure 1. Balancing oil dominance with renewable ambitions and green innovation

Norway enters 2025 at a pivotal moment in its energy evolution—one defined by the tension between its legacy as Western Europe's largest oil and gas producer and its long-term vision of a carbon-neutral economy by 2050. The country continues to anchor global and regional energy security, particularly for Europe, while simultaneously accelerating its shift toward renewables, clean technologies, and new value chains. Oil and gas investments are expected to peak in 2025 at approximately NOK 275 billion ($24.7 billion), fueled by major developments such as Johan Castberg and Balder X in the Barents Sea. Yet beneath this peak lies a clear transition: capital is gradually being reallocated to offshore wind, solar, hydrogen, and carbon capture solutions that will define Norway's energy system in the decades ahead.

Oil & Gas: Sustaining Supply Amid Transition

Norway's offshore oil and gas sector remains one of the most mature and technologically advanced in the world, with 94 producing fields as of 2025. Operators are extending the lifespan of key fields through enhanced recovery, brownfield upgrades, and infrastructure-led exploration. Gas production reached record levels in 2024, reinforced by Europe's urgent need to replace Russian supply. As a result, Norway has solidified its position as Europe's largest natural gas supplier, accounting for more than 30% of imports to the continent.

Equinor and other major operators are continuing to invest heavily in near-field exploration to maintain plateau production through the late 2020s. The government's 26th licensing round, focused on frontier and underexplored areas, underscores continued political support for ensuring long-term resource availability even as global demand patterns shift. These efforts are vital for maintaining state revenues, employment, and the competitiveness of service and maritime industries that depend on the offshore sector.

However, the long-term trajectory points toward gradual decline. After 2025, total petroleum investments are forecast to fall

to NOK 251 billion in 2026 and to NOK 203 billion by 2029 as fields mature and fewer new projects come online. This anticipated contraction reflects both geological limits and Norway's broader transition to a more diversified, lower-carbon energy economy.

The nation's sovereign wealth fund, the Government Pension Fund Global (GPFG), is already reshaping its energy investment strategy. Recent acquisitions include stakes in major offshore wind farms such as Thor and Nordseecluster, representing a combined 2.64 GW of capacity. The fund is also expanding its solar portfolio internationally, signaling how Norway is channeling its legacy hydrocarbon wealth into future-oriented clean-energy assets.

Renewable Energy: Scaling Beyond Hydropower

Hydropower has long been the backbone of Norway's electricity system, providing 90–95% of generation and enabling the country to maintain one of the lowest carbon intensities in the world. However, maintaining this advantage requires addressing increasing environmental scrutiny. A recent HydroCen study revealed inconsistencies in hydropower operators' environmental practices, prompting calls for clearer standards, improved biodiversity protection, and enhanced compliance with EU taxonomy rules to preserve hydropower's green classification.

To diversify beyond hydropower, Norway is accelerating deployment of wind and solar energy. The government plans to double onshore wind capacity by 2030, supported by reforms in licensing, local compensation schemes, and community engagement. Offshore wind is emerging as a strategic priority, with large-scale floating wind projects in the North Sea advancing under new regulatory frameworks. These include hybrid offshore systems that combine wind, wave, and solar technologies—an area where Norway's marine engineering expertise offers a competitive advantage.

Solar energy, while limited by high latitude, is expanding rapidly through rooftop PV incentives, industrial collaborations, and declining technology costs. Industrial actors, including Norsk Hydro, are integrating PV into operations and upgrading pumped-storage facilities to support grid flexibility and energy security.

Innovation and Green Technologies

Norway's technological leadership is increasingly evident in carbon capture and storage (CCS), hydrogen, and next-generation energy solutions. Hydrogen is another pillar of Norway's transition strategy. Projects such as the Risavika Hydrogen Hub are testing blue and green hydrogen pathways for application in industry, shipping, and heavy transport. Collaboration with the U.S. Department of Energy on hydropower modernization, marine energy research, and digital optimization further demonstrates Norway's commitment to innovation-driven growth.

Outlook

Norway's dual strategy—maximizing the value of hydrocarbons while scaling renewable energy and clean technologies—positions it as a global energy leader. The country offers investors a unique combination of stability, advanced infrastructure, skilled labor, and world-class innovation ecosystems. Success, however, will depend on regulatory clarity, infrastructure modernization, and the continued ability to balance economic competitiveness with climate ambition. For technology providers and investors, Norway remains one of the most promising destinations for energy transition partnerships in 2025 and beyond.

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Solar & Grid Modernization Strategy

Norway Approves 26th Oil & Gas Licensing Round to Secure Long-Term Supply

Figure 1.New exploration blocks aim to sustain Europe's energy security

Norway's Ministry of Petroleum and Energy has announced plans for its 26th oil and gas licensing round, targeting frontier areas on the Norwegian Continental Shelf. The initiative seeks to counter an anticipated production decline from the early 2030s and maintain Norway's role as Europe's leading gas supplier.

The licensing round follows record-high investments of NOK 275 billion ($24.7 billion) in 2025, driven by major projects such as Johan Castberg and Balder X. Despite this peak, forecasts indicate a gradual decline in hydrocarbon spending, reinforcing the need for new exploration.

Energy Minister Terje Aasland emphasized Norway's commitment to balancing energy security with climate goals: "Norway wants to remain a reliable supplier of oil and gas to Europe while creating value and jobs at home." The round will include blocks in underexplored regions, offering opportunities for international operators to leverage Norway's stable regulatory environment and advanced offshore infrastructure. Bidding details will be finalized ahead of the Norway Energy Summit in early 2026.

Norway Accelerates Offshore Wind Development to Meet 2030 Targets

Figure 1. Government doubles onshore wind capacity and boosts floating wind projects

Norway is fast-tracking its renewable energy strategy with a comprehensive plan to double onshore wind capacity by 2030 and expand offshore wind deployment. The government's roadmap includes large-scale floating wind projects in the North Sea and hybrid systems integrating wind, wave, and solar technologies. The initiative complements Norway's existing hydropower dominance, which supplies 90% of electricity, and aims to address rising demand from electrification and data center growth. Key measures include grid modernization, energy storage investments, and incentives for rooftop solar installations, leveraging Norway's 31 GW potential.

Energy Minister Terje Aasland stated: "Offshore wind is central to Norway's green transition and future export opportunities, including hydrogen." The government is also introducing guarantees of origin and streamlined permitting to attract foreign investment. With strong policy signals and public-private partnerships, Norway is positioning itself as a leader in offshore wind innovation, reinforcing its commitment to carbon neutrality by 2050.

Industry News

Shell Simplifies Executive Committee to Drive Energy Transition

Figure 1. Shell simplifies executive committee to accelerate energy transition, integrating renewables and empowering leaders for cleaner, more agile operations

Shell plc has announced a significant simplification of its executive leadership structure to accelerate its transformation strategy focused on delivering more value with fewer emissions. The reorganization, effective April 2025, will align the company around three core business areas: Integrated Gas, Upstream, and Downstream, Renewables & Energy Solutions, while elevating Trading and Supply.

Key leadership changes include Zoë Yujnovich, Integrated Gas and Upstream Director, stepping down after March 31, 2025. Cederic Cremers will become President, Integrated Gas, and Peter Costello will take on the role of President, Upstream. These appointments aim to bring technical expertise closer to value creation and empower business units for faster execution.

CEO Wael Sawan stated, “This simplification will make Shell more agile and better positioned to deliver on our strategy of powering progress with cleaner energy.” The move underscores Shell’s commitment to integrating renewables and low-carbon solutions into its core operations while maintaining strong financial performance.

Duke Energy Appoints New CEO for Carolinas Division

Figure 1. Duke Energy appoints Kodwo Ghartey-Tagoe as Carolinas CEO to drive $83 billion grid modernization and clean energy initiatives amid strong financial gains.

Duke Energy has announced the appointment of Kodwo Ghartey-Tagoe as the new Chief Executive Officer of Duke Energy Carolinas, marking a significant leadership transition for one of the largest electric power holding companies in the United States. This change is part of a broader leadership reshuffle aligned with Duke Energy’s ambitious $83 billion capital investment plan, which focuses on grid modernization, clean energy expansion, and meeting the growing demands of advanced technologies.

Kodwo Ghartey-Tagoe, a seasoned leader with extensive experience in regulatory affairs, legal strategy, and corporate governance, steps into the role of CEO for Duke Energy Carolinas as part of the company’s $83 billion modernization plan. His appointment reinforces Duke Energy’s commitment to navigating a rapidly evolving energy landscape driven by AI-powered data centers, electrification, and clean energy initiatives. Under his leadership, the division will focus on grid modernization, reliability improvements, and expanding natural gas generation to complement renewables. This move follows strong financial results, including an 18.9% EPS beat and a 1.95% stock uptick, with CEO Lynn Good affirming that Ghartey-Tagoe’s expertise will be pivotal in delivering smarter, cleaner energy solutions while maintaining operational excellence and shareholder value.

Plenitude Acquires 760 MW Renewable Portfolio from Neoen in France

Figure 1. Renewable Surge: Plenitude's 760 MW French Acquisition Accelerates Europe's Green Shift.

Plenitude, the renewables and retail energy subsidiary of Eni, has announced a landmark acquisition of a 760 MW portfolio of operating renewable assets from Neoen in France. The portfolio includes 37 solar plants, 14 wind farms, and one battery storage facility, collectively generating approximately 1.1 TWh of electricity annually. This transaction ranks among the largest renewable mergers and acquisitions in France in recent years and underscores Plenitude's ambition to accelerate the energy transition across Europe.

Plenitude's acquisition supports its goal of reaching 10 GW of renewable capacity by 2028, strengthening its integrated model across solar, wind, and storage while enhancing resilience and sustainability. The deal reflects confidence in hybrid energy systems and includes battery storage to ensure grid stability and optimize output. According to CEO Stefano Goberti, this milestone reinforces Plenitude's commitment to expanding its renewable footprint and driving Europe's decarbonization, in line with Eni's broader sustainability objectives.

American Gridwork Partners (USA) Acquires PMT Site to Accelerate U.S. Grid Modernization

Figure 1.American Gridwork Partners (USA) acquires PMT Site to enhance U.S. grid modernization efforts, focusing on resilient, AI-enabled infrastructure for electrification, renewables, and data centers.

American Gridwork Partners (AGP), a U.S.-based infrastructure investment firm backed by Legacy Holdings, has announced the acquisition of PMT Site, a leading provider of underground utility and site infrastructure solutions. This strategic move is part of AGP's ambitious initiative to modernize America's sub-regional and last-mile energy, water, and data infrastructure grids. AGP's acquisition of PMT Site aims to strengthen its ability to deliver resilient, future-ready infrastructure for electrification, renewable integration, and AI-driven data centers. PMT Site's expertise in underground utility construction will support grid modernization and reliable energy delivery across U.S. markets. The move reflects growing private investment in critical infrastructure as stakeholders prioritize grid reliability amid surging electrification and renewable adoption. AGP plans to integrate PMT Site into its nationwide network, leveraging advanced technologies and best practices to meet evolving regulatory and environmental standards

Patrick Pouyanné: Driving TotalEnergies' Global Energy Transition

Patrick Pouyanné, CEO of TotalEnergies, is driving one of the most ambitious energy transition strategies in the global energy sector. Under his leadership, the French multinational has committed to reaching net-zero emissions by 2050 and is reshaping its investment priorities to support that goal. More than half of the company's future capital spending is now directed toward renewables and low-carbon solutions, marking a clear strategic pivot away from a traditional reliance on hydrocarbons.

TotalEnergies is rapidly expanding its portfolio of solar and wind assets, with major projects underway across Europe, the Middle East, and Asia. The company is also positioning itself as an early mover in green hydrogen, advancing large-scale ventures designed to support decarbonization in hard-to-abate sectors.. Partnerships—whether with governments, industry peers, or emerging technology □irms—are a central element of the company's roadmap. Through these collaborations, TotalEnergies aims to accelerate deployment, enhance grid integration, and expand its footprint in rapidly growing renewable markets. Pouyanné's strategy underscores the company's ambition to become an integrated, multi-energy leader capable of supporting global climate objectives while ensuring reliable

Shell Simplifies Executive Committee to Drive Energy Transition

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Anders Opedal: Equinor's Bold Shift to Renewables

Anders Opedal, CEO of Equinor, is guiding Norway's energy giant through a pivotal transformation as it evolves from a traditional oil and gas producer into a broad, multi-energy company. Since assuming leadership, Opedal has accelerated investments in low-carbon solutions and positioned Equinor as a global force in offshore wind. The company now leads major wind developments across the North Sea and the U.S. East Coast, leveraging decades of offshore expertise to deliver reliable, large-scale renewable power.

Beyond wind, Opedal is advancing Equinor's ambitions in green hydrogen, recognizing its potential to support industrial decarbonization and strengthen energy security. Opedal also reinforces Equinor's commitment to ESG principles, integrating safety, environmental stewardship, and transparent governance into every stage of the company's transition. With a clear focus on achieving net-zero emissions by 2050, he underscores the need for diversification and collaboration to meet global energy demands responsibly. Under Opedal's direction, Equinor is redefining its role in the energy landscape, shaping a more sustainable and resilient future.

Catherine MacGregor: Engie's Global Push for Green Energy

Catherine MacGregor, CEO of Engie, is steering the company through a transformative strategy aimed at establishing Engie as a global leader in renewable energy and green hydrogen. Since taking charge, MacGregor has significantly expanded the company's presence in solar, wind, and energy storage, with major developments across Europe, Latin America, and Asia. Her leadership emphasizes scaling clean energy assets while ensuring affordability and resilience in rapidly evolving markets.

MacGregor also places strong emphasis on technological modernization and operational excellence, integrating digital tools and advanced energy management systems to enhance performance across the value chain. These efforts reinforce Engie's long-term sustainability objectives and its commitment to achieving net-zero emissions. Her vision positions Engie as an influential player in global decarbonization efforts, combining renewable energy scale-up with pioneering low-carbon solutions. Under MacGregor's leadership, the company is helping shape a cleaner, more resilient, and more competitive energy system for the future.

Patrick Pouyanné: Driving TotalEnergies' Global Energy Transition

Figure 1. AI-driven smart grids set to transform global energy systems.

Siemens Smart Infrastructure has released insights from its 2025 Infrastructure Transition Monitor, underscoring the pivotal role of automation and AI in achieving net-zero objectives. According to the report, 74% of energy executives consider smart grids and advanced grid software essential for enabling the clean energy transition. In response, Siemens is investing significantly in autonomous grid systems designed to optimize efficiency, reduce carbon emissions, and enhance reliability across energy networks. Siemens' strategy includes deploying autonomous control platforms at scale across Europe and Asia, preparing grids to meet growing electrification demands from industrial, commercial, and residential sectors. By combining cutting-edge software with practical implementation, Siemens is positioning itself as a global leader in digital energy transformation. The initiative reflects a broader vision where intelligent, connected infrastructure becomes the backbone of a low-carbon, sustainable energy future.

Schneider Electric Launches AI-Powered Digital Grid Platform

Figure 1. New platform promises 40% fewer outages and faster DER integration.

Schneider Electric has launched its One Digital Grid Platform, a comprehensive ecosystem designed to modernize grid operations through advanced automation and AI. The platform provides utilities with real-time insights, predictive analytics, and automated fault detection, helping reduce outages by up to 40% and accelerating distributed energy resource (DER) interconnection timelines by 25%. By addressing growing challenges such as extreme weather events and rising electricity demand, the solution offers a secure, scalable foundation for modern energy networks. Schneider Electric leverages decades of experience in energy management to ensure that One Digital Grid not only improves operational efficiency but also accelerates the global energy transition. By combining technological innovation with practical deployment, the platform positions Schneider as a leader in digital energy transformation. This initiative exemplifies how intelligent, connected infrastructure can enable cleaner, more reliable, and more resilient electricity systems worldwide, supporting utilities and stakeholders in achieving net-zero and sustainability objectives.

EnerVenue Introduces High-Efficiency Metal-Hydrogen Batteries for Long-Duration Energy Storage

Figure 1.EnerVenue reveals long-lasting, safe metal-hydrogen batteries for renewable energy and grid resilience.

EnerVenue, a U.S.-based energy storage innovator, announced its breakthrough Energy Storage Vessels™ (ESVs) technology, which leverages metal-hydrogen chemistry to deliver ultra-long life (30,000 cycles), intrinsic safety, and scalability for large-scale renewable integration. Unlike conventional lithium-ion batteries, ESVs offer fire-safe operation, water-based electrolytes, and recyclability, making them ideal for utilities and industrial applications requiring long-duration storage. This innovation addresses critical challenges in renewable adoption by enabling 12+ hour discharge capabilities and reducing lifecycle costs. EnerVenue's Energy Storage Vessels™ deliver enhanced safety, extended lifespan, and reduced environmental impact, positioning the company as a leader in next-generation energy storage. Leveraging proven metal-hydrogen chemistry with modern engineering, the technology supports global renewable deployment and grid resilience for utilities and large-scale energy consumers. EnerVenue plans to scale production and partner internationally to integrate ESVs into renewable projects, microgrids, and industrial facilities.

Schneider Electric Launches AI-Powered EcoStruxure™ Platform for Energy Resilience

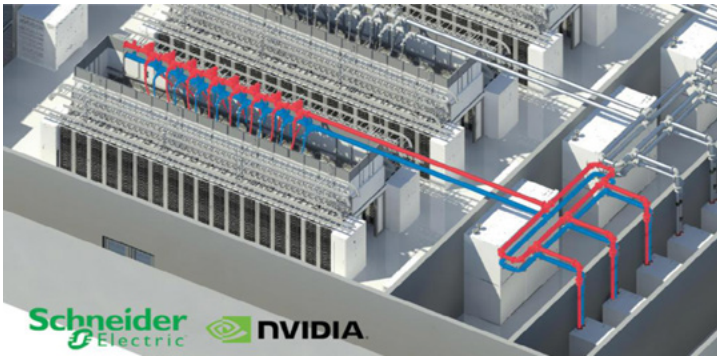


Figure 1.Schneider Electric launches the AI-powered EcoStruxure™ Platform to enhance energy resilience, optimize usage, and support decarbonization across buildings, data centers, and industrial facilities worldwide

Schneider Electric, a global leader in energy management and automation, has announced the launch of its next-generation EcoStruxure™ Platform, designed to help businesses and utilities meet the growing challenges of electrification, digitalization, and sustainability.

Schneider Electric has launched its EcoStruxure™ Platform, integrating AI-driven analytics, real-time monitoring, and predictive maintenance to optimize energy use across buildings, data centers, and industrial facilities. Designed to address rising global energy demand from AI workloads, electrification, and industrial growth, the platform offers advanced load forecasting, dynamic optimization, and cybersecurity features while supporting renewable integration to accelerate decarbonization and reduce costs. This innovation underscores Schneider Electric's commitment to digital transformation and sustainability, enabling smarter, more resilient energy systems for a low-carbon future.

India's Gujarat Hybrid Renewable Energy Park Sets Global Benchmark

Figure 1. 30 GW solar-wind mega project to power 18 million homes by 2026.

India is developing one of the world's largest renewable energy parks in Gujarat's Kutch district, aiming for a combined capacity of 30 GW from solar and wind power. Covering 72,600 hectares, the Gujarat Hybrid Renewable Energy Park is set to significantly expand India's clean energy portfolio, reducing dependence on fossil fuels while supporting the country's climate commitments.

Strategically located on barren land, the site minimizes social and environmental displacement while taking advantage of high solar irradiance and consistent wind conditions. The integrated hybrid model demonstrates India's focus on combining renewable generation with advanced energy storage to manage intermittency and enhance grid resilience. This ambitious initiative underscores India's leadership in global renewable infrastructure and reflects a broader national strategy to accelerate the energy transition. By blending scale, technology, and sustainability, the Gujarat Hybrid Renewable Energy Park exemplifies how emerging economies can drive decarbonization while fostering economic development and energy independence.

SunZia Wind and Transmission Project Advances U.S. Clean Energy Goals

Figure 1. 3.5 GW wind farm and 550-mile HVDC line to power western markets.

The SunZia Wind and Transmission Project, led by Pattern Energy, stands as one of the largest renewable energy developments in U.S. history. Stretching across New Mexico and Arizona, the initiative integrates a 3.5 GW wind farm with a 550-mile high-voltage direct current (HVDC) transmission line, enabling the delivery of clean electricity to western states. Construction commenced in 2023, with full commercial operations anticipated by 2026. Beyond power generation, SunZia exemplifies strategic infrastructure development that balances technical, environmental, and regulatory challenges. Its integrated approach—including advanced transmission technology and large-scale renewable capacity—demonstrates how renewable energy projects can be both ambitious and practical. The milestone reflects America's accelerating investment in clean energy infrastructure and reinforces the country's commitment to achieving net-zero emissions. Once operational, SunZia will play a critical role in modernizing the grid, expanding renewable access, and shaping a sustainable energy future for the western United States.

Kuwait Launches 500 MW Jahra Solar PV Project Under PPP Model

Figure 1. New solar project strengthens Kuwait's renewable energy ambitions.

Kuwait has announced the 500 MW Jahra Solar PV Project, a flagship development within its Shagaya Renewable Energy Park initiative. The project is being managed jointly by the Kuwait Authority for Partnership Projects (KAPP) and the Ministry of Electricity, Water and Renewable Energy, and will operate under a 30-year power purchase agreement (PPA). This long-term framework ensures stable energy supply while encouraging investment in the country's clean energy sector. Beyond environmental benefits, the initiative is expected to attract foreign investment and stimulate the local economy through public-private partnerships. Once operational, the solar park will deliver clean electricity to thousands of households, enhancing energy security and contributing to sustainable development objectives. The Jahra Solar PV Project underscores Kuwait's commitment to transitioning toward low-carbon energy while leveraging international expertise and capital. It exemplifies how strategic renewable infrastructure can drive both climate action and economic growth, positioning the country as a regional leader in sustainable energy.

Schneider Electric Launches AI-Powered EcoStruxure™ Platform for Energy Resilience

Figure 1. Energy storage milestone enhances grid stability and renewable integration.

Engie has successfully completed both phases of its 800-MWh battery energy storage system (BESS) project in Belgium, representing a major milestone in grid modernization and renewable energy integration. The large-scale storage facility is designed to provide critical flexibility, enabling the grid to balance intermittent solar and wind generation, reduce energy curtailment, and strengthen overall energy security across the region.

Engie's investment highlights its commitment to advancing innovative energy solutions while enhancing system resilience and sustainability. The facility positions Belgium at the forefront of large-scale energy storage deployment, setting a benchmark for future projects in Europe and beyond. This achievement also demonstrates how strategic infrastructure can accelerate decarbonization while enabling a more flexible, intelligent, and low-carbon electricity network. As renewable penetration continues to grow, projects like Engie's BESS are vital for ensuring a stable, resilient, and sustainable energy future.

Westinghouse Electric Company (USA) and MVM Group (Hungary) Forge Strategic Nuclear Fuel Partnership

Figure 1. Westinghouse and MVM Group announce nuclear fuel partnership to bolster Hungary's energy security and promote multi-supplier strategies for sustainable power.

Westinghouse Electric Company, a global leader in nuclear technology headquartered in the United States, has announced a landmark agreement with Hungary's MVM Group to diversify nuclear fuel supply for the Paks Nuclear Power Plant. This strategic partnership marks a significant step toward enhancing energy security and reducing reliance on single-source suppliers in Central Europe.

Westinghouse will begin supplying VVER-440 fuel reloads to Hungary in 2028 from its European facilities, a move aimed at enhancing the country's energy independence and supporting EU goals for supply chain resilience and sustainability. The agreement, announced amid geopolitical tensions and energy security concerns, positions MVM Group as a proactive player in ensuring long-term stability for Hungary's nuclear energy mix. Industry experts view this as a key step toward multi-supplier strategies and regional collaboration, reinforcing Westinghouse's role as a global leader in innovative, sustainable nuclear solutions.

Siemens Gamesa Secures 1 GW Offshore Wind Order in Taiwan

Figure 1. Taiwan's Wind Power Leap: Siemens Gamesa Lands 1 GW Offshore Turbine Deal.

Siemens Gamesa Renewable Energy has announced a landmark offshore wind turbine order for Taiwan, totaling an impressive 1 GW of capacity. This project represents a significant step forward in Asia-Pacific's renewable energy expansion and underscores Taiwan's commitment to achieving its clean energy targets.

Siemens Gamesa's latest offshore wind turbines, equipped with advanced digital monitoring for predictive maintenance and real-time optimization, will power a major wind farm in Taiwan, delivering clean energy to millions of households and supporting the nation's decarbonization roadmap. This milestone reinforces Siemens Gamesa's leadership in offshore wind technology and highlights the growing role of international collaboration in accelerating the energy transition across Asia-Pacific, where offshore wind is emerging as a key pillar of sustainable energy diversification.

Events

CARE MENA 2025

Figure 1. Dubai to spotlight climate action and renewable energy partnerships.

On November 26–27, Dubai will host CARE MENA, a leading B2B platform dedicated to advancing sustainability and renewable energy collaboration across the Middle East and North Africa. The event will convene policymakers, investors, and technology innovators to accelerate climate action and foster partnerships for clean energy deployment.

Key sessions will explore hydrogen integration, solar expansion, and financing models for large-scale renewable projects. With regional governments committing to ambitious net-zero targets, CARE MENA aims to provide actionable strategies for scaling green infrastructure while addressing energy security challenges.

Attendees can expect interactive panels, networking opportunities, and showcases of cutting-edge technologies driving the transition to a low-carbon economy. Positioned as a catalyst for regional cooperation, CARE MENA underscores the urgency of aligning policy frameworks with investment flows to meet global sustainability goals.

EnerGaïa Forum 2025

Figure 1. Montpellier gears up for Europe's premier energy transition showcase.

Scheduled for December 10–11 at Parc des Expositions in Montpellier, the EnerGaïa Forum will bring together European energy leaders to accelerate the continent's clean energy transition. The forum will feature over 250 exhibitors and 100 expert speakers addressing renewable integration, energy efficiency, and decarbonization pathways.

With the EU's Green Deal and Fit for 55 targets shaping policy, EnerGaïa provides a critical platform for discussing regulatory updates, financing mechanisms, and technological innovations. Highlights include sessions on offshore wind development, hydrogen strategies, and digital solutions for grid modernization.

The event also offers matchmaking opportunities for investors and project developers, reinforcing its role as a hub for sustainable energy partnerships. As Europe races to meet 2030 climate objectives, EnerGaïa stands out as a must-attend event for stakeholders seeking actionable insights and collaboration.

World Future Energy Summit 2026

Figure 1. Abu Dhabi to set the tone for global clean energy innovation.

From January 13–15, the World Future Energy Summit will return to Abu Dhabi National Exhibition Centre, reaffirming its status as a global hub for sustainable energy innovation. The summit will showcase breakthroughs in solar, wind, hydrogen, and energy storage technologies, alongside smart city solutions and climate resilience strategies.

With over 30,000 attendees expected, the event will feature high-level panels, technical workshops, and an expansive exhibition floor highlighting next-generation clean energy systems. Key themes include accelerating investment in renewables, leveraging AI for grid optimization, and scaling green hydrogen projects.

As COP28 commitments drive momentum across the Middle East, the summit offers unparalleled opportunities for networking and knowledge exchange among policymakers, investors, and technology providers. Positioned at the intersection of innovation and policy, this event will shape the global energy transition narrative for 2026.

POWERGEN International 2026

Figure 1. San Antonio prepares for the power industry's largest innovation showcase.

POWERGEN International, scheduled for January 20–22 at the Henry B. González Convention Center in San Antonio, will convene thousands of energy professionals to explore the future of power generation. The event will spotlight advancements in renewable integration, hydrogen technologies, and grid modernization, alongside solutions for decarbonizing conventional power assets.

Attendees can expect a robust conference program featuring sessions on energy storage, digitalization, and cybersecurity for critical infrastructure. The exhibition floor will host leading OEMs, technology innovators, and service providers showcasing cutting-edge products and services.

With global energy demand surging and decarbonization targets looming, POWERGEN serves as a strategic platform for utilities, developers, and policymakers to align on practical solutions for a resilient, sustainable energy future.

Japan Energy Summit & Exhibition 2025

Figure 1. Dubai to spotlight climate action and renewable energy Figure 1. Tokyo charts a course for LNG security and decarbonization.

Tokyo hosted the Japan Energy Summit & Exhibition 2025 from June 18–20, bringing together over 100 senior energy professionals to address Japan's evolving energy landscape. Led by Nobuo Tanaka, former Executive Director of the International Energy Agency, discussions focused on LNG supply security, decarbonization targets, and investment in clean technologies. With long-term LNG contracts nearing expiration, panelists emphasized the urgency of securing new agreements amid geopolitical uncertainty.

Ken Kuroda of Cheniere Marketing highlighted regulatory hurdles impacting U.S. LNG exports to Japan, while Bruno Gaussorgues of Societe Generale pointed to Europe's decarbonization policies as a model for Japan's transition.

The event also explored Japan's Seventh Strategic Energy Plan and financing mechanisms for renewable projects. As global energy partnerships shift, Tokyo reaffirmed its commitment to balancing energy security with climate goals, positioning Japan as a key player in Asia's energy transition.

15th IRENA Assembly

Figure 1. Global leaders unite in Abu Dhabi to accelerate renewables.

Abu Dhabi hosted the 15th International Renewable Energy Agency (IRENA) Assembly on January 12–13, marking the first major global energy meeting of 2025. Under the theme "Accelerating the Renewable Energy Transition – The Way Forward," ministers and high-level delegates from 170 member states convened to strategize on tripling renewable capacity by 2030. Key discussions centered on enhancing Nationally Determined Contributions (NDC 3.0), supporting transitions in emerging economies, and mobilizing innovative financing for developing nations. IRENA Director-General Francesco La Camera stressed that renewables remain the most effective pathway to meet climate and development goals amid geopolitical shifts and technological breakthroughs like AI.

Slovenia, presiding over the Assembly, called for unity and cross-sector collaboration to ensure a just and inclusive energy future. The UAE reaffirmed its leadership role by showcasing investments in smart grids and renewable innovations. The Assembly concluded with a strong call for collective action to keep global decarbonization targets within reach.

Energy Future Forum 2025

Figure 1. Washington debates energy security in an era of rising demand.

On May 19, Washington, D.C. hosted the second annual Energy Future Forum, gathering policymakers, industry leaders, and analysts to address the realities of energy security, affordability, and reliability. Organized by RealClear Energy in partnership with the U.S. Chamber of Commerce, the event spotlighted the growing tension between ambitious climate goals and surging energy demand driven by AI-powered data centers and reshored manufacturing. Discussions revealed a shift in the policy "Overton Window," with pragmatic approaches gaining traction amid geopolitical uncertainty. Marty Durbin, President of the Global Energy Institute, emphasized the need for "more electrons, more transmission lines, and more critical minerals" to sustain economic growth. Experts debated strategies for balancing energy reliability with affordability, underscoring the importance of flexible infrastructure and diversified supply chains. The forum concluded with consensus on accelerating investment in both conventional and renewable energy sources to meet rising global demand.

MIT Energy Conference

Figure 1. Cambridge explores grid resiliency and storage breakthroughs.

Held September 9–10 at MIT, the annual MIT Energy Conference convened over 150 participants from academia, industry, and government to tackle emerging energy challenges. This year's theme, "Tackling Emerging Energy Challenges," highlighted grid resiliency, energy storage, and sustainable fuels.

A key session examined the April 2025 Iberian blackout, stressing the need for smarter, more resilient grids amid climate-driven disruptions and cyber threats. MIT researchers unveiled the "Data Center Power Forum," addressing soaring electricity demand from AI and cloud computing. Asegun Henry presented his "sun in a box" concept—a high-temperature thermal energy storage system using liquid metal and graphite to store electricity as heat for up to 500 hours.

Panels also explored sustainable aviation fuels and drop-in solutions to decarbonize hard-to-electrify sectors. Industry leaders agreed that partnerships across startups, utilities, and policymakers are essential to accelerate innovation and achieve a low-carbon future.

Services

CAREER CENTER

Energy Trading Analyst

Location: New York, New York

Company: GridEdge Markets

Description:

Analyze electricity and gas markets, develop trading strategies, and monitor real-time grid conditions. Requires strong quantitative skills and market experience.

How to Apply: Apply via GridEdge Markets careers page

Renewable Project Development Manager

Location: Denver, Colorado

Company: SolarWind Global

Description:

Lead development of large-scale solar and wind projects, manage permitting and stakeholder engagement. Experience in renewable project finance preferred.

How to Apply: Apply via SolarWind Global website

Power Plant Operations Supervisor

Location: Houston, Texas

Company: Luminex Energy

Description:

Supervise daily operations of a combined-cycle power plant, ensure compliance with safety standards, and manage shift teams. Requires 7+ years in plant operations.

How to Apply: Apply via Luminex Energy careers portal

Transmission Planning Engineer

Location: Chicago, Illinois

Company: PowerLink Infrastructure

Description:

Design and optimize high-voltage transmission systems, conduct load flow studies, and ensure NERC compliance. PE license and 5+ years in transmission planning required.

How to Apply: Apply via PowerLink Infrastructure website

COMING EVENTS

December 2025

Global Renewable Energy Summit

Type: International Conference

Location: Berlin, Germany

Date: December 10–12, 2025

Description:

Focus on solar, wind, and storage technologies. Includes policy discussions and investment strategies.

Sign-Up: Register via Renewable Energy Council

Energy Transition Leadership Forum

Type: Executive Leadership Forum

Location: Houston, TX, USA

Date: December 15–16, 2025

Description:

Designed for energy executives to discuss decarbonization, ESG compliance, and future energy markets.

Sign-Up: Register via Energy Leaders Network

January 2026

Smart Grid & Digital Energy Conference

Type: Innovation & Technology Summit

Location: Amsterdam, Netherlands

Date: January 20–22, 2026

Description:

Explores smart grid technologies, IoT integration, and AI-driven energy management systems.

Sign-Up: Register via Smart Energy Alliance

Hydrogen Economy Forum

Type: Industry Forum

Location: Tokyo, Japan

Date: January 28–30, 2026

Description:

Covers hydrogen production, storage, and transportation. Includes global case studies and technology showcases.

Sign-Up: Register via Hydrogen Global Network

February 2026

Offshore Wind Leadership Conference

Type: Leadership Conference

Location: Copenhagen, Denmark

Date: February 12–14, 2026

Description:

Empowering leaders in offshore wind development through policy insights, financing models, and technology updates.

Sign-Up: Register via Offshore Wind Association

Women in Energy Leadership Summit

Type: Leadership Summit

Location: Dubai, UAE

Date: February 20–21, 2026

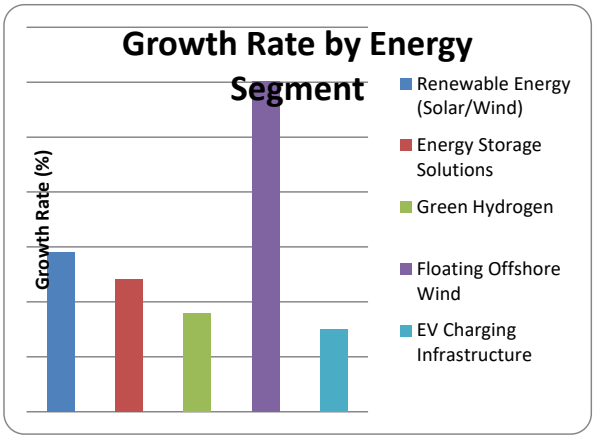
Description:

Promotes diversity and inclusion in the energy sector with mentorship programs and networking sessions.

Sign-Up: Register via Women in Energy Network

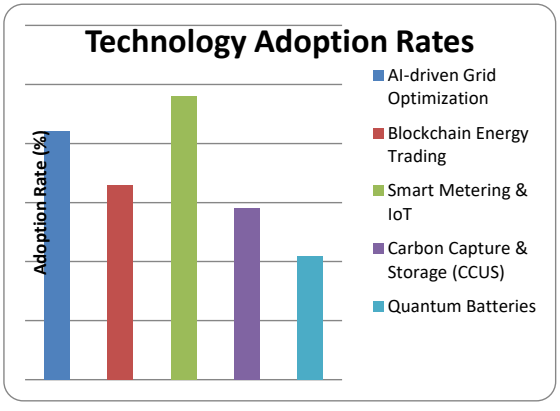
Products

Products	Region	Growth Rate (%)	Trend
Renewable Energy (Solar/Wind)	Global	29	Booming
Energy Storage Solutions	North America	24	Growing
Green Hydrogen	Europe	18	Emerging
Floating Offshore Wind	Asia-Pacific	60.1	Surging
EV Charging Infrastructure	Latin America	15	Rising



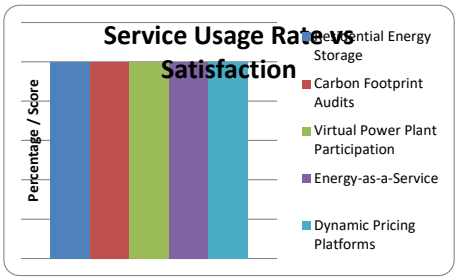
Technologies

Technology	Adoption Rate (%)	Impact Score	Trend
AI-driven Grid Optimization	42	9.3	Growing
Blockchain Energy Trading	33	8.5	Emerging
Smart Metering & IoT	48	9	Growing
Carbon Capture & Storage (CCUS)	29	8.1	Rising
Quantum Batteries	21	8.9	Emerging



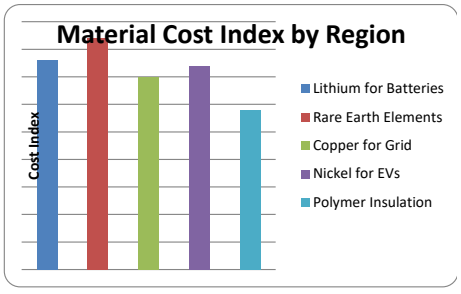
Services

Service	Usage Rate (%)	Satisfaction Score	Trend
Residential Energy Storage	58	8.6	Rising
Carbon Footprint Audits	46	9	Growing
Virtual Power Plant Participation	61	8.4	Steady
Energy-as-a-Service	44	8.9	Emerging
Dynamic Pricing Platforms	52	8.7	Rising



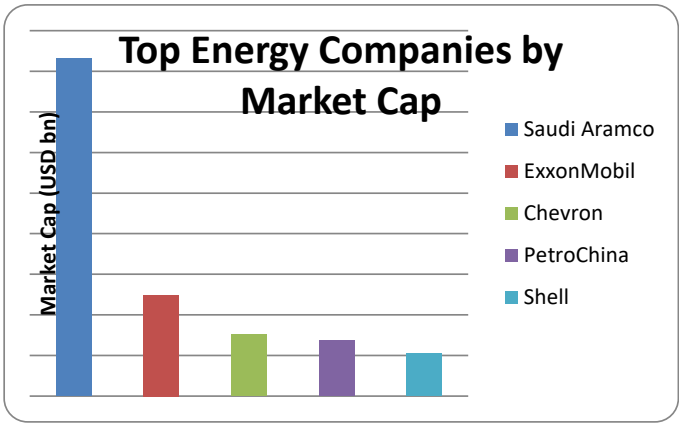
Services

Material	Region	Cost Index	Source
Lithium for Batteries	Global	3.8	Benchmark Minerals
Rare Earth Elements	Asia-Pacific	4.2	China Export
Copper for Grid	Latin America	3.5	Chile Mines
Nickel for EVs	Europe	3.7	Norway Supply
Polymer Insulation	North America	2.9	Local Manufacturers



Market Leaders

Rank	Company	Market Cap (USD bn)	Country
1	Saudi Aramco	1662	Saudi Arabia
2	ExxonMobil	499	USA
3	Chevron	302	USA
4	PetroChina	274	China
5	Shell	209	UK



Project Monitor / Initiation & Tendering

Tender Title	Country	Procuring Entity	Description	Contact
Green Hydrogen Hub Development	Saudi Arabia	NEOM	Construction of a large-scale green hydrogen production hub.	NEOM Procurement
Offshore Wind Farm Phase III	UK	Ørsted	Expansion of offshore wind capacity by 150MW.	Ørsted Tendering
Smart Grid and Energy Storage Upgrade	USA	Pacific Gas and Electric	Modernization of grid infrastructure with integrated battery storage.	PG&E Procurement
Geothermal Power Plant Construction	Indonesia	Pertamina Geothermal Energy	Development of a new geothermal plant with 100MW capacity.	Pertamina Tender Office

General Queries & Contact Info

energyHQ was founded in 2023 and seeks to become a full-fledged energy industry platform composed of multi-media channels, each having a large, specialized & worldwide audience. The platform actively participates at leading energy industry events which provides additional high-level exposure to promotional partners! energyHQ magazine is published monthly by One Media – a One World (1W) division - and is circulated to a select audience & also available by subscription.

Media Kit 2025	Everything about energyHQ ~ Here! https:// energyhq.world/media/1935/energyhq_media-kit_2025.pdf
Holisitic Promotional Packages (HPP)	From Bronze to Platinum Package ~One HPP To Rule Them All! https:// energyhq.world/packages
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Advertising / Promotional Queries	To receive a Customized Promotional Offer (CPO) or for all your advertising & promotional queries, please contact Mr. Jad Aboulhosn, Chief Marketing & Sales Officer, via mobile / WhatsApp: +961 3 039199 or email: marketing@energyHQ.world
Content / Editorial Queries	To submit your content / editorial material (for possible publishing – noting priority publishing of editorial material is provided to our promotional partners - or for all content & editorial inquiries, please contact Ms. Nada Hammoud, Content & Research Officer, via email: content@energyHQ.world

1M Industry Platfroms

One World (1W)* Team *(Email domain is @1world.xyz)*

Parent company of* **One Media (1M), *publisher of healthHQ*

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Schneider Electric	Phone (US): +1-877-342-5173	Schneider Electric is a global leader in energy management and automation. It provides solutions for electrification, automation, and digitalization across industries, homes, and infrastructure, including smart grids, industrial IoT, and energy efficiency technologies.	Germany	5
Tepe Prefabricated Construction Industry & Trade	Phone: +90 312 499 51 28	Tepe Prefabrik specializes in modular prefabricated buildings, living containers, steel frame structures, and turnkey mobilization camps for construction, oil & gas, energy, and mining projects. It offers design, engineering, manufacturing, and assembly services globally. [members.modular.org]	Turkiye	15

Small Modular Reactors: Redefining Global Energy Security

As the global energy landscape accelerates toward decarbonization, one technology stands out for its potential to deliver clean, reliable, and scalable power: Small Modular Reactors (SMRs). Unlike traditional nuclear plants, SMRs are compact, factory-built, and designed for flexible deployment—whether in remote industrial sites, urban grids, or regions with limited infrastructure.

SMRs offer a compelling solution to two pressing challenges: energy security and emissions reduction. Their modular design reduces construction timelines and costs, while advanced safety features minimize operational risks. For industries with high energy demands—such as manufacturing, data centers, and transportation—SMRs provide a stable, carbon-free alternative that complements intermittent renewables.

Global interest is surging. Governments and private investors are channeling resources into SMR development, recognizing its strategic role in achieving net-zero targets. Tech giants and utilities are exploring partnerships to integrate SMRs into future energy portfolios, signaling a paradigm shift in how we think about nuclear power.

Beyond their inherent safety and efficiency, SMRs play a pivotal role in enabling greater integration of renewable energy sources. By providing a stable baseload and rapid load-following capabilities, SMRs help balance the variability of wind and solar generation, ensuring grid reliability even during peak demand or intermittent supply. This synergy between nuclear and renewables creates a more resilient energy ecosystem, reducing dependence on fossil fuels while supporting ambitious decarbonization targets. For businesses and policymakers alike, this means SMRs are not just a nuclear solution—they are a strategic enabler for a cleaner, smarter, and more flexible energy future.

For decision-makers, the message is clear: SMRs are not a distant concept; they are an emerging reality. Their deployment could redefine energy resilience, offering a pathway to sustainable growth while safeguarding against volatility in traditional fuel markets.

Sincerely,

Dr. Nikolaos Katsiotis

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