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Dear Reader,

For many years, the Energy Show in San Diego has been a regular fixture in my professional calendar. It has been a place of exchange, innovation, and open debate about the future of clean energy.
This year, however, I will not be attending in person.
I never imagined I would have to write this.

The decision not to travel was not made lightly. Recent developments in the United States, including acts of violence, heightened political tensions, and growing uncertainty around civil protections, have created a situation in which personal safety and legal predictability can no longer be assumed. As someone who has publicly and repeatedly engaged in political commentary, and who has published a book critically examining Donald Trump and his presidency, I must take these risks seriously.

Choosing not to travel was not a decision against dialogue, cooperation, or the American clean energy community. It was certainly not a decision against the American people, nor against the United States as a country. Over many years, I have felt welcome in the U.S. I have experienced openness, professionalism, and a strong culture of collaboration across the energy sector. These experiences have shaped my work and my respect for the country in lasting ways.

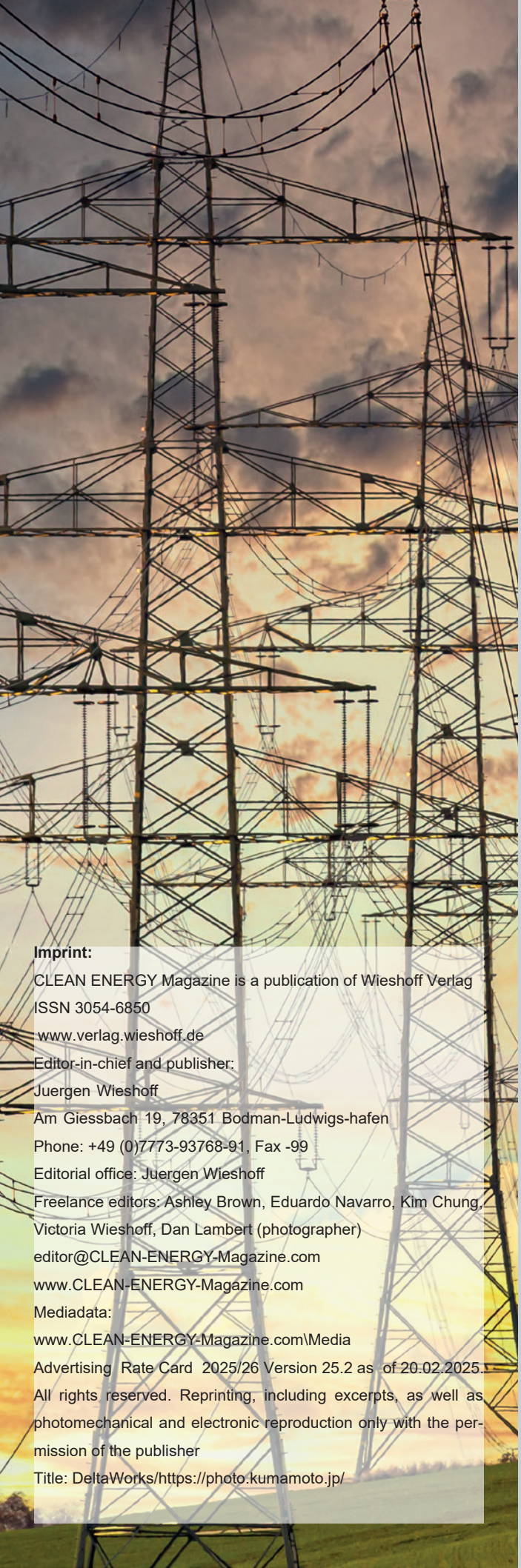
This decision is directed neither at individuals nor at a society that I know to be far more diverse, complex, and resilient than any single political moment might suggest. It is a response to current circumstances, not a judgment of a nation or its people. Precisely because of my many positive experiences in the United States, making this choice was particularly difficult.

Clean energy is not only about technology, infrastructure, or markets. It depends on trust, legal reliability, and social stability. Innovation thrives where institutions are strong, where critical voices are protected, and where open exchange is considered a strength rather than a risk. In this issue of Clean Energy Magazine, we therefore look beyond projects and policy targets. We examine how political uncertainty influences investment decisions, international cooperation, and long-term planning in the energy sector. The energy transition cannot be separated from the broader societal conditions that enable it to succeed.

I write this editorial with a sense of disbelief. I truly never expected to explain my absence from an energy conference in terms of personal safety and civil liberties. Yet editorial responsibility requires engaging honestly with the world as it is, not as we might wish it to be.

We will continue to engage, analyze, and report. From wherever we can do so responsibly, safely, and with clarity. Because the transition to clean energy depends not only on clean electrons, but on open societies capable of sustaining them.

Warm regards,
Juergen Wieshoff
Publisher, CLEAN ENERGY Magazine



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Editor-in-chief and publisher:

Juergen Wieshoff

Am Giessbach 19, 78351 Bodman-Ludwigs-hafen

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

Editorial office: Juergen Wieshoff

Freelance editors: Ashley Brown, Eduardo Navarro, Kim Chung, Victoria Wieshoff, Dan Lambert (photographer)

editor@CLEAN-ENERGY-Magazine.com

www.CLEAN-ENERGY-Magazine.com

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Leading the Way – Off Course: Germany's Energy Strategy

Why nuclear power is not the answer, what hydrogen really costs – and why renewable energies remain the only rational solution

It was an evening in January 2026 when Friedrich Merz stood before business representatives in Halle an der Saale and described the nuclear phase-out as a „serious mistake." On the podium, the newly elected Federal Chancellor outlined an energy future based on hydrogen-capable gas power plants, possibly new nuclear reactors, and the offshore wind of the North Sea. Just days later, at the North Sea Summit in Hamburg, he praised that very wind power – while reportedly describing it internally as a „transitional technology." This is no accidental contradiction. It is a symptom of a German energy debate that systematically oscillates between wishful thinking and technical reality.

This article follows the facts wherever they lead. And the facts show: the path back to nuclear power in Germany is not only politically blocked – it is technically and economically absurd.

The so-called hydrogen transition, as currently planned and priced, will remain an expensive illusion for years to come. And renewable energies are no longer a vision – they are the cheapest, fastest, and most mature technology the market offers today.

I. The Dream of Re-entry – and Why It Won't Come True

On April 15, 2023, Germany's last three nuclear power plants were taken off the grid: Isar 2 in Bavaria, Neckarwestheim 2 in Baden-Württemberg, and Emsland in Lower Saxony. It was the end of a decades-long political process, accelerated by Chernobyl in 1986 and shaken once more by Fukushima in 2011. Now, three years after the shutdown, the debate has returned – louder, more polemical, and above all worse informed than ever before.

Let us first look at what would technically be possible. According to the Fraunhofer Institute IKTS, up to eight reactor blocks in Germany are theoretically still reactivable, where decommissioning has not yet progressed too far.

Even by the most optimistic estimates – such as those of nuclear services provider Nukem – these could deliver power again at the earliest in 2030, if decommissioning were immediately halted and political will were present. That is already a scenario at the edge of what is physically feasible.

The operators themselves leave no doubt about this. EnBW stated unequivocally that resuming operation of its five nuclear power plants was no longer realistic. The plants are being actively dismantled. PreussenElektra expressed similar clarity. And Markus Krebber, CEO of energy group RWE, made a statement that is cited far too rarely in the debate: Germany had moved „beyond the point where we should reconnect decommissioned nuclear power plants to the grid." Nuclear power plants would „no longer be economically viable" given cheap wind and solar energy, licenses had expired, skilled workers were lacking, and economically viable operation would not be achievable without state-guaranteed minimum prices.

> ***„Germany is beyond the point where we should reconnect decommissioned nuclear power plants to the grid."***
> *Markus Krebber, CEO RWE*

But even if reactivation succeeded – what would be gained? The three most recently shut-down reactors had a combined capacity of around 4.2 gigawatts. In a German electricity system that already has over 145 gigawatts of installed renewable capacity and in which the share of renewables stood at 55 percent of net electricity consumption in 2023, this would be a marginal contribution. One that, moreover, would only be available until the reactors' technical end of life – and that would not add a single additional kilowatt of clean electricity to the system that renewables could not deliver faster, more cheaply, and without residual nuclear risk. When it comes to new nuclear power plants, the facts are even clearer.

A typical Western new-build with around one gigawatt of capacity costs approximately 10 billion US dollars at current prices – corresponding to investment costs of 10,000 dollars per installed kilowatt. Construction times for modern reactors have realistically been ten to fifteen years in recent years, as the examples of Finland (Olkiluoto 3: around 16 years) and France (Flamanville 3: likewise 16 years, still with problems) demonstrate. Even if political consensus, industrial capacity, and skilled personnel were available in Germany today – the earliest possible grid connection date would be in the late 2030s. For the goal of 80 percent renewables by 2030 and climate neutrality by 2045, that would be irrelevant.

Added to this are the regulatory hurdles: the Atomic Energy Act currently prohibits the construction of new nuclear power plants. An amendment would require political majorities in the Bundestag and Bundesrat – a contentious undertaking given the positions of many federal states. Nuclear regulatory authorities, having spent years overseeing decommissioning, would not be geared toward new construction permits. And the search for a final repository for highly radioactive waste is still ongoing in Germany – with a statutory target of 2031 that experts consider barely achievable. 27,000 cubic meters of highly radioactive waste already exist without a secured final repository. A re-entry would exacerbate this problem, not solve it.

The costs of disposal are difficult to fully capture. Depending on the calculation method, costs for the final storage of existing highly radioactive waste alone are estimated at between 8.3 and 51 billion euros – an enormous range that shows how uncertain these long-term calculations are. Professor Mathias Mier of the ifo Institute summed up the situation concisely: „The construction of new nuclear power plants makes no sense."

DIW economist Claudia Kemfert framed it from an economic policy perspective: renewable energies were far cheaper and more economically stimulating – nuclear power was „not a sensible energy source in Germany."

This is not about ideologically dismissing nuclear power. The question is of a factual nature: can nuclear power contribute to decarbonization in Germany within a relevant timeframe and at acceptable costs? The answer that follows from the sum of these facts is clear: no.

II. Nuclear Power Internationally – A Nuclear Boom That Only Happens in China

Anyone following the nuclear debate repeatedly encounters the argument that the technology is experiencing an international renaissance. That is true – but only if you look closely at where.

Globally, the share of nuclear energy in the electricity mix has fallen from 17.5 percent in 1996 to around 9 percent today. More reactors are being shut down than new ones are being built. Of the approximately 63 countries that currently use or are developing nuclear power, only 8 are actively building new reactors. In 23 other countries with existing nuclear facilities, there is no expansion whatsoever. The nuclear fleet is aging: the average age of reactors worldwide is nearly 32 years; in France, nearly 39 years. This global trend is unambiguous – it shows a technology that is being managed, not developed, in most countries.

The only true outlier is China. No other country is building as many reactors simultaneously. At the end of 2025, 32 nuclear power plants were under construction in China – more than in the entire rest of the world combined, where 31 reactors were under construction. Since 2005, China has commissioned 51 new reactors without decommissioning a single one. This Chinese special case is the primary reason why global nuclear electricity production recently again reached the historical peak of 2006. Without China, it would be significantly lower.

For Germany, but also for Europe, China‘s nuclear boom is not a model but a mirror. It shows how central state planning capacities, financial state power, and low participation requirements are for rapid reactor construction. China builds standardized and in series – construction times of five to seven years are possible because Western democratic safety, public participation, and permitting procedures are absent. That is not a model transferable to Germany, even if one wanted it to be.

France: The Warning Image for New Construction Projects

France is the country most dependent on nuclear power, with around 70 percent of electricity generation coming from it – and the country that therefore knows the technology best. The lesson that France imparts should give pause to those recommending a nuclear renaissance for Germany.

Macron‘s announcement of a „rebirth of nuclear power“ encompasses the construction of up to 14 new EPR 2 reactors by 2050. Six have already been ordered. EDF raised its cost estimate for these six EPR 2 reactors to 67.4 billion euros at the end of 2023 – around 30 percent more than previous projections. The French Court of Auditors warned in a report from January 2025 of „considerable uncertainties“ and an „accumulation of risks.“ It recommended waiting to begin construction until financing and planning were on a sound footing.

The pattern is not new. The EPR reactor at Flamanville, under construction since 2007, was originally budgeted at 3.3 billion euros – the estimate has since risen to 23.7 billion euros. It was first connected to the grid only at the end of 2023 but must be shut down again in 2026 because a faulty reactor lid needs to be replaced. The first new EPR 2 is currently planned to begin operations at the earliest in 2038.
Flamanville: Planned for 3.3 billion euros – final bill: 23.7 billion. 16 years of construction. A faulty lid.

Finland has had similar experiences: Olkiluoto 3, Europe‘s first new EPR, cost around 11 billion euros instead of the originally planned 3 billion – an increase of more than 260 percent. The reactor entered service in April 2023, 16 years after construction began. Finland‘s positive example is the „Onkalo“ repository project: as the first country in the world, Finland has an approved deep geological repository for spent fuel under construction, 450 meters deep in granite. That is impressive – but it is the result of decades of political consensus that will not be achievable in Germany in the foreseeable future.

Canada, USA, Sweden: The SMR Hope
For nuclear power advocates, the hope no longer lies with classic large reactors but with so-called Small Modular Reactors (SMRs) – smaller, serially manufactured units below 300 megawatts of electrical output. Canada is furthest along: Ontario Power Generation has decided to build a BWRX-300 reactor at the Darlington site. It is expected to be completed by 2028/2029 and would be the first SMR at commercial scale in a G7 country.
Expectations are high. But the numbers are sobering. For this single 300-megawatt reactor, OPG estimates investment costs of around 7.7 billion Canadian dollars – equivalent to approximately 5.3 billion euros for 300 megawatts of installed capacity. By comparison: an offshore wind farm with comparable capacity currently costs around 1.5 to 2 billion euros in Europe – with a shorter construction time and no disposal questions.
For four planned units at Darlington, the total price is estimated at nearly 21 billion Canadian dollars.
There are also SMR projects in the USA, and US reactor manufacturer NuScale received a license from the Nuclear Regulatory Commission (NRC) in 2022 as the first company to do so. But the promised pilot project in Utah was abandoned in 2023 after the cost estimate rose to 9.3 billion dollars for 462 megawatts. The IEEFA calculated electricity generation costs of 119 dollars per megawatt-hour – and that without external costs such as disposal and state insurance.
The IW Cologne judges soberly: SMRs will likely play no significant role in Germany‘s climate neutrality by 2045, as they arrive too late and are too expensive. This aligns with the assessment of many energy economists: SMRs are interesting research objects, but no solution to the climate problem of the 2030s.

III. SMR, Thorium, Fusion – Technologies of the Future or Distractions?
In the political debate, alternative nuclear technologies come up most frequently precisely when the arguments for conventional nuclear power have been exhausted. SMRs are mentioned in the same breath as thorium reactors and nuclear fusion – as if these were mature technologies that merely needed a little political will to save the energy transition. Reality is more complicated.

Thorium Reactors: Promises with a Long-Term Timeline
Thorium reactors – more precisely, molten salt reactors with thorium as breeding material – theoretically promise considerable advantages: thorium is three times more abundant in the Earth‘s crust than uranium, the technology produces less long-lived nuclear waste, and the liquid core material can drain into a passively safe state in the event of incidents. China has been operating a 2-megawatt experimental reactor in the Gobi Desert since September 2021 – the first thorium molten salt reactor since the 1960s. A larger reactor with 373 megawatts of thermal output is planned to follow by 2030.

But the physics of the technology is demanding. Thorium is not directly fissile but must first be converted into fissile uranium-233 by neutron irradiation. To start a thorium reactor, some fissile material is always initially needed – uranium or plutonium.

The molten salt in which the fuels are dissolved is highly corrosive and attacks pipes and seals. Materials science here has decades of catching up to do compared to conventional reactor construction. Proliferation risks must also be considered: the irradiation of thorium produces uranium-233, which under certain conditions can be used for weapons programs.

The World Nuclear Industry Status Report assesses the results soberly: the first pilot plants – Russia‘s floating small power station Akademik Lomonosov and China‘s HTR-PM – have so far delivered disappointing results: high costs, low output, complicated operation. The technology is „not very glamorous“ in its real-world performance. Until thorium reactors become commercially available, expert estimates put the timeline at at least 20 to 30 years.

Nuclear Fusion: The Eternal Promise

Few energy topics have so consistently raised hopes – and so consistently pointed to a distant horizon – as nuclear fusion. Yet remarkable things have genuinely happened in research: in December 2022, the American National Ignition Facility achieved a net energy gain in a fusion experiment for the first time. Private companies such as Commonwealth Fusion Systems, Helion Energy, or Munich-based spin-off Proxima Fusion – spun out of the Max Planck Institute for Plasma Physics – are working on commercial concepts with considerable capital and increasing pace.

Nevertheless: the DIW Berlin concluded in a 2025 study that commercial energy generation through nuclear fusion is not foreseeable in the near term – meaning the next 25 to 30 years. The international ITER project, the world‘s largest fusion research reactor, announced in the same year further delays and cost overruns of 5 billion euros. A demonstration power plant – DEMO – is planned to operate around 2050 under current plans. A commercial fusion power plant would, on this timeline, be expected at the earliest in the 2060s to 2070s.

The German Academies of Sciences (ESYS) have also stated unequivocally in an impulse paper on nuclear fusion: for climate neutrality by 2045, and even by 2050, fusion plays no role. The technology is not an option for the energy transition of the 21st century – it is a long-term research program that should be pursued in parallel but must not influence today‘s political energy decisions.

Nuclear fusion remains what it has been for 70 years: the energy of the future – and irrelevant to the urgent climate targets of the next decade.

The lesson from examining all three technologies – SMR, thorium, fusion – is the same: they are scientifically interesting, in some cases promising, but without significance for Germany‘s decarbonization

in the decisive years 2025 to 2040. Whoever bets on them today is choosing a future hope as an excuse for inaction in the present.

IV. The Hydrogen Detour – The Calculation of the Impossible

In January 2026, Federal Chancellor Friedrich Merz said at a business reception (left) that new gas power plants could be built „without needing to be hydrogen-capable from day one.“ His reasoning: „We don‘t have the hydrogen that we would actually need for that.“ With this, Merz unwittingly delivered one of the most precise energy policy diagnoses of his term in office. What he meant as justification for delay is in reality the core statement against the entire hydrogen power plant strategy: the hydrogen is missing. And it will remain missing for a very long time.

What H2-Ready Really Means

„H2-Ready“ has become a buzzword in German energy policy. It refers to gas power plants designed technically to allow later conversion to hydrogen. The Merz government plans to build around 10 gigawatts of new controllable power generation capacity to be tendered as „hydrogen-capable.“

What does this mean technically? The leading gas turbine manufacturers – Siemens Energy, GE Vernova, Mitsubishi – have made considerable progress in recent years. In 2023, Siemens Energy became the first company to receive a TÜV certificate for an H2-Ready power plant concept, guaranteeing turbines capable of processing up to 75 percent hydrogen admixture from commissioning. GE Vernova declared its intention to achieve full 100-percent hydrogen capability for all gas turbines by 2030. EnBW commissioned one of Germany‘s first „hydrogen-capable“ combined cycle gas turbine (CCGT) power plants in Stuttgart-Münster in mid-2025.

That sounds good. The detail view is sobering. H2-Ready means that the turbines are designed for later conversion – not that they operate on hydrogen today or tomorrow.

EnBW itself stated clearly: the Stuttgart plant would „presumably undergo a second fuel switch in the mid-2030s“ to run on up to 100 percent hydrogen – provided it is „available in sufficient quantities.“ Until then, it runs on natural gas.

There are also real technical limits. Up to five percent hydrogen admixture requires hardly any modifications. From around 25 percent, new burner technologies are required. At higher proportions, increased NOx emissions arise from the water vapor in the exhaust gases, creating regulatory challenges. Large high-performance turbines require step-by-step, years-long testing before they can be reliably operated with high hydrogen proportions. Fraunhofer ISI explicitly noted in a study for the Deutsche Umwelthilfe (DUH) that the permanent operation of these power plants with hydrogen is a pure assumption – not a technical certainty.

The Cost Calculation: Green Hydrogen and Its Price Reality

The actual weakness of the hydrogen strategy is price. Green hydrogen – i.e., hydrogen produced by electrolysis with renewable electricity – currently costs between 6 and 10 euros per kilogram, depending on production location and electricity procurement costs. The Research and Development Society for Energy FfE Munich analyzed in a recent discussion paper why earlier projections for cost reductions of electrolyzers were systematically too optimistic: actual project costs in the past were far above model projections because idealized assumptions about the hydrogen ramp-up and electricity costs were used.

For 2030, current studies project hydrogen prices of approximately 4 to 7 euros per kilogram for favorably produced imported hydrogen. In the long term – with optimistic scaling and large imports – the price could fall to 2 to 3 euros per kilogram. The Federal Ministry for Economic Affairs itself stated that green hydrogen should enable fully decarbonized power plants by 2045. How this path looks economically is calculated by Fraunhofer ISE in a brief analysis of flexible power plants:

The electricity generation costs of a newly built hydrogen-fired gas power plant currently stand at around 40 to 60 cents per kilowatt-hour – calculated with current hydrogen prices and realistic operating hours.

For comparison: new onshore wind turbines generate electricity for 4 to 7 cents per kilowatt-hour, new ground-mounted solar plants for 4 to 7 cents, offshore wind for 7 to 10 cents. Even in the most optimistic scenario – hydrogen price at 2 euros per kilogram, high full-load hours, no intermediate storage costs – H2 power plant costs still stand at around

15 to 20 cents per kilowatt-hour. This technology is planned for periods of „Dunkelflaute“ – times of low wind and solar irradiation. In such phases, the plants typically run for 500 to 1,500 hours per year – which further increases generation costs due to poor utilization.
H2 power currently costs 40–60 cents per kWh. New wind power: 4–7 cents. This cost difference is the actual message of the hydrogen strategy.

The Import Route: From Saudi Arabia to Germany
Because green hydrogen cannot be produced in Germany itself in sufficient quantities, energy policy relies on imports. The concept: in sun- and wind-rich countries like Saudi Arabia, Morocco, Chile, or Australia, hydrogen is produced cheaply via electrolysis, then converted to ammonia (NH□ to enable transport and storage) and shipped to Germany, where it is reconverted and used.

EnBW signed a framework agreement with Saudi energy group ACWA Power in February 2026 – for a possible supply of green ammonia from the NEOM project in Saudi Arabia. Economics Minister Katherina Reiche visited Saudi Arabia shortly before and signed energy partnerships. That sounds good. The cost structure, however, is complex and raises questions.

The cost chain for imported hydrogen via ammonia looks simplified as follows: in the most favorable case, the NEOM project in Saudi Arabia produces ammonia at production costs of around 400 to 500 dollars per ton. After transport across the Mediterranean, offloading in Germany, reconversion to hydrogen (so-called „cracking“) and conversion losses, a final price results that, depending on the calculation basis, stands at a minimum of 5 to 7 euros per kilogram of hydrogen.

The DVGW fact sheet on hydrogen import economics puts production costs for selected supply countries for 2030 at 2 to 4 euros per kilogram at the production site – before conversion, transport, and reconversion are factored in, which add another 1.5 to 3 euros depending on the route.

The issue of availability adds to this. The H2Global program – a state-funded procurement program for green hydrogen – completed its first pilot auction in 2025. The result: deliveries of around 19,500 tons of renewable ammonia from 2027 were pledged.

That sounds like a milestone, but in relation to Germany‘s hydrogen demand it is tiny – even for the narrowest use case of a handful of H2 power plants. For comparison: a single CCGT power plant with 800 megawatts of capacity, operated for 2,000 full-load hours per year with hydrogen, requires around 150,000 to 200,000 tons of hydrogen per year. Germany‘s entire planned import infrastructure is to be built up gradually by 2030 – a process that requires pipelines from Southern Europe and North Africa, ammonia terminals at German ports, and industrial cracking plants. All of this has yet to be built and will, even under optimal conditions, not be available at relevant scale until the early 2030s at the earliest.

Merz and Wind Power as a „Transitional Technology“
In this context, another statement by the Federal Chancellor is particularly revealing. At the North Sea Summit on January 26, 2026, to which Merz had invited the heads of government of all North Sea coastal states, offshore wind power was invoked as the „world‘s largest energy hub.“ Germany committed itself to ambitious expansion. At the same time, the Berliner Morgenpost reported that Merz had emphasized internally that wind power was for him only a „transitional technology“ – his focus lay elsewhere.

This statement stands in a curious contrast to the figures. Last year, the offshore wind share in Germany stood at around 15 percent of the electricity mix and is to rise to around 20 percent under current plans. Offshore wind electricity prices in Europe currently stand at 7 to 10 cents per kilowatt-hour – dramatically cheaper than any form of nuclear power or hydrogen-based electricity generation.

© Nordex

The steel, mechanical engineering, and electrical engineering industries needed for wind turbines are based in Germany. The technology transfer, the value creation, the jobs – all of that stays domestic with wind power.
Whoever describes offshore wind as a „transitional technology“ without naming what should come after does not describe a plan. They describe a gap.

V. The Way Forward – Renewables as the Only Rational Answer

There is an energy technology that has become up to 80 percent cheaper over the last ten years. There is a technology that already supplies more than half of Germany‘s electricity today without problems of final storage, accident risks, or fuel dependency on geopolitically insecure regions. There is a technology for which the infrastructure, the industry, the skilled workers, and the political consensus exist across broad sections of society. This technology is called renewable energy – and it is no longer a vision but lived reality.

In 2023, 55 percent of German net electricity consumption came from wind, sun, hydropower, and biomass. In the years 2022 to 2024 alone, 36 gigawatts of new solar capacity and a net 8 gigawatts of wind power were installed. The goal of achieving an 80 percent share by 2030 appears ambitious but achievable under these conditions – provided the expansion maintains its pace.

The Cost Revolution: How Solar and Wind Have Changed Energy Markets

The electricity generation costs of renewable energies have changed dramatically over the past ten years. Fraunhofer ISE puts the generation costs of new ground-mounted photovoltaic plants in Germany at 4.1 to 6.9 cents per kilowatt-hour (2024).

IRENA calculated that solar electricity globally costs an average of 4.3 US cents per kilowatt-hour in 2024 – cheaper than any conventional alternative. Lazard, the internationally renowned advisory firm, confirmed in its LCOE+ Report 2025: new onshore wind turbines and new solar PV are the cheapest sources of new electricity generation worldwide.

By comparison, the cost curves for nuclear energy have moved in the opposite direction. While solar became 80 percent cheaper in ten years and wind energy 60 percent cheaper, the electricity generation costs of new nuclear power plants rose by around 47 percent. This is no coincidence or cyclical fluctuation – it is a structurally different dynamic: renewables benefit from learning curves, economies of scale, and global mass production. Nuclear power suffers from the opposite: increasing regulatory complexity, safety requirements, and the de facto end of industrial reactor construction in Europe and North America.

The Flexibility Problem – and Its Solutions

The most common argument against a 100-percent-renewable strategy is the question of security of supply. What happens when the wind doesn‘t blow and the sun doesn‘t shine – the so-called „Dunkelflaute“? It is a legitimate question. But the honest answer is: the problem is solvable, and the solutions are available.

First, storage. Grid-scale battery storage has undergone a similar cost curve in recent years to solar PV. Globally, according to the IEA, twelve times more battery storage capacity was installed in 2025 than in 2021 – within just four years. In Germany, home storage is on the rise: 183,000 home storage systems were sold in the second half of 2025 alone. Large stationary battery storage systems are increasingly being deployed in the grid as well.

Second, gas power plants – more precisely: as backup capacity, not as baseload supply. That is precisely the role that hydrogen-capable gas power plants could and should play. But this role is a different one from that often described in the political debate. They do not run continuously – they run in extreme situations. That makes them unattractive for investors, which is why state capacity markets or premiums are necessary. That is not a fault of renewable energies. It is the normal economic problem of maintaining reserve capacity in any electricity system.

Third, the grids. Germany has for years lagged behind the requirements of renewable energy expansion in network development. The result is systemic curtailment – cutting wind power because it cannot be transported. In 2024, according to Strategic Energy Europe, around 97 percent more solar and wind power was curtailed than in the previous year. That is an enormous waste of resources and a clear indication of where investment must go: into transmission and distribution networks, not into new power plants.

Fourth, Power-to-X technologies. Surplus wind power can be used to produce hydrogen – but sensibly for applications where hydrogen is unavoidable: steel, chemicals, shipping, heavy-duty transport. Not for re-electrification, which is massively inefficient. An electrolysis efficiency of 70 to 80 percent, followed by a re-electrification efficiency of 55 to 60 percent, yields an overall round-trip efficiency of only around 40 to 48 percent. Every kilowatt-hour of wind power re-electrified as hydrogen costs more than twice as much as a kilowatt-hour used directly. Power-to-X is not an energy supplier – it is an energy storage medium for sectors without alternatives.

Offshore Wind: The Untapped Potential

Germany possesses one of the most attractive offshore resources in Europe. The North Sea offers wind speeds that enable full-load hours of over 4,000 hours per year – corresponding to a utilization rate of almost 46 percent, twice as much as typical onshore sites. The potential of the German North Sea and Baltic Sea is far from exhausted.

At the North Sea Summit in January 2026, the coastal states committed to an ambitious joint expansion. This is politically significant because offshore wind is a European infrastructure project that requires cross-border network planning, port expansion, and international supply chains. Germany has in recent years raised its expansion target corridor: 70 gigawatts of offshore wind by 2045 is the current target, with interim steps of 30 gigawatts by 2030.

These figures are achievable, but only with consistent action on permitting procedures, grid connections, and industrial capacity. The German industry – Siemens Energy, Vestas, Nordex – is capable of building these turbines. The value creation stays in the country. That is a fundamental difference to uranium imports for nuclear power plants or ammonia imports for hydrogen power plants.

The Employment and Economic Dimension
The energy transition is not merely environmental policy – it is industrial policy. BloombergNEF recorded global energy transition investments of 2.3 trillion US dollars for 2025, an increase of 8 percent over 2024. Europe and Germany have a choice: will they become producers of these technologies or importers?

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Solar PV manufacturing has largely migrated to China. That is a real problem – but not an argument against solar, but rather an argument for a European industrial policy that secures raw and intermediate materials, builds manufacturing capacities, and trains skilled workers in the process. Wind energy, on the other hand, is a domain in which Europe is still the world market leader. Denmark, Germany, Spain, and the Netherlands dominate the global market for wind turbines. Preserving this lead – that is an economic future question.

A re-entry into nuclear power would do the opposite: tie up capital that is needed for renewable energy expansion. Divert skilled workers who are needed as engineers for wind projects and grids. Tie up political energy and regulatory capacity for a project that would deliver electricity at the earliest in ten to fifteen years. That is not a theoretical concern – it is the outcome of historical experience from every country that has invested in both in parallel in recent decades.

VI. What Really Needs to Be Done – A Realistic Program
The debate about nuclear power and hydrogen risks distracting from what is actually urgent. Because the real bottlenecks of the German energy transition are not technological in nature – they are political, regulatory, and infrastructural.

Here is what is needed:
First, accelerated grid expansion. Without efficient transmission networks, wind power from northern Germany cannot flow to the industrial centers in the south. That is the most pressing problem. The Federal Network Agency has clear plans – they need political prioritization, not further expert reports.
Second, streamlined permitting procedures. Onshore wind projects in Germany struggle with permitting times of five to seven years. Species protection legal challenges, municipal resistance, and federal fragmentation delay expansion.

Other European countries like Denmark or Norway complete comparable projects in half the time. That is a regulatory performance gap that can be closed.
Third, an investment framework for storage. The market for grid-scale storage needs clear regulatory frameworks – remuneration models, grid connection rights, demarcation from other flexibility markets. Without these, investments will not materialize.

Fourth, a realistic hydrogen strategy. That means: prioritizing hydrogen for applications without electrical alternatives. No large-scale admixture into the gas grid that produces efficiency losses without climate benefit. No re-electrification as regular operation. Instead: clear sector allocation, industrial ramp-up strategy, and honest communication about the price path.

Fifth, a consistent commitment to offshore wind as a core industrial policy project. That means: expanding ports, training skilled workers, securing supply chains, and treating wind energy not as a transitional technology but as a cornerstone of the future electricity system.

Conclusion: No Wrong Turn Without a Decision
Germany stands at an energy policy crossroads. The decision is not an abstract choice between technologies – it is a decision about capital, time, and political credibility. Both are finite.

Whoever describes nuclear power as a serious contribution to the energy transition of the 2030s misunderstands the physics of the project. Whoever plans hydrogen as cheap backup power ignores thermodynamics. And whoever treats wind power as a „transitional technology“ carelessly surrenders one of the greatest economic opportunities in German industrial history.

The renewable energy transformation is not a linear continuation of the fossil age with a green coat of paint. It is a systemic change – toward decentralized, cheap, domestic generation with entirely different economic logics than the large power plants of the 20th century. This systemic change is in full swing. It is happening in Germany, in Europe, in China, in the USA, in Australia, and in India. The question is not whether – the question is only whether Germany will be a shaper or a bystander of this transformation.

„Renewable energies are no longer a vision of the future – they are the cheapest, fastest, and most mature technology the market offers today.“
The facts supporting this assessment do not come from environmental organizations or activists. They come from Fraunhofer ISE, from IW Cologne, from the ifo Institute, from the International Energy Agency, from Lazard, from BloombergNEF, from IRENA. They come from the RWE CEO and from the ifo economics professor. They come, if you listen carefully, even from Friedrich Merz himself, when he says: „We don‘t have the hydrogen that we would actually need for that.“

Germany‘s wrong turn does not consist of having shut down nuclear power. It would consist of following the wrong technologies once again, in the face of the clearest energy price signals in the history of industrial society – out of habit, out of fear of change, or out of the political reflex to defend the old.

The alternative is tangible. It stands on every roof, turns in every offshore wind farm, and is in the process of fundamentally transforming the global electricity system. Germany can participate in this – but only if it stops looking in the wrong direction.

The Editor‘s Take
“Leading the Way – Off Course” may ultimately describe not a technological failure, but a political one. Energy systems at this scale are not governed by slogans or symbolic reversals. They are governed by grid physics, capital intensity, industrial demand curves and integration constraints. When debate reduces these variables to familiar narratives, it reveals less about strategic alternatives than about institutional strain.

Germany’s challenge is not a shortage of technological pathways. Nor is it a lack of options. It is the recurring impulse to reopen foundational questions without fully acknowledging how far the system has already evolved — and how deeply its new architecture is embedded in infrastructure, capital flows and industrial planning.

At this stage of the transition, energy policy cannot be steered by reflex, nostalgia or short-term political pressure. It requires technical literacy, systems thinking and long-term capital discipline. In short, it requires expertise equal to the complexity of the undertaking.

The real risk is not that Germany has chosen the wrong technologies. It is that the debate underestimates the sophistication of the system already in motion.

If the country intends to remain a leader, system design must be guided less by political immediacy and more by technical competence. The energy transition has moved beyond symbolism. It now belongs — quietly, structurally and irreversibly — to those who understand how it actually works.

Juergen Wieshoff

About the Study

The present study, “Germany’s Energy Future 2025–2045: Fact Check on Nuclear Power, Hydrogen Technologies and Renewable Energy,” was developed against the backdrop of an energy policy debate in Germany that has increasingly been shaped by political narratives rather than technological realities and robust data. The current positioning of the German federal government on key questions of energy supply visibly follows political objectives that withstand technical and scientific scrutiny only to a limited extent.

Whether regarding a possible re-entry into nuclear energy, the role of hydrogen technologies, or the realistic expansion potential of renewable energy, public discourse is too often dominated by simplified messaging while complex technical and economic realities recede into the background.

This study addresses precisely that gap. Its objective is to establish a clear factual framework based on current data and independent analysis—beyond ideology and partisan opportunism. It is directed at decision-makers in politics and industry, professionals within the energy sector, and an interested public seeking a well-founded and differentiated basis for forming opinions. Sustainable energy policy cannot be built on wishful thinking. It must align with facts, technological maturity, and economic feasibility.

The study draws on recognized international sources, including the International Energy Agency (IEA), IRENA, BloombergNEF, and the Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE). The analysis aims to assess technological developments realistically, present cost dynamics transparently, and critically examine politically defined targets—such as climate neutrality by 2045 and 80 % renewable electricity by 2030—for their practical feasibility.

The study was developed in cooperation between the Wieshoff Consulting Research Lab and Clean Energy Magazine. The Wieshoff Consulting Research Lab is the research division of Wieshoff Consulting and is dedicated to scientifically grounded analysis of energy and technology markets, regulatory frameworks, and strategic transformation processes in the field of clean energy. With an interdisciplinary approach, the Research Lab combines technical expertise with economic and regulatory perspectives, delivering analyses that go beyond pure market observation.

Clean Energy Magazine is among the leading international online publications covering innovation topics, with a particular focus on renewable energy, energy storage, and the global energy transition. As an independent media platform, it contributes an international perspective and deep understanding of technological trends to this collaboration.

Download Study: www.wieshoff.com

About us

CLEAN ENERGY Magazine is a FREE digital publication dedicated to the burgeoning sector of renewable and sustainable energy. Through insightful articles, latest news updates, and in-depth analyses, the magazine endeavors to be the vanguard of critical discussions surrounding energy generation, storage, and its sustainable use.

The focus extends to the realm of mobility, exploring how clean energy can revolutionize transportation, making it eco-friendlier and more efficient. In the digitalization sector, it delves into the role of modern technology in optimizing energy use, promoting sustainability, and propelling the world towards a greener future.

With a penchant for thorough research and a diverse panel of experts contributing to their stories, CLEAN ENERGY Magazine aims to inform, educate, and inspire individuals and organizations alike to partake in the global movement towards clean energy and sustainability. The goal is to foster a well-informed community ready to engage with the clean energy revolution, making a tangible impact on the world.

CLEAN ENERGY Magazine is produced exclusively as an electronic medium (PDF file), optimized for display on mobile devices. Electronic media are standard today. In addition to the ecological aspects (which are obvious), the cost-effective as well as rapid dissemination of information speaks for the success of the new media. In the USA and Asia, they are almost on a par with their printed counterparts. The magazine is available for download at www.clean-energy-magazine.com, and it is FREE to all readers.

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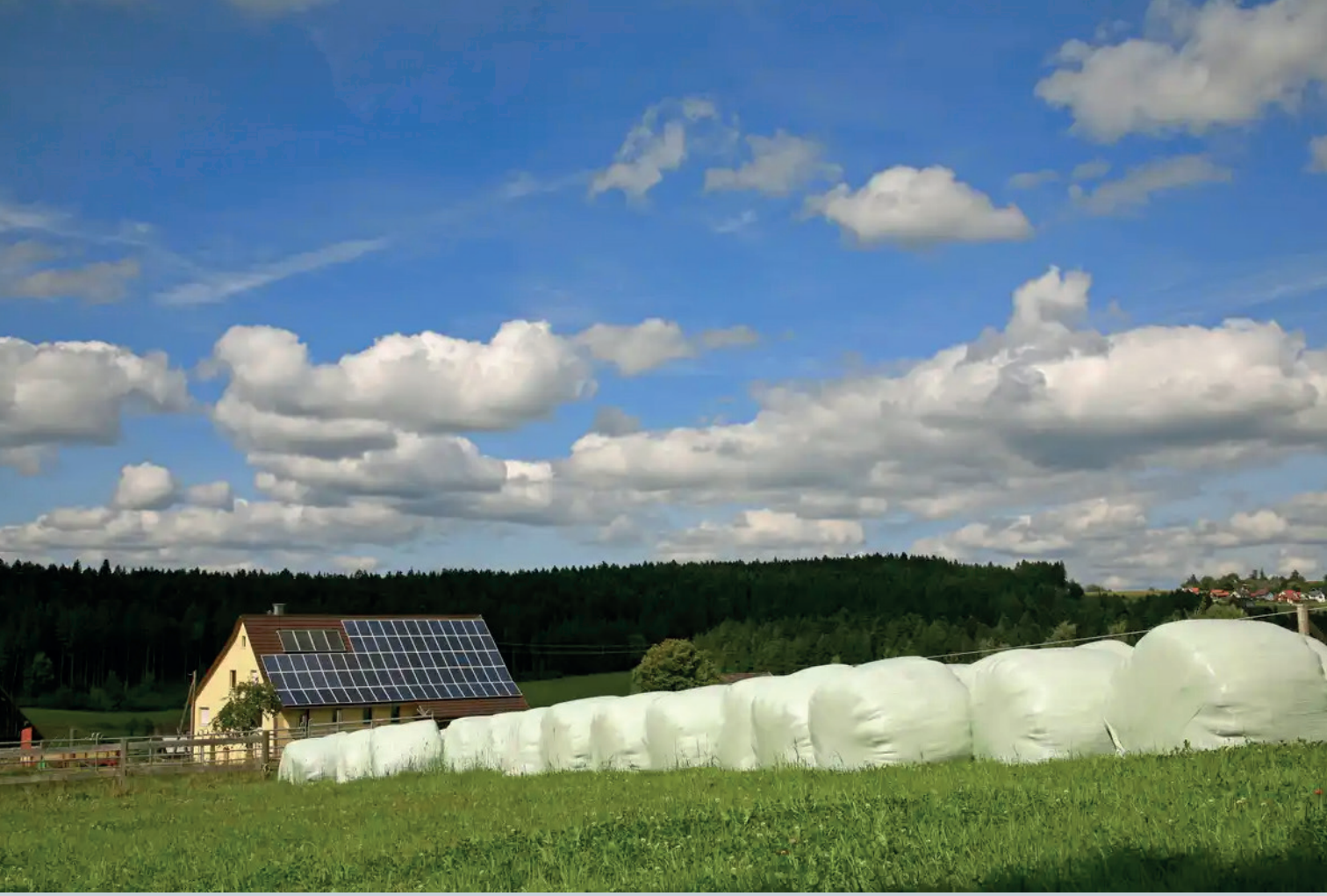

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The EU's vision of citizen energy remains a dream – for now

The dream of an EU energy revolution at local level is being slowed down by technical and legal hurdles, according to a new report from the European Court of Auditors (ECA). Citizens, local authorities and small businesses across the EU were meant to increasingly produce, manage, share and consume their own energy through 'energy communities'. But almost a decade after these ambitions were set, the EU auditors paint a sobering picture: progress is lagging far behind expectations. To help these citizen-led initiatives fulfil their promise, they call for clearer rules, stronger incentives for citizens and vulnerable households, and more support for the development of energy storage solutions.

Energy communities are legal structures that allow people, local authorities and small businesses to join forces to generate, manage, share and use energy. That can mean anything from solar panels on shared rooftops to jointly-owned wind turbines supplying electricity to a village or neighborhood.

These initiatives are eligible for EU funding worth billions of euros. The EU has considered energy communities to be a powerful lever for meeting its climate and energy targets, anticipating that by 2030 they could account for a significant share – 17% and 21%, respectively – of Europe's wind and solar capacity.

On the ground, things are looking bleaker: the estimate was overly optimistic, say the auditors. One of the main reasons is that there are simply not enough energy communities across the EU.
"As the EU races to meet its climate and energy goals, citizen-led energy remains a compelling idea – ideal in theory, but challenging in practice", said João Leão, the ECA Member responsible for the audit. "The EU now needs to sweep away legal hurdles and technical roadblocks to make it work effectively on the ground."

One aim at EU level was for every municipality of over 10 000 inhabitants to host at least one renewables-based energy community by 2025. The European Commission has not yet reported on this goal, but data compiled by the EU auditors show that the EU has largely missed its target.

The EU's unclear definitions have led to confusion over what exactly qualifies as an energy community, how to structure one, how to share the electricity it produces, and how to sell surplus power. This legal fog risks deterring citizens' involvement, and ultimately hampers the creation of energy communities.

This is particularly true for apartment buildings – home to nearly half of the EU population – where the prospect of adding a new legal entity on top of existing owners' associations created to manage buildings can seem like just another layer of red tape.

Furthermore, delays or refusals to connect new facilities because of grid congestion are slowing the development of energy communities. Part of the problem is that production and consumption patterns do not naturally match: solar panels generate most of their power around midday, while household demand peaks in the early morning and evening. Combining new renewable-energy projects with flexible services – in particular energy storage – could help to balance supply and demand in real time, reduce grid pressure, and boost self-consumption of locally generated electricity. However, the European Commission has not yet prioritised storage support for such communities, thereby missing a chance to scale them up.

The European Commission introduced EU legal definitions for energy communities in Directive (EU) 2018/2001 on the use of energy from renewable sources (RED II) and Directive (EU) 2019/944 on the internal market for electricity (IEMED).
Special report 10/2026, "Energy communities – Potential yet to be fulfilled", is available on the ECA website, together with a one-page overview of the key facts and findings.

ECA Special Report 10/2026: Energy Communities – Potential Yet to Be Fulfilled
Overview and Purpose
This Special Report, published by the European Court of Auditors (ECA) in early 2026, presents the findings of a performance audit assessing whether the European Commission and four selected member states — the Netherlands, Poland, Italy and Romania — have effectively supported the development of energy communities and whether they are on track to meet the EU's political objective set out in the 2022 EU Solar Energy Strategy.

The audit was motivated by the significant potential of community-owned renewable energy to accelerate the energy transition, strengthen citizen engagement, and improve energy affordability, particularly for vulnerable households. The ECA also aimed to inform the upcoming recast of the Renewable Energy Directive and the implementation of the Citizens Energy Package. Energy communities are legal entities that empower citizens, local authorities, and small businesses to collectively produce, manage, share and consume their own energy. The Commission has introduced two formal EU legal definitions: Renewable Energy Communities under the Renewable Energy Directive II (RED II), and Citizen Energy Communities under the Internal Market for Electricity Directive (IMED). Though overlapping in purpose and governance, they differ in scope — the former is restricted to renewables and can include medium-sized companies, while the latter covers electricity more broadly and allows a wider range of membership without geographical restrictions.
The Commission projected that citizens could produce up to 50% of the EU's renewable energy by 2050, making energy communities a potentially transformative element of Europe's climate strategy.

The EU Objective and Its Shortcomings
The central EU objective under review was set in the 2022 Solar Energy Strategy: that the EU and member states should work together to establish at least one renewables-based energy community in every municipality with a population above 10,000 by 2025. The ECA assessed this objective against the SMART criteria — Specific, Measurable, Achievable, Relevant and Time-bound — and found it to be seriously deficient on several counts. While the objective is specific (it names a particular type of entity) and time-bound (2025 deadline), it is difficult to measure because the term „renewables-based energy community" does not align with the official EU definitions in the directives, and the Commission issued no guidance clarifying whether national variants such as Dutch energy cooperatives or Polish energy clusters should be counted.

Crucially, the objective lacks relevance: it says nothing about the number of citizens participating, the renewable generation capacity owned, or whether vulnerable households are being meaningfully served — all of which are central to the rationale for energy communities in the first place.

The Commission did not analyse whether the objective was actually achievable before adopting it, and no formal justification was found in any public or internal document explaining how the specific threshold of „one community per municipality over 10,000 inhabitants“ was arrived at.

The objective was also weakly endorsed at national level. Under the EU Governance Regulation, member states are not legally required to include energy community targets in their National Energy and Climate Plans (NECPs). As a result, only Italy and Poland included such targets, and even those were not fully aligned with the EU objective. Italy‘s RRF-linked measure targeted municipalities with fewer than 5,000 inhabitants — the opposite threshold — while Poland set a target of 300 communities by 2030, five years later than the EU deadline.

The Commission did not recommend corrections, citing the absence of a legal mandate to do so. Monitoring was equally inadequate. The Commission relied on an ad hoc inventory compiled by external consultants rather than consistent, verified national registers. The inventory included communities that do not conform to EU definitions and failed to identify which were actually renewables-based.

The Commission did not match communities to qualifying municipalities to track progress, and had not published any progress report against the EU objective as of December 2025. The ECA‘s own analysis, updating the inventory with national register data, estimated that the EU had achieved roughly 27% of its objective by early 2025 — making it very unlikely to be met by the deadline. Denmark, the Netherlands and Ireland were the top performers, each exceeding 78% of their respective local targets. At the other extreme, Romania, Latvia, Malta and Cyprus had effectively zero qualifying communities. Poland, Italy and Germany were among the larger countries still significantly short.

Despite this overall shortfall, there are grounds for cautious optimism: Poland and Italy both saw explosive growth during the first half of 2025, with energy community numbers rising by 80% and 75% respectively, likely driven by financial incentives, streamlined registration, and expanded eligibility rules.

Overoptimistic Projections on Renewable Energ Contribution

A related finding concerns the Commission‘s original 2016 Impact Assessment for RED II, which projected that energy communities could own more than 50 GW of both solar and wind capacity in the EU by 2030 — equivalent to 21% of installed solar and 17% of wind generation capacity.

The ECA assessed the realism of these projections by examining updated forecasts for the Netherlands, the most advanced member state in terms of energy cooperative development. A 2024 CE Delft study commissioned for the Dutch context — providing a more reliable basis for extrapolation than a 2016 EU-wide estimate — found that Dutch energy cooperatives might own approximately 4.4% of solar and 4.3% of wind generation capacity by 2030, even under favourable scenarios. This is roughly five times lower than the Commission‘s original forecasts.

The ECA applied the same analytical lens to its broader conclusions and found the 2016 projections to have been significantly overstated, based on a broader concept of energy communities than the legal definitions eventually adopted in the directives, and without adequate methodological grounding. In practice, the contribution of energy communities to solar and wind capacity remains negligible in Poland and Italy (below 0.1%), and modest even in the Netherlands (around 1.5–3.2% depending on the technology).

Incomplete Transposition of EU Directives

The audit found widespread failure among member states to transpose the relevant EU directives into national law within the required deadlines. The IMED had a transposition deadline of December 2020, and RED II of June 2021. As of July 2025 — nearly four years later — only Italy had demonstrably transposed all energy community-related articles of both directives. Poland and Romania had transposed the IMED requirements but remained incomplete on RED II. The Netherlands had transposition gaps in both directives, having instead maintained its older national framework of energy cooperatives, though new harmonising legislation did enter into force in 2026.

Key facts and findings

EU objective by 2025

Every municipality with over 10 000 inhabitants should have at least one energy community

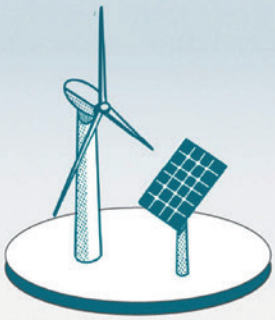
Energy communities are groups of

citizens

small businesses

local authorities

which produce, manage, share and consume their own energy



contribute to the EU's renewable energy target

drive the energy transition locally

make the transition affordable for all and reduce energy poverty

What did we find?

- Rules for setting up and participating in energy communities are unclear, in particular for apartment buildings
- The EU objective lacks relevance, national endorsement and monitoring
- Necessary conditions for the roll-out of energy communities are missing, including incentives to develop energy storage

The Commission followed up by issuing letters of formal notice and reasoned opinions in infringement proceedings, but had not referred any of the four remaining non-transposition cases to the European Court of Justice as of June 2025. The ECA noted that this incomplete transposition creates legal uncertainty for citizens and entrepreneurs seeking to set up or join energy communities, potentially deterring uptake.

Definitional Confusion at National Level

A persistent theme throughout the report is the confusion caused by the coexistence of multiple definitions and legal models for energy communities — both at EU level and in national law. The EU's two definitions (renewable energy communities and citizen energy communities) overlap in significant respects but differ on energy type, membership structure and geographic scope. The Commission has issued guidance, but national authorities and stakeholders in focus groups consistently flagged ambiguity and inconsistency. In Poland, 100% of focus group participants found the national definitions unclear; in Italy, 75%; across all groups, nearly half found them insufficiently clear.

Two of the four audited member states use national frameworks that are not aligned with EU definitions. The Netherlands operated solely on the basis of energy cooperatives — citizen-owned organisations with no formal grounding in the EU legal framework — until new harmonising legislation took effect in 2026. Poland merged both EU definitions into a single national concept of „citizen energy communities," while retaining two older formats (energy cooperatives and energy clusters) with their own rules and incentive structures. This means three overlapping definitions co-exist in Polish law, creating confusion about eligibility for different support mechanisms. A particular gap highlighted by the report concerns apartment buildings, which house 48% of the EU population. Residents of multi-apartment buildings can, under RED II, organise collectively as „jointly acting renewables self-consumers" to generate, share, store and sell energy without needing to create a legal entity.

However, they cannot use existing owners' associations to register as full energy communities, since such associations involve mandatory membership, while energy communities require voluntary, open membership. The Commission has not published guidance clarifying the range of options available to apartment dwellers — from simple collective self-consumption to establishing a formal community — and this gap was identified by Poland and Romania as a significant barrier to uptake.

Governance, Guidance and Capacity Gaps

The Commission has provided a range of guidance and support through the Energy Communities Repository, the Concerted Action on RED II, and events such as the Citizens Energy Forum.
Member states generally rated this support positively, though they called for more tailored assistance on secondary legislation. At national level, however, support structures vary dramatically in quality and accessibility.

The Netherlands stands out positively: two government-cofinanced organisations — Energie Samen and HIER — provide structured, practical and accessible support including training, templates and administrative services. Dutch energy communities in focus groups reported finding this support sufficient. By contrast, Poland, Italy and Romania all struggle with fragmented or overly complex guidance that often requires expert interpretation. In Poland, despite the existence of handbooks, calculation tools and training programmes, half of the communities surveyed said they lacked adequate support. Italy's GSE website hosts detailed guidance and interactive tools, but stakeholders described the material as requiring professional interpretation to navigate. Romania had no dedicated publicly available guidance material until a network of one-stop shops became operational in 2025, and is still awaiting secondary legislation before developing further support.

Only half of the audited member states — Poland and the Netherlands — had published the national assessments of barriers to and potential for energy communities that RED II requires. Italy acknowledged working on the elements of such an assessment but had not produced a formal report. Romania's submissions addressed renewable energy market barriers generally but failed to identify specific obstacles for energy communities or assess their potential. The Commission collected assessments from 41% of member states overall and regarded several as inadequate. Without these assessments, the ECA warned, both national and EU policy risks being poorly targeted and ineffective.

Citizen Participation and Social Inclusion

One of the central rationales for energy communities is to democratise the energy transition — to ensure that tenants, low-income households and apartment residents, who cannot typically install their own generation assets, can also participate. The audit found significant gaps in this area. Across the 32 energy communities that participated in focus groups, only about half had individual citizens as members.

The situation varied widely: 83% of Dutch communities had citizen members, reflecting incentive structures that require minimum citizen participation. In Poland, 100% of focus group communities were composed entirely of legal entities such as municipalities or companies; in a random sample of 20 Polish cooperatives, only 10% had any citizen members at all. Italian communities were more mixed, with about two thirds including citizens. None of the audited member states had adopted specific legal provisions mandating citizen participation.

The Netherlands relied on incentives (such as the requirement under its Subsidy Scheme for Cooperative Energy Generation that all participants have equal voting rights and a minimum membership threshold per kW installed) rather than hard requirements. The risk highlighted by NGOs and the European Economic and Social Committee is that, without such provisions, companies and municipalities may form communities purely to access subsidies, without genuine local citizen engagement — potentially triggering public resistance to renewable energy projects rather than building acceptance.

Regarding vulnerable households, the picture is similarly patchy. Across focus group communities, 60% offered no benefits to vulnerable households at all. Romania was the only country to have enacted dedicated legislation, in November 2025, allowing communities to offer preferential prices to energy-poor consumers. Italy provided some targeted incentives through regional development funds, and in May 2025 extended full premium tariff eligibility to individuals in RRF-funded installations. The Netherlands and Poland lacked specific provisions. The Commission had issued guidance on vulnerable household inclusion, but it had not been updated to reflect recent policy developments and was unknown to the stakeholders the ECA interviewed in all four member states.

Grid Connection Delays and the Storage Solution

Grid connection delays emerged as one of the most serious structural barriers to energy community development. Focus group participants reported average connection times of nearly two years across all countries, with the Netherlands as a significant outlier: Dutch communities reported an average of around 1,000 days (roughly three years) to get connected, with one case extending to 132 months. Grid congestion maps show that the vast majority of Dutch territory is affected by congestion, and one major DSO reported that average connection times for renewable projects rose by a third between 2020 and 2024. Over 4 GW of renewable capacity was waiting to be connected in the Netherlands as of 2024 — enough to supply three million people. Poland also identified grid connection delays and refusals as a principal barrier to cooperative development. Despite a preferential 30-day connection target for micro-installations, Polish focus group participants waited an average of 10 months. Italy had better but still imperfect performance, with an average of five months despite legally mandated priority processing timelines. In all cases, the underlying cause is peak-time grid congestion rather than administrative failure per se.

The ECA, supported by research and DSO testimony, identified energy storage as a key instrument for addressing this problem. If energy communities paired their generation assets with storage, demand response or load-shifting capabilities, they could smooth out peak generation and consumption mismatches — solar panels peaking at midday, consumption peaking in morning and evening — and thereby reduce the strain on local grid infrastructure. DSOs in both the Netherlands and Poland confirmed they would be willing to connect new assets faster if generation were combined with such flexibility services. The Commission has taken some steps to support electricity storage in general, but had not introduced specific incentives for energy communities. Only Polish energy clusters (not cooperatives or citizen energy communities) were in line to benefit from reduced storage tariffs pending Commission state aid approval. No equivalent incentive was found in the other three member states.

Financial Incentives and Payback Periods

The EU Solar Energy Strategy recommended that member states establish support frameworks with

payback periods of less than ten years for solar rooftop systems — the typical generation technology used by energy communities. The ECA assessed whether existing incentive structures in the four audited countries met this standard. In the Netherlands, the Renewable Generation Development Fund stands out as a particularly effective model: it provides interest-free loans covering up to 80% of project development costs, and converts unpaid loans into forgiven debt if a project is cancelled — effectively eliminating financial risk for cooperatives at the most vulnerable early stage. According to REScoop.eu, each euro of public money mobilises approximately €40 of private investment.

Italian communities receive a feed-in premium on shared energy for 20 years (around €0.10/kWh), plus RRF capital grants covering up to 40% of eligible costs, and reimbursement of the variable transmission tariff component. Payback periods across Italian case studies ranged from 5 to 14 years. Romania was the stark exception: no subsidies, no network charge exemptions, no support schemes of any kind. Stakeholders and NGOs consistently identified this as the primary reason why Romania has only one functioning energy community, and that community generates no electricity. One cross-cutting concern flagged in the report is the potential inequity of network charge exemptions and self-consumption arrangements. When community members consume locally produced electricity, they avoid certain grid charges — but they remain physically connected to the grid as a backup. This means that grid maintenance costs are increasingly borne by non-participating consumers, who tend to be less affluent. None of the four audited countries had formally assessed how these arrangements affect the broader consumer base, though the Dutch National Regulatory Authority expressed growing concern about this risk given the rapid expansion of prosumerism and cooperative energy generation.

Recommendations

The ECA issued six recommendations: The Commission should publish guidance clarifying how apartment owners and residents can access renewable energy production, sharing and selling — including through existing owners‘ associations where feasible — with an implementation target of December 2026. It should design SMART objectives covering meaningful metrics such as the number of participating citizens and the generation capacity of communities, and consider proposing an obligation for NECPs to include aligned national targets in the revision of the Governance Regulation, with a deadline of December 2027. It should also publish improved guidance for member states on how to register and monitor energy communities, targeted at December 2026. Italy and Romania were specifically recommended to produce and publish the barrier assessments required by RED II, with a deadline of July 2027.

The Commission was asked to update and disseminate its guidance on involving vulnerable households, while Poland, Italy and Romania were asked to introduce provisions promoting citizen participation in energy communities — all by December 2026. Finally, the Commission‘s Citizens Energy Package should encourage member states to incentivise energy storage by energy communities, and the Netherlands and Poland were asked to provide direct incentives for storage or other flexibility services, with implementation targets of December 2026 and July 2027 respectively. All recommendations directed at member states were accepted by the relevant ministries, as recorded in the national replies annexed to the report.

Conclusion

The ECA‘s overall verdict is that the energy community concept holds genuine and significant potential for Europe‘s energy transition, but that this potential has not come close to being realised. The 2025 objective will not be met. The Commission‘s projections were overoptimistic, its monitoring was inadequate, and its objectives poorly designed. Member states, meanwhile, have been slow to transpose directives, reluctant to carry out barrier assessments, inconsistent in their support structures, and largely passive on citizen participation and social inclusion.

Grid infrastructure bottlenecks — particularly congestion — are acting as a serious brake on development, and energy storage incentives are largely absent. The picture is not entirely bleak: Italy and Poland showed dramatic growth in the first half of 2025, and models like the Dutch revolving development fund demonstrate what well-designed public support can achieve. But closing the gap between ambition and reality will require substantially stronger and more coherent action at both EU and national level.

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NEWS

Commercial Storage Systems: Reducing Energy Cost and Generating Revenue

ees: Commercial Storage Systems: Reducing Energy Cost and Generating Revenue

Battery storage systems are becoming increasingly important for the energy transition and their deployment is surging. Since 2021, the installed capacity in the European Union (EU) has grown almost tenfold. According to SolarPower Europe, there was a 45 percent increase in 2025. This boom was mainly driven by large-scale storage systems. Meanwhile, commercial storage systems grew by 31 percent, though some of their potential still remains untapped.

The main focus of ees Europe in 2026 is to explore the role of commercial storage systems in tomorrow's energy system and how exactly they can be used to generate profit. Europe's largest exhibition for batteries and energy storage systems will take place in Munich from June 23–25, 2026 as part of The smarter E Europe, Europe's largest alliance of exhibitions for the energy industry. Companies will present their latest technologies and business models while industry professionals will gain insights into market trends, regulatory developments and concrete use cases. They will also have the opportunity to network with manufacturers, project developers, investors and utilities in person. More than 2,800 exhibitors and over 100,000 visitors from all over the world are expected to attend.

Further growth in storage systems for industry and commerce is expected in Europe, driven by rising energy costs and lower battery prices, which have dropped by 75 percent since 2010. The largest markets for commercial storage systems in Europe are Germany, the Netherlands and Italy. Commercial storage systems are part of the commercial and industrial (C&I) segment, with outputs ranging between 20 and 1,000 kilowatt hours. They provide flexibility and ensure a reliable energy supply, stabilize grids, reduce curtailments and electricity costs. This makes commercial storage systems particularly attractive to companies with a high power consumption and high peak loads. Typical clients include transport and logistics centers, airports, harbors, data centers, hospitals, universities, retailers, supermarkets, cottage industries and agricultural operations, as well as municipalities.

“Payback periods of less than four years”
“We are only at the beginning of the battery age,” says Daniel Hannemann, CEO and co-founder of Tesvolt, a battery storage system provider. “Through peak shaving and other applications, commercial storage systems can achieve payback periods of less than four years. Companies can generate monthly revenues in the four- to six-digit range if they use their storage systems in energy trading. Storage systems should be viewed as financial assets that can be flexibly used for different applications. A reliable political framework that provides investment security is a key requirement for this.”

However, the lack of standardized rules, grid charges, and tariffs in the EU complicates planning and financing for developers and investors. Several countries already offer dynamic grid charges and flexible electricity prices. As of January 2025, all electricity suppliers in Germany have been required to offer dynamic electricity tariffs. Since April 2025, grid operators have been required to offer a module with variable grid charges and three tariff levels: low tariff (NT), standard tariff (ST) and high tariff (HT). The tariffs are based on grid utilization, and the time period for each tariff depends on the grid area.

Storage pays off – even without a PV system
Commercial storage systems are typically combined with a PV system to maximize cost reduction and make optimal use of the self-generated electricity. They are already worth their price on their own, though, because they can store electricity drawn from the grid. With the help of AI, companies can purchase and store the required energy when prices are low, for example, in the summer around noon. That way they help reduce the stress on the power grids while benefiting from low grid charges (sometimes dropping below one cent) and negative electricity prices, significantly reducing their overhead. Franz-Josef Feilmeier, CEO of Fenecon, a leading storage solution provider, has observed the growing trend of storing solar power from other suppliers rather than generating one’s own. “2026 will mark the first year of ‘storage-without-PV boom’,” he says. “Not because PV is bad. People should obviously continue to build PV systems wherever possible.

But the combination of grid charges under module 3 (Section 14a of the German Energy Industry Act EnWG) that vary by time of day and quarter, very low NT prices and quarter-hourly dynamic electricity tariffs is a real boon for low-voltage commercial storage systems, including in locations where property or rental constraints, building structure, shading or small rooftops have previously limited the cost-effective use of PV. An energy management system based on the right time period and energy roadmap can make third-party solar power extremely cheap to use.”

ees Europe 2026 shines the spotlight on commercial storage systems
Investing in commercial storage systems is worthwhile, even for cottage industries. On June 25, there will be an event at the ees Forum aimed directly at them. Attendees will learn all about regulatory reforms and discover best-practice examples and technological innovations from installation companies and manufacturers. New opportunities and markets will emerge for developers of large-scale storage systems, suppliers in the residential sector as well as for electric vehicle companies that want to integrate storage into charging infrastructure. How can they benefit from the trend towards commercial storage systems? This will be one of the main topics discussed at the exhibition and at the accompanying ees Europe Conference on June 22 and 23.

DLA Piper advises Flower Infrastructure Technologies on acquiring its first BESS project in Germany
DLA Piper has advised Flower Infrastructure Technologies AB (Flower), a leading energy trading and optimisation platform provider and Battery Energy Storage System (BESS) operator, on the acquisition of its first BESS project in Germany. The project, currently under development in Döllnitz, Germany, has a grid connection capacity of 63 MW. The transaction was signed on 4 February 2026 and closed on 16 February 2026.

Flower has acquired the project and corresponding project rights from CCE group (CCE), a German-Austrian developer. CCE will continue to support the development of the project until the construction phase, expected to start in 2027. Flower will act as the Engineering, procurement, and construction (EPC) partner for the project and subsequently as its operator.

With an industry-leading AI-powered optimization platform at its core, Flower's service as a large-scale BESS operator includes stabilising the energy system by enhancing predictability and flexibility for both energy producers and consumers. The newly acquired BESS project further extends Flower's growing BESS-portfolio in Europe and significantly enlarges Flower's footprint in Germany.

LG Chem to Unveil Integrated Battery Safety Solution

© LG Chem

LG Chem announced that it will participate in InterBattery 2026, Korea's largest battery exhibition, set for March 11 to 13 at COEX in Seoul. At the event, LG Chem will unveil an integrated battery safety solution designed to delay and block thermal runaway.

As electric vehicles (EVs) and energy storage systems (ESS) rapidly expand across everyday life and industrial applications, battery safety has emerged as a critical factor shaping market trust beyond technological performance. In response to increasingly stringent global OEM regulations on thermal propagation, thermal runaway mitigation has become an essential requirement in modern battery design.

At the exhibition, LG Chem will introduce its thermal-runaway-delaying Engineering Plastics(thermoplastics), which form a hard, dense protective barrier when exposed to flames. This transformation effectively slows both flame and pressure propagation, helping to prevent heat from spreading to adjacent cells and modules. The lightweight and highly processable material also enhances design flexibility in battery pack architecture.

Recognized for its differentiated safety performance, the technology received the InterBattery Award in the Reliability, Safety and Sustainability category, reflecting its strong alignment with tightening global thermal propagation standards.

"As batteries become more deeply embedded in our daily lives, safety and reliability are becoming core competitive advantages," said Kim Dong-choon, CEO of LG Chem. "LG Chem will continue to strengthen its global market leadership through core materials competitiveness and technology-driven integrated solutions."

LG Chem will also showcase Nexula®, an aerogel-based thermal barrier material. With its superior heat-insulation properties, the aerogel effectively blocks thermal diffusion not only between battery cells but also between modules and within battery packs. By combining thermal-runaway-delaying materials with aerogel insulation, LG Chem has established a dual-layer safety system that both delays and blocks heat propagation.

Under the exhibition theme "Beyond EV, Creating Tomorrow," LG Chem's booth on the third floor of COEX will highlight advanced material solutions extending beyond electric vehicles to future industries such as Humanoid robots and Urban Air Mobility (UAM).

The display will also feature LG Chem's comprehensive battery materials portfolio spanning the entire value chain, including cathode materials such as High-Ni, High-Voltage Mid-Ni, Lithium Iron Phosphate (LFP), and Lithium Manganese-Rich (LMR), as well as carbon nanotubes (CNTs), anode binders, and recycled materials—demonstrating the company's integrated competitiveness across performance, safety, and sustainability.

Dominion Energy‘s Coastal Virginia Offshore Wind Project Now 50% Complete

© Dominion Energy

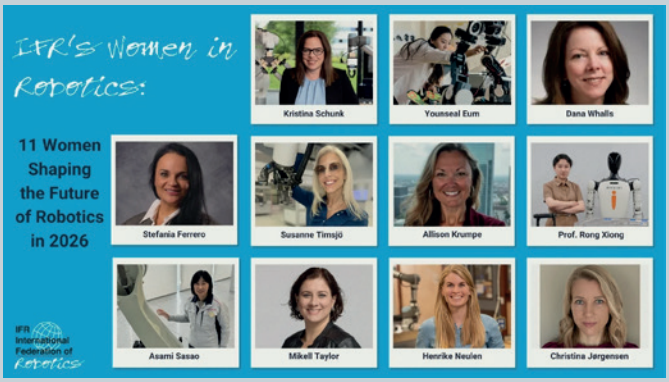
Dominion Energy‘s 2.6 GW Coastal Virginia Offshore Wind (CVOW) project — the largest offshore wind project in US history — is approximately 50% complete and on track for on-time completion at end of 2026. Significant construction milestones have been achieved, including installation of the first 16 transition pieces. The first of three 4,300-ton offshore substations has arrived at Portsmouth Marine Terminal. Estimated total project cost has risen ~9% to $10.7 billion, with robust cost-sharing mechanisms protecting customers. The project supports 2,000 direct and indirect US jobs and $2 billion of economic activity

“Women in Robotics 2026” Awarded by International Federation of Robotics

Global industrial robotics installations are forecast to surpass 700,000 units in 2028 – representing a compound annual growth rate of about 7% (CAGR, 2025-2028). On their way to strengthen competitiveness, companies actively set up strategies to benefit from female participation. Success stories from the Americas, Asia and Europe show how women contribute to the development of next-generation robotic systems. To give women in the industry more visibility and acknowledgment, the International Federation of Robotics awarded 11 women shaping the future of robotics in 2026.

“Women are critical contributors in the fast-growing field of robotics,” says Dr. Susanne Bieller, General Secretary of the International Federation of Robotics. “This is clearly illustrated by diverse teams developing unbiased AI technology and next-generation robotics systems. These projects aim to open up new sectors for automation, not only in traditional manufacturing settings, but also in healthcare and elderly care, or in consumer markets.”

The Global Gender Gap Report 2025 by the World Economic Forum showed that more and more women have entered the labor market around the world: Today, over 40% of the global workforce are women. However, the proportion of women in the workforce varies greatly by industry. While the rate of female participation in consumer services, education and care services exceeds 50%, manufacturing does not even rank among the top ten industries, with participation by women amounting to less than 35%. This result corresponds with the fact that the share of women within science, technology, engineering, and mathematics (STEM) is below 30%.



Ensuring women contribute to the development of robotics is key to building future-ready industries: This is demonstrated by the success stories of IFR‘s 11 Women Shaping the Future of Robotics in 2026. This year‘s awardees are in alphabetical order:

Younseal Eum – AeiROBOT, South Korea
Stefania Ferrero – Comau, Italy
Christina Jørgensen – Universal Robots, Denmark
Allison Krumpe – HealthTech Partners Global, USA
Henrike Neulen – Intrinsic, Germany
Asami Sasao – Kawasaki Heavy Industries, Japan
Kristina Schunk – Schunk, Germany
Mikell Taylor – General Motors, USA
Susanne Timsjö – ABB Robotics, Sweden
Dana Whalls – Association for Advancing Automation (A3), USA
Prof. Rong Xiong – IPLUSMOBOT/ Zhejiang University, China

The IFR congratulates all Women in Robotics 2026. More details, including the profiles of the individual women, will be published successively on the IFR website.

Notice regarding Acquisition of All-solid-state Lithium-ion Battery Business from Kanadevia Corporation

Suzuki Motor Corporation announced that it has entered into a business transfer agreement with Kanadevia Corporation to acquire Kanadevia's all-solid-state lithium-ion battery business, effective July 1, 2026.

Kanadevia began the development of all-solid-state lithium-ion batteries in 2006. Through its proprietary dry manufacturing process, Kanadevia's all-solid-state lithium-ion batteries offer high safety, including the absence of liquid leakage, excellent environmental resistance, and operation across a wide temperature range. These characteristics make them particularly strong for specialized applications such as in aerospace or in high-temperature, vacuum conditions.

Through this Business Acquisition, Suzuki will inherit and further develop the all-solid-state lithium-ion battery technologies cultivated by Kanadevia. The execution of this Business Acquisition is subject to the fulfillment of customary closing conditions.

ENEROC USA has officially launched operations in North America

March, 2026 – USA – ENEROC USA, in partnership with Contemporary Amperex Technology Co., Limited (CATL), a global leader in lithium battery design and manufacturing, has officially launched operations in North America.

ENEROC USA has assembled a seasoned team of professionals specializing in the material handling and industrial battery sectors. Together, the team boasts over 100 years of combined experience, positioning ENEROC USA as a trusted partner for customers in North America.

Sandro Pagliarulo, CEO of ENEROC USA, expressed his excitement for this new chapter:

„ENEROC USA is here to redefine the energy landscape for industrial and off-highway EVs. With our state-of-the-art technology, robust after-sales support, and commitment to sustainability, we are confident we will exceed the expectations of our North American customers in terms of product excellence and customer service.“

ENEROC is backed by CATL investment and technology to deliver unparalleled motive power batteries, combining world-class technology and reliability.

ENEROC's lithium batteries are designed to meet the demanding requirements of industrial applications, offering exceptional durability, advanced safety features, and industry-leading after-sales support.

The system is equipped with a proprietary battery management system (BMS) that continuously monitors and corrects the real-time state of charge (SOC) of individual cells. This ensures optimized battery performance, improved efficiency, and a longer overall service life by keeping the cells balanced and operating within ideal parameters.Safety has been a key focus in the design. The batteries incorporate several innovations, including a built-in fire extinguisher that can respond automatically in the unlikely event of a thermal incident. In addition, an integrated 4G tracking module enables remote monitoring, allowing operators to track battery status and location in real time.To ensure reliability under demanding conditions, the batteries have undergone extensive durability testing.

Certified by internationally recognized organizations such as UL and SGS, and protected by robust IP-rated enclosures, they have successfully passed rigorous tests including vibration and drop simulations designed to replicate harsh operating environments. These engineering measures contribute to an extended operational life expectancy of up to 12 years or approximately 4,000 charge cycles. Through its partnership with CATL, ENEROC USA offers a comprehensive after-sales service program designed to minimize downtime and disruptions for customers. 24/7 remote support is available in North America.

https://www.linkedin.com/company/eneroc-usa/

China Achieves Record 315 GW Solar PV Installed in 2025; Non-Fossil Power Overtakes Thermal for First Time

China's National Energy Administration reported the country added a record 315 GW of solar capacity in 2025, lifting cumulative installed PV capacity to 1.2 TW. Wind additions of 119 GW also set a new record. Together, solar and wind account for 47.3% of China's total installed capacity. In a historic first, non-fossil sources now represent 60.4% of total installed power capacity, compared to 39.6% for thermal — a structural crossover in the country's generation mix. December 2025 alone saw over 40 GW installed, driven by commissioning deadlines.

World‘s First 628Ah Ultra-Large Battery Energy Storage Station Connected to Grid

On January 31, 2026, the world‘s first 400MWh energy storage station using 628Ah ultra-large battery cells entered operation. Equipped with 80 sets of minimalist integrated 5MWh DC energy storage systems („Mr. Giant“) and 40 sets of integrated power conversion cabins, this marks a critical leap in EVE Energy‘s large battery technology from pioneering exploration to grid-scale validation, solidifying a foundation for high-quality industry growth.

From Validation to Benchmark: Large Battery Technology Proves Grid-Ready

The success of the Ruite New Energy Lingshou 200MW/400MWh project demonstrates the 628Ah large battery technology can reliably support grid-scale applications. Backed by EVE Energy‘s industry-first full industrialization—first to announce, mass-produce, and deploy—cumulative production has exceeded 1 million cells, verifying both manufacturing scale and product maturity.

The system integrates EVE Energy‘s inherently safe cell technology and minimalist design, employing innovations such as stacking process and high-toughness separators to enhance safety while optimizing Levelized Cost of Storage (LCOS), meeting core requirements of high safety, efficiency, and long lifespan.

From Cooperation to Symbiosis: 10GWh Partnership Locks in Future Growth

The signing of a 10GWh strategic agreement elevates EVE Energy‘s collaboration with Guowang Technology from single projects to a long-term, symbiotic partnership, emphasizing scaled deployment and ecosystem synergy.

Leading Industry Advancement: Enabling Energy Transition

As competition shifts from scale to technology and system value, EVE Energy leads as both innovator and ecosystem builder. Moving forward, EVE Energy will deepen large battery technology iteration and strengthen global manufacturing, cooperation, and service capabilities. Through open collaboration, EVE Energy aims to expand reliable energy storage applications, supporting the global transition to a clean, low-carbon energy system.

IEA Ministerial Meeting underscores Agency's central role in tackling global energy challenges

Global energy leaders gathered in Paris for the International Energy Agency (IEA) Ministerial Meeting, reinforcing the agency's role as a central platform for international cooperation on energy security, affordability and sustainability.

The two day meeting brought together officials from a record fifty four countries including about forty ministers along with executives from fifty five major companies representing a combined market capitalization of fourteen trillion dollars. Member governments agreed to deepen institutional cooperation with Brazil, Colombia, India and Viet Nam while also expanding collaboration on critical minerals through the IEA's Critical Minerals Security Programme.

Dutch Deputy Prime Minister Sophie Hermans who chaired the meeting emphasized that energy remains the invisible force behind daily life and stressed the importance of resilient energy systems capable of withstanding global uncertainty. IEA Executive Director Fatih Birol highlighted the growing value of reliable energy data and analysis as demand increases and energy systems face mounting pressures.

Stronger engagement with Brazil, Colombia, India and Viet Nam significantly expands the reach of the IEA Family whose members and partners now represent more than eighty percent of global energy use compared with less than forty percent a decade ago.

Ministers also endorsed stronger action to secure critical mineral supply chains which are essential for clean energy technologies. They called for improved data tools collaborative exercises and guidance on measures such as strategic stockpiling to reduce supply risks and diversify sources.

The ministers also advanced new institutional relationships. Colombia was invited to become the thirty third IEA member while Brazil was invited to begin the process toward full membership. India continued discussions about joining as a full member and Viet Nam joined the IEA Family as an Association country.

Member countries also approved integrating the Clean Cooking Alliance into the IEA strengthening global efforts to expand access to modern cooking solutions for the more than two billion people who still lack them.

The agency will host its second Clean Cooking Summit in Africa in Nairobi in July 2026. Additional discussions focused on electricity security Ukraine's energy recovery and innovation including resilient power grids fusion energy sustainable fuels and stronger technology supply chains linking innovation with economic competitiveness and long term energy resilience worldwide according to meeting participants and organizers alike.

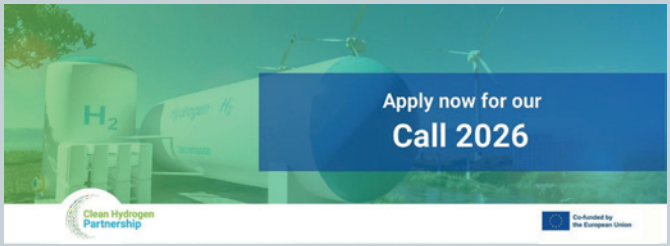
emsys VPP and Statkraft Integrate 300 MW Thurrock Battery Storage Facility

Statkraft, Europe‘s largest producer of renewable energy, and emsys VPP, a leading Virtual Power Plant provider, have reached an important milestone in their collaboration. Following the successful connection of the 300 MW Thurrock battery storage facility in 2025, emsys VPP is now enabling Statkraft to manage a gigawatt-scale portfolio of installed battery capacity in the United Kingdom.

By connecting the large-scale battery to the Virtual Power Plant, emsys VPP facilitates Statkraft, a direct marketer, to participate in the wholesale market and in balancing services, specifically dynamic services and reactive power. Thurrock thus contributes to grid stabilization by maintaining frequency and providing reactive power.

For the emsys VPP, the Thurrock project serves as a reference for integrating large-scale storage facilities into modern electricity markets. It shows how technological flexibility and intelligent commercial strategies can speed up the decarbonization of electricity grids worldwide and create new revenue opportunities for operators.

Driving hydrogen innovation in Europe: Clean Hydrogen Partnership opens 2026 call with €105 million



The Clean Hydrogen Partnership has launched its 2026 Call for Proposals, making €105 million available under the Horizon Europe programme to accelerate the deployment of clean hydrogen technologies across Europe and strengthen European industrial leadership.

The funding comes as the Clean Hydrogen Partnership enters its technology upscaling phase, supporting projects that can bring innovations closer to market - from renewable hydrogen production and advanced storage solutions to fuel cell deployment in heavy-duty transport and the maritime sector. A total of €25 million is earmarked for Hydrogen Valleys, supporting regional ecosystems that connect hydrogen production, distribution and end uses.

The call aims to strengthen Europe's position in clean hydrogen by backing real-world demonstration projects that help reduce costs, increase reliability and lower investment risk - key enabling factors for wider deployment.

"This call underlines our commitment to a competitive clean hydrogen value chain in Europe. It targets wider applications, better fuel cell performance and improved electrolysis efficiency — while addressing costs, durability, safety and infrastructure. Hydrogen Valleys remain central to building integrated ecosystems," said Valérie Bouillon-Delporte, Executive Director of the Clean Hydrogen Partnership.

The call is addressing key priorities from the Clean Hydrogen Partnership Strategic Research Agenda with funding allocated as follows:

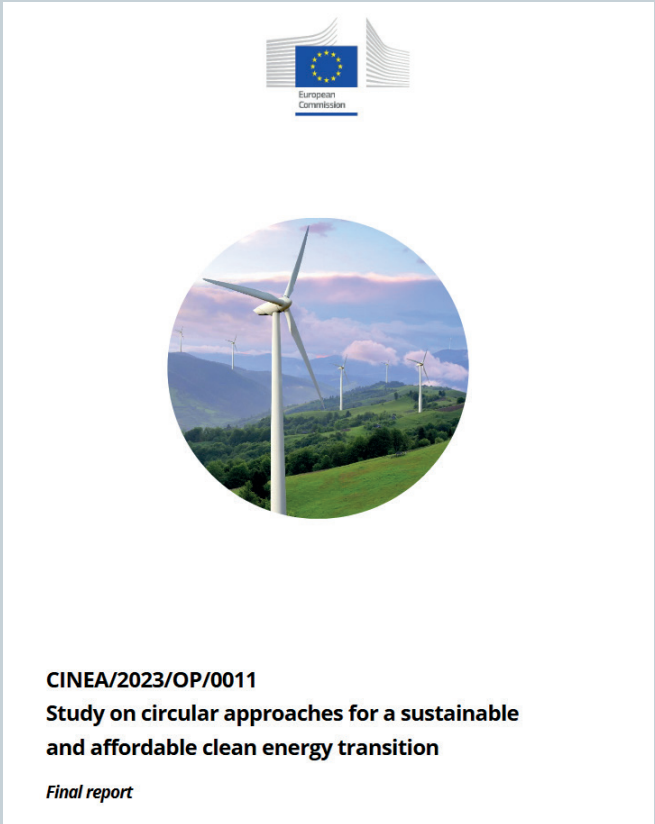
- 16M€ funding - Renewable Hydrogen Production
- 17.5M€ funding - Hydrogen Storage and Distribution
- 25M€ funding – Transport
- 16M€ funding - Heat and Power
- 5.5M€ funding - Cross-cutting
- 25M€ funding - Hydrogen Valleys

All applications must be submitted via the EU's Funding and Tenders portal before the deadline of 15 April 2026, 17:00 (CEST). The Clean Hydrogen Partnership will host an information day in Brussels on 21 January. For more information, visit the dedicated call pages on the Clean Hydrogen Partnership website.

Study on circular approaches for a sustainable and affordable clean energy transition

Funded under the Horizon Europe Work Programme 2021-2022 (Cluster 5- Climate, Energy and Mobility), the 'Study on circular approaches for a sustainable and affordable clean energy transition' aims to strengthen the European Commission's knowledge-based approach in the early and continuous assessment of innovative clean energy technologies in the context of the EU Framework Programme for Research and Innovation.

The objective of the study was to develop a methodology to assess the impacts of clean energy technologies on the following dimensions: sustainability (covering environmental, social, and economic aspects), circularity, and EU resilience and technological autonomy. This assessment methodology is complemented by technology-specific guidelines, providing actionable instructions for specific technology-related assessment.



VERBUND Green Power and Nordex Group sign multi-year framework agreement for supply of wind turbines totalling 700 MW

The companies will cooperate through 2030 to facilitate the supply of turbines for VERBUND Green Power's upcoming wind projects in various European markets.

VERBUND Green Power, the international renewable energy subsidiary of Austria's leading energy company VERBUND, has entered into a multi year framework agreement with the Nordex Group, a leading global manufacturer of onshore wind turbines, for the potential procurement of up to 700 MW capacity in wind turbines. The agreement was officially signed in VERBUND Green Power's Madrid office on January 16th by Dietmar Reiner, Managing Director of VERBUND Green Power, and José Luis Blanco, CEO of the Nordex Group.

Under the framework pact, the parties will cooperate to facilitate the supply and delivery of up to 105 units of Nordex onshore wind turbines for VERBUND Green Power's future wind projects across six core markets: Austria, Germany, Spain, Italy, Romania and Albania. The partnership agreement runs through 2030. Based on current pipeline estimates, the 700 MW capacity potentially available under the framework would cover approximately 50% of VERBUND Green Power's wind project pipeline, subject to final approvals, commercial agreements and customary conditions.

The VERBUND Group, historically recognized for its strong market position in hydropower, is accelerating its expansion in wind and solar generation under the Mission V corporate strategy, which targets that photovoltaics and wind energy will account for 25% of the Company's total generation by 2030. With over 1.2 GW of renewable capacity already operational across Europe, VERBUND Green Power is progressing a variety of projects under construction and pursuing an ambitious development pipeline to accelerate further growth.

"This collaboration with Nordex supports our strategic objective of scaling up renewable generation across Europe," said Michael Strugl, CEO VER-

BUND. “It strengthens our supply options as our projects mature, allowing us to secure the supply chain in a very competitive environment and deliver on Mission V targets, contributing to a secure and accelerated energy transition in our markets. We are exceptionally pleased to partner with Nordex — a respected European leader in wind technology — whose expertise and reputation will be invaluable as we move from planning to deployment.”

“We are very proud of our partnership with Verbund Green Power. Through this multi-year framework, Nordex will provide the turbine capacity to convert an ambitious pipeline into clean generation across six multi-country markets in Europe. With up to 700 MW of our latest 7 MW class onshore turbines slated across Austria, Germany, Spain, Italy, Romania and Albania, we’re creating a clear path to deliver reliable, cost-efficient wind energy together with VERBUND through 2030. Just end of last year, we received a first order from VERBUND for nine N175/6.X turbines for the first time now in Romania and so we’re expanding our footprint in this country,” says José Luis Blanco, CEO of the Nordex Group.

About VERBUND

VERBUND is Austria’s leading energy company and one of the largest producers of hydroelectricity in Europe. The Group generates around 96 % of its electricity from renewable energy, primarily from hydropower. With its subsidiaries and partners, VERBUND is active in the generation of electricity, transmission and in international trading and sales. VERBUND has been quoted on the Vienna Stock Exchange since 1988 with 51% of the share capital being held by the Republic of Austria.

The challenges that lie ahead require a new company spirit, which VERBUND is driving forward with its Mission V. The Mission V is a long-term and comprehensive transformation program and stands for the will to confront the climate crisis as a force for change. This program is based on the VERBUND Strategy 2030 with its three main pillars: Strengthening the integrated home market, expanding renewable energies in Europe and becoming a European hydrogen player. With Mission V, VERBUND is accelerating the achievement of the strategic goals 2030 and ensuring their implementation.Further information: www.verbund.com

© Both images Eco Wave Power

Eco Wave Power Reports Continued Strong Wave Energy Production

Tel Aviv, Israel–(February 12, 2026) – Eco Wave Power Global AB (NASDAQ: WAVE) ("Eco Wave Power" or the "Company"), a global leader in onshore wave energy technology, is pleased to provide an update on wave energy production at its EWP-EDF One wave energy pilot project at Jaffa Port, Israel, during January 2026.

During January 2026, the EWP-EDF One system continued to demonstrate stable and reliable operation under real-world sea conditions. Over approximately 11 days characterized by wave heights ranging between 1 and 2 meters, the project generated more than 2,300 kWh of clean, renewable electricity. Since the beginning of 2025, the EWP-EDF One system at Jaffa Port has maintained zero downtime, with consistent performance recorded in wave conditions of 1 meter and above. The January 2026 results further validate the system's operational robustness and its ability to deliver reliable energy generation during moderate wave conditions.

The EWP-EDF One project at Jaffa Port is a pilot-scale demonstration array, consisting of a limited number of small-scale floaters. The project is designed primarily to validate continuous operation, system durability, and real-world energy production performance, while generating high-quality operational data to support future commercial-scale deployments.

Performance data collected during January 2026 further supports the scalability of Eco Wave Power's proprietary technology. Future commercial projects are planned to utilize significantly larger floaters and a substantially greater number of units. These configurations are expected to materially enhance energy capture, improve capacity factors, and deliver a more powerful and stable production profile compared to pilot-scale installations.

Eco Wave Power continues to advance wave energy as a predictable and complementary renewable energy source in suitable coastal environments, while systematically optimizing system design based on real-world operational experience.

In parallel with its activities in Israel, Eco Wave Power is expanding its global presence. In September 2025, the Company successfully launched its wave energy project at AltaSea in the Port of Los Angeles in collaboration with Shell Marine Renewable Energy, following the receipt of all required regulatory approvals, including a federal license from the U.S. Army Corps of Engineers. The Company is also progressing projects in Taiwan, in collaboration with I-KE; in India, in collaboration with Fortune 500 Bharat Petroleum; and in Portugal, where preparations are underway for Eco Wave Power's largest installation to date.

"January's production results further demonstrate the reliability and consistency of our technology under real sea conditions," said Inna Braverman, CEO and Founder of Eco Wave Power. "While Jaffa Port is a pilot installation, the system continues to provide valuable operational data that directly informs our commercial strategy. As we scale to larger floaters and expanded arrays, we believe wave energy has the potential to deliver a meaningful and stable contribution to the global renewable energy mix."

Eco Wave Power's innovative wave energy systems are designed to be efficient, scalable, and environmentally responsible, offering a sustainable alternative to conventional power generation. With projects operational and under development across multiple regions, the Company continues to demonstrate the viability of ocean waves as a clean and reliable energy resource.

Sodium-ion battery momentum grows, but challenges remain

IEA (2026), IEA, Paris https://www.iea.org/commentaries/sodium-ion-battery-momentum-grows-but-challenges-remain, Licence: CC BY 4.0

- Teo Lombardo, Transport Modeller
- Leonardo Paoli, Clean Energy Technology Analyst
- Araceli Fernandez Pales, Head of Technology Innovation Unit
- Timur Gül, Chief Energy Technology Officer

Recent technological advances and investment announcements suggest dynamics are shifting for sodium-ion batteries

Sodium-ion batteries are emerging as a new player in battery markets, offering opportunities to diversify battery chemistries and supply chains at a time of rising global demand for electric vehicles and energy storage. Developed in laboratories since the early 1980s, sodium-ion batteries operate on the same fundamental principles as lithium-ion batteries – which currently dominate the market – yet their path to commercialisation has been markedly slower.

While lithium-ion batteries entered commercial use in the 1990s – with the first electric vehicles appearing in Japan in 1996 – sodium-ion batteries reached vehicle applications much later, with the first sodium-ion powered electric car introduced in China only in late 2023. The first battery storage system using sodium-ion batteries was installed a few years earlier, in 2019 in China. However, in 2025 their total global production was less than 1% of that of lithium-ion technologies.

Recent technological advances and investment announcements suggest that this dynamic is starting to change. CATL, the world's largest battery manufacturer, released its second-generation sodium-ion batteries and has confirmed plans for their commercial-scale deployment across multiple sectors starting in 2026. BYD, the second largest producer, began construction of its first sodium-ion battery plant in January 2024, targeting applications in electric vehicles, grid-scale storage and industry. Hina, a smaller Chinese battery manufacturer and the first to power an electric vehicle using sodium-ion batteries, also released an advanced sodium-ion battery designed for electric cars last year.

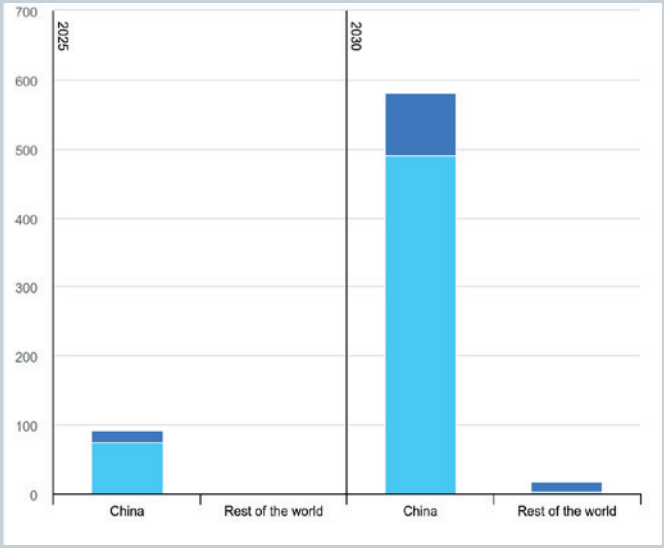
These investments are driven primarily by the goals of improving battery performance in cold climates and reducing exposure to lithium-price volatility. Sodium-ion batteries exhibit significantly better low-temperature performance than lithium-ion batteries, particularly lithium iron phosphate (LFP) chemistries. The latest generation of sodium-ion batteries can retain around 90% of nominal capacity at temperatures as low as -40 °C, and can operate at temperatures as high as 70 °C.

In addition, sodium-ion batteries do not rely on lithium, which has been subject to price swings in recent years. For the largest global battery manufacturers, which are capable of maintaining several supply chains in parallel, sodium-ion expertise and production capacity can act as a strategic hedge against the risk of lithium price spikes, enabling rapid switching if needed. This flexibility could become increasingly valuable. Although lithium prices remain around 70% below their 2022 peak, they doubled over the past year. Current lithium price levels are not yet high enough for sodium-ion batteries to undercut LFP costs in most applications, but sodium-ion technology is already cost-effective for electric vehicles and stationary storage in particularly cold climates. It can also be deployed in hybrid electric vehicle battery packs to limit range losses in cold weather.

Barriers remain to large-scale adoption of sodium-ion batteries

Despite recent progress, sodium-ion batteries remain constrained by lower energy density than prevailing lithium-ion technologies. The latest sodium-ion cells reach up to around 175 Wh/kg, compared with up to 205 Wh/kg for LFP batteries and 255 Wh/kg for lithium nickel cobalt manganese oxide (NMC) batteries. In practical terms, this translates into a driving range of up to 350 km for an average sport utility vehicle (SUV) equipped with sodium-ion batteries, compared with a range of 400–600 km for lithium-ion batteries under average weather conditions.

Sodium-ion batteries are often highlighted as a way to reduce reliance on critical minerals and diversify battery supply chains. This claim is only partially



Sodium-ion battery installed and announced manufacturing capacity by chemistry and region, 2025 and 2030

accurate. While sodium-ion batteries do not require lithium and graphite, the chemistries closest to commercial deployment rely on other critical minerals, such as nickel and manganese, whose processing remains highly concentrated geographically. Moreover, global supply chains for sodium-ion batteries are far less developed than for lithium-ion batteries, constraining near-term prospects for large-scale deployment.

While sodium-ion batteries could enable more geographically diverse supply chains over time, current project pipelines point in the opposite direction. Nearly all existing global sodium-ion manufacturing capacity is located in China, which also accounts for more than 95% of 2030 capacity, when accounting for already installed and announced production plants.

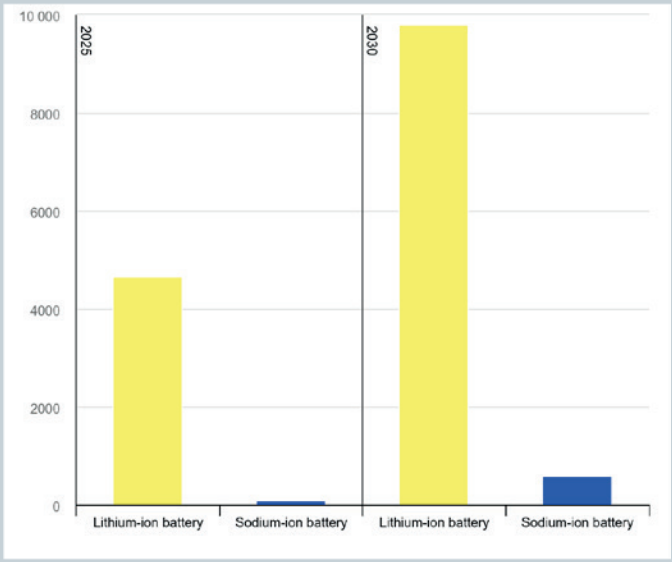
Scaling up this technology outside China remains challenging. Korean LG Energy Solution, the world's third-largest battery manufacturer, announced a sodium-ion pilot line at its existing plant in Nanjing, China – a choice highlighting the attractiveness of China's rapidly developing sodium-ion ecosystem. The recent shutdown of Natron Energy, an US-based sodium-ion battery company, further underscores the challenges of building competitive sodium-ion battery supply chains outside of China.

Sodium-ion batteries are growing but still struggle to compete with lithium-ion

Sodium-ion batteries are on course for commercial success, and 2026 could prove to be a pivotal year for the technology's scaling efforts. Nevertheless, highly optimised and low-cost lithium-ion batteries – particularly the latest LFP technologies – continue to offer advantages in energy density, supply chain maturity and cost. For sodium-ion batteries to compete on a more equal footing, either sustained higher lithium prices or technological advances that significantly improve the energy density of sodium-ion batteries would be required.

Despite these challenges, sodium-ion battery performance is already sufficient for specific applications, most notably in cold climates and in hybrid battery systems that pair lithium-ion and sodium-ion cells. In these applications, sodium-ion batteries can complement lithium-ion technologies to meet different customer needs.

Sodium-ion batteries would contribute to technology diversification, and the supply of their constituent materials is generally more geographically diversified than for lithium-ion batteries. However, concentration risks in sodium-ion battery and component manufacturing remain significant. Current investment plans suggest that China could play a role at least as large as it does in the lithium-ion battery industry. Addressing these risks through greater diversification of supply chains will require higher investments, partnerships with leading battery manufacturers and stronger international co-operation.



Installed and announced sodium-ion manufacturing capacity compared with lithium-ion battery manufacturing capacity, 2025 and 2030

© European Commission

Industrial Accelerator Act

Today, the European Commission has adopted a legislative proposal to increase demand for low-carbon, European-made technologies and products. The Industrial Accelerator Act (IAA) will boost manufacturing, grow businesses, and create jobs in the EU, while supporting industry‘s adoption of cleaner, future-ready technologies.

In line with the recommendations of the Draghi report, the IAA introduces targeted and proportionate ‘Made in EU‘ and / or low-carbon requirements for public procurement and public support schemes. These will apply to selected strategic sectors, notably in steel, cement, aluminium, cars, and net-zero technologies, while establishing a framework that can be extended, where appropriate, to other energy-intensive sectors such as chemicals. This will strengthen European production capacities and boost demand for European-made clean technologies and products. The Act includes a requirement for Member States to set up a single digital permitting process to speed up and simplify manufacturing projects.

The IAA aims to increase value creation in the EU, strengthening our industrial base against the backdrop of growing unfair global competition and increasing dependencies on non-EU suppliers in strategic sectors. It therefore represents a strategy to support long-term economic growth, prosperity and security. In 2024, manufacturing represented 14.3% of EU GDP and therefore plays a vital role in Europe‘s economic resilience, innovation lifecycle, and social fabric. The Act sets a goal to increase manufacturing‘s share of EU GDP to 20% by 2035.

At the same time, the EU remains one of the world‘s most open markets and is committed to maintaining that openness as a key source of economic strength and resilience. The proposal encourages greater reciprocity in public procurement, by providing equal treatment to countries that offer EU companies access to their markets, in line with the Draghi report. Content from partners with which the Union has concluded an agreement establishing a free trade area or a customs union, or that are parties to the Agreement on Government Procurement, and where relevant obligations of the Union exist under that agreement, shall be deemed to be of Union origin.

For other public interventions, notably public schemes and auctions, partners can be covered within the IAA scope if they have a free trade agreement or customs union with the EU.

While remaining open to foreign direct investment, the IAA establishes conditions for major investments in strategic sectors exceeding €100 million where a single third country controls more than 40% of global manufacturing capacity. Such investments must create high-quality jobs, drive innovation and growth, and generate real value in the EU through technology and knowledge transfer, as well as compliance with local content requirements. They must also guarantee a 50% minimum level of European employment, ensuring businesses and citizens benefit alongside investors from access to the Single Market. In doing so, the IAA strengthens EU economic security and reinforces supply chain resilience.

The Industrial Accelerator Act leverages the strengths of the Single Market by:

Supporting lead markets for 'Made in EU' and low-carbon products

The IAA introduces 'Made in EU' and low-carbon preferences in public procurement and public support schemes to boost demand for European industrial products — cement, aluminium to net-zero technologies like batteries, solar, wind, heat pumps, and nuclear. For steel, the Act proposes specific low-carbon preferences to create market demand. This measure will give investors confidence and predictability, boosting innovation and making clean steel a core part of the EU's industrial future. Strategic use of public funds will support investments in the EU, thereby strengthening access to low-carbon products and safeguarding competitiveness.

Ensuring that foreign direct investments bring value to the EU

The EU remains a top destination for foreign direct investments (FDI), hosting almost one quarter of global FDI stock in 2024. To ensure that FDI strengthens EU supply chains, promotes technology transfer, and supports quality job creation, the IAA introduces conditions for investments above €100 million in emerging sectors such as batteries, electric vehicles, photovoltaics and critical raw materials.

Simplifying permitting

As part of the Commission's simplification agenda, the IAA streamlines and digitalises permitting procedures for industrial projects. This includes the introduction of a single digital 'one-stop-shop' with clear time limits as well as the principle of tacit approval at intermediate stages of the permit-granting process for energy-intensive decarbonisation projects.

Boosting sustainable manufacturing

The IAA introduces Industrial Acceleration Areas designed to enable industrial symbiosis and encourage the creation of clean manufacturing project clusters. The creation of such clusters will facilitate essential energy infrastructure investments and promote area-wide permits. Projects in these areas will avail of profiling with investors and support with skills development.

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MOBILITY

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The beginning of a new era: Fully electric BMW M models set highperformance standards

BMW M's high-performance vehicles will soon deliver the 'Ultimate Driving Machine' experience in electric form. From 2027, the BMW M Neue Klasse will usher in a new era in the high-performance vehicle segment and, for the first time, bring BMW M's motto, "Born on the racetrack. Made for the streets. Core of a passionate community", to life with a fully electric drivetrain.

"The next generation of models are set to establish a new benchmark in the high-performance vehicle segment," says Franciscus van Meel, Managing Director of BMW M GmbH. "With the latest generation of Neue Klasse technology, we are taking the BMW M driving experience to a new level and will inspire our customers with outstanding, racetrack-ready driving dynamics for everyday use."

The fully electric drivetrain redefines the brand's dynamics, combining driving pleasure with racetrack capability in an unprecedented way. Long range, high charging performance thanks to 800-volt technology, and highly efficient energy recuperation make the BMW M Neue Klasse a versatile everyday companion.

The significant gains in driving dynamics are also the result of the forward-looking central control and electronics architecture of the Neue Klasse. Four high-performance computers, known as "Superbrains," unite computing power for driving dynamics ("Heart of Joy"), automated driving, infotainment, as well as basic and comfort functions. In addition to enhanced overall performance through accelerated data exchange, the next-generation BMW M models also benefit from faster updates and upgrades.

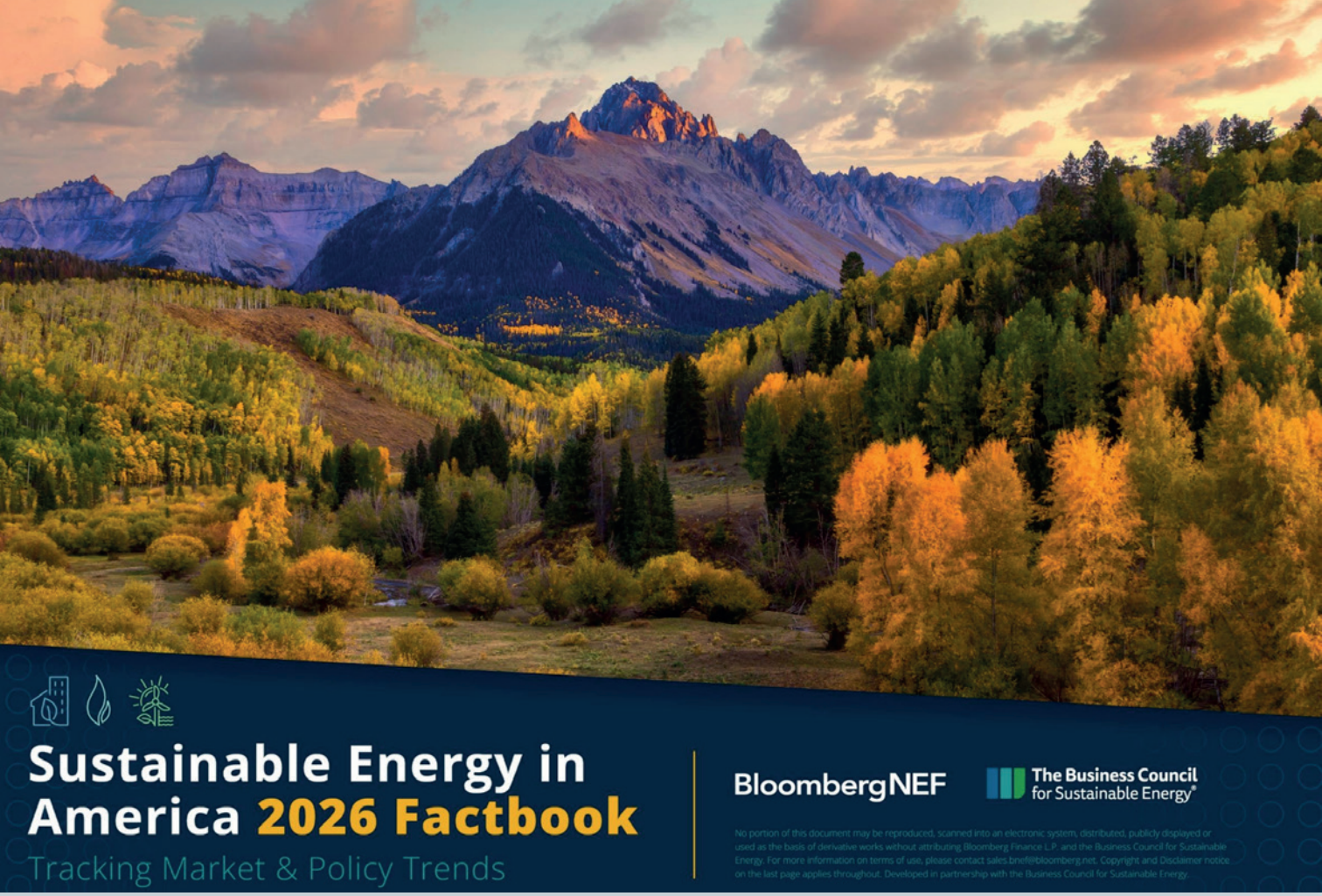
Innovative BMW M eDrive concept with fully integrated M Dynamic Performance Control.
The BMW M Neue Klasse has been developed from the ground up. At the core of the new architecture is BMW M eDrive, which is based on the BMW Gen6 technology of the Neue Klasse. Each wheel is driven by an electric motor. In combination with the M-specific control software of the 'Heart of Joy', the 'BMW M Dynamic Performance Control' unlocks completely new potentials in driving dynamics and safety for high-performance vehicles. Additionally, the system enables maximum recuperation and optimum traction right up to the limit, as well as a more direct response.

In all electric models of the BMW M Neue Klasse, two electric drive units on the front and rear axles, each with one electric motor per wheel, ensure driving performance expected from BMW M. Each of the four electric motors drives one wheel. Additionally, the front axle can be completely decoupled. For the unmistakable BMW M driving experience and enhanced drivability, various predefined driving modes, simulated gear shifts, and a newly developed soundscape come into play.

The electric drive units of BMW M eDrive are characterized by high power density and are the most powerful drives BMW M has ever used. In both drive units, the electric motors are arranged in parallel, each delivering power to one gearbox per wheel. The drive units also integrate the inverter for controlling the electric motors and the oil supply. The system enables precise control of torque and power at each individual wheel, allowing for optimal traction, continuous torque distribution between the braking system and electric motors, as well as brake energy recuperation right up to the limit. The result is a driving experience in BMW M production vehicles that has never been achieved before.

Powerful high-voltage battery for peak performance and faster charging.

The high-voltage battery, boasting over 100 kWh of usable energy as the powerhouse for the BMW M eDrive system, has also been specifically adapted to meet the demands of high-performance vehicles. The focus remains on compatibility with both road and racetrack use. This is achieved through a „Design to Power“ approach, featuring a performance-optimized variant of the Gen6 cylindrical cell. Supporting this, the cooling system and the Energy Master — the highly intelligent control center of the battery located outside the battery pack — have been optimized for higher power outputs. With BMW M specific solutions, the Gen6 high-voltage battery in the fully electric high-performance models delivers even greater peak and charging performance. Additionally, within the Gen6 technology, the Neue Klasse models offer the highest recuperation values. The high-voltage battery housing also serves as a structural component of the vehicle and is connected to the front and rear axles. The higher resulting stiffness in the overall vehicle also leads to improved driving dynamics.



Every year, policymakers, investors, and energy professionals look to one document for a clear snapshot of the U.S. energy transition: the Sustainable Energy in America Factbook. Published annually by BloombergNEF in partnership with the Business Council for Sustainable Energy, the 2026 edition offers a comprehensive portrait of how the American energy system is evolving under the pressure of rising demand, technological change, and shifting political priorities.

Now in its fourteenth edition, the Factbook has become a widely used reference for understanding the structure and trajectory of the U.S. energy sector. Drawing on data from a range of government agencies, research institutions, and market analysts, the report tracks developments across renewable energy, natural gas, energy efficiency, electricity grids, storage technologies, and sustainable transportation.

The 2026 edition paints a picture of an energy system in transition but also in tension. Electricity demand is rising again after years of stagnation, renewable technologies are scaling rapidly, and yet fossil fuels remain deeply embedded in the system. The transition is clearly underway, but it is unfolding in complex and sometimes contradictory ways.

Electricity Demand Returns

For much of the 2010s, electricity demand in the United States barely moved. Improvements in energy efficiency offset economic growth, leaving overall consumption largely flat. That pattern has begun to change. Electricity demand has started to climb again, reflecting broader economic growth and new forms of digital infrastructure. One of the most important drivers of this new demand is the explosive expansion of data centers supporting artificial intelligence, cloud computing, and digital services.

Across the country, utilities and grid operators are now preparing for significant increases in electricity consumption from these facilities. Large clusters of new data centers are being built or planned in regions such as Texas, the Mid-Atlantic, and the Southeast. Their enormous computing capacity requires vast amounts of power, making them a central factor in energy planning.

The rapid expansion of AI infrastructure is beginning to reshape electricity markets. Grid operators, policymakers, and energy companies are all grappling with how to provide enough reliable generation capacity while keeping costs manageable for consumers.

Investment in the Energy Transition

Despite political uncertainty and rising costs in parts of the supply chain, investment in sustainable energy technologies has continued to grow. Spending across the U.S. energy transition ecosystem reached record levels in 2025. A large portion of this investment went toward electricity grids and electrified transportation systems, both of which are critical for supporting the shift toward cleaner energy sources. Grid infrastructure in particular has become a major focus of spending. As electricity demand increases and renewable energy sources are integrated into the system, utilities must expand and reinforce transmission networks to ensure reliability.

Corporate demand for clean electricity has also become a powerful force in the market. Major technology companies and industrial buyers are signing long-term power purchase agreements to secure low-carbon electricity for their operations. These contracts increasingly include not only wind and solar power but also nuclear energy, geothermal power, and hydropower, reflecting a growing interest in around-the-clock clean electricity supply.

Renewables Continue to Expand

Renewable energy continues to play a central role in the transformation of the U.S. power sector. In 2025, the country added the largest amount of new electricity generation capacity in more than two decades. The majority of this new capacity came from renewable technologies, particularly solar energy. Utility-scale solar projects dominated the expansion, while wind energy also continued to grow.

Battery storage has emerged as another crucial component of the modern electricity system. Large-scale battery installations expanded rapidly, helping to balance supply and demand and allowing renewable power to be stored and used when needed. The rapid growth of renewable capacity has significantly changed the structure of the U.S. electricity system. Solar and wind energy now account for a growing share of power generation, supported by improvements in technology and falling costs.

At the same time, natural gas remains the single largest source of electricity generation in the United States. Nuclear power continues to provide a stable share of the energy mix, while coal, although declining over the long term, still contributes a meaningful portion of electricity production.

This combination of old and new technologies illustrates the layered nature of the energy transition. Rather than replacing the existing system overnight, renewable technologies are gradually reshaping it.

Electric Vehicles and New Fuels

Transportation is another sector undergoing rapid transformation. Electric vehicles have reached record levels of adoption in the United States, with millions of new vehicles entering the market each year. Consumers have increasingly embraced electric mobility as battery technology improves and charging infrastructure expands. Although the pace of growth has slowed somewhat compared with earlier years, electric vehicles are steadily becoming a significant share of new car sales. Alongside electrification, alternative fuels are also gaining momentum. Renewable natural gas and sustainable aviation fuel are attracting growing interest as industries search for ways to reduce emissions in sectors where electrification remains difficult. Airlines, utilities, and industrial companies are increasingly exploring these fuels as part of broader decarbonization strategies.

Policy Uncertainty and Market Volatility

While technological progress continues, the policy environment surrounding the U.S. energy transition has become more volatile. Some long-standing incentives for renewable energy, electric vehicles, and efficiency improvements are being phased out or modified. Trade policies and tariffs affecting energy technologies have also fluctuated significantly, influencing global supply chains for batteries and other key components. These developments have created a complex investment environment. Companies must navigate changing regulations, evolving incentives, and geopolitical tensions that affect energy markets.

Meanwhile, certain sectors have experienced particular challenges. Offshore wind development, for example, has faced delays and permitting hurdles, highlighting the regulatory complexities that often accompany large-scale energy infrastructure projects.

Climate Pressures Intensify

Even as clean technologies expand, the broader challenge of climate change continues to shape the energy debate. Recent years have shown that the financial consequences of climate-related disasters are rising rapidly. Severe weather events, wildfires, and other climate impacts are imposing significant costs on governments, insurers, and communities

At the same time, overall greenhouse gas emissions have not declined as quickly as many policymakers had hoped. In some cases, rising electricity demand has increased reliance on fossil-fuel generation, slowing progress toward long-term emissions targets.

These trends underscore the scale of the challenge facing energy systems worldwide. Expanding renewable capacity is essential, but it must occur alongside improvements in efficiency, infrastructure, and industrial processes.

A Transition in Motion

The central message of the 2026 Sustainable Energy in America Factbook is that the U.S. energy transition has entered a new and more complex phase. Electricity demand is growing again after years of stability. Renewable technologies are expanding rapidly and attracting enormous investment. At the same time, traditional energy sources remain deeply integrated into the system, and policy uncertainty continues to shape the pace of change.

The transformation of the energy sector is not a simple or linear process. It involves technological innovation, infrastructure investment, market forces, and political decisions, all interacting in dynamic ways.

What is clear, however, is that the stakes are rising. As electricity demand accelerates and climate pressures intensify, the choices made today will shape the structure of the American energy system for decades to come.

In that evolving landscape, understanding the data has never been more important. The Sustainable Energy in America Factbook offers precisely that: a detailed, evidence-based view of where the energy transition stands today and where it may be heading tomorrow.

Graphics: Clean Energy Magazine

Where Sea Turtles Meet a New Era of Ocean Protection on Príncipe

Between February and April, something quietly miraculous happens along the beaches of Príncipe. Beneath the warm sand of this small island in the Gulf of Guinea, hundreds of tiny sea turtles begin to stir. After weeks hidden below the surface, they emerge during the cool hours of evening or just before sunrise and make their instinctive dash toward the Atlantic. For a few fleeting minutes the shoreline becomes a living river of movement, each hatchling guided only by instinct and the distant shimmer of the sea.

This annual spectacle is one of the most moving natural events in the tropical archipelago of São Tomé and Príncipe. It is also a reminder of how fragile marine ecosystems can be and how much careful stewardship is required to protect them. On Príncipe, a growing coalition of conservation groups, local communities, and the eco-tourism initiative HBD Príncipe is working to ensure that these ancient creatures will continue returning to the island's shores for generations to come.

The volcanic islands of São Tomé and Príncipe lie off the west coast of Africa and are among the most biologically rich environments on the continent. Lush rainforests climb steep mountain slopes while mangroves, coral reefs, and seagrass beds thrive in surrounding waters. Within this remarkable mosaic of habitats, sea turtles play a vital ecological role. Their presence signals a healthy ocean environment. As they graze on seagrass meadows and move between feeding grounds and nesting beaches, they help maintain the delicate balance of coastal ecosystems.

Five of the world's seven sea turtle species inhabit the waters of this island nation. Three species regularly come ashore on Príncipe to lay their eggs: the green sea turtle, the beautifully patterned hawksbill turtle, and the leatherback, the largest of all sea turtles and an animal that can grow to more than two meters in length. On rare occasions visitors may also witness nesting attempts by olive ridley or loggerhead turtles. Each nesting season adds a new generation to a lineage that has existed in the oceans for more than one hundred million years.

That these turtles still find safe nesting beaches on Príncipe is far from accidental. Over the past decade, conservation programs on the island have intensified their efforts to protect nesting areas and reduce threats to marine life. Since 2015, the Fundação Príncipe together with the ProTetuga project

has monitored the island's beaches throughout the nesting season. Conservation teams patrol remote stretches of coastline, record nests, protect vulnerable eggs, and carefully document the moment when hatchlings emerge. Their work has produced remarkable results. In the most successful years, more than 150,000 young turtles have reached the ocean safely from Príncipe's shores.

Protection efforts are now entering a new phase. In June 2025, the government of São Tomé and Príncipe announced plans to establish eight new marine protected areas surrounding the archipelago. Six of these zones will lie around Príncipe, while two will be located near the larger island of São Tomé. Together they will safeguard roughly ninety-three square kilometers of coastal and marine habitat.

Within some sections of these new protected areas, fishing will be completely prohibited to allow marine ecosystems to recover. Other zones will remain open to traditional small-scale fishing practices that have supported local communities for generations. The initiative forms part of a broader international effort to protect thirty percent of the planet's land and ocean areas by 2030. For sea turtles, the benefits are immediate and tangible. Safer coastal waters reduce the risk of accidental capture in fishing gear, feeding grounds remain intact for young turtles as they mature, and sensitive nesting beaches face fewer disturbances.

For the people of Príncipe, marine conservation is deeply intertwined with daily life. Many families depend on the sea for food and income, and restoring fish stocks is a long-term investment in both ecological and economic stability. Protected waters can allow marine populations to rebuild, ensuring that traditional fisheries remain viable while preserving the extraordinary biodiversity that makes the island unique.

Visitors who arrive on Príncipe during turtle season often find themselves drawn into this quiet story of conservation. Several of the island's boutique hotels, grouped under the Príncipe Collection, offer carefully guided excursions that allow travelers to witness nesting turtles or observe conservation teams at work. The experiences are intentionally intimate, with very small groups accompanied by local guides who ensure that wildlife remains undisturbed.

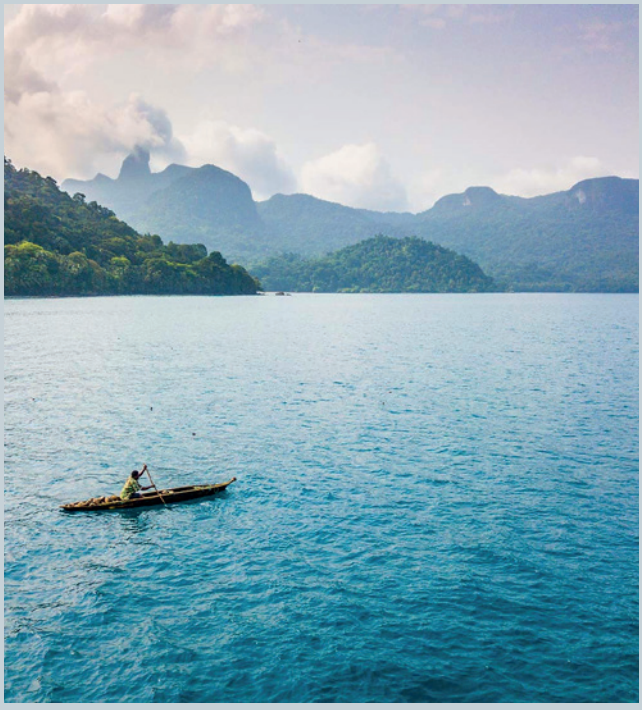
The guiding philosophy is simple but powerful: tourism should not exploit nature but help protect it.

Guests who participate in turtle excursions contribute directly to conservation through a small fee that supports community projects managed by Fundação Príncipe. In this way, travelers become part of a broader effort to protect the island's natural heritage.

Príncipe itself remains one of the least developed tropical destinations in the world. Once known primarily for its cocoa plantations, the island has evolved into a model for sustainable tourism while still retaining an atmosphere of quiet authenticity. Dense rainforests shelter rare bird species, waterfalls tumble through jungle valleys, and deserted beaches stretch for kilometers without a building in sight. As a UNESCO Biosphere Reserve, the island stands as an example of how conservation and community development can move forward together.

Watching a newly hatched turtle scramble across the sand toward the Atlantic can feel like witnessing the beginning of an ancient journey. Only a tiny fraction of hatchlings will survive the hazards of the open ocean and return decades later to nest on the same beach where they were born. Yet each season on Príncipe brings thousands of new travelers into that fragile cycle of life.

Every clutch of eggs laid in the sand is both a promise and a reminder. The oceans that sustain these remarkable animals also sustain us. Protecting them means safeguarding the delicate balance of nature and preserving a living world that future generations will inherit.



EU-Funded Ocean Energy Platform Begins Testing to Prove Storm Resilience and 24/7 Power from the Sea

Las Palmas, Spain, October 2025 - A new storm-resistant ocean energy structure has been installed off the coast of Gran Canaria, marking a breakthrough in developing renewable systems capable of operating through hurricanes. Developed under the EU's Horizon Europe–funded PLOTEC project, the prototype represents the next step in harnessing Ocean Thermal Energy Conversion (OTEC) to deliver round-the-clock clean power to island nations most exposed to climate risks.

"This is more than just a test of the core technology, which has already been proven to work — it's a demonstration of resilience," said Dan Grech, Founder & CEO of Global OTEC. "If we can demonstrate that OTEC platforms can operate safely and continuously through extreme weather, we open a new chapter for clean baseload power in regions that need it most."

The installation comes just weeks before COP30 and the Earthshot Prize 2025, where climate resilience and energy security for vulnerable regions are expected to top the agenda.

It marks the first long-term offshore operation of an OTEC platform in decades, following early temporary demonstrations such as the historic Mini-OTEC and OTEC-1 projects, deployed in the late 1970s and early 1980s off Keahole Point, Hawaii, USA, which used a U.S. Navy barge and a converted World War II T2 tanker, respectively.

This phase involved deploying the platform's cylindrical hull at the Oceanic Platform of the Canary Islands (PLOCAN) test site. The next phase will see the installation and connection of the cold-water pipe, completing the system ahead of full structural testing in the Atlantic environment.

During this structural testing stage, the platform will face the rough conditions of the Atlantic Ocean, allowing detailed analysis of its resistance, materials, and design. Advanced sensors from Fugro will record gyroscopic and accelerometer data to monitor the vessel's motion and, later, the cold-water pipe's stability, correlating these with local wave data. Previous computer simulations and a scaled tank test conducted in the UK have already verified the structure's design at laboratory scale.

“The data collected during the tests will validate our computational models and show how accurately we can simulate the interaction between the large-diameter riser and the vessel under a range of conditions,” explains Sam Johnston, Lead Engineer at Global OTEC. It will be combined with performance data from grid-connected OTEC power plants to de-risk future projects.

The PLOTEC project aims to accelerate the renewable energy transition for tropical island states such as Barbados, which face extreme weather and remain heavily reliant on diesel generation. OTEC offers a uniquely suited solution, using the ocean — their most abundant resource — to provide stable, 24/7 clean power. This prototype, engineered to withstand tropical storms, demonstrates how OTEC could deliver resilient and reliable energy to storm-prone regions.

Beyond advancing OTEC’s role in clean energy generation, the project contributes to marine engineering, computational modelling, and the development of weather-resistant materials for offshore use. The structure is named “Don” in honour of Don Lennard, a British aircraft engineer and Royal Navy veteran who dedicated his life to advancing OTEC technology.

Testing will continue over the coming months, with performance data expected in early 2026. If successful, the results will guide the design of full-scale OTEC systems capable of powering entire island grids and offshore facilities.

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Path to Bankability: Unlocking Investment in LDES - Free Webinar

Long Duration Energy Storage (LDES) plays a central role in the integrated, decarbonised, and secure energy system of the future, with a value that extends beyond managing the variability of renewable power.

While the importance of LDES has been recognised in relation to grid stability and renewable integration, widespread deployment requires overcoming hurdles such as revenue certainty and bankability.

This joint webinar by Flow Batteries Europe, the LDES Council and Energy Storage Europe brings together leading policy, finance, and industry perspectives to examine what it will take to unlock investment and accelerate LDES deployment across Europe and globally. The session will explore how governance frameworks, revenue models, and investor confidence can align to make LDES projects viable at scale.

Content:

- Understand how policy, governance, and market structures directly impact project bankability
- Learn from emerging best practices and proven frameworks already shaping the sector
- Discover how innovative revenue mechanisms including cap & floor approaches can create investable projects

© ClaudiaOtte / Fotolia

Climate action pays off

Every tonne of greenhouse gases avoided reduces damage to health, prosperity, infrastructure and the economy: New UBA Environmental Costs Handbook puts global damage caused by Germany's annual greenhouse gas emissions at more than EUR 640 billion, which can be avoided through ambitious climate action

Greenhouse gases and other pollutant emissions not only harm the environment and the climate; they also cause significant damage to the economy and human health. Appropriate measures can prevent these damages. To make these effects visible and comparable, the German Environment Agency has been using scientific models to calculate the economic cost of environmental pollution and climate change since 2007. The new "Environmental Costs Handbook – Methodological Convention 4.0" has been updated and expanded to help politicians and businesses make sound decisions.

Be it crop failures as a result of droughts, infrastructure damage by floods, or respiratory diseases caused by particulate matter: Environmental pressures such as greenhouse gas and air pollutant emissions cause a wide range of damage to society – at an immense cost. To better assess the scale of damage and the benefits of preventive measures, and to factor them into political and economic decisions, it can be helpful to convert them into euros. Taking environmental costs into account can support management and investment decisions as well as sustainability reporting in businesses. In the public sector, environmental costs can help to better estimate the impacts of new legislation or infrastructure investments.

According to current modelling, the greenhouse gas emissions released in Germany in 2024 will, over the time they remain in the atmosphere, incur losses in global welfare amounting to EUR 647 billion, if damages for present and future generations are weighted equally.

These figures are based on the climate damage cost rates from the newly released "Environmental Costs Handbook – Methodological Convention 4.0" from the German Environment Agency (UBA), as well as provisional data on German greenhouse gas emissions in 2024.
More information here

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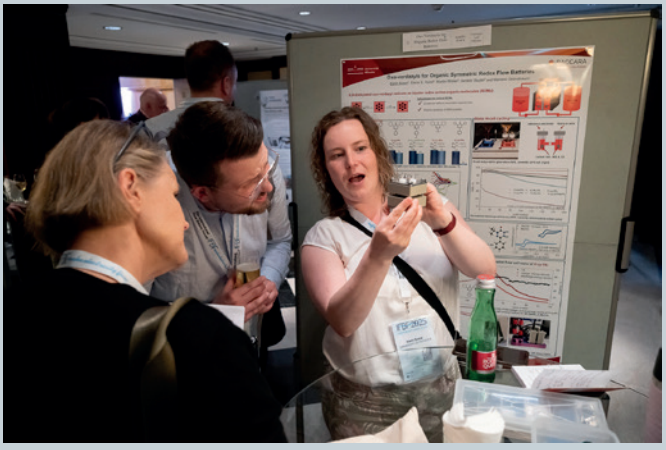
IFBF2026 – It's time for flow batteries!

The International Flow Battery Forum (IFBF®) - the leading event for the flow battery community - is back on 16-18 June 2026 in the capital of Hungary, Budapest, at the Intercontinental Hotel, located in the city centre in front of the Danube river.
The IFBF is the annual event promoting the most recent developments in the science, technology and commercialisation of flow batteries, covering a broad range of interests in the research and commercial aspects of flow batteries.

After the great success of the 2025 edition in Vienna, this year's edition expects 350 delegates from all over the world - featuring the leading experts of the flow battery sector - along with 20 exhibitor booths and 50 posters. Only a few months ahead of the event, the IFBF2026 exhibition area is already 75% booked.

Over three days, the IFBF agenda will feature talks on flow batteries latest developments and commercialisation, with policy presentations and market forecasts.

A number of networking activities are also foreseen, starting with a conference dinner on 16 June at Hungary's most famous and only Hungaricum restaurant, the almost 130-year-old Gundel Palace. On 17 June, a speed pitch session will allow researchers to introduce their research in less than a minute, which will set the stage for networking at the evening's poster session and cocktail reception. Finally, on 18 June, a local site visit will take participants to see a flow battery in action at a Hungarian site in Osku.



The IFBF call for proposals closed at the end of January with over 100 submissions. ‚The amount of submissions this year shows the interest and crucial focus flow battery is achieving at the international level'' states Secretary Anthony Price, Programme Coordinator of the IFBF2026. ‚We still have space for some poster proposals, and we are always interested in reading about outstanding presentations that could engage the flow battery experts in the audience. If that's your case, contact us!"
Sessions at the IFBF this year will include, but are not limited to, large scale flow battery systems for transmission reinforcement and data-centres, as well as distributed energy storage systems. The flow battery industry will also be discussed, along with the technology issues of the sector, the strategy and the comparison with other energy storage systems. The preliminary programme will be ready at the beginning of March. Tickets sales will follow soon.

IFBF2026 is possible thanks to the sponsoring of Quino Energy, Rongke Power, AMG Titanium, H2, InoHub Energy, and Volterion. The International Flow Battery Forum 2026 is supported by Flow Batteries Europe (FBE) and organised by CLERENS.
Website: https://flowbatteryforum.com/

IFBF The International Flow Battery Forum Budapest, Hungary 16-18 JUNE 2026

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WindEnergy Hamburg expands global leadership

More diversified, more innovative, more international: The world's leading wind industry fair asserts its key role in the wind energy industry while reaching out to Asia.

Hamburg, March 2026 – The countdown is on – 200 days to go until the launch of WindEnergy Hamburg. The global wind industry's top event will be writing the next chapter of its success story next September: already the number of registrations is about five per cent higher than it was around this time ahead of the 2024 event, and the exhibition floor at the world's leading wind industry fair will exceed 80,000 m2 for the first time. The new Hall A2 will be dedicated to the all-important subject of Energy Storage.

The integration of energy storage technology is considered as crucial for the long-term success of renewable energy. Exhibitors will showcase large-scale battery arrays as well as smart energy management technologies. What is more, the world's leading wind industry fair is becoming even more international: This year's exhibiting companies hail from more than 40 different countries, and the number of national pavilions is higher than at the last WindEnergy Hamburg, as well, now rising to a record 30.

A summit with a message

With this event, Hamburg is once more highlighting its role as a world-leading hub for wind energy. A powerful signal was sent from here at the end of January, when ten European energy ministers and other EU top representatives met in Hamburg for the North Sea Summit. The message of their "Hamburg Declaration": The North Sea is to become the world's biggest "power generator". There are plans for thousands of new offshore wind turbines, and new sea bottom cables are to improve the continent's grid connections. At total of 300 gigawatts (GW) of wind power capacity are to be installed by 2050 to reduce the continent's dependence on imported energy substantially. According to calculations published by the industry organisation WindEurope, this would be tantamount to replacing 70bn euros worth of fossil fuels from the year 2040.

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The European wind energy industry welcomes this announcement, which promises to provide a more robust basis for planning, saying it intends to invest around 9.5bn euros in new production capacity and create more than 90,000 jobs by 2030.

Crucial impetus for the industry

Complex bidding procedures, delayed grid connections, high cost pressures, political opposition and a changing security situation: “The industry is facing enormous challenges,” says Andreas Arnheim, Director – WindEnergy Hamburg. The more vital it is to seize the opportunity to engage in an exchange of views with the global community, he adds. “It is all about taking an active role in shaping the future of our energy supply. WindEnergy Hamburg 2026 is the ideal platform to do so,” says Arnheim. Apart from well-established companies, the show floor will see many newcomers: Exhibitors from Germany qualifying as “Young Innovators” benefit from a grant offered by the German Federal Office of Economics and Export Control (BAFA), and international start-ups will enjoy an exclusive participation offer. Many new enterprises specialise in Artificial Intelligence solutions, a key enabler of the energy transition.

Conference programme features numerous highlights

A total of six open stages will be set-up directly within the exhibition halls to host a multifaceted conference programme, accessible to all visitors free of charge. From reports on various market segments and regions to innovative technologies, and through to effective ways to protect critical infrastructure, top-flight speakers will address many topics relevant to the industry’s future.

Political Industry Summit: Decision-makers from the industry meet policymakers to discuss current challenges and opportunities facing the global wind energy sector.
Speakers’ Corner (Hall A3): Representatives of exhibiting companies will deliver keynote
speeches on their innovative solutions for the energy transition.
Global Markets Theatre (Hall B1.OG): Background information and analyses of international market developments will provide valuable input to inform global business strategies.
Energy Transition Stage (Hall B6): Industry leaders will explore topics such as international
cooperation, or innovative approaches to securing

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tomorrow's energy supply.
Offshore Stage (Hall B5): Speakers will provide practical insights and deliver strategic perspectives on current developments and technology trends related to offshore wind energy.
Energy Storage (Hall A2): Energy storage technologies are an indispensable prerequisite for the flexibility and reliability of our entire energy system. Representatives of manufacturers, suppliers, project developers and scientific research institutions will elaborate on practical approaches.
Recruiting Forum (Hall B3.OG): Young talents and career changers meet human resources representatives of exhibiting companies as well as experts from leading industry organisations.

Focus on recruitment

Attracting skilled professionals is the purpose of the Recruiting Days. On two days of the fair, young talents will be the focus of attention. Exhibiting companies and industry associations will provide insightful introductions to jobs in the wind energy sector, describing career paths, answering questions, and making time for personal conversations. Trainees, university students and pupils will have free access to the fair.

Encouraging face-to-face interaction is a core objective of WindEnergy Hamburg: special areas for conversations between exhibitors and visitors will be provided in every hall, and popular networking formats such as Wine o'clock will be given even more space. What is more, around 100 company parties at exhibitor stands will create additional opportunities for informal in-depth exchanges.

Successful concept rolled out to Asia-Pacific

The Asia-Pacific region harbours significant potential for European companies. India, for example, is planning to expand its installed capacity by 140 gigawatts by the year 2030. Hamburg Messe und Congress (HMC) has formed a new cooperation partnership to unlock this promising market: Following its successful premiere in Hamburg last November, the RECHARGE Wind Power Summit powered by WindEnergy Hamburg will travel to Singapore in May. The two-day RECHARGE Wind Power Summit Asia-Pacific powered by WindEnergy Hamburg will launch as a combination of a top-flight industry conference and a compelling exhibition. "This event merges our know-how as trade fair organisers with the expertise of the industry magazine RECHARGE to make our mark in this dynamic growth market," says Claus Ulrich Selbach, Vice

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President Exhibitions at HMC. The two partners will receive organisational support from two government agencies, Enterprise Singapore and the Singapore Tourism Board (STB).

About WindEnergy Hamburg

From 22 to 25 September 2026, WindEnergy Hamburg, the world's leading wind industry fair, will once again be the pivotal networking hub for experts, companies and investors from around the world: At the exhibition complex of Hamburg Messe und Congress, right in the heart of the famous German port city, more than 1,600 companies from roughly 40 countries will present their innovations and solutions to 43,000 participants from around 100 different nations. Covering more than 80,000 m² of exhibition floor, equipment manufacturers and suppliers representing all stages of the onshore and offshore wind energy value chain will provide a comprehensive market overview.

The new Energy Storage expo area, located in a hall of its own (A2) with roughly 3,600 square metres of floor space, will put the spotlight of the flagship fair on energy storage technology. The exhibition will be accompanied by freely accessible conference sessions where top-ranking experts will address the industry's key topics. Featuring more than 300 renowned speakers on six open stages, this free conference programme is organised by the WindEnergy Hamburg team jointly with its partners, including the Global Wind Energy Council (GWEC), the European industry organisation WindEurope, the national industry associations Verband Deutscher Maschinen- und Anlagenbau (VDMA, Europes largest engineering association) and Bundesverband WindEnergie (BWE), as well as leading industry media and enterprises.

Highlighting its global relevance, WindEnergy Hamburg is pleased to announce a new cooperation project: On 19 and 20 May, the RECHARGE Wind Power Summit Asia-Pacific powered by WindEnergy Hamburg will take place in Singapore.

Opening hours and further information

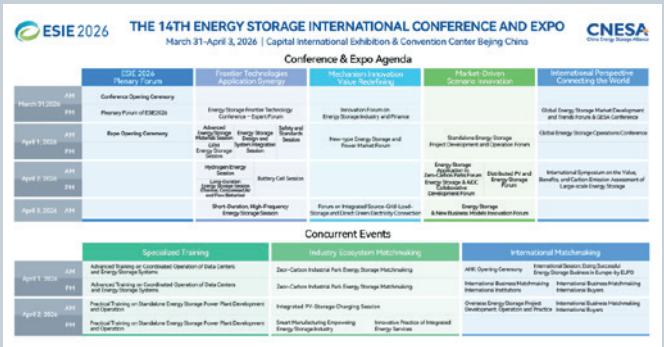
WindEnergy Hamburg 2026 will open from 10:00am to 06:00pm Tuesday 22 September to Thursday 24 September, and from 10:00am to 04:00pm on Friday 25 September.

ESIE 2026 Conference & Expo

The global energy storage industry event — the 14th International Energy Storage Conference and Expo (ESIE)— will be grandly held from March 31 to April 3, 2026 at the Beijing Capital International Exhibition & Convention Center.

Under the theme “Scenario Innovation, Value Redefining, Connecting the World”, ESIE 2026 is jointly hosted by China Energy Storage Alliance, China Energy Research Society, and Institute of Engineering Thermophysics, Chinese Academy of Sciences.

As part of the upcoming International Energy Storage Conference and Expo 2026 (ESIE 2026), we are pleased to present a series of high-level concurrent events taking place alongside the exhibition in Beijing this April.



These sessions will gather global industry institutes, developers, utilities, EPCs, investors, and technology leaders to discuss:

- Utility-scale & standalone storage development
- Commercial & industrial energy storage applications
- Global market outlook & cross-border opportunities
- Zero-carbon parks, VPPs & integrated energy systems

ESIE 2026 CONFERENCE & EXPO | CNESA 中关村储能产业技术联盟 China Energy Storage Alliance