



CBAM

The global impact
of Europe's carbon
border adjustment
mechanism



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Happy New Year

By **Ed Wiseman**, *EEI* magazine

There can be few more notable examples of Europe's commitment to scientific progress than its 'Community Research and Development Information Service', or CORDIS, which celebrated the 30th birthday of its website in November.

CORDIS itself is in fact older than that – older even than the World Wide Web itself – but in late 1994, the domain "cordis.lu" was registered, cementing the European Union's presence on the then-embryonic internet. It was the EU institutions' first permanent foray into this hopeful new world, and one of the first ten thousand or so sites to exist; it predated Hotmail, Geocities, and the other long-dead giants that will be distantly familiar to anyone who "surfed the web" in the Nineties.

The image above is a relic from this not-so ancient era. Providing instructions on how to access CORDIS using Telnet, EuropaNet, and videotex, it goes on to suggest entering "the command `https://www.cordis.lu`" into "browser software (e.g. Mosaic)" in order to reach the "CORDIS WWW service", which was to launch in December 1994 – almost exactly three decades ago at the time of writing.

Today, you can access CORDIS by mashing "ccordiws" into your mobile phone while waiting for a bus. Despite increasingly dispiriting news, even the most pessimistic of outlooks must take into account how much has been achieved in our lifetimes, especially in the field of communication. CORDIS is a tiny aspect of this, but is totemic of the phenomenal change – and the pace of that change – made possible by cooperation.

EEI in 2025

EEI is around half as old as CORDIS, and plays a relatively modest role in communicating the activities of Europe's research programme; as this magazine enters its 15th year, it has worked with mere hundreds of Horizon projects, compared with the 150,000 or so currently searchable on CORDIS. But

CORDIS ON INTERNET WORLD-WIDE WEB

From early December 1994 CORDIS will be extended to include a CORDIS World-Wide Web (WWW) server on Internet. This service will provide information on CORDIS and the CORDIS databases, full text documents including the work programmes and information packages for calls for proposals, and a link to the existing CORDIS databases.

To help proposers find appropriate partners, CORDIS will also extend its existing partner search service and establish a new expressions of interest service for the Information Technologies programme. The service will allow proposers to submit their entries electronically and to search for suitable partners via the CORDIS WWW server.

CORDIS is available through ECHO (the European Commission Host Organization) and can be accessed using a direct telephone line, your local packet switched data network (PSDN), the Internet and Europenet networks, as well as all operational videotex services in Europe, and via gateways from other systems:

- Telephone: +352-420347 using 300 - 9600 bps (even parity, 7 data, 1stop);
- PSDN: NUA access for Europe 0270448112, or for the UK only, A9270448112;
- Internet: Telnet echo.lu;
- Europenet: +204-370-310099.

In order to use all the facilities of the CORDIS service on ECHO you need to register as a user with the ECHO Help Desk or by using the new ECHO on-line registration system.

Access to the CORDIS WWW service will be available on the Internet using browser software (e.g. Mosaic) and the command:

`http://www.cordis.lu/`

CORDIS Help Desk

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L-1023 Luxembourg

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E-mail helpdesk@cordis.lu

The CORDIS Help Desk can also be reached by using the following freephone numbers:

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Netherlands:	060223356
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Spain:	900993521
Sweden:	020795838
United Kingdom:	0800899256

in addition to its editorial articles and original interviews, EEI remains one of the leading dissemination partners for projects in the energy and sustainability space, and the only print publication of its kind.

This issue features four research projects, opinion pieces by MEP Lynn Boylan and EUREC Secretary General Greg Arrowsmith, and an article by EEI journalist Elizabeth Meager about the impact of CBAM. We have also shared work by EU Sustainable Energy Week (EUSEW) Young Energy Ambassadors in recognition of our longstanding partnership with the event. And we've included a selection of relevant energy news, a data-led piece by journalist Ada Homolova, as well as the usual events listings at the back.

EEI has evolved and adapted extensively over the years and will continue to do so in 2025. The EEI team and I look forward to working with Europe's energy leaders in January and beyond, whatever challenges and opportunities the new year might bring. ■

European Energy Innovation

is written *by and for* the leaders of Europe's green transition. Senior politicians, policymakers, researchers and heads of industry contribute to this unique magazine, which will always be free to read.

Carbon border rules: winners and losers

The EU's world-first CBAM is poised to transform global trade, driving an ever-sharper divide between companies embracing sustainability – and those struggling to adapt

Image: Shutterstock



By EEI journalist
Elizabeth Meager

When EU policymakers crafted the world's first Carbon Border Adjustment Mechanism (CBAM), they aimed to shake up global trade by leveling the playing field – forcing companies in carbon-regulated regions to compete fairly with those in places with weaker environmental rules. While the mechanism is not yet operational, both companies and the lawyers that advise them say it represents a major game-changer.

As of October 2023, producers of aluminum, fertilisers, cement, steel, hydrogen, and electricity must measure the carbon dioxide emissions generated during the production of all goods they export to the EU. As of January 2026, they will be required to pay the EU's carbon border tax. As the CBAM will align with the EU's emissions trading system (ETS), the price per tonne of imported goods is, as of today, €67.88 – but by 2035, it could be as high as €200, according to BloombergNEF.

The idea is that EU-based producers have been at a competitive disadvantage for years because of the EU's sophisticated ETS, which it introduced years before much of the rest of the world. The belief is that this has made it difficult to compete with companies in countries not subject to carbon pricing, stalling economic growth within the bloc and limiting certain EU industries' ability to be part of the energy transition.

Thousands of companies globally are expected to be hit by the CBAM, with Russia and China accounting for more than one-quarter of EU trade in affected industries (based on 2019 data). The UK, Turkey, and Norway are also home to a high proportion of affected companies. According to analysts Wood Mackenzie, the CBAM is expected to generate more than \$US9bn in revenues per year from all sectors by 2030. Some of that will go to EU countries, and

some will be redistributed to developing country trading partners to incentivise decarbonisation.

The first-mover advantage

All of this means that for companies around the world that have been leading on sustainability, the CBAM could represent a major export opportunity – while others say it is so far an economic and compliance-related headache.

PT Gunung Raja Paksi (GRP) is one of Indonesia's biggest steel producers, and has been facing significant competition from Chinese steel mills in recent years. "That means we have to be very different in our approach," Kelvin Fu, GRP's Jakarta-based chief transformation officer, tells *EEI*. Unlike its competitors which tend to use blast furnaces, GRP uses electric arc furnaces, and in June 2024 secured \$60m in financing from the International Finance Corporation, which is directly tied to GRP's decarbonisation efforts.

"There are not many electric arc furnace mills in Asia that will be able to export their steel to the EU in the future," says Fu. "With the CBAM in place, the higher the carbon tax, the less competitive blast furnaces become, and the more competitive we become. This is a game-changer for us."

While it is facing higher compliance and operational costs than its competitors today, GRP has concluded that in the coming years it will have a far bigger market share "in places like the EU that are serious about carbon", adds Fu. And this first step from the EU – combined with the IFC's financing – could open up further markets for GRP, he explains, because other countries are highly likely to follow in the EU's CBAM footsteps.

Adapt or die

Serbian-German phosphoric acid and mineral fertiliser producer Elixir Group is another of those companies. As Matthias Predojević, Elixir's vice president of corporate development, tells *EEI*, 70% of its products are imported internationally – and mostly into the EU – and the business has long taken a proactive approach towards energy efficiency and sustainability.

"Elixir Group values the transition to low-carbon alternatives, both in terms of raw materials and energy, so measures have already been taken to reduce emissions," says Predojević. "We are strongly focused on reducing energy dependence on fossil fuels. Decarbonisation of mineral fertiliser

production is achieved through the use of raw materials and energy sources that require fewer resources and energy to produce."

As he explained, Elixir Group strives for complete decarbonisation in the production of thermal energy as a large consumer. When it comes to electricity, they are planning investments in renewable energy sources, solar and wind power plants.

These decisions have been driven by cost and energy efficiency, but the company's carbon footprint has fallen in parallel. "To be able to stay long term on the market, you have to be energy-efficient and sustainable – it's absolutely logical," he adds. "We are convinced that sustainable chemical production is the only way to survive in the future."

Elixir Group is committed to the full implementation of CBAM regulations and has established that the company is in good stead to meet EU standards for phosphoric acid production – and potentially even exceed them.

These decisions have been driven by cost and energy efficiency, but the company's carbon footprint has fallen in parallel, he says. "To be able to stay long term on the market, you have to be energy-efficient and sustainable – it's absolutely logical," he says. "We are convinced that sustainable chemical production is the only way to survive in the future."

Serbia is in a somewhat more favorable position compared to other non-EU countries, as it has been a candidate for EU membership since 2012. Most Serbian energy is derived from coal, with the fossil fuel making up around 60% of its total mix, while the remainder is made up of hydropower, wind and solar.

While there is currently no carbon market in place, the Serbian government remains dedicated to advancing its EU membership efforts, which includes aligning its environmental policies with EU standards.

Compliance challenges

While it presents a major opportunity for some companies, for others, the CBAM is "primarily a compliance challenge", says Dylan Geraets, counsel at law firm

"For companies around the world that have been leading on sustainability, the CBAM could represent an export opportunity"

Mayer Brown in Brussels. This applies to both non-EU businesses and those within the bloc that rely heavily on the imports of CBAM-affected goods, and in his experience, has been the consensus across various sectors and company sizes.

“Many non-EU companies are struggling in their attempts to satisfy the requests to collect and provide data on actual emissions,” adds Geraets. “They do not have the ability to provide verifiable emissions data, as no reliable and accepted monitoring systems are in place. In the absence of information on current emissions, it is premature to speak of a switch to different, less CO₂-intensive product processes or technologies,” he says.

Meanwhile Totis Kotsonis, a trade-focused partner at law firm Pinsent Masons in London, says that in his experience, most companies are still working out the extent to which the CBAM will affect their business.

He acknowledges the dialogue about the regulatory complexity it introduces, but says “there is a general sense that businesses are in fact adapting and implementing the necessary processes that would allow them to comply with the new law”.

Trade wars ahead?

GRP’s Fu believes that policies like the CBAM – combined with steps towards a global carbon price – will help drive demand for grid decarbonisation around the world. “There’s a lot of international funding going towards helping Indonesia to decarbonise its grid, but demand also needs to be there,” he says. GRP has told the Indonesian government it is ready and willing to invest in renewables.

But GRP may well be an outlier. Policymakers from certain countries, including but not limited to India and China, have been vocal about what they perceive to be an unfair system that discriminates against their domestic industries. Many used the Cop29 talks in Baku, Azerbaijan as an opportunity to raise these concerns, and while the issue was not tackled in the end, reports suggest that their request delayed the opening plenary.

According to consultancy Grant Thornton, while most countries with a large proportion of affected companies are actively engaging the EU to seek exemptions or solutions, “China is seeking alternative markets to reduce its dependency”.

While there have not been formal challenges at the World Trade Organisation just yet, it has been discussed – and the US’ re-election of Donald Trump, who has never shied away from a trade fight, heightens that likelihood, says Pinsent Masons’ Kotsonis.

“A number of countries [believe] the EU’s expectation that the CBAM would incentivise the adoption of local measures that promote decarbonisation to be misplaced, given the costs that such measures would involve,” says Kotsonis. “All in all, CBAM was and continues to be controversial, and it is too early to say whether it will have the desired effect of ... facilitating the move away from carbon-intensive processes at a global level.”

Fu says that as a long-term steel market participant, GRP has long had to be cognisant of global trade protectionism. “Asian countries in general, where manufacturing

“Policymakers from certain countries have been vocal about what they perceive to be an unfair system”

dominates, will be price-takers on the CBAM – they have no choice but to embrace it,” says GRP’s Fu. “Most of these companies are very late in the game and have no clue how they’re going to respond to the CBAM.”

The future of trade

Indeed at an energy industry event in Belgrade in November, representatives from heavy industry affected by the CBAM – including cement producer Lafarge Serbia and steel firm Metalfer Group – asked the Serbian government to align its rules with the EU’s mechanism.

The UK has already concluded a consultation process on a CBAM to complement its ETS, and Australia, Canada, South Korea and Taiwan are all reportedly considering introducing their own carbon border adjustments.

There are approximately 75 carbon pricing instruments in place as of today, covering 24% of global emissions – but that is likely to change once the CBAM is fully operational, says Fu.

“I believe that once governments realise that there’s carbon leakage and companies are paying other governments taxes, they will say: stop that, and pay me instead,” says Fu. “I think in a few years everyone will be rushing to implement a carbon tax. People are really underestimating the power of the CBAM.” ■

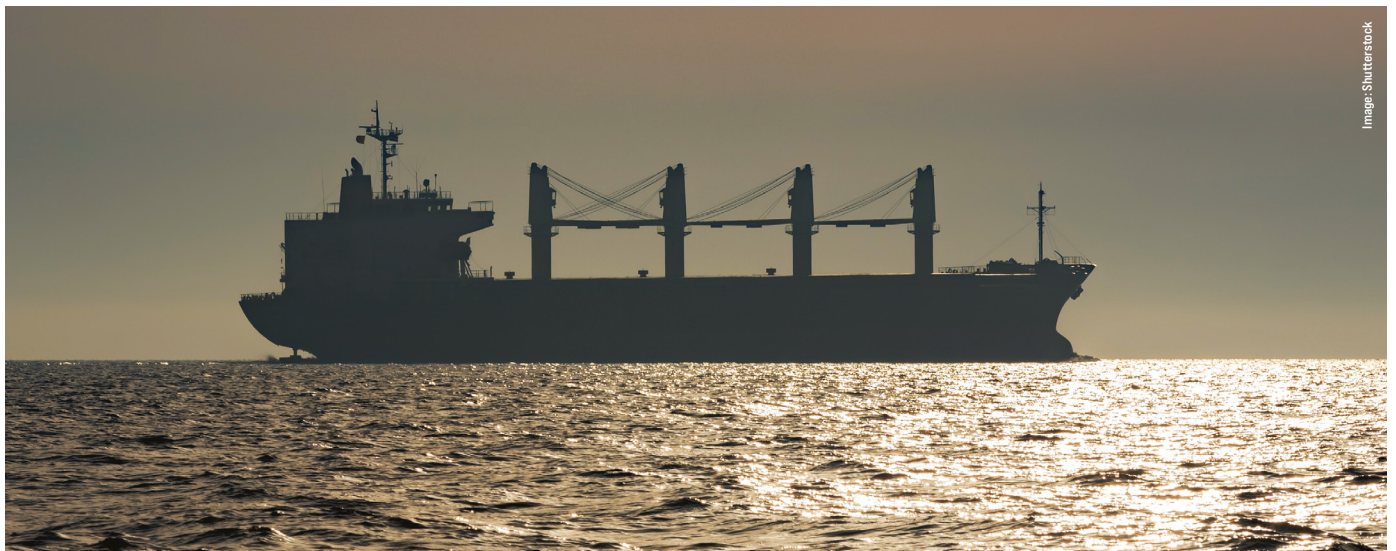


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The perception of progress

Ireland's unreliable emissions reductions could be undone by the EU's CBAM.



By Lynn Boylan, MEP

During the recent elections in Ireland, the governing parties were quick to take credit for reductions in greenhouse gas emissions achieved under their watch. However, a closer examination reveals that these reductions were driven by transient external circumstances rather than durable policy changes. As a result, the incoming government could soon face rising emissions, spurred by the same external factors that previously masked the lack of genuine climate action. Much will depend on the EU's Carbon Border Adjustment Mechanism (CBAM), which could soon reverse Ireland's perceived progress.

A climate laggard's fleeting success

Ireland has long been seen as a climate laggard, with the second-highest per capita emissions in the EU. For 2022, when emissions began to decline, there was cautious optimism that the country had turned a corner. This optimism surged for 2023, when emissions plummeted by 6.8%, dropping below the 1990 baseline for the first time in three decades.

Politicians celebrated this apparent triumph. Not only had emissions fallen, but they had done so while the economy continued to grow – an apparent political victory for Fine Gael (EPP), Fianna Fáil (RE), and the Green Party (Greens), who claimed they had achieved the elusive goal of reducing emissions without disrupting business-as-usual.

Why did emissions fall so rapidly?

A sectoral breakdown of the reductions reveals that the energy sector was

responsible for most of the heavy lifting, with a dramatic 21.6% decline in emissions. Other sectors showed much more modest reductions, such as agriculture (down 4.6%), or even increases, such as transport and land use (LULUCF). More than half of the total reduction came from the energy sector.

Setting aside the preferred approaches of the fossil fuel industry, such as hare-brained carbon capture and storage initiatives or using fossil gas as a 'bridging fuel' away from coal and oil, the main way to eliminate emissions from energy is to stop burning fossil fuels. In the electricity sector, there are generally two main strategies: reducing consumption of electricity or increasing the share of renewables to displace fossil fuels. Ireland's recent reductions, however, reflect neither.

Unlike most EU countries, which cut electricity consumption in response

to soaring energy prices following Russia's invasion of Ukraine, Ireland's electricity demand actually increased. While households and small businesses reduced consumption due to record-high electricity prices (the most expensive in the EU) large energy users, almost exclusively data centres, drove demand higher.

Renewable energy's share of Ireland's electricity mix rose modestly from 38.6% in 2022 to 40.7% in 2023. However, this increase of 2.1% in renewables was largely outstripped by the increased overall demand for electricity of 2.5% – almost exclusively driven by data centres. As a result, fossil fuels would not have been significantly displaced by these additional renewables.

The main cause: offshoring emissions

If neither reduced consumption nor

A Meta data centre in Ireland



expanded renewables explains the rapid decline in emissions, what does? The answer lies in electricity imports. In 2023, Ireland's electricity imports surged twelvefold, with early indications suggesting the upward trend has continued in 2024.

Due to the way carbon accounting works, emissions associated with imported electricity are attributed to the exporting country – in this case, Britain. Thus, any fossil fuel-powered electricity imported into Ireland is counted under Britain's emissions, not Ireland's.

Politically, this offshoring of emissions was convenient for the Irish government, which could claim emissions reductions. However, in the absence of adequate data it is unclear if they really reduced emissions or if fossil fuel burning remained unchanged – merely displaced across the Irish Sea. Despite internal warnings to steer clear of unwarranted self-praise, there was significant political pressure exerted to ensure the government got credit, deservedly or not.

The role of price and policy

The Irish government has attempted to claim credit for the rise in imports by

pointing to its longstanding policy of increasing interconnection with Britain. However, this argument is flawed: the interconnectors enabling these imports have been operational for years, well before the surge began in Spring 2023. The true driver lies in the significant price difference between electricity in Britain and Ireland.

British electricity became cheaper in 2023, partly due to differences in carbon pricing. The UK's carbon price fell well below the EU's, with the gap reaching a peak discount of £31 per ton of CO₂ in September 2023. This price disparity made British electricity more attractive, contributing to the flood of imports to Ireland.

Carbon leakage and the CBAM

The phenomenon at play here – carbon-intensive industries relocating to jurisdictions with laxer emissions constraints – is known as carbon leakage. The Irish government is well aware of this issue, as it is legally required to consider it when designing climate policies under its own climate law. However, there hasn't been much action evident. For example, there are reports of Irish renewable energy

“There are generally two main strategies: reducing consumption of electricity, or increasing the share of renewables to displace fossil fuels. Ireland's recent reductions reflect neither.”

producers being told to “dispatch down” and cease supplying to the grid even when dirty fossil fuel-generated electricity is being imported from Britain.

To counter carbon leakage, the EU is rolling out the Carbon Border Adjustment Mechanism (CBAM). CBAM will impose levies on carbon-intensive imports like electricity, thereby reducing the price advantage of British electricity. Its full implementation by 2026 will likely reduce imports, forcing Ireland to fill the gap with domestic electricity generation, potentially increasing domestic fossil fuel use and emissions.

Aside from climate targets, this could also lead to an increase in electricity prices which are already the highest in the EU and have led to untenable levels of indebtedness to energy suppliers.

Real climate action

Ireland's recent emissions reductions are a fragile achievement built on transient external factors. Without decisive action, the country risks a sharp rebound in emissions. Instead of relying on offshoring, the government must pursue reliable climate action.

We need to reduce demand from large energy users. Data centres, the fastest-growing consumers of electricity, need stricter regulation. Mandating that new data centres be powered entirely by renewable energy *at any given time* will help curtail their impact. Removing significant tax incentives would also seriously stem the flow of investment.

We also need to accelerate renewable energy deployment. The pace of renewable energy development must outstrip the growth in electricity demand to ensure fossil fuels are displaced, not supplemented.

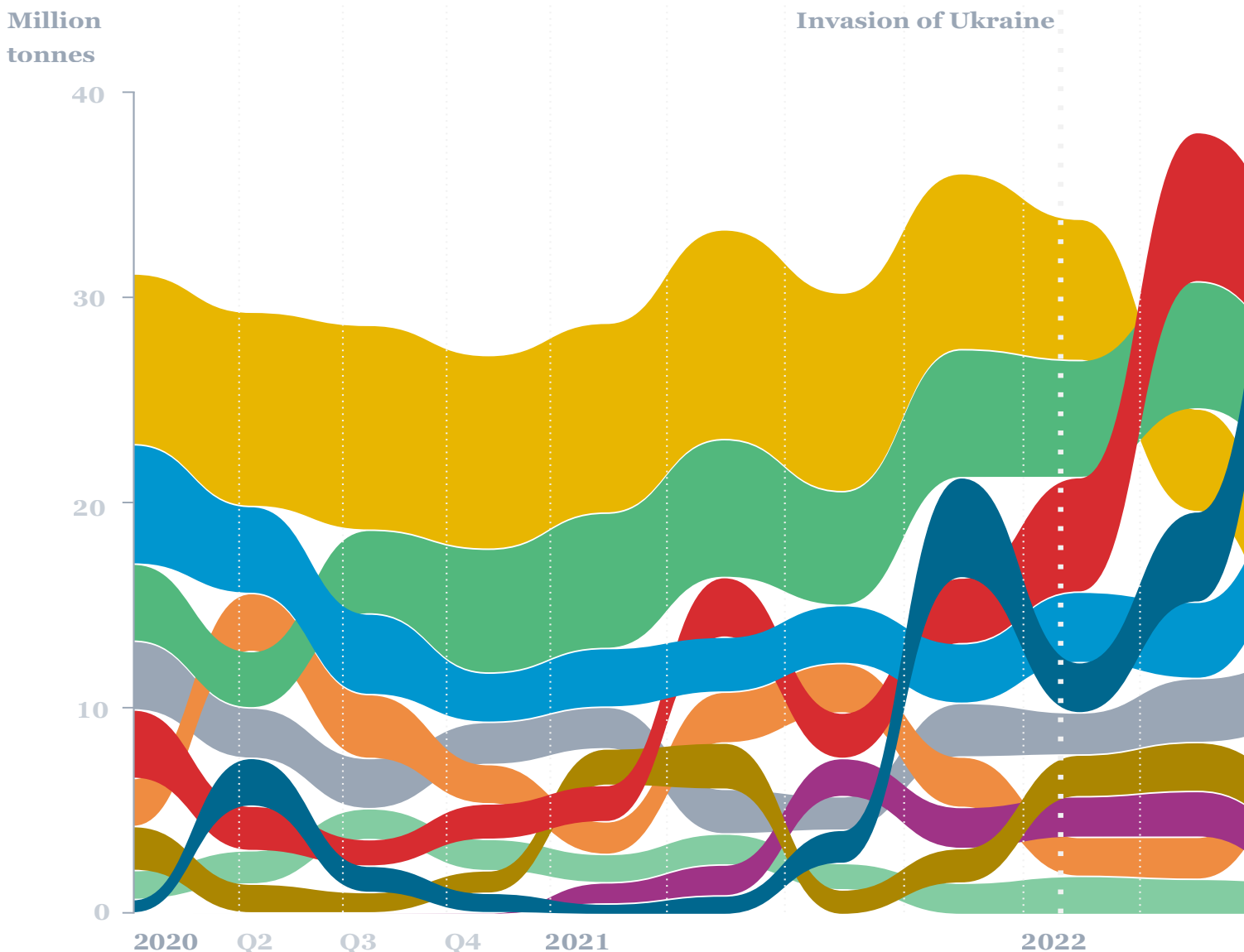
Without bold action, Ireland's climate targets and credibility are at serious risk. What appears to be a success story today could easily unravel tomorrow. ■



Image: Alamy

The Shifting Currents of European Gas

Exports of liquified natural gas and natural gas in gaseous state to EU countries from 2020 to Q3 of 2024



By **Adriana Homolova**,
EEI journalist

The Russian invasion of Ukraine has profoundly reshaped Europe's natural gas supply dynamics. The graphic covers the period from 2020 to Q3 2024, charting 626 million tonnes of gas imported by EU countries

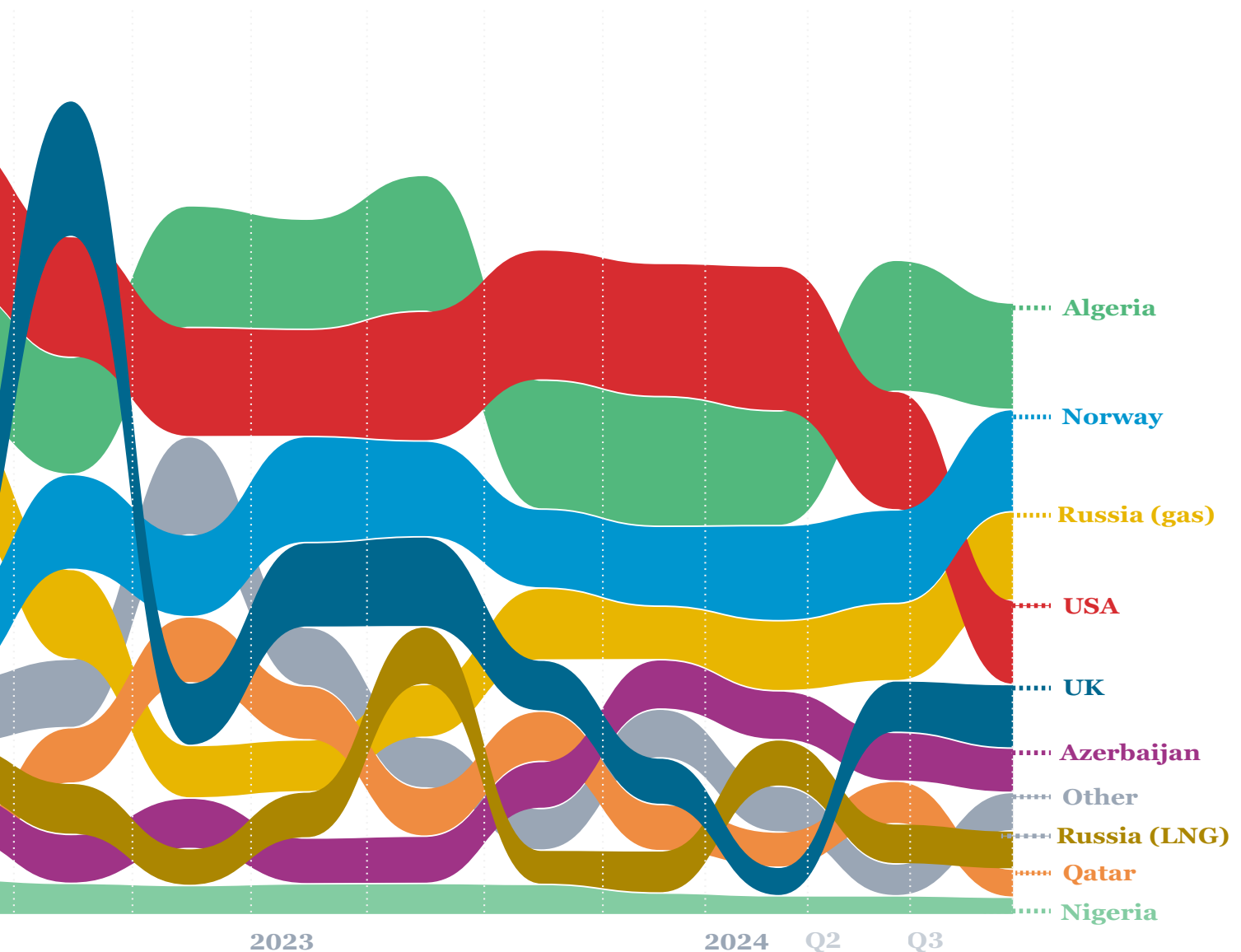
Following the invasion of Ukraine, Russian gas flows to Europe sharply declined but began recovering in 2023. By the third quarter of this year, Russian pipelines ranked as Europe's third-largest source, driven by consistent exports to Hungary and Italy, which together account for 40% of Russian pipelined gas purchases in 2024. When combined with Liquefied Natural Gas

(LNG) exports, Russia remains Europe's largest overall gas supplier.

The United Kingdom, a country not exactly known for its gas fields, stepped into the breach left by Russian gas, topping the charts Q3 2022. UK LNG imports soared by 74% compared to 2021, with shipments arriving mostly from the US and Qatar. This LNG, once regassified, has flowed back across the Channel—mainly to Belgium.

Post-invasion, the US and Algeria emerged as Europe's go-to suppliers. But since the second quarter of 2024 the U.S. has declined to fourth place in Europe's supply chain as US exports to Spain, one of their largest customers, dropped by

Gas



Source: COMEX trade database. Data aggregated by quarters.

56% in Q2 and Q3 2024 compared to the previous year. Meanwhile, Norway has taken second place, with Azerbaijan making waves thanks to a deal to double exports by 2027.

Italy, by a considerable margin, stands as the dominant importer during the period analyzed, capturing a hefty 35% of gas exports. This is partially thanks to its pipeline connection with Algeria, but also because Italy relies heavily on gas for electricity generation. While Algeria (35%) and Russia (25%) dominate its supply mix, Italy also taps into reserves from Azerbaijan and Qatar, each accounting for 11% of its imports. Notably, Italy holds the crown as the top

customer for these latter exporters—Russia being the exception.

Trailing right behind Italy are Belgium and Spain, each accounting for around 16% of the exports shown. Belgium leans heavily on imports from the UK and Norway. Spain is basing its energy diet on a mix of Algerian and U.S. gas.

But the landscape is poised for another seismic shift. Russia is expected to halt all gas flows through Ukraine by year's end, a move likely to send a ripple through global markets. Flows into Austria, for whom Russia was a key supplier, were ceased in November. LNG prices began to climb in Q3 and currently (early December 2024) hover

near their annual peak of €48/MWh—still far below the eye-watering €336/MWh spike seen in August 2022.

Meanwhile, Europe's gas demand has softened, down 7% in 2023 compared to the previous year. The EU's gas storage facilities are also pretty full, now at 94% capacity. Yet, the winter came on stronger this year than last. Reliance on spot-priced LNG instead of pre-negotiated pipeline contracts leaves the continent's industrial economy exposed to volatile price swings. As Europe navigates this precarious energy landscape, the resilience of its supply chain—and its economy—remains a critical issue. ■



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The dawn of the geothermal age

“Geothermal energy has enormous potential in Europe – but its three main hindrances are surmountable”



By **Sanjeev Kumar**, Head of Policy, the European Geothermal Energy Council (EGEC)

There is a saying in the English language that sometimes one waits an eternity for a bus to arrive and then two, sometimes more, come along at once. The same can be said about geothermal energy in December 2024.

Two historic events occurred a few days apart. Firstly, the International Energy Agency (IEA) launched its Future of Geothermal Energy Report. It was the first time the world's leading energy experts recognised geothermal's pivotal role in the global energy transition.

Moreover, it outlined a roadmap to catalyse the oil and gas industry's skills and assets towards a renewable energy sector that is not too dissimilar from their current worlds.

Energy Ministers, in another historic first, agreed to EGEC conclusions

“Wind, solar, offshore energy, biomethane and hydrogen were given indicative EU targets. The same is required for geothermal”

to advance geothermal investments across the continent a few days later. They highlighted regulatory complexity, financial and commercial barriers, insufficient human capacity or technology-specific experience in permit-granting authorities, and the lack of a skilled workforce or specialised companies – which led to the “suboptimal” use of geothermal energy's potential.

The European Commission was given robust instructions to prepare a Geothermal Action Plan and launch an industrial alliance. Both are essential for consumers and the industry. The former will provide political orientation, while the latter will house industry, governments and consumers in a forum to co-create solutions to smooth investment pathways.

When total lifetime costs are measured, geothermal shines as a very competitive solution. This, however, depends on the maturity of the market in which it operates. The problem is that there are too few mature markets across the EU. This must be the strategic objective of the Geothermal Action Plan and Industrial Alliance.

Multiple service providers, simple permitting processes, accessible finance and/or business models combined with consumer awareness are the foundations of a mature geothermal market. The Geothermal Action Plan must address three hindrances preventing the mainstreaming of geothermal.

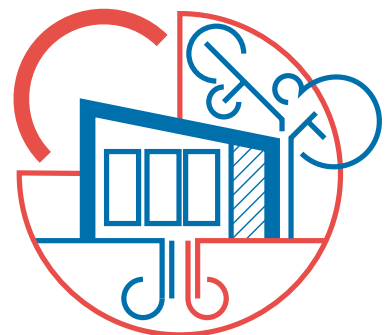
Firstly, a competitive market will drive down drilling costs. These include the time spent obtaining permits, exploring geothermal resources and actual project development. A raft of new legislation on permitting has been agreed upon in the recent revisions to Renewable Energy Directive. Ensuring these rules are implemented effectively to make geothermal project development more rapid and less cumbersome yet still respecting strict environmental protections is crucial.

Digitalisation has a major role to play in this. Financial risk guarantees for large-scale projects, support for heat and cold zoning as well as infrastructure, remuneration of energy system benefits such as grid stability and energy storage, and level-playing fields are also important.

Secondly, a sizeable market is a prerequisite to crowding in private capital and engineering expertise, which is locked in other, more financially lucrative activities. Wind, solar, offshore energy, biomethane and hydrogen were given indicative EU targets. The same is required for geothermal.

Finally, EU guidance on Renewable Heating & Cooling Purchase Agreements is required. These allow consumers, such as cities, farmers and manufacturing industry to invest in long-term supply contracts with geothermal providers. Sadly, Public-Private Partnerships have a poor reputation in many countries. EU guidance will restore confidence.

Aside from mainstreaming geothermal, these EU actions will reset the negative politics concerning the energy transition. After all, geothermal brings inclusive and sizable change to our energy mix. It is one of the few solutions that benefits the masses. This is the real energy required to reinvigorate the energy transition. ■



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A ‘vast but underutilised pool’ – can the EU stimulate operational data sharing in renewables?



By **Greg Arrowsmith**,
EUREC Secretary General

“In some domains, such as wind energy, some relevant actors such as component manufacturers (Tier 2-3 categories), ICT companies, SMEs and academia do not have access to operational data, causing the block of their capacity to improve existing products and develop innovative digital services.”

In July the five [Horizon Europe projects designing a Common European Energy Data Space](#) released “[Blueprint of the Common European Energy Data Space \(version 2.0\)](#)”. They specifically call for sharing of wind energy data within the sector.

First, a quick question: who of Letta, Draghi or von der Leyen used the phrase quoted in the headline to describe electronic data in their major policy document this year¹?

Now the bigger question: just through applying data-driven digital tools, can Europe shave a few percent off the cost of transforming its energy system to one meeting the Renewable Energy Directive target of 42.5% of final energy consumption from renewables by 2030?

These would be tools – most likely in the form of sophisticated software with an AI component – that a) optimise intervals for plant repairs and pinpoint the cost-optimal repair, b) detect anomalies in plant performance and advise on likely causes, and c) give insights in the optimal combinations of subcomponents in a plant and into plant layout (see box).

In other words, they would focus on getting the most out of an installation for the least cost, as opposed to tools that the European Commission is already promoting² for dealing with the electricity once it is ready to leave the plant, for example by adapting demand to the second-by-second and hour-by-hour output of PV and wind plants.

Let’s add some real-world constraints to the way in which the tools should be built:

- For the tools to perform well, high-quality data from tens of GW of plants will be needed to train them. Such volumes of data are greater than all but the biggest wind or PV plant owners have access to, so the tool creator will most often need several data owners to share data with them. But data has value, so the owner must be offered something in return.
- Forget about accessing data on how the generating technology (e.g. wind turbine, PV module) was made; manufacturers’ intellectual property is too precious and will not be shared. The tools will have to work with operational data alone (e.g. real time data like electricity output, light levels, wind speeds, ambient temperature, as well as meta-data describing the plant).

What could the EU do to ensure such tools are developed? The European Commission could help today by incentivising the sharing of the operational data needed to train them.

Data access... but how?
EUREC has identified five ways in which data might be shared between a data owner and one or more recipients, depending on the sensitivity of the data. Then we imagined the data owner would

Case	Type of sharing	Premium
1	Operational plant data shared publicly; the plant and its components identified	High
2	As 1 but data is anonymised just enough to make a specific plant unidentifiable	Low
3	Operational plant data shared with a group of recipients but not publicly; precise identities of the recipients not known at time of winning the tender, only their nature; the plant and its components identified	Medium
4	As 3 but the recipient(s) is/are named at the time of bidding. Recipients’ ability to work with another provider of data is restricted	Very low
5	As 4 but recipients’ ability to work with other providers of data is unrestricted	Very low

participate in a tender that specified a requirement to share data, and the price premium it would demand for each case (Table 1).

Table 1 Scenarios ('cases') shows ways in which the owner of operational data from a renewable energy installation might share it with another party or parties. The right-hand column qualitatively describes the premium the owner might add to its bid compared to tender making no requirements for sharing, relative to the other scenarios.

Case 1 corresponds to the model of the [US Dept of Energy Solar Energy technologies Office Solar Data Bounty Prize](#) (2023). Anyone on the planet may download the multi-gigabyte datasets of the participating plants.

Case 2 allows anyone accessing the data to benchmark a specific plant against a plant having the same characteristics, albeit more approximately than cases 3 to 5 because the data is anonymised, making it impossible to know the full extent to which like is being compared with like.

In Case 3, the challenge is to define classes of recipient having a legitimate interest to access the data. Public research centres listed on a specific register or that have published, or presented, a recent paper in a relevant journal or conference could be eligible; companies might need to show they are developing plant monitoring software or hardware to qualify as recipients. The question of whether those companies are under European control is relevant.

For Case 4 a very low premium would be needed because the relationship between the provider data and recipient will be very tight, and exclusive (at least for the recipient). The recipient will provide insights to the provider about their plant – that will be motivation enough for the provider to share. In return, the recipient will be able to use those insights for the improvement of its own tools.

In Case 5, the situation where the recipient is a government body has been tested in the US since 2019, when the DoE started funding the PV Fleet Performance Data Initiative. If a plant owner agrees to share detailed plant



information with the Initiative, DoE scientists will compare the particular plant against the fleet and report the result to the owner. Private companies offering plant monitoring services are also examples of 'Case 5': 3E, Powerfactors, Inavitas. Park owners pay for their services.

Driving data sharing with the Net Zero Industry Act

NZIA will see Member States use non-price criteria that support innovation in auctions awarding public support to renewable energy installations (alongside criteria that support resilience, sustainability and grid integration). The relevant secondary legislation is under preparation in the European Commission. **We ask the Commission to write down in the secondary legislation that data-sharing activities will qualify for meeting 'innovation' non-price criteria.**

Member States should be encouraged to use the data-sharing criterion

at least for some of their auctions/ public interventions, either as a 'pre-qualification criterion' or as an 'award criterion'. The rules for sharing would need to be spelled out clearly in the tender documentation. If used as an award criterion, bidders would select one of various sharing options described in detail in the tender (e.g. any of the five cases above), with more points available for the sharing options likely to attract the highest premia per Table 1.

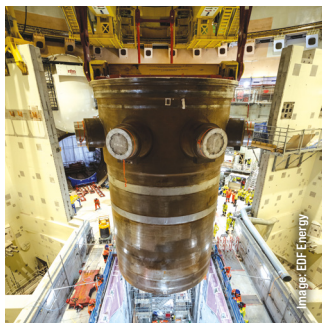
Help coming from Common European Energy Data Space

Building on the results of five Horizon European scoping projects, the European Commission expects work on a Common European Energy Data Space, which it is funding, to start imminently. CEEDS is a system for entities to share energy data in full confidence that the rules under which the sharing happens are understood and respected by the parties concerned, and lawful. It will lubricate the sharing of data. ■

References

- 1) Answer: [Letta](#), but von der Leyen and Draghi in their strategies, share the view. [Von der Leyen](#) talks of "Access to data [being] a major driver for competitiveness" and of building on her [flagship data legislation](#) with a Data Union Strategy; [Draghi](#) of "AI algorithms [supporting] the planning, optimisation and predictive maintenance of energy grids, assets and usage"
- 2) The European Commission's 2022 [Action Plan 'Digitalising the Energy System'](#) and legislation (e.g. [EU/2019/944](#) and [C/2023/ 3477](#)) testifies to its commitment to see "flexibility services for the energy markets and grids" developed

News in Brief

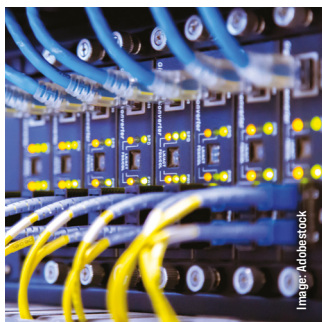


UK installs first reactor for a generation

Britain's first nuclear power project for over 30 years has reached a construction milestone with the installation of one of two reactor pressure vessels at Hinkley Point C. Combined, the two new reactors will generate around 7 percent of the UK's electricity, though

only the first has a projected completion date, which has slipped from 2025 to at least 2029 according to owner EDF.

The 500t reactor pressure vessel, manufactured by Framatome, was lowered into position with just 40mm clearance on each side. The station's 450-tonne generator stator was delivered to the Somerset site from Belfort, France, in November this year.



Irish data centres criticised in report

Data centres in Ireland – which currently absorb around a fifth of the country's electricity – will derail its decarbonisation and climate commitments if they continue to expand, according to a report commissioned by Friends of the Earth.

"Datacentres are growing far faster than the renewable energy procured to meet their needs," said Hannah Daly, professor of sustainable energy and energy systems modelling at University College Cork, who authored the report.

Official figures revealed in July showed that Irish data centres consumed more electricity than the country's urban homes during 2023. The percentage of Ireland's electricity consumed by data centres has more than doubled since 2019.



Stellantis and CATL in €4.1bn LFP joint venture

Stellantis and CATL will build a large-scale lithium-iron phosphate battery factory in Zaragoza, Spain, in a €4.1bn joint venture. The LFP batteries will be used in the corporation's B- and C-segment vehicles.

The factory is expected to come online in 2026. An annual capacity of up to 50GWh has been the official figure, though Stellantis points out that this will depend on prevailing conditions in Europe's EV market.

Stellantis brands include Peugeot, Fiat, Opel and Jeep. The company will use cheaper LFP for its affordable models, and pricey but more energy-dense nickel cobalt manganese batteries for its larger, more expensive, long-range vehicles.



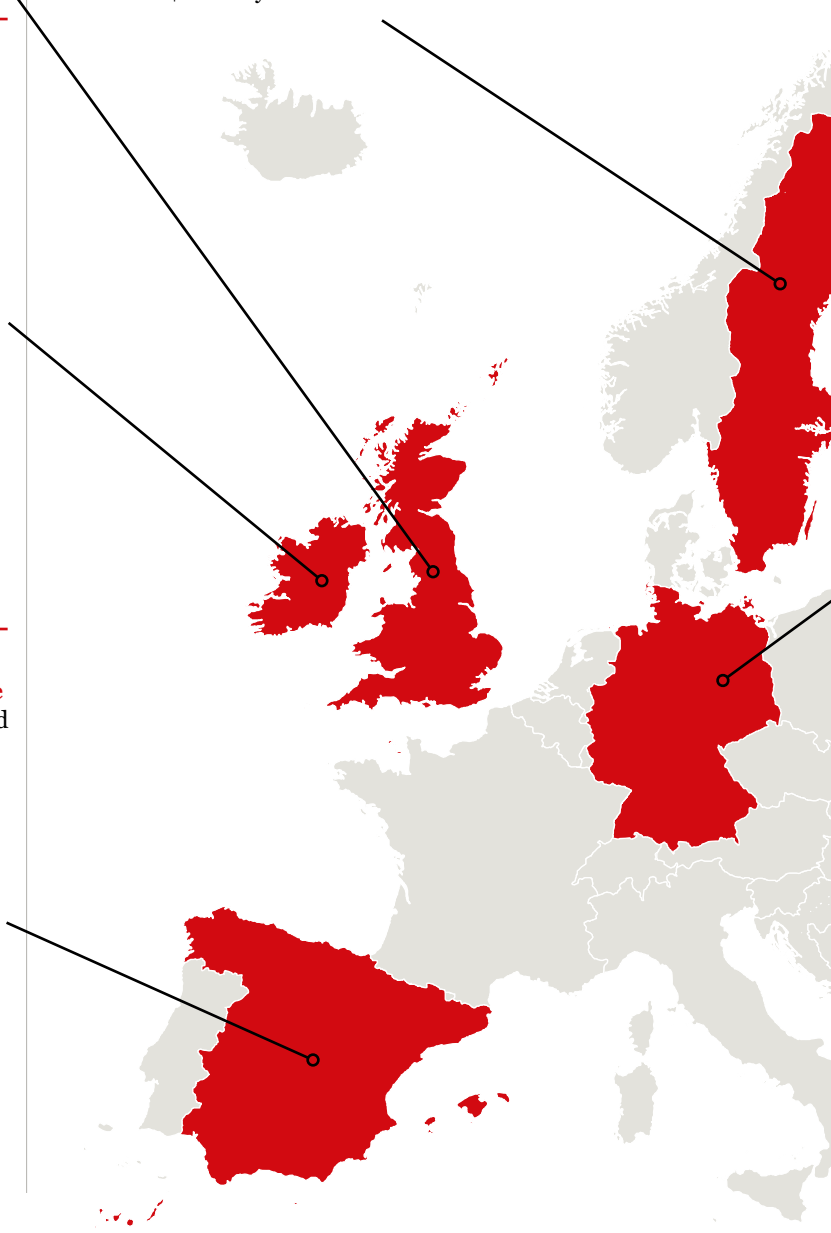
Electric hydrofoil 'takes off' in Sweden

The Candela P-12, one of the world's first electric hydrofoil ferries, has entered service in Stockholm. The commuter service is not only more fuel-efficient, but also faster; the vessel's small wake means it can exceed speed limits on

the city's crowded waterways without affecting traffic.

"Passenger ferries use a lot of energy," explained Candela founder and CEO Gustav Hasselskog in an interview with Reuters. "But with hydrofoils [and an] electric drivetrain, we reduce energy consumption by 75 percent."

On the other side of the world, a similar machine from New Zealand firm Vesuvius has entered service on tourist routes in Auckland. The global market for electric boats is expected to be worth over \$14bn by the end of the decade.





Estonia opens largest solar site in Baltic region

The largest solar farm in the Baltics has opened near Pärnu, Estonia, as part of the country's ambitions to be powered entirely by renewable electricity by 2030. Covering 110 hectares and capable of generating

77.5MW, the Kirikmäe Solar Farm is expected to power around 35,000 homes, and was completed in just six months.

"There were 250 builders on site at its peak," said Karl Kull, CEO of Estonian energy company Evecon.

Estonia is heavily dependent on oil shale, and renewables account for a small (albeit fast-growing) percentage of total energy. Along with Latvia and Lithuania, Estonia will decouple from Russia's grid and synchronise with Europe's in February 2025, after a decade-long negotiation with its neighbour.



Germany welcomes new hydrogen fuel cell trains

A new hydrogen train, the Mireo Plus H, has entered service in Germany. Siemens' new model will replace diesel sets on the Heidekrautbahn line in the Brandenburg area, where green hydrogen is set to be produced locally. The Mireo Plus H will also enter service in Bavaria.

"We are delighted to be a driving force behind the phasing out of diesel trains," says Andre Rodenbeck, CEO Rolling Stock at Siemens Mobility.

Elsewhere in the country, hydrogen train trials have been divisive; poor reliability affected the fleet of Alstom Coradia iLint trains operating in the Frankfurt area, and some will be replaced by diesel units in early 2025.



EC approves €790m in Romania coal closure aid

The European Commission has approved €790m (3.9bn RON) in aid to support the closure of four coal mines in Romania. The money will be used to fund social costs for the employees made redundant by the closure of the mines, as well as environmental and

safety work that will secure the mine shafts and enable the surrounding land to be used for farming. The beneficiary will be Societatea Complexul Energetic Valea Jiului S.A., which runs the four affected mines (Lonea, Lupeni, Livezeni and Vulcan) as well as the coal-fired Pârâșeni power station.

Earlier in 2024, the Commission approved a similar €300m euro package for Poland to help workers affected by the closure of lignite mines and coal- and lignite-fired power stations.



Greece revokes wind farm project licences

Greek authorities have revoked licences for three new wind projects in Thrace following appeals from environmental campaigners.

The Hellenic Ornithological Society, WWF Greece and the Society for the Protection of Biodiversity of Thrace raised concerns that

the wind farms' environmental assessments did not take into account recent data. Wildfires in 2023 significantly impacted the area; WWF Greece said that following this devastation, "the priority should be the restoration and protection of nature" and that the suspension of the licences was "a vindication for the environmental organisations trying to curb the unrestrained development of wind farms in the region of Thrace".

News in Brief

CORDIS celebrates 30 years on the 'World Wide Web'

The public portal for the dissemination of information on EU-funded research projects, the Community Research and Development Information Service (CORDIS), has reflected on over 30 years of achievement.

Over that period of time, the EU has funded more than 150,000 research projects across different domains, with CORDIS helping to make those results accessible. This principle of accessibility has, thus far, guided the evolution of EU-funded research and CORDIS has stressed that it will continue to do so in future.

CORDIS was launched in 1990 as part of the European Commission's early dissemination strategy, initially consisting of a series of offline databases focussing on EU-funded research and innovation projects, which was accessible to experts.

It was registered on the world wide web in 1994. Since then, it has evolved into a vibrant platform that combines research data with editorial content, including articles, news, videos and podcasts.

It now sees more than 500,000 visitors every month, consulting over 15 million pages every year. This material documents just over 150,000 projects going right back to the first framework programme in 1984.

The current 2021-2027 Horizon Europe programme has launched nearly 14,000 of these projects, and CORDIS expects that number to continue to grow over the near future.



Logistics pilot reduces emissions by 30 percent

A pilot programme conducted by deep tech innovation specialists Digital Catapult focusing on the decarbonisation of empty trucks in the UK has demonstrated potential emissions reductions results of up to 30 percent.

The trial demonstrated how deep tech can help to decarbonise UK logistics without sacrificing efficiency, particularly with regard to freight, which accounts for 31 percent of total UK transport carbon emissions, exacerbated by the 30 percent of trucks on UK roads running with empty loads.

Logistics is a vital industry driving national economic growth, contributing £163 billion (\$205 million) to the UK economy and enabling links with the wider global market.

Digital Catapult delivered the pilot scheme in partnership with AF Blakemore & Son Ltd, parent company of the SPAR convenience store chain, assessing how shared digital infrastructure can develop intelligent vehicle slot filling, routing, and tracking. At scale, this could enable competing logistics providers to share information on available truck space across their fleets without full control or visibility of the entire system being surrendered to just one entity.



Expenditure on EU R&D reached €381.4 billion in 2023 according to Eurostat

EU statistics and data website Eurostat has reported that in 2023 the EU spent 381.4 billion euros on research & development (R&D), a rise of 6.7% on 2022 (357.4 billion euros) and 57.9% greater than spent in 2013 (241.5

billion euros). R&D expenditure as a percentage of GDP (R&D intensity) remained stable compared to 2.2% in 2022.

EU R&D intensity increased by 0.1 percentage points (pp) over the period 2013 to 2023, with the greatest increases recorded by Belgium (1.0 pp), Poland (0.7 pp) and Greece (0.7 pp), increasing in a total of 19 EU countries altogether.

5 EU countries registered an R&D intensity above 3% in 2023, the highest being in Sweden (3.6%), Belgium and Austria (3.3% each), with Germany and Finland following at 3.1% each.

At the lower end of the scale, 5 EU countries reported R&D intensity below 1%: Romania (0.5%), Malta (0.6%), Cyprus (0.7%), Bulgaria and Latvia (both 0.8%).

The largest share of R&D expenditure was within the business enterprise sector, representing 66% of EU R&D spending, a total of €253.1 billion, in 2023. This was followed by the higher education sector (€81.7 billion; 21%), the government sector (€41.0 billion; 11%), and the private non-profit sector (€5.5 billion; 1%).



EU in decarbonisation and hydrogen push

The European Union (EU) has launched two calls for proposals focused on raising 3.4 billion euros to accelerate the deployment of innovative decarbonisation technologies, along with a 1.2 billion euros auction focusing on the accelerated production of renewable hydrogen. This

includes resilience criteria to boost European industry and avoid European dependency on a sole supplier.

The efforts to boost net-zero technologies by the European Commission is seen as key to ensuring European industrial competitiveness while also meeting EU climate targets.

The auction, the second to be conducted by the European Hydrogen Bank, is aimed at accelerating renewable hydrogen in the European Economic Area (EEA), supported by an EU-funded budget of 1.2 billion euros, along with over 700 million euros provided by three EU member states.

The financing for both the calls for proposals and the auction has been provided by the Innovation Fund from revenue generated by the European Emissions Trading System (ETS).

The 2.4 billion euro general call for net-zero technologies (IF24) encourages decarbonisation projects of different scale, alongside projects to manufacture components for renewable energy technologies including energy storage, heat pumps and hydrogen production.

Sentinel-1 reaches orbit aboard Vega-C rocket

The third Copernicus Sentinel-1 satellite has been launched from the European Spaceport in French Guiana. It will deliver high-resolution radar imagery for the monitoring of the changing environment on the Earth's surface, aided by a diverse range of applications and advancing scientific research. It also introduces new capabilities for the detection and monitoring of maritime traffic.

Sentinel-1 was launched on a Vega-C rocket on 5 December at 22:20 CET, reaching orbit in eight minutes and departing Vega-C at around 00:04 CET.

Vega-C is Europe's lightweight, high-performance rocket. Its return to space, on a mission termed VV25, marks its return to routine commercial operations. The European Space Agency (ESA) successfully established communication with Sentinel-1C, confirming its safe arrival in orbit.

"One moment combined two great European achievements today: the third launch of a Sentinel-1 satellite and the third launch of Vega-C, marking a triumphant return to form for both flagship European projects" said ESA Director General Josef Aschbacher.

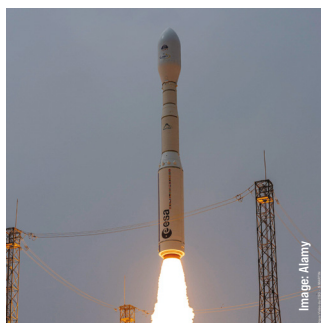


Image: Alamy

EU countries disagree on nuclear targets

Pro-nuclear parts of the Union have indicated that they will not back a renewable energy goal that excludes nuclear power generation, according to Reuters. The outlet quoted an unnamed source that suggested governments in support of nuclear could block any target that excludes atomic power. These comments came during a meeting of pro-nuclear countries in Brussels.

"France encourages the European Commission to establish a clear path to adequately reflect the role of nuclear energy in all its communications and legislative proposals," said French ecological transition minister Agnès Pannier-Runacher.

"Is it more important to have a specific target for renewables ... where you can tamper with statistics, for example, by closing down nuclear power plants? Or is the main target fossil-free and clean energy production in Europe?" asked Ebba Busch, minister for energy in Sweden.

Energy Commissioner Dan Jørgensen has indicated that while nuclear power has a role to play in Europe's decarbonisation strategy, it would not be "wise" to include it in the same target Europe has for renewables.



Image: Shutterstock

IATA expects record air travel in 2025

The International Air Transport Association (IATA) is expecting the global airline industry to achieve record profits and passenger numbers in 2025, in the face of ongoing supply chain disruptions, potentially surpassing \$1 trillion for the first time.

Growth in both passenger and cargo carriage by air are the main drivers. Shares of Alaska Air Group have surged 13.4%, while those traded by American Airlines Group Inc increased by 3%. Delta Air Lines Inc and United Airlines Holdings Inc both added 1.6% to their share value, JetBlue Airways added 0.7% and Toronto-listed Air Canada gained 1.7%. The total global profit for the airline industry is expected to reach \$36.6 billion in 2025, according to IATA, representing a 3.6% profit margin and 16% higher than the \$31.5 billion expected in 2024.

Passenger numbers are expected to grow 6.7% year-over-year to 5.2 billion, generating a net profit per passenger of \$7, rising from \$6.40 this year but less than \$7.90 seen in 2023.

IATA is expecting passenger revenues to reach \$705 billion, with an increase of 6% for air cargo revenues, to reach \$157 billion. Expenses generally are forecast by IATA to grow by 4% to \$940 billion.

The number of flights is expected to reach 40 million, increasing airline employment to 3.3 million.



Image: Shutterstock

University of Algarve scientists study organic matter decomposition using tea bags

A research team from the University of Algarve Centre for Marine Sciences (CCMAR) has participated in a large global study focusing on the use of tea bags to measure the decomposition rates of organic matter, with Ria Formosa in the Algarve being one of the study sites.

Intertidal seagrass, low marsh and marshland were the three types of land assessed. The team buried 19,000 tea bags, using green and rooibos tea, in 180 wetlands in 28 countries, assessing the ability of these environments to store carbon.

Buried about 15 cm deep, the tea bags are collected at particular time intervals over a period of three years, with the locations marked using GPS. The remaining organic mass within the tea bags is measured to assess the amount of carbon retained by the wetlands, which enables researchers to better understand wetland carbon sequestration.

"The Ria Formosa provides an excellent natural laboratory for understanding how temperature and ecosystem characteristics influence carbon storage" said researcher Carmen B. de los Santos. "Our work here contributes valuable data to the global effort to understand carbon storage in wetlands."

The results will help experts to improve global carbon storage models and inform policymakers on priority areas.



Image: Shutterstock



TEAPOTS: Agriculture Waste Pyrolysis and Thermocomposting for Renewable Energy in Sustainable Agri-Food Sector

By Anna Tatáková and Ivana Koláčková, FENIX TNT

Agriculture represents a critical juncture of global energy consumption and environmental impact, with energy being essential across the entire value chain - from primary production to processing, drying, cooling, and storage.

Unfortunately, the heavy reliance on non-renewable energy sources increases the carbon footprint of the agricultural sector. The TEAPOTS Project addresses this by combining advanced technologies to convert agricultural waste into renewable energy, covering 100% of

electricity needs via pyrolysis units, Organic Rankine Cycle (ORC) systems and refrigeration technologies supported by a Decision Support System (DSS). This innovative approach aims at reducing fossil-based energy reliance, thus lowering emissions from waste



burning and promoting a circular agricultural economy.

The innovative TEAPOTS Integrated Solution (TIS) transforms agricultural waste into valuable energy forms, such as heat, electricity, and refrigeration, while simultaneously producing biochar and compost as by-products. The first valorisation process employs pyrolysis to extract heat from waste, which is then converted into electricity using an ORC system. This electricity powers refrigeration for cold storage of agri-food products. The second valorisation process employs a Compost Heat Recovery System (CHRS) to generate hot water from biomass oxidation, which is suitable for sanitary applications. Together, these technologies deliver a modular and flexible solution capable of addressing seasonal and localized energy demands, enhancing sustainability, and reducing the use of synthetic fertilizers by repurposing biochar and compost as

biostimulants.

Both biochar and compost play a vital role in the TEAPOTS Project by enhancing soil health and promoting biodiversity. Biochar's porous structure improves water retention and nutrient absorption in soils, while compost replenishes organic matter and mitigates soil compaction. These features can help reduce greenhouse gas emissions by up to 48% and combat soil erosion, reinforcing the transition to a sustainable, circular agricultural model. Mixed feedstocks in the TIS further optimize energy production and by-product quality, ensuring economic and environmental efficiency.

To support the efficiency of the TIS, it is paired with a significant digital component, the TEAPOTS Digital Platform (TDP), which utilizes satellite and field data to predict biomass growth and optimize logistics for agricultural waste management. This platform integrates operational data from the TIS to conduct life cycle assessments, evaluating environmental impact and overall system functionality. A data-driven Decision Support System (DSS) enables efficient planning for field operations and waste logistics, ensuring the continuous operation of the TIS throughout the different seasons. With a user-friendly interface, the TDP empowers end-users, particularly farmers, to actively manage their agricultural waste and energy production, transforming them into prosumers of renewable energy.

To ensure scalability, TEAPOTS solutions are tested and demonstrated through pilot implementation in two farms, one in Italy and one in Greece, designed to showcase the modularity and adaptability of the TIS under varying technical and environmental

“Reliance on non-renewable energy sources increases the carbon footprint of the agricultural sector”

conditions. These pilots emphasize collaboration across the agricultural value chain, fostering partnerships among farmers, policymakers, industry players, and associations. A multi-actor approach will be employed to create a network of biomass producers interested in using agricultural waste to improve their environmental impact.

By transforming agricultural waste into valuable resources and enabling farmers for energy self-sufficiency, TEAPOTS aims at supporting the change to meet the European Union's climate and energy targets for 2030 and its ambition of achieving net-zero greenhouse gas emissions by 2050, resulting in healthier ecosystems across Europe.

The TEAPOTS project, starting in January 2024 and ending in December 2027, is coordinated by SMACT SOCIETÀ CONSORTILE PER AZIONI and funded by the European Union under Grant Agreement No. 101118296. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them. ■



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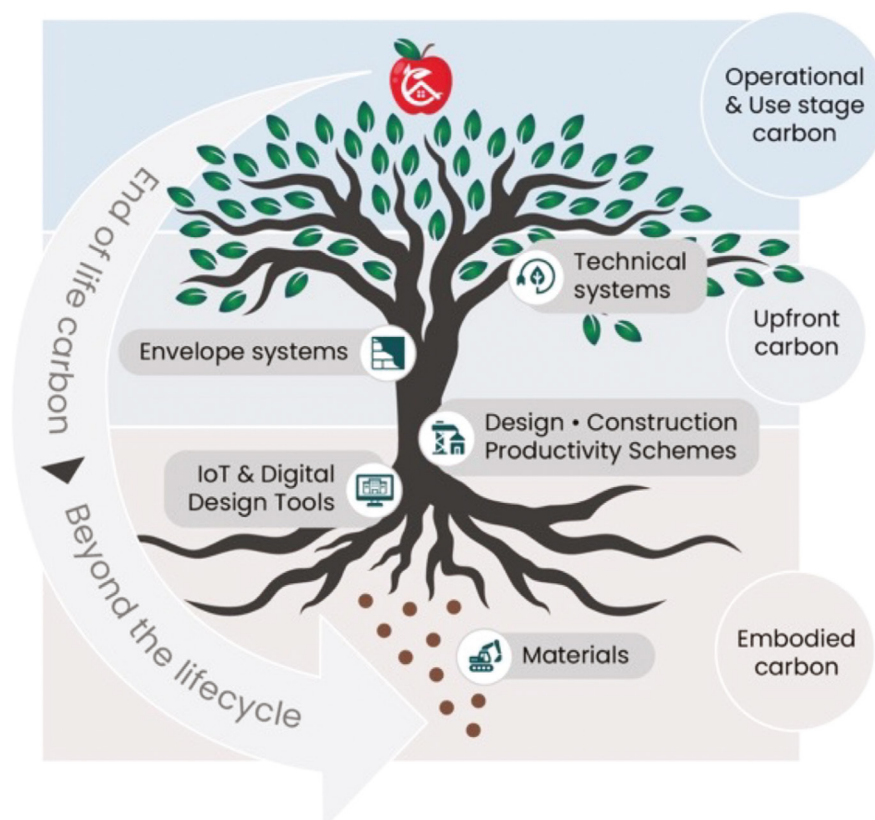
www.teapots-project.eu

GreeNest: NEST ingrained ecosystem for zero emission buildings

By Anna Taťáková and Ivana Koláčková, FENIX TNT

“GreeNest will employ local and regional supply chains and value networks to enhance replication potential across Europe”

COST-EFFICIENT ZeB



Embodied emissions, the carbon emissions generated during the manufacture of building materials, make up a significant part of a building’s overall carbon footprint. GreeNest aims to create a construction ecosystem integrating biogenic materials and renewable energy systems to drastically reduce embodied and operational emissions. The project minimizes carbon output and resource use by using recycled and locally sourced materials, focusing on fully zero-carbon construction.

GreeNest plans to cut embodied emissions by 50% compared to the current Near-Zero Energy Buildings standard and reduce lifecycle GHG emissions by 60% while also boosting construction productivity by over

30%. Techniques such as digitization, prefabrication, and circular design are central to the project’s low-emission, resource-efficient approach.

GreeNest is developing a range of advanced smart envelope systems designed to enhance sustainable building practices. Among these is the SmartWall, a modular, prefabricated wall that integrates energy-efficient HVAC components and low-carbon materials, providing flexible, multi-functional applications across various climates. Its innovative design supports high indoor air quality (IAQ) and comfort with minimal energy demands.

Another system is the GreenWall, a vertical garden integrated into building facades, which not only improves energy efficiency and reduces urban heat but also supports biodiversity and improves air quality.

The EcoTechWall is crafted from circular materials, including waste wood and natural fibers, promoting low-impact, climate-neutral construction and contributing to a healthier indoor environment. As part of the EcoTechWall, the KARZ insulation panel uses 50-60% coffee bean waste and biogenic polyurethane (PUR) for eco-friendly insulation, achieving 20-40% lower U-values than conventional options. The project aims to increase the coffee content, increasing carbon storage by 50%.

In the realm of windows, the Heat-Harvest Window (HHW) incorporates a ventilation system with heat recovery, effectively minimizing heating and cooling requirements while enhancing indoor air quality.

The Reversible Window offers a unique solution with a 180° rotating design, allowing it to adjust to seasonal changes by altering solar gain, thus reducing energy consumption throughout the year. Together, these envelope systems are central to GreeNest’s mission to create buildings that are both energy-efficient and



environmentally responsible.

The project is also advancing key technologies to further reduce energy consumption, such as the Eco-BIPV/BAPV, optimized for easy, plug-and-play installation, and the CASCADE system, which leverages low GWP R290 heat pumps for eco-friendly heating, cooling, and domestic hot water (DHW). NestControls will be fine-tuned to maximize comfort and energy efficiency through dynamic thermal and daylight control.

A notable element of the project is the demonstration of its innovative solutions in four real-world construction projects and two virtual building models across five European countries. These demonstration sites include a museum and knowledge center in Berlin, an info center in Italy, and a youth recreational

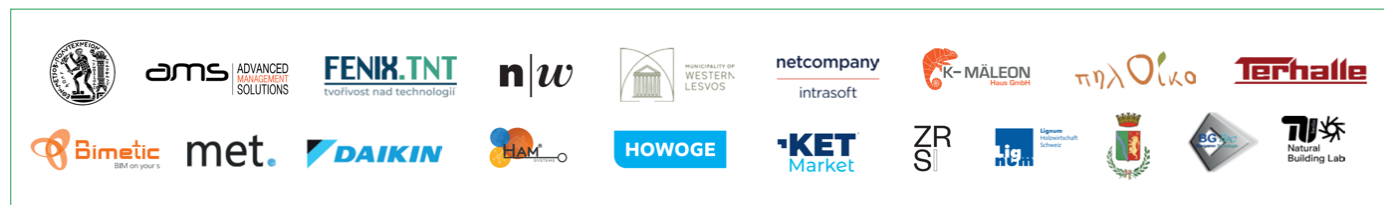
center in Greece, each uniquely built to showcase the feasible adoption of sustainable materials and practices. GreeNest will employ local and regional supply chains and value networks to enhance replication potential across Europe, particularly benefiting construction SMEs.

The project's replicability is further bolstered by its emphasis on digitization and modular, adaptable building design strategies, which will allow for easier scaling and customization across multiple building typologies and climatic regions.

By incorporating renewable energy systems, the project will also target primary energy consumption reductions of 30 to 40 kWh/m², potentially pushing the building standard closer to Zero Energy Buildings (ZeB) or even

positive energy standards. With a focus on not only energy efficiency but also human impact and comfort, GreeNest represents a major step forward in addressing both climate change and modern lifestyle demands in the built environment.

The GreeNest project, starting in January 2024 and ending in December 2027, is coordinated by ETHNICON METSOVION POLYTECHNION (NTUA) and co-funded by the European Union under Grant Agreement No. 101138242 and the State Secretariat for Education, Research and Innovation (SERI). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them. ■



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www.greenest-ecosystem.eu

The role of tradition in the energy transition

“The cultural and social complexities of phasing out coal in Europe can’t be ignored”, write three EUSEW Young Energy Ambassadors.



By Agnieszka Szostok, Blanka Tarsoly & Devesh Mishra,
EUSEW Young Energy Ambassadors

The phase-out of coal across the European Union is essential to combating climate change. However, for coal-dependent regions, particularly in Central and Eastern Europe, coal is not just a source of energy – it is part of their cultural fabric. Understanding the socio-cultural impact of the transition away from coal is key to ensure an inclusive transition while preserving culture and leaving no-one behind.

A historically significant industry
Coal mining has played a transformative role in shaping Europe’s industrial and economic history. During the Industrial Revolution of the 18th and 19th centuries, coal became the primary driver of industrialisation, powering factories, railways, and urban expansion. In countries like Romania, Germany, and Poland, coal mining was the backbone of economic growth, providing jobs to millions.

Silesia in Poland, the Ruhr region in Germany, and Jiu Valley in Romania emerged as industrial powerhouses thanks to their rich coal reserves. In these regions, coal was not just an energy resource; it became the foundation of local economies and fostered strong, robust working-class communities.

The danger associated with their occupation formed profound and lasting comradeship among coal miners. Coal thus did not just become

a symbol of economic prosperity, but also of labor solidarity within mining communities, forming a key part of regional identities.

Cultural and regional traditions

In coal-rich regions, the mining industry became intertwined with local traditions and cultural identity.

For example, in **Poland’s Silesia**, Barbórka, celebrated on December 4th, is a vital festival that honors Saint Barbara, the patron saint of miners. This event blends religious and secular traditions, with parades, prayers, and community gatherings celebrating the mining profession and the region’s deep connection to coal.

Similarly, in **Germany’s Ruhr region**, coal mining is commemorated through festivals, public monuments, and museums, such as the Zeche Zollverein in Essen, a UNESCO World Heritage site. Though the coal mines have largely closed, the Ruhr’s industrial past remains alive through such landmarks, representing the industrial development of the entire region and honouring the resilience and all the hard work that made it possible.

In **Romania’s Jiu Valley**, the historic Lupeni strike of 1929 came to represent the miners’ collective struggle for better and more fair working conditions. The strike’s legacy spans from features in songs, movies and statues, and up until 1989, Miners’ Days was also celebrated.



The impact of coal’s decline

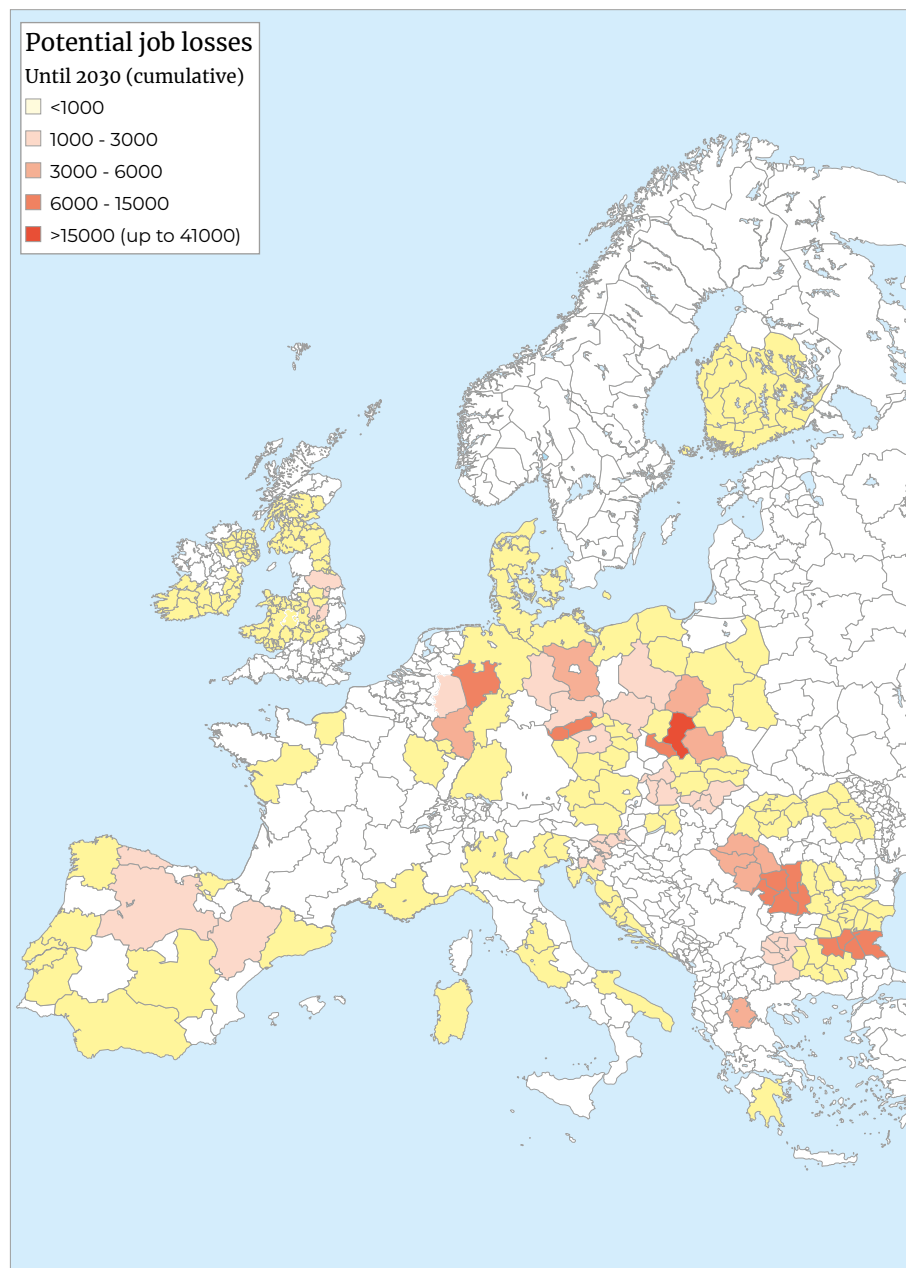
The closure of coal mines across Europe has brought significant economic and social challenges to mining communities. Unemployment rates surged as mines closed, leading to population decline and the erosion of long-standing traditions. In many cases, younger generations have moved away in search of opportunities, leaving behind aging populations and weakening local economies.

While environmental awareness has grown, and the push for renewable energy has gained momentum, coal regions have struggled to adapt. Despite initiatives like the EU’s Just Transition Fund and



Potential job losses connected to the coal industry.

(Source: Joint Research Centre (JRC), 2018)



the Coal Regions in Transition Initiative (CRiT), which aim to support affected areas, the economic restructuring has been slow and difficult. Local traditions and cultural heritage tied to coal mining are at risk of fading as these communities grapple with the changes.

Rebuilding collective identities

Moving forward, it is crucial to find ways to re-imagine identities tied to coal extraction to ultimately create an energy transition that encompasses a cultural shift too.

Proposal 1: Local Energy Communities

Local energy cooperatives and

renewable energy projects could help restore a sense of belonging to regions transitioning away from coal. By involving locals in the management and ownership of new energy initiatives, these projects can provide new economic opportunities and foster community spirit, much like coal mining once did.

Proposal 2: Repurposing Coal Festivals

Modern-day festivals are increasingly shifting to environmentally conscious modus operandi – of course, with coal festivals, the switch inevitably also includes a thematic one. Evolving existing

coal traditions and festivals by adding a new focus on the energy transition could help keep traditions alive while introducing a focus on sustainability. This approach could highlight both the importance of the energy transition and the value of honoring the hard work and culture of coal mining communities. ■

This opinion editorial is produced in co-operation with the European Sustainable Energy Week 2025.

See ec.europa.eu/eusew for open calls. Please find out all details on p.2-3 related to EUSEW 2025

ReUse: Efficient direct recycling for low-value LFP battery for circular and sustainable waste management

By Anna Tatáková and Ivana Koláčková, FENIX TNT

“Among the project’s key innovations is the automated sorting of end-of-life lithium-ion batteries”

The rapid rise of electric vehicles (EVs) and renewable energy storage solutions has led to the exponential increase of lithium-ion batteries (LIBs). As these batteries reach the end of their life, efficient and sustainable recycling methods become essential to avoid resource waste and reduce environmental impacts. The ReUse project is dedicated to addressing this challenge by developing new processes for recycling lithium iron phosphate (LFP) batteries, which are expected to dominate a substantial share of the battery market by 2030.

ReUse focuses on direct recycling and reuse of critical battery materials. Unlike traditional pyro- and hydrometallurgical recycling processes, direct recycling is considered to have lower energy requirements, minimal greenhouse gas emissions,

and higher recovery rates of essential battery components, such as graphite, electrolyte, and cathode materials. The extraction and recovery of electrode binders, such as PVDF (polyvinylidene fluoride) used in LFP electrodes, represents a significant innovation in this area. The processes developed in the project are scalable and sustainable, enabling reuse of the recycled materials in the production of new electrodes or other industries, contributing to a near-closed-loop lifecycle for battery components.

Among the project’s key innovations is the automated sorting of end-of-life (EoL) lithium-ion batteries, enabling the systematic separation of valuable active materials with high selectivity, yield, and purity, using automated centrifugation. This process increases material recovery efficiency and improves process water treatment, minimizing waste and optimizing material reuse. In alignment with the EU’s Critical Raw Materials Act, these innovations reduce Europe’s reliance on third-party countries for primary resources, positioning the EU more competitively in the global market and increasing energy autonomy.

For cathode and anode regeneration, electrochemical re-lithiation and microwave-assisted regeneration offer recycling options for LFP materials with 30% energy savings compared to traditional methods. The flexibility of these processes ensures that the maximum amount of valuable materials is reclaimed while waste is kept to a minimum, all without compromising the performance of newly manufactured components.

A comprehensive monitoring framework integrates automated disassembly, selective shredding, and real-time data management, ensuring material traceability and operational efficiency. The recovery of electrolyte





salts and binders supports a more circular battery production system, leading to enhanced speed and precision as well as reduced reliance on new raw materials. The online database created by ReUse will help optimize battery discharging routines, making the reuse of LFP batteries in future applications more efficient.

The performance of recovered functional materials, such as active materials, binders, and electrolytes, is often lower than that of pristine materials. As the ReUse project advances, one potential challenge is their difference in performance. For the EV market, e.g., higher performance thresholds are crucial. However, there are other large markets, like stationary or portable energy storage, where slightly decreased performance may be acceptable compared to the EV sector.

Addressing logistical challenges, the complex notification procedures related to transporting waste batteries within the EU can hinder the efficient delivery of end-of-life (EoL) lithium-ion batteries (LiBs) to recycling facilities. Developing a clear and streamlined shipping strategy is crucial to ensure the timely arrival of materials.

The project aims to increase the global competitiveness of the European battery ecosystem in line with the European Strategic Plan for a clean and sustainable transition towards climate neutrality. Building on the BATTERY 2030+ Initiative's Roadmap and the European Partnership on Batteries, ReUse aims to contribute to the policy needs of the European Green Deal and efficient recycling technologies.

The ReUse project, starting in January 2024 and ending in

December 2026, is coordinated by Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.V. (Fraunhofer Institute for Silicate Research ISC) and co-funded by the European Union under Grant Agreement No. 101137774 and the State Secretariat for Education, Research, and Innovation (SERI). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them. ■

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www.reuse-batteries.eu

Energy communities should be part of the green (re) industrialisation debate



By **Chris Vrettos**, expert at REScoop.eu, Electra Energy (Greece), and EUSEW Young Energy Ambassador

“It’s not climate policies that are being questioned; rather, their distributional effects”

Citizen ownership of the energy transition is gaining increasing traction as a measure to tackle energy poverty, promote climate action, strengthen the economic competitiveness of SMEs, and boost household income. In her Mission Letters, the Commission President has called for broadening direct democracy, introducing a dedicated Citizens Energy Package. Further policy, regulatory, and financial support will be needed over the next legislature, to horizontalise energy democracy measures in all major policy files, as well as in the negotiations around the next EU budget.

Greenlash or Make Polluters Pay?

Major geopolitical conflicts, cost of living, housing and energy price crises, democratic backsliding: multiple priorities are vying for oxygen in the mainstream political discourse. This may have dethroned ‘environmental protection’ as one of the top three priorities for Europeans, leading to speculation by political analysts around a general ‘greenlash’.¹ Dig under the surface of the narrative and it becomes obvious that climate policies are not the ones being questioned; rather, their distributional effects. Citizen support for the environmental cause remains steadfast, akin to the record setting 2019 levels. But the real sticking point is who bears the costs of the transition. An overwhelming 92% of European citizens agree that “companies should pay for the costs of cleaning up their pollution”.

With the conclusion of the Fitfor55 Package, a monumental task lies ahead: millions of leaky houses will have to be renovated, gas boilers replaced, public transport lines rolled out, and land set aside for renewable energy projects. An ambitious, 1,5° C aligned set of climate policies will make us healthier, produce up to 1 trillion euros in benefits for the EU economy by 2030, reduce dependencies, and increase competitiveness. However, the key make-or-break element of this broad

societal transformation will be the equal sharing of costs and benefits.

Energy Communities: the right scale and message

Energy communities could help ensure a more equal distribution of costs and benefits in the energy transition. 1 in 2 Europeans could be producing their own electricity by 2050, covering 50% of the EU’s demand. In the reform of the Electricity Market Design the Commission acknowledges that local energy sharing, also by energy communities, can act as a key price stabilisation mechanism. In this spirit, Dan Jørgensen – the next Commissioner-designate for Energy and Housing – has been tasked with the creation of a dedicated Citizens Energy Package.

As the green transition begins having a material impact on peoples’ lives (from reducing meat consumption, to renovating one’s house), social dialogue will be essential. This is why the revised Energy Performance of Buildings and Energy Efficiency Directives both highlight the role of energy communities in helping homeowners navigate the – often complex and bureaucratic – processes of energy savings interventions. Local/regional One Stop Shops, operated through community actors, including energy communities, can centralise information in an accessible and peer-to-peer approach that cultivates trust. The cases of EcoVision in Ireland, and La Palma Renewable in Spain, provide such a framework.

The extension of the Emissions Trading System to the buildings and transport sectors is another key policy where regressive effects could hurt the most vulnerable. An effective implementation of the National Social Climate Plans will be key: local actors, including energy communities, should be mobilised to help with the identification and capacity building of individuals facing energy and transport poverty.

Pioneering large scale projects with equitable benefit distribution

Beyond their strong roots in the social economy, energy communities have the heft to contribute to the industrialisation debate – and a track record to prove it: they help realise large projects such as offshore wind parks, large district heating and cooling networks, and e-bike manufacturing factories. By pooling the resources of thousands of citizens, they can mobilise considerable investments, with the latest example being a £5 million refinancing loan provided to a UK community energy project, through REScoop MECISE, a European Co-operative Society.

Energy communities naturally facilitate social dialogue and promote benefit sharing by bringing members of the local community together to co-develop a project. This approach can help ensure that these large renewable projects don't get tangled up in endless legal disputes due to local resistance, ultimately accelerating their permitting. This is why Member States should,

as per the Commission's Guidance, consider the role of energy communities during the designation of Renewable Acceleration Areas.

Lastly, as policymakers gear up for the next EU budget negotiations, a European Investment Facility for energy communities should be explored. Backed by the European Investment Bank, the Facility could mobilise national intermediaries to disperse loans for large scale community energy projects in the EU27.

Energy communities can actively contribute to the EU's green industrialisation ambitions, while ensuring that the benefits from the energy transition are equally distributed to all citizens. Policy support will be required, which is why the Clean Industrial Deal must carve out a space for citizen participation, including through dedicated incentives (e.g., opening up wind projects to shares by local communities), in order to ensure a coherent policy framework with the Citizens Energy Package. ■

About the author

Chris Vrettos is working for REScoop.eu, the European Federation of Energy Cooperatives, and Electra Energy (Greece). Both organisations promote the active engagement of citizens in renewable energy production in Europe. He has worked on multiple research programs as an assistant, on topics such as the EU Green Deal and degrowth. He is interested in international climate politics and journalism and has attended multiple UNFCCC COPs.

This opinion editorial is produced in co-operation with the European Sustainable Energy Week 2025.

See ec.europa.eu/eusew for open calls. Please find out all details on p.2-3 related to EUSEW 2025



Recommended links

1. [REScoop.eu's priorities for the new Commission](#)
2. [Energy communities in the Fitfor55 revised Directives](#)
3. [How to effectively mobilise EU funds \(including from the Recovery Facility\) to help energy communities](#)

AM2PM: Additive to predictive manufacturing for multistorey construction using learning by printing and networked robotics

By Anna Tatáková and Ivana Koláčková, FENIX TNT

The EU's construction sector is struggling to meet its 2050 climate goals, contributing nearly 40% of global CO₂ emissions and energy consumption. The whole industry faces mounting pressure from global climate change, the rising cost of labor, and the need to provide efficient solutions to the housing crisis. The EU-funded AM2PM project seeks to address these challenges by leveraging additive manufacturing (AM) technologies, specifically 3D

concrete printing (3DCP), alongside AI and digital twin technologies.

By integrating collaborative robotic systems and advanced materials, AM2PM aims to drastically improve efficiency, reduce material use by 50%, and cut millions of tons of CO₂ emissions to align with the EU Green Deal and New European Bauhaus objectives.

Concrete is the most widely used building material and relies heavily on cement, which accounts for about 8% of

global CO₂ emissions. One of the core aspects of AM2PM is its use of local recycled concrete aggregates and quarry waste, which can easily be integrated into 3DCP cementitious mixes. These inherently fine-grained materials are suitable for use in 3DCP since the technology requires mixes with fine particles. In conventional construction, fine particles typically decrease workability and strength.

However, AM2PM has demonstrated

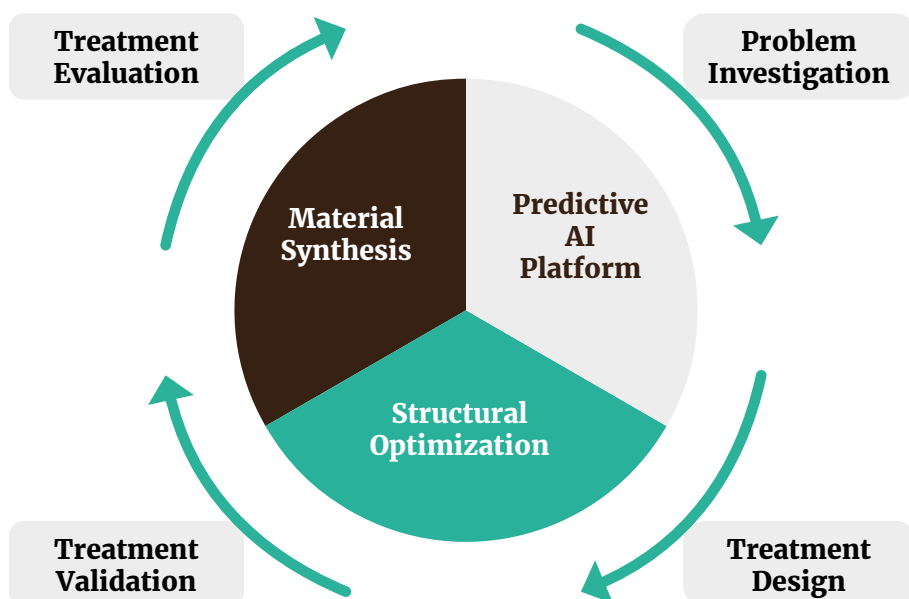


that these materials, when used in 3D printing, contribute positively by enhancing buildability and accelerating the early stiffening and strength of 3D-printed components, thereby reducing construction time and cutting costs by over €11 billion annually.

One of the key goals of the AM2PM project is to reduce material consumption by as much as 50%, which has the benefit of reducing embodied CO₂ and lowering construction costs. As opposed to conventional construction methods that require large, bulky elements, AM2PM allows for precisely placing material only where it's structurally necessary.

By utilizing a truss-like architecture and optimized geometrical designs, AM2PM achieves significant material savings without compromising mechanical integrity. These savings can be further amplified by eliminating the need for conventional molds, which often consume half of the overall material in traditional construction methods.

While 3D printing has been demonstrated effectively in small and



specialized applications, scaling it for large-scale multistorey construction has been challenging. AM2PM integrates comprehensive design and manufacturing quality control across all stages of construction.

Furthermore, the “Learning-by-Printing (LbP)” principle pioneered by AM2PM will change the way 3D printed construction is approached. By using machine learning to predict and control the end-to-end 3D printing process, incorporating over 1000 automated experiments, the project aims to bridge the gap between digital simulations and real-world results, improving the precision of 3D printed materials and components.

These models will be able to predict both the geometry and physical properties of printed structures based on environmental and design inputs, creating continuous improvements in the construction process.

The project is committed to

overcoming issues like cybersecurity risks, compliance with new building regulations, and concerns over the robustness of printed structures. By focusing on stakeholder engagement and increasing awareness about the technology's potential benefits, AM2PM aims to bring about a shift in construction that will make multistorey buildings more sustainable, cost-effective, and environmentally friendly, paving the way for the future of construction.

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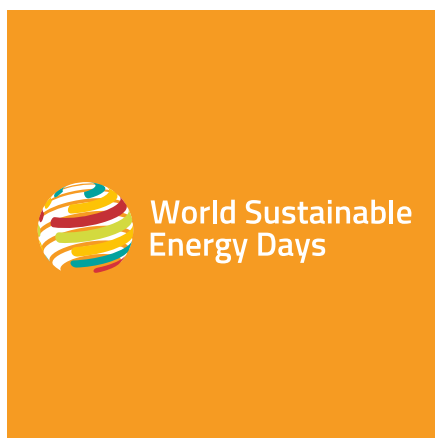
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Upcoming events 2025

1. **Bio360**
Nantes | 5-6 February | www.bio360expo.com
2. **E-world Energy and Water**
Essen | 11-13 February | www.e-world-essen.com
3. **Energy Storage Summit**
London | 17-19 February
storagesummit.solarenergyevents.com
4. **Global Decarbonisation Summit and Expo**
Paris | 18-19, 19-20 March
globaldecarbonizationexpo.com
5. **Heat Pump Technologies**
Milan | 2-3 April | www.heatpumptechnologies.it
6. **Wind Europe**
Copenhagen | 8-10 April | windeurope.org/annual2025
7. **Industrial Decarbonisation Europe 2025**
Amsterdam | 9-10 April
events.reutersevents.com/energy-transition/industry-europe
8. **SolarEx**
Istanbul | 10-12 April | solarexistanbul.com/en
9. **ees (Electrical Energy Storage) Europe**
Munich | 6-7 May | www.ees-europe.com
10. **Invest in African Energy 2025**
Paris | 13-14 May | invest-africa-energy.com
11. **10th International Conference on Sustainable and Renewable Energy Engineering (ISCREE)**
Nice | 13-16 May
12. **21st International Conference on the European Energy Market**
Lisbon | 27-29 May | eem25.pt
13. **Lisbon Energy Summit**
Lisbon | 3-4 June | www.lisbonenergysummit.com
14. **Hydrogen & P2X**
Copenhagen | 11-12 June
15. **PCIC Energy Europe**
Düsseldorf | 17-19 June | pcic.energy
16. **Connecting Hydrogen Europe**
Madrid | 18-19 June
www.connectinghydrogeneurope.com



17. World Sustainable Energy Days
4-7 March
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18. Coastlink Conference
29-30 April
Port of Bilbao, Spain



19. EU Sustainable Energy Week
10-12 June
Brussels



20. EU PVSEC
22-26 September
Bilbao



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