

# **WORLD POWER SYSTEMS REVIEW**

**15 February 2024**

**1 February 2024**

## **Australia should develop solar PV sector to avoid dependence on China, report finds**

Australia should develop its own solar photovoltaic (PV) manufacturing sector to avoid over-reliance on China for supply and tap into an industry with great potential, a report backed by the Australian Renewable Energy Agency (ARENA) has found. The decades-long expansion of the industry in China had driven the cost of solar panels down by more than two-thirds since 2016 alone. Chinese companies now dominate the global market and supply more than 90% of solar modules sold in Australia. "Setting up viable, relevant and timely solar PV manufacturing in Australia can build resilience to future supply chain shocks, secure access to solar PV modules critical to meet Australia's decarbonisation targets, and ensure implementation of more sustainable manufacturing practices," the Silicon to Solar study said.

Creating a supply chain of 1 gigawatt PV yearly capacity – covering all steps from the polysilicon material to wafers, cells and then modules – would cost \$3.2bn in subsidies over 10 years. A 5GW-sized industry roughly meeting existing Australian demand would cost \$7.8bn in support over that period. The report said a domestic solar industry would also create 4,000 well-paid jobs, reverse the drain of talent and intellectual property abroad and lure \$2.9bn in upfront investment. Renate Egan, the executive director for the Australian Centre for Advanced Photovoltaics and one of the report's authors, said one impetus was that "the geopolitics is changing", as tensions rise between China and the US. Australia's own emissions goals also pointed to the need for Australia's solar installations to at least quadruple.

"We can imagine a 20-gigawatt-a-year market," Egan said. "If we were manufacturing for our market, that's enough [size] to get the economies of scale." Australia's current solar module production capacity is presently limited to just one firm, South Australia-based Tindo solar, at 160MW a year. Tindo, one of the backers of the report, said last month it had plans to expand to 1GW at the cost of \$90m to \$100m but it would need support to do so.

Other ventures that governments have chosen to make national priorities include the Aukus nuclear submarines, which are predicted to cost \$368bn out to the mid-2050s, while the Snowy 2.0 pumped hydro project will cost at least \$12bn excluding \$5bn-plus for transmission links. China almost tripled its annual PV capacity in three years, reaching 817GW by the end of 2022, Bloomberg reported in January. Output of solar cells jumped 54% last year to 541GW but not enough to soak up excess capacity, while falling panel prices squeezed already-thin profit margins. Egan said Australia must take a longer-term view. "Only 5% of world energy comes from solar at the moment and we need that to grow tenfold," Egan said. "So there is still a big opportunity ahead of it."

*The Guardian*  
<http://www.theguardian.com/>

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## **China's wind and solar power generation capacity to surpass coal in 2024**

China's installed capacity for wind and solar energy will exceed that of coal for the first time by the end of this year, according to an estimate made by the country's power trade association, as the country remains on track towards sourcing 80 per cent of its energy needs from non-fossil fuel sources by 2060, when it plans to be carbon-neutral.

Non-fossil energy, which includes nuclear and hydropower, already accounts for over half of the power generating capacity in the world's second-biggest economy. The country's grid-connected wind and solar power generation capacity could exceed 1,300 gigawatts (GW) by the end of this year, with about 530GW of capacity coming from wind, and 780GW

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from solar, the China Electricity Council (CEC) said in a report on Tuesday. This could boost the share of wind and solar power to 40 per cent in China's total installed power generation capacity by the end of 2024, up from 36 per cent at the end of 2023, according to CEC.

In 2023, the total installed capacity of power from non-fossil fuel sources, including renewables, nuclear and hydropower, had exceeded 50 per cent of the total generation capacity for the first time, according to CEC. By the end of 2024, the cumulative capacity of non-fossil fuel power is expected to reach 1,860GW or 57 per cent of the total capacity, it said. China will work toward having 80 per cent of its total energy mix from non-fossil fuel sources by 2060, when the nation aims to be carbon neutral. Meanwhile, the share of coal-fired power is expected to fall to 37 per cent of the total installed capacity by the end of 2024, from 39.9 per cent in 2023, the CEC report forecast.

"Judging from the investments, growth rate of power-generation capacity and changes in power structures, the power industry continues to advance the trend of green and low-carbon transformation," said Hao Yingjie, secretary general of the CEC. China is the world's biggest producer of climate-warming greenhouse gases and the power sector is the largest contributor to these emissions. The combined 1,300GW of wind and solar power generation capacity by the end of 2024 also means that China will have exceeded its goal of installing 1,200GW of solar and wind capacity earlier than its initial timeline of 2030.

While the country's installation of renewable energy capacity continues to break records, the CEC report did not disclose details and forecast about the share of renewable energy sources in its power consumption. According to CEC, coal power will account for nearly 60 per cent of China's total power use in 2023, being the dominant source in the current power supply. It is estimated that China's electricity consumption will grow by 6 per cent in 2024 to reach 9.8 trillion kilowatt hours, slower compared with the 6.7 per cent growth rate in 2023 when the country lifted its zero-Covid policy, according to CEC.

Some of the country's regions will face significant challenges due to the intermittent supply of renewable power, and there will be increased pressure on power supply due to the continued growth in power consumption, said CEC. It called for the power sector to improve its resilience to natural disasters and supply shocks, to ensure stable operation, accelerating the development of a market-based power tariff system, and continue to push for the construction of a "new-type power system" where renewable energy plays a dominant role, by advancing energy storage technologies.

*China Morning Post*  
<http://www.scmp.com/>

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## **Record-breaking energy demand, power cuts in Argentina amid high temperatures**

Temperatures soared in Argentina on Thursday as sweltering heat prompted blackouts and pushed energy demand to an all-time high. At 2.40pm, more than 29,601 megawatts was in demand across the energy grid, authorities said. The extremely high temperatures recorded on Thursday, touching over 37 degrees in the capital, came as energy regulators said they expected record levels of demand to continue. The previous record had been on March 13, 2023, when the demanded power reached 29,105 MW, at 3.28 pm.

Every time the temperature stays above 20°C for several nights in a row, there are possible power cuts. Some areas in Buenos Aires City and Buenos Aires Province experienced cuts on Wednesday evening. Over 35,000 Edesur and 16,000 Edenor users were without power in their homes on Thursday afternoon in the Buenos Aires Metropolitan Area.

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Early in the afternoon, the thermometer went above 37 degrees in the City. The CAMMESA Administrator of the Wholesale Electricity Market informed that at 2 pm, the electricity demand record had been broken, at 29,029 MW. Given that consumption level, according to figures on the state of the electricity utility on the official website of the ENRE Electricity Regulation Entity, after 3 pm, 42,015 Edesur and 16,895 Edenor customers were left without power. The Buenos Aires Province cities affected in the Edesur area are Almirante Brown, Avellaneda, Berazategui, Esteban Echeverria, Ezeiza, Florencio Varela, Lanús, Lomas de Zamora, Presidente Perón, Quilmes and San Vicente.

Households without power supply in Buenos Aires City are in the neighbourhoods of Almagro, Barracas, Caballito, Floresta, Mataderos, Monte Castro, Parque Chacabuco, Parque Las Naciones, Recoleta, San Cristóbal, San Telmo, Villa Crespo, Villa Devoto, Villa Lugano, Villa Riachuelo, Villa Soldati and Villa Santa Rita. In the meantime, Edesur's concession areas affected by power cuts at noon in Buenos Aires Province were 3 de Febrero, Escobar, General Rodríguez, General San Martín, Hurlingham, Ituzaingó, La Matanza, Malvinas Argentinas, Merlo, Moreno, Morón, Pilar, San Fernando, San Isidro, San Miguel, Tigre and Vicente López.

Argentina needed to import 2,441 MW from countries in the region to cover the record-breaking energy demand on Monday March 13 last year at 3:53 pm, the previous record. That day, Brazil contributed 1,866 MW. The demand from the local generation park was at its peak. The thermal sector still has 7,448 MW unavailable.

*Buenos Aires Times*  
<http://www.batimes.com.ar/>

## **2 February 2024**

### **US bitcoin miners use as much electricity as everyone in Utah**

Bitcoin miners in the US are consuming the same amount of electricity as the entire state of Utah, among others, according to a new analysis by the US Energy Information Administration. And that's considered the low end of the range of use.

Electricity usage from mining operations represents 0.6% to 2.3% of all the country's demand in 2023, according to the report released Thursday. It is the first time EIA has shared an estimate. The mining activity has generated mounting concerns from policymakers and electric grid planners about straining the grid during periods of peak demand, energy costs and energy-related carbon dioxide emissions. "This estimate of U.S. electricity demand supporting cryptocurrency mining would equal annual demand ranging from more than three million to more than six million homes," the report said

While mining began in the US a decade ago, an influx of crypto mining companies have relocated from China after that country banned the industry in May 2021. Over the last three years, a flurry of large-scale miners have gone public in the US, setting up operations in some of the most energy-rich states such as Texas and New York. To date, EIA has identified a total of 137 facilities located in 21 states, with most in Texas, Georgia and New York. The agency used data from the Cambridge Bitcoin Electricity Consumption Index as well as the data it collected from the facilities for its calculations.

"CBECI estimates put electricity supporting Bitcoin mining in 2023 at about 0.2% to 0.9% of global demand for electricity," according to the report. "Based on those estimates, global electricity use in cryptocurrency mining was about the same as total electricity consumption in Greece or Australia, respectively."

Bitcoin mining is an energy-intensive process in which miners use specialized computers to validate transactions on the blockchain and receive rewards in the form of the token. While it has been difficult to collect data, EIA said it plans to begin conducting a mandatory survey "focused on systematically evaluating the electricity consumption

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associated with cryptocurrency mining activity,” the report said. Data will be collected on a monthly basis from February through July.

*Bloomberg*

<http://www.bloomberg.com/>

**2 February 2024**

## **UK Energy Minister condemns wind farms for overstating their output**

A UK energy minister on Thursday condemned the behavior of wind-farm operators who have routinely overestimated how much power they'll generate — a practice that adds to consumers' bills, according to electricity traders and market experts.

Andrew Bowie was responding to a Bloomberg News report that found dozens of the country's wind farms, many run by some of Europe's largest energy companies, have overstated their power generation in forecasts. An analysis of 30 million market records indicates that such overestimation has cost bill payers tens of millions of pounds in additional costs since 2018.

“It is completely unacceptable to overcharge for people's bills,” Bowie said. “British energy generators must operate at the highest standards.” Later on Thursday, the UK energy regulator, known as Ofgem, said it had opened an investigation into the conduct of the wind farms. The UK's outdated electricity network can't always handle all the power that wind farms produce. When that happens, the National Grid Plc's system operator often pays energy companies to switch off their turbines. Payments for this “curtailment” are based on wind farms' predictions of how much they'll generate — and some operators exaggerate their forecasts, which boosts what they receive, according to nine traders, academics and market experts. Consumers ultimately pick up that tab.

“Ofgem's wholesale markets oversight team are investigating the alleged behavior,” a spokesman for the regulator said in an emailed statement, adding that it had also asked the system operator to look into the matter. “We will continue to work to protect market integrity and consumers. Bloomberg analyzed records from 2018 through June 2023 to compare wind operators' daily generation forecasts to their actual production when they weren't curtailed. Out of 121 wind farms in the analysis, 40 overstated their output by 10% or more on average, and 27 of those overestimated by at least 20%.

It's impossible to determine precisely how much bill payers have had to pay due to such overstatements. But assuming a similar rate of overestimation during the times that those 40 farms were paid to stop generating, consumers would have overpaid an estimated £51 million (\$65 million) since 2018. UK regulations explicitly prohibit generators from “obtaining an excessive benefit” when they are paid to stop or reduce their output due to grid constraints. Other rules stipulate that firms must submit a “best estimate” of their generation plans and stick to it as closely as possible.

*Bloomberg*

<http://www.bloomberg.com/>

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## **Raccoon mischief triggers blackout in Toronto, trapping people in elevators**

An inquisitive raccoon fiddled with electricity equipment in Toronto and cut power for thousands in the downtown core late on Thursday, knocking out traffic lights in Canada's largest city and trapping some people in elevators.

Crews investigating the outage determined that the nocturnal mammal made contact with equipment at a downtown Toronto station, Utility Hydro One (H.TO), opens new tab said on social media. A spokesperson for Hydro One said the raccoon did not survive the



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contact. According to think-tank Electricity Canada, squirrels are by far the most common culprit when it comes to animal-related outages, followed by raccoons and birds.

The power outage on Thursday hit areas about 2 km (1.24 miles) from the CN Tower landmark and left about 7,000 people in the dark for nearly three hours. Some traffic lights were also turned off in downtown Toronto, which is also home to the busy Union Station rail transport hub, according to a Reuters witness.

*Reuters*

<http://www.reuters.com/>

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## **Roadmap for energy market reforms agreed and support to Moldova reaffirmed by the European Commission at the 5th EU-Moldova High-Level Energy Dialogue**

During the discussions, the Minister mentioned that Moldova intends to intensify efforts for the full implementation of the Energy Community acquis as a key priority, in particular the transposition and full implementation of the Clean Energy Package and the Electricity Integration Package, enabling Moldova's integration into the EU internal electricity market, as well as further gas market opening and liberalisation. In this sense, the Republic of Moldova, the European Commission and the Secretariat of the Energy Community have agreed to commit to a joint Roadmap for further reforms in the energy sector of the Republic of Moldova, covering electricity, gas, renewable energy and energy efficiency.

In order to increase energy security of the country, the possibility of increasing the electricity import capacity from the Continental European Network and increasing the physical reverse flow capacity of the Trans-Balkan gas pipeline was discussed. The Republic of Moldova has also committed to accelerate the development of electricity interconnections, with an emphasis on the timely construction of the 400 kV Vulcănești-Chișinău and Bălți-Suceava 400 kV overhead power lines and will proceed with the third 400 kV Strășeni interconnection – Romania. Moldova will also explore the possibility of proposing the 400 kV Bălți-Suceava interconnection for the EU list of projects of mutual interest, as well as the third power line.

At the same time, the European Commission reiterated its commitment to support Moldova in further energy sector reforms and the development of its energy infrastructure, including by seeking to allocate up to EUR 10 million to the Residential Energy Efficiency Fund in its first year of functioning and another EUR 3 million for technical assistance of the National Centre for Sustainable Energy (NCSE), which should be the national focal point for the country's energy efficiency needs, including in the residential sector, and a trusted institution. At the same time, the European Commission will support Moldova to reach net zero by 2050 by expanding the electrification process, as well as the efficiency of the energy sector by digitizing critical infrastructure, optimising processes and capitalising on energy efficiency, promoting the use of green technologies (battery storage, heat pumps, smart meters, increased use of electric vehicles, etc.) and attracting financing to the sector.

*EEAS*

<http://www.eeas.europa.eu/>

**5 February 2024**

## **FERC Filing Marks PJM's Second Collaboration With New Jersey on Offshore Wind Transmission Study**

PJM and the New Jersey Board of Public Utilities have agreed to the terms on the next phase of a historic collaboration that deploys PJM's competitive planning process to help New Jersey further advance its ambitious offshore wind goals.

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This next phase of the State Agreement Approach Study Agreement (referred to as “SAA 2.0”), signed by PJM and NJBPU and filed (PDF) with the Federal Energy Regulatory Commission on Feb. 2, marks the second time New Jersey has leveraged a provision in PJM’s Operating Agreement that enables the state to take advantage of PJM’s expertise and planning process to develop transmission improvements necessary to support the reliable interconnection of public policy resources.

This request asks PJM to solicit transmission solutions to serve an additional 3,500 MW of offshore wind energy, totaling 11,000 MW, by 2040.

New Jersey is the first state to use PJM’s State Agreement Approach process to advance public policy goals. PJM’s work with NJBPU under the SAA has been cited as a model for other states to develop the transmission infrastructure needed for their own energy policies.

“The continued collaboration between PJM and New Jersey through the State Agreement Approach underscores PJM’s commitment to reliably and cost-effectively facilitating states’ renewable energy policy goals,” said PJM President and CEO Manu Asthana. “PJM’s competitive planning process allows for creative solutions to complex infrastructure challenges. New Jersey has been a leader in this approach and can be a template for other states pursuing their individual energy policies.”

The NJBPU in November 2020 requested use of the SAA to incorporate New Jersey’s initial offshore wind goals (7,500 MW by 2035) into PJM’s regional transmission planning process. That culminated in NJBPU awarding \$1.1 billion in projects to construct the onshore transmission facilities necessary to deliver those 7,500 MW to New Jersey customers, while minimizing community and environmental impacts and customer costs. Those enhancements to the grid are currently being implemented by the designated entities that were awarded project components.

“In 2022, New Jersey demonstrated its national leadership in coordinated offshore wind transmission with the first-ever use of State Agreement Approach to help support the interconnection of responsibly developed offshore wind off of our coasts,” said NJBPU President Christine Guhl-Sadovy. “Through our SAA 2.0 Study Agreement with PJM, we are excited to take a major step forward in evaluating the best and most cost-effective ways to on-shore more clean energy and further cement New Jersey as a national leader in the offshore wind industry.” The New Jersey Board of Public Utilities also issued a news release announcing the collaboration.

***PJM***

<http://insidelines.pjm.com/>

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## **Germany outlines \$17 bln plan to subsidise gas-to-hydrogen shift**

Germany’s government has agreed plans to subsidise gas power plants that can switch to hydrogen, the economy ministry said on Monday, with a price tag of \$17 billion in subsidies as part of efforts to supplement intermittent renewable energy and speed up the transition to low carbon generation.

The announcement follows pressure from the industry, impatient for detail after the government had promised the strategy last year as Germany counts on hydrogen to help the country move away from gas and coal. The tender process for the four gas plants with total capacity of up to 10 gigawatts (GW) would take place soon, the ministry said, without specifying when. The state support for companies to build and operate the future hydrogen-ready gas power plants will total around 16 billion euros (\$17 billion), including capital and operating subsidies, two coalition sources told Reuters on Monday. The ministry said

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hydrogen transition plans should be drawn up by 2032 to enable the plants to be fully switched to hydrogen between 2035 and 2040.

EnBW opens new tab board member Georg Stamatelopoulos said that while the agreement was an important step, the 10 GW goal was too low to ensure an accelerated exit from coal-fired power by 2030, a swift tender process was key given such projects take 6-8 years. RWE opens new tab said it planned to take part in the tenders.

The government will also subsidise power plants running exclusively on hydrogen with a capacity of up to 500 megawatts for energy research purposes, the ministry said, without providing financial details. In addition, Berlin said on Monday a new design for the electricity market would introduce a market-based capacity mechanism, to be agreed around the middle of this year to be operational by 2028. It would reflect increased renewables in Germany's energy mix, following criticism from environmental campaigners that capacity mechanisms to pay utilities to ensure baseload capacity when intermittent solar and wind power fall short have been used to subsidise fossil fuel production.

Germany's Deutsche Umwelthilfe environmental group said the agreement, including the financing and tender design remained vague and may lead to gas power plants being built that do not get converted to hydrogen. It said the agreement considers deploying expensive or uncertain technologies that are still in development, such as nuclear fusion and carbon capture, instead of relying on existing solutions. Utilities association BDEW said the agreement must be followed promptly by a concrete legislative proposal so the first call for tenders takes place this year. Utility Unipe, opens new tab said it expects to build some of the new capacity: "As soon as we have been able to examine the details, we will decide whether and with which investments we will participate," Chief Executive Michael Lewis said in a statement.

Germany last year agreed with the European Commission to tender 8.8 GW of new hydrogen plants, and up to another 15 GW that will run initially on natural gas before being connected to the hydrogen grid by 2035 at the latest, but Berlin and Brussels have disagreed on how the gas plants would be subsidised. The German government will discuss whether further gas capacity is needed beyond the 10 gigawatts planned, a spokesperson for the economy ministry said on Monday. Chancellor Olaf Scholz, Economy Minister Robert Habeck and Finance Minister Christian Lindner also agreed to remove obstacles to the construction and operation of electrolyzers, which can use renewable energy to separate hydrogen from water, the ministry said.

Germany's power plant strategy was supposed to be ready last year, but a constitutional court ruling that vetoed 60 billion euros (\$64.5 billion) of debt earmarked for climate projects forced the government to rethink its budget. The planned plants will be crucial for Berlin to convince the eastern producers of brown coal, the most polluting kind, to phase out coal-fired stations earlier than the official date of 2038 and help Germany to reach its greenhouse emissions targets faster.

*Business Recorder*  
<http://www.brecorder.com/>

**6 February 2024**

## **Europe's power system gets off to record clean start in 2024**

Europe's power producers boosted clean electricity generation to a new record in January thanks to steep jumps in output from hydro and solar sites during the first month of the year. The 268.5 terawatt hours (TWh) of clean electricity output in January was the second consecutive month of record high clean generation in Europe, and was 8.4% more than the same month a year ago, data from energy think tank Ember [shows](#).

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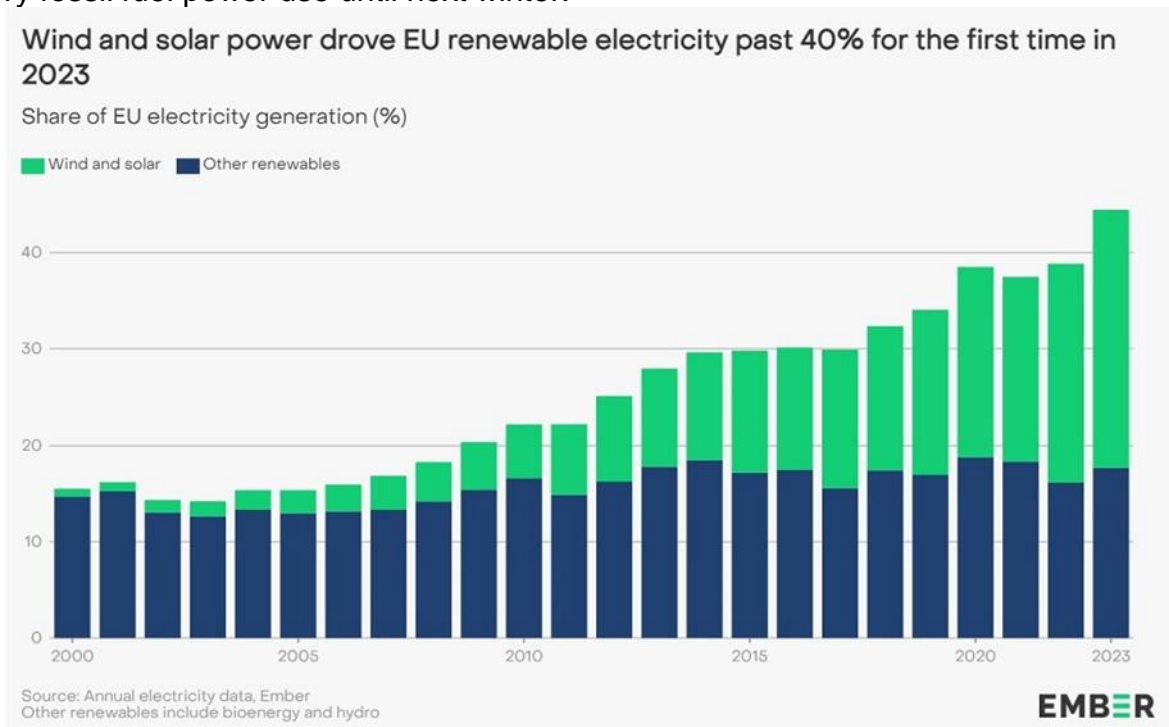
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Clean power's share of total electricity generation also hit a new milestone in January, accounting for 59.5% of total electricity generation that month in Europe, compared to 56% for the same month in 2023. The widespread advances in clean electricity output indicates that Europe's electricity generators continue to make important progress towards energy transition goals, even during the coldest months of the year when fossil fuel-powered generation has historically peaked.

Fossil fuel electricity generation also increased in January from December's total, but sharply lagged the growth rate in clean generation. Fossil fuel generation was 186 TWh, down 11% from January 2023 and the lowest for the first month of the year since at least 2015, Ember data shows. Europe's power sector emissions trend mimicked that of fossil fuels use, and dropped to 138 million metric tons of carbon dioxide and equivalent gases, and the lowest January total in at least 9 years.

The low level of fossil-based generation in January will raise hopes of steep declines in fossil generation for the year as a whole, as for the past two years January has marked the nual high point of gas and coal-fired generation in Europe.

Relatively mild weather so far this winter has been a key factor limiting the need for fossil generation, as above-normal temperatures have reduced the need for heating in many areas. The record pace of installations of heat pumps and other energy-saving devices have also helped cap fossil fuel use, and if power generators can get through February without needing to crank coal and gas power stations then the region will likely be able to avert heavy fossil fuel power use until next winter.

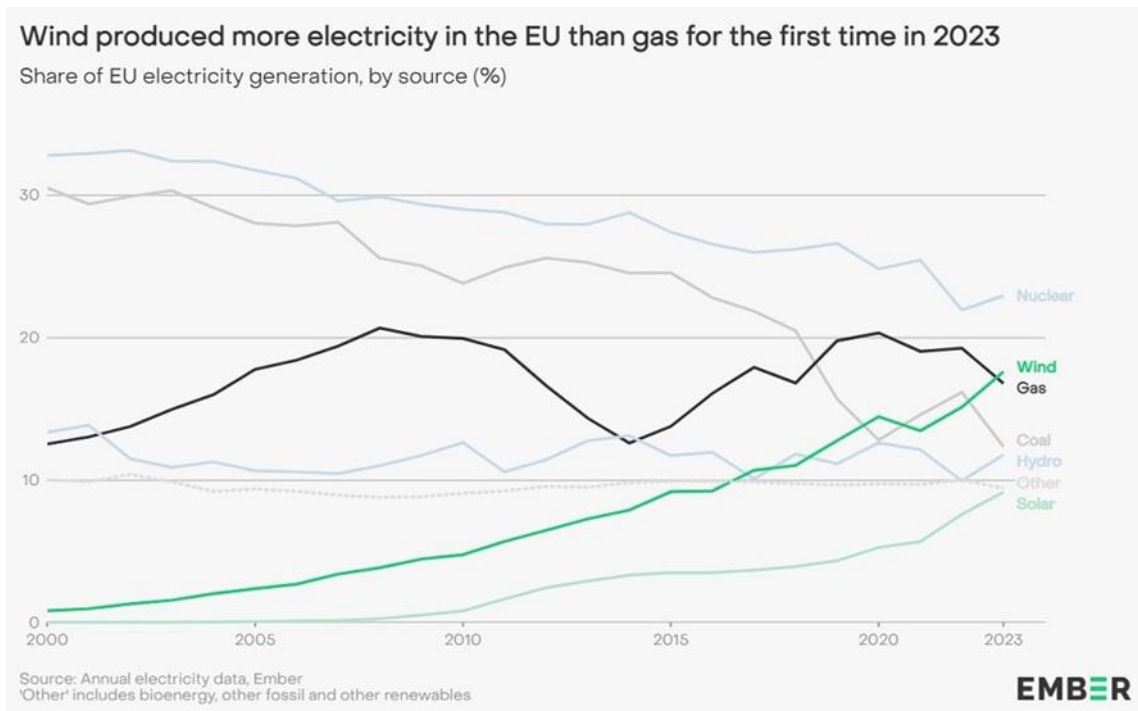


Nuclear and hydro sites remain the primary sources of clean electricity in Europe, but the region's solar facilities have been the strongest performers so far in 2024 in terms of year-on-year comparisons. Solar generation topped 10.24 TWh in January, compared to 7.7 TWh a year ago. That 33% gain in solar output compares to a 4% rise in nuclear generation and a roughly 20% rise in hydro generation from January 2023.



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Much of solar's increased production stems from expanded capacity, as utilities have rolled out cheap-to-install solar at a much faster pace than all other forms of energy over the past five years. From 2018 through 2022, solar generation capacity in Europe expanded by 86% to 236.5 gigawatts (GW), and is expected to have notched up a new record in terms of installations in 2023. That 2018-22 growth rate compares to 34.4% in wind, 8% in bioenergy, and 3.1% in hydro generation capacity.

Over the same period, Europe's power firms cut coal-fired generation by more than 38 GW, or by 15.6%, Ember data shows. Given the combination of expanded clean generation capacity and decreased fossil capacity, Europe's power system looks set to hit further clean power milestones in the months and years ahead, and should help realise longer-term emissions reduction targets.

Reuters

<http://www.reuters.com/>

6 February 2024

## NAESB to develop standardized distribution services contract to facilitate DER aggregation

The North American Energy Standards Board on Monday said it will begin work on a standardized services contract that aims to ease the aggregation of distributed energy resources, or DERs, and facilitate development of virtual power plants.

"There is a growing need for standards to support integration and interoperability of DERs and DER aggregations, and the framework established by a NAESB model distribution services contract may lead to future standards development that can improve data sharing practices and enhance cybersecurity," Chairman Michael Desselle said in a statement.

NAESB is launching the effort at the request of the U.S. Department of Energy, and plans to hold a kick-off meeting on Wednesday. The board has developed model contracts for both the gas and the electric sectors, which Desselle said have improved "transactional efficiencies within wholesale markets and for competitive retail energy services."

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NAESB said that at the Wednesday kick-off meeting Joseph Paladino, DOE's acting director for grid technical assistance, will provide background on related program activities underway at the federal agency and how they resulted in the request for assistance in the development of a model contract.

NAESB said DOE's request indicated that "a significant market barrier inhibiting the provision of distribution services from DER aggregations is the lack of a standard contract that specifies discrete services and related performance expectations from aggregators. Currently, contracting practices can widely vary between jurisdictions and even utilities within the same state, NAESB said

Standardizing the process "will encourage market and operational coordination across distribution and wholesale interactions, enabling more seamless participation for DER aggregators seeking to participate in wholesale markets, consistent with FERC Order No. 2222 requirements," NAESB said. The Federal Energy Regulatory Commission issued Order 2222 in 2020, directing grid operators to enable DER aggregations to participate in wholesale markets. But its impact so far has been "mixed," according to Guidehouse Insights.

*Utility Dive*

<http://www.utilitydive.com/>

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### **Elering seeks license for third interconnector between Estonia and Finland**

Estonian transmission system operator Elering has applied for a licence for the development of EstLink 3, an electricity interconnection between Estonia and Finland with 700MW of capacity.

Elering has applied to Estonian governmental agency the Consumer Protection and Technical Regulatory Authority. EstLink 3 will be the third electricity interconnection between the two countries. It will support climate and energy policy objectives by fostering a more integrated Baltic and Nordic market. Elering management board chairman Kalle Kilik stated: "We have analysed various potential locations for EstLink 3 and we now consider north-western Estonia to be the most promising area. For security reasons, it will be appropriate to build the new interconnection as far as possible from the existing ones.

"In the long term, this route option will allow connecting the development areas of offshore wind farms that could potentially be built in the area of western Estonian major islands with the resilient power grid." The application includes the coordinates for the potential onshore connection point of the submarine cable in Lääne-Nigula municipality, Estonia.

*Power Technology*

<http://www.power-technology.com/>

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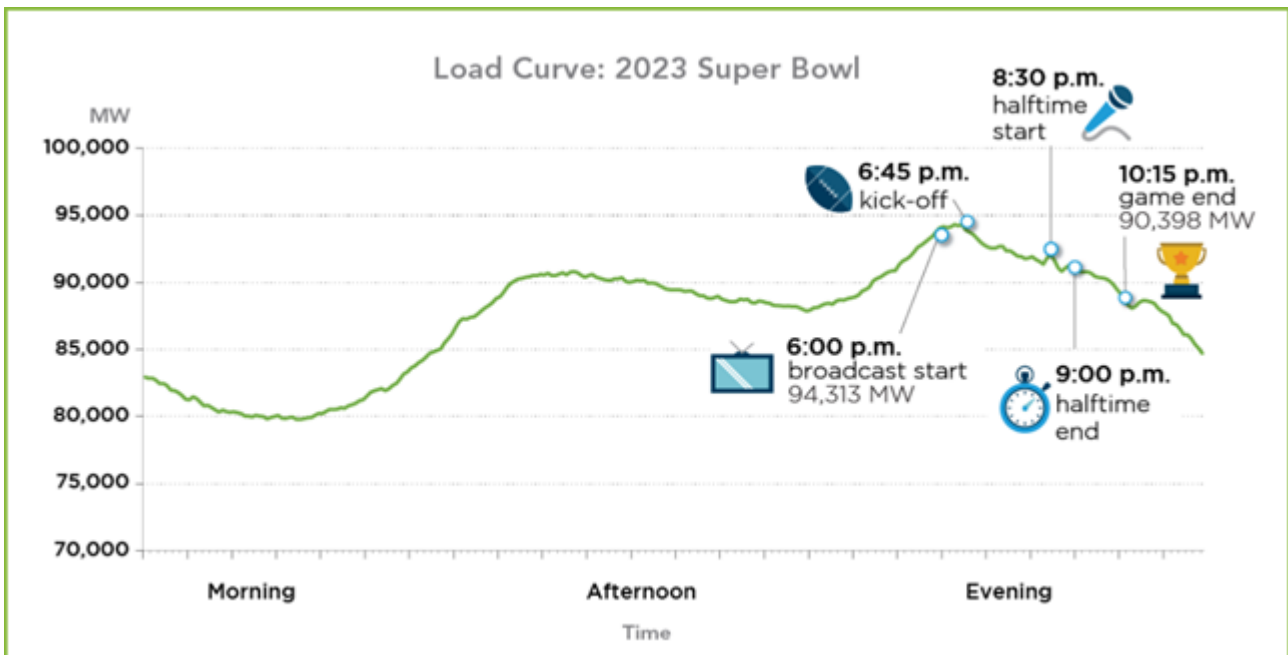
### **How the super bowl plays into electricity use**

While more than 100 million people are watching Super Bowl LVIII this weekend, PJM will be tuning in to the unique pattern of energy usage that the pregame, halftime and postgame festivities produce throughout the region. As the country's largest grid operator, PJM's job is to continuously match power supply with demand, transmitting electricity the second it is needed to the 65 million people it serves across 13 states and Washington, D.C.

Regardless of how the San Francisco 49ers and the Kansas City Chiefs perform in Las Vegas – or how many times Taylor Swift pops up on your screen – PJM will be prepared. Its operators were doing this for decades before Super Bowl I in 1967 saw the same Chiefs lose to the Packers.

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On the day of the Super Bowl and every day, PJM is constantly forecasting customers' needs. After weather and historical usage comparisons, human behavior is the biggest factor in this equation. PJM considers people's routines during certain seasons, holidays, days of the week and times of the day.

The pattern on Super Bowl Sunday is pretty consistent, but it might surprise you; see the accompanying chart that details the pattern of demand during last year's Chiefs-Eagles Super Bowl. (All times are approximate.) It's not the 70-inch televisions tuned in to the game that drive up electricity use, but fans' preparations before the game, last-minute prep during halftime and cleanup after it's over. That's when electricity is powering ovens, crock pots, microwaves, refrigerators, hot-water heaters, dishwashers and other energy-thirsty electric appliances.

Game day starts off like any other Sunday in February, with electricity use climbing as people wake up, turn on lights, make coffee and get ready for the day. It then flattens out around lunchtime, coinciding with last-minute trips to the store or travel to parties. Around 3 p.m., energy usage starts heating up, along with the food being prepared for the main event and pregame revelry. Kickoff, scheduled for 6:30 p.m., marks a drop in electricity use as folks settle in to watch the game. At the end of the first half, there's a bump as people get off the couch, open the fridge for a drink, reheat the wings and replenish their plates.

As halftime performer Usher takes the stage Sunday night around 8:30 p.m., the demand curve will drop again for another 15 or 20 minutes, as it did last year when Rihanna performed high above the field in State Farm Stadium. After another momentary flurry of activity in homes and bars across the country when the halftime show ends, the demand for electricity will continue to decrease until the last bump at the end of the game.

That's when folks will be cleaning up, heading home or preparing for bed. How the curve behaves toward the end of the game depends on the action on the field. If it's a tight game, demand will remain low until the end. If it's a blowout, folks will leave the TV, start washing dishes or turn to other activities. All the while, PJM dispatchers will be coordinating with generators to reliably serve the electricity needs of the biggest power grid in the country. You can find real-time conditions of load, generation fuel mix and more on the Markets & Operations dashboard or on the PJM Now app.

PJM  
<http://insidelines.pjm.com/>

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**8 February 2024**

## **DOE: Puerto Rico can transition to 100% renewables by 2050 but costs ‘will be significant’**

Puerto Rico’s transition to renewable energy “will be a substantial effort, and won’t happen overnight, but 100% clean energy is 100% possible,” Agustín Carbó, director of DOE’s Puerto Rico Grid Recovery and Modernization Team, said in a call with reporters on Tuesday.

The PR100 study assessed the land requirements and technical potential for utility-scale solar, land-based wind and offshore wind, among other technologies. The study was published by DOE’s National Renewable Energy Laboratory and takes into account the island’s financial situation and the bankruptcy of its electric utility, the Puerto Rico Electric Power Authority, known as PREPA.

Utility-scale PV deployment on non-agricultural land “is sufficient to meet total annual electric load to 2050 in our scenarios,” NREL concluded. The study also concluded that “additional generation capacity is needed immediately — on the scale of hundreds of megawatts — to achieve system adequacy and minimize outages.” Even if all of PREPA’s renewable energy and storage procurements result in their planned capacity additions, “a significant investment in additional generation capacity would still be needed to achieve acceptable reliability performance,” the report found.

To achieve 40% renewable energy, which Puerto Rico law requires by 2025, DOE concluded the optimal approach includes up to 3,500 MW of utility-scale solar capacity, depending on scenario inputs, along with approximately 700 MW of 4-hour-duration utility-scale batteries, up to 400 MW of long-duration storage, and up to 340 MW of land-based wind. The utility-scale capacity additions add to the distributed renewables and storage additions, NREL expects.

However, researchers also noted the speed of additions will need to pick up. “The current pace of utility-scale deployment is likely too slow to result in 40% renewable energy by the 2025 statutory deadline and a reliable grid in the near term,” the report found. Much of the island’s approximately 4 GW of existing fossil fuel generation would remain online during this initial renewables buildout, according to the study.

Puerto Rico customers paid about \$0.25/kWh for their electricity in October, according to EIA data, significantly higher than mainland U.S. prices. The cost of new clean energy resources “will be significant regardless of the mix of generation technologies,” the report warned. Under one scenario that leans on cheaper utility-scale solar generation, Puerto Rico electricity prices rise to about \$0.32/kWh in 2025 and \$0.35/kWh in 2050. The study found households earning \$15,000 per year or less “were particularly vulnerable” to large retail rate increases, “especially if they were more likely to be nonadopters of rooftop PV, resulting in energy justice implications,” the report found.

DOE’s accessible solar program, which launches Feb. 22, aims to address energy affordability issues by helping low-income customers in Puerto Rico install rooftop solar and energy storage with zero upfront costs. Funding for the program comes from the \$1 billion DOE Puerto Rico Energy Resilience Fund. The DOE loan program office “is also working with independent power developers in Puerto Rico to offer federally-backed loans and loan guarantees with low interest rates so that utility-scale solar PV generation and battery storage projects can be built at a low cost to consumers,” Carbó said.

*Utility Dive*

<http://www.utilitydive.com/>

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## **Iceland volcano erupts for second time this year with lava close to power plant**



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A volcano in Iceland has erupted for the second time this year and the third time since December, pumping lava up to 80 metres (260ft) into the air and disrupting life in the Reykjanes peninsula in the south-west of the country. Fountains of bright orange molten rock spewed from cracks in the ground and lava crossed a road near the Blue Lagoon, a luxury geothermal spa, which had closed on Thursday.

The lava flow also hit thermal-based water pipes in the region just south of the capital, Reykjavík, disrupting the supply of hot water to more than 20,000 people and leading the Civil Protection Agency to raise its alert level to emergency status. The agency also asked households and businesses to conserve electricity. Restoring hot water via an emergency pipeline that was already under construction could take days, it said.

Volcanic outbreaks in the Reykjanes peninsula are fissure eruptions, which do not usually cause large explosions or significant dispersal of ash into the stratosphere. However, scientists fear they could continue for years, and Icelandic authorities have started building dykes to divert burning lava flows away from homes and critical infrastructure. The lava stream was only about 0.6 miles (1km) from the peninsula's Svartsengi geothermal power plant, said Rikke Pedersen, who heads the Nordic Volcanological Center research group in Reykjavík.

Protective dykes have been built in the area and workers were trying to fill in small gaps along the road as the lava flowed. "So they are really doing all they can to prevent lava reaching the power plant," she said. The latest eruptive fissure, the sixth outbreak since 2021, was roughly 2 miles (3km) long, Iceland's meteorological office said. Intense earthquake activity began at about 5:30am and the eruption came 30 minutes later. A plume of smoke rose 2 miles into the air, according to the Met Office. Still, Reykjavík's international airport, about 12 miles (20km) to the north-west of the fissure, was operating as normal, airport operator Isavia said.

The previous eruption in the area started on 14 January and lasted roughly two days, with lava flows reaching the outskirts of the Grindavík fishing town, whose nearly 4,000 inhabitants had been evacuated, and where some houses were set alight. Thursday's eruption took place some way from Grindavík and was unlikely to pose a direct threat to the town, an Icelandic geophysicist, Ari Trausti Guðmundsson, told Reuters. Iceland's president, Guðni Jóhannesson, posted an image on social media of the view from his residence, with flames and smoke in the distance.

*The Guardian*  
<http://www.theguardian.com/>

**10 February 2024**

### **Thin as a wafer: the quest for the world's most powerful, ultrathin and bendable silicon solar cell**

New research led by a team of Chinese scientists has achieved the thinnest silicon solar cells ever – a flexible, paper-like material that converts light into electricity without sacrificing efficiency. Silicon solar cells are the backbone of the world's solar-generated electricity, accounting for about 95 per cent of the solar cells in the photovoltaic market. As manufacturing and power generation costs have declined, solar cells have gained wider use in ground-mounted solar farms and distributed photovoltaics.

State-run Science and Technology Daily quoted Li Yang, a professor at Jiangsu University of Science and Technology (JUST), on Monday as saying that crystalline silicon solar cells, which are made from silicon wafers, were the most mature and widely used photovoltaic power generation technology, "but they face two major technological bottlenecks". One drawback is that the power conversion efficiency of large-area silicon cells remains limited to 26 per cent; the other hindrance is cell thickness – typically 150 to 180

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micrometres (0.15mm to 0.18mm), making it difficult for use in applications that require a more flexible and lightweight material, such as curved roofs, satellites and space stations.

Aircraft, for instance, have extremely stringent weight requirements and have used thin-film solar cells, another broad category of solar cells. However, according to Li, they are expensive, have a short lifespan, and are not well suited to commercial requirements. The flexible silicon solar cells developed by Li and his collaborators are much thinner and lighter than their conventional counterparts, and boast high power efficiency. “We have developed crystalline silicon cells that are as thin as 50 micrometres – thinner than an A4 sheet of paper – that can be bent into a roll, and are much more efficient than conventional ones,” he said.

The research, published in the journal *Nature* on January 31, was a joint effort by scientists from JUST, Xian-based company LONGi Green Energy Technology, and Australia’s Curtin University. Crystalline silicon solar cells are known as a “sandwich” structure, meaning their wafer substrate – the middle layer – accounts for more than 99 per cent of the cell’s thickness. Scientists around the world have been using various approaches to develop solar cells that are lighter, more flexible, highly efficient and commercially viable.

In May last year, a group of scientists from the Shanghai Institute of Microsystem and Information Technology, Changsha University of Science and Technology, and the computer, electrical and mathematical science and engineering division at King Abdullah University of Science and Technology, reported that they had developed silicon solar cells that were just 60 micrometres thick, which could be folded like a sheet of paper.

Still, achieving ever thinner wafers has typically come at the cost of efficiency – thinner silicon solar cells have typically been less efficient at converting sunlight into electricity than thicker ones. In a briefing article published in the same issue, the authors said that previous thin crystalline silicon cells – less than 150 micrometres thick, produced using conventional techniques – had power conversion efficiencies (PCE) that ranged from 23.27 to 24.7 per cent.

In this study, however, the scientists produced five types of thin cells ranging from 55 to 130 micrometres in thickness that all had a PCE greater than 26 per cent. These ultrathin solar cells are also bendable. “While it cannot be folded in half, it can be bent into any curvature,” Li said, adding that the feature would greatly expand the range of applications for crystalline silicon cells. Solar cells that are flexible have far more application possibilities, including uses in aerospace, blimps, drones and wearable smart devices. Li said the researchers were working to develop more flexible and efficient crystalline silicon cells that could one day be as portable as a roll of film.

*China Morning Post*  
<http://www.scmp.com/>

**11 February 2024**

## **28-ton, 1.2-megawatt tidal kite is now exporting power to the grid**

Minesto's fully operational Dragon 12 looks like some sort of futuristic military drone – but it behaves remarkably like a kite underwater. It uses lift generated by tidal flows to fly patterns faster than the currents, harvesting renewable energy. Solar energy is the bedrock of most renewable energy grid plans – but lunar energy is even more predictable, and a number of different companies are working to commercialize energy generated from the regular inflows and outflows of the tides.

One we've completely missed is Minesto, which is taking a very different and remarkably dynamic approach compared to most. Where devices like Orbital's O2 tidal turbine more or less just sit there in the water harvesting energy from tidal currents, Minesto's Dragon series are anchored to the sea bed, and fly around like kites, treating the currents like wind. Just as land-based wind energy kites fly in figure 8 patterns to accelerate

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themselves faster than the wind, so does the Dragon underwater. This, says Minesto, lets the Dragon pull more energy from a given tidal current than other designs – and it also changes the economic equations for relevant sites, making slower tidal flows worth exploiting.



These are by no means small kites – the Dragon 12 needs to be disassembled to fit in a shipping container. It rocks a monster 12-meter (39-ft) wingspan, and weighs no less than 28 tons. But compared to other offshore power options like wind turbines, it's an absolute minnow, and extremely easy to install using a single smallish boat and a sea bed tether. As with any renewable energy project, the key figure here is LCoE (levelized cost of energy) – so what's it gonna cost? Well, back in 2017, Minesto projected about US\$108/MWh once its first hundred megawatts of capacity are installed – with costs falling thereafter as low as \$54/MWh.

For an unfair comparison, Orbital has claimed it's hoping for an LCoE less than \$253/MWh for its very first O2 tidal turbine, a figure that'll drop with scale, and fixed-bottom offshore wind projects in 2022 had an estimated average LCoE around \$89/MWh in 2022, according to the US DoE.

The Dragon 12, like other tidal devices, will be more effective in some places than others – and Denmark's Faroe Islands, an archipelago in the chilly North Atlantic between Scotland and Iceland, offer ideal conditions. Home to about 55,000 people and more than a million puffins, the Faroe Islands funnel tidal currents through a number of slim channels. This accelerates the water significantly, and thus increases the energy that devices like the Dragon 12 can harvest.

*New Atlas*

<http://newatlas.com/>

12 February 2024

## Storms in Australia leave half a million customers without power

More than half a million energy customers in Victoria, Australia's second-most populous state, lost power after severe storms caused the failure of parts of the grid. "Approximately 500,000 customers throughout Victoria are now without electricity," the Australian Energy Market Operator said in a statement on Tuesday. "These power outages are due to high temperatures, strong winds and lightning causing damage to the electricity network." The Moorabool to Sydenham 500 kilovolt transmission lines were tripped and AGL Energy Ltd. suffered disruption to supply from the Loy Yang A coal-fired power plant, according to Victoria's Energy Minister Lily D'Amrosio.

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AEMO earlier removed load shedding measures that had cut power to about 90,000 customers under efforts to stabilize Victoria's grid. Spot electricity prices in the southern state briefly surged on the disruption to more than A\$16,600 (\$10,818) a megawatt hour, compared to an average of A\$28.05 this month, according to AEMO data.

*Bloomberg*  
<http://www.bloomberg.com/>

## **13 February 2024**

### **Power system event in Victoria**

14 February 5pm statement

Power restoration progressing in Victoria

Today, electricity crews have made significant progress in restoring power to thousands of properties in Victoria that suffered power outages due to yesterday's storms.

Approximately 127,743 homes and businesses remain without power in Victoria due to destructive winds across the state, down from 280,000 this morning and a peak of 530,000 yesterday.

Vegetation clearing and repairs to damaged powerlines and poles continue. However, given the extent of the widespread damage, it may take days or more than a week in extreme circumstances to restore electricity to all of those impacted.

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14 February 10:30am statement

Storms disrupt power supply in Victoria

Electricity network crews have restored power to thousands of properties this morning, which lost power due to a severe storm that damaged the poles and wires network in Victoria yesterday.

Approximately 220,000 homes and businesses remain without power in Victoria due to storm damage across the state, down from a peak of 530,000.

Vegetation clearing and repairs to damaged powerlines and poles continue. However, given the extent of the widespread damage, it may take days if not weeks to restore electricity to all of those impacted.

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14 February 7:30am statement

Storms disrupt power supply in Victoria

Electricity network crews have restored power to a large number of properties that lost power due to a severe storm that damaged the poles and wires network in Victoria yesterday.

Approximately 285,500 homes and businesses are still without power in Victoria due to storm damage across the state, down from a peak of 530,000.

Vegetation clearing and repairs to damaged powerlines and poles continue. However, given the extent of the widespread damage, it may take days if not weeks to restore electricity to all of those impacted.

Emergency crews continue to endure challenging conditions to access and repair damaged powerlines and critical energy infrastructure.

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13 February 8:30pm statement

Storms disrupt power supply in Victoria

Storms continue to damage Victoria's electricity network this evening, disrupting the power supply to approximately 473,000 homes and businesses, slightly down from today's earlier peak (530,000).



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It's estimated that strong winds and fallen trees have damaged hundreds of powerlines and power poles.

Network crews continue to endure challenging weather conditions, falling trees and access issues to repair damaged powerlines and critical energy infrastructure.

Crews are actively working to restore power to these impacted areas. However, given the extent of the widespread damage, it may take days if not weeks to restore electricity to all of those impacts.

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13 February 5:30pm statement

Around 4pm, AEMO cancelled the controlled disruption to people's electricity supply in Victoria (load shedding), required as a last resort to return the power system to a secure operating state.

All of these customers (approx. 90,000) across the state have had their electricity restored.

Investigation into the power system security event in Victoria, including the tripping of the Moorabool to Sydenham 500 kilovolt transmission lines, are still underway.

At the same time, Victoria's electricity distribution businesses have confirmed that approximately 500,000 customers throughout Victoria are now without electricity.

These power outages are due to storm activity, strong winds and lightning causing damage to the electricity network.

Crews are actively working to restore power to these impacted areas, clearing vegetation to make the areas safe before replacing poles and mending fallen powerlines.

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13 February 3:30pm statement

AEMO can confirm that a significant power system event occurred in Victoria early this afternoon.

In Victoria, the Moorabool to Sydenham 500 kilovolt transmission lines tripped, multiple generators disconnected from the grid and some consumers experienced a loss of electricity supply.

AEMO is investigating the cause.

To keep the power system secure, AEMO has directed AusNet Services to enact load shedding.

Controlled load shedding is a mechanism AEMO uses as an absolute last resort to protect system security and prevent long-term damage to system infrastructure.

Further updates will be provided.

For further information, please read our load shedding fact sheet.

**AEMO**

<http://www.aemo.com.au/>