

NetZero Pathfinders Quarterly

The power and grids edition

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BloombergNEF



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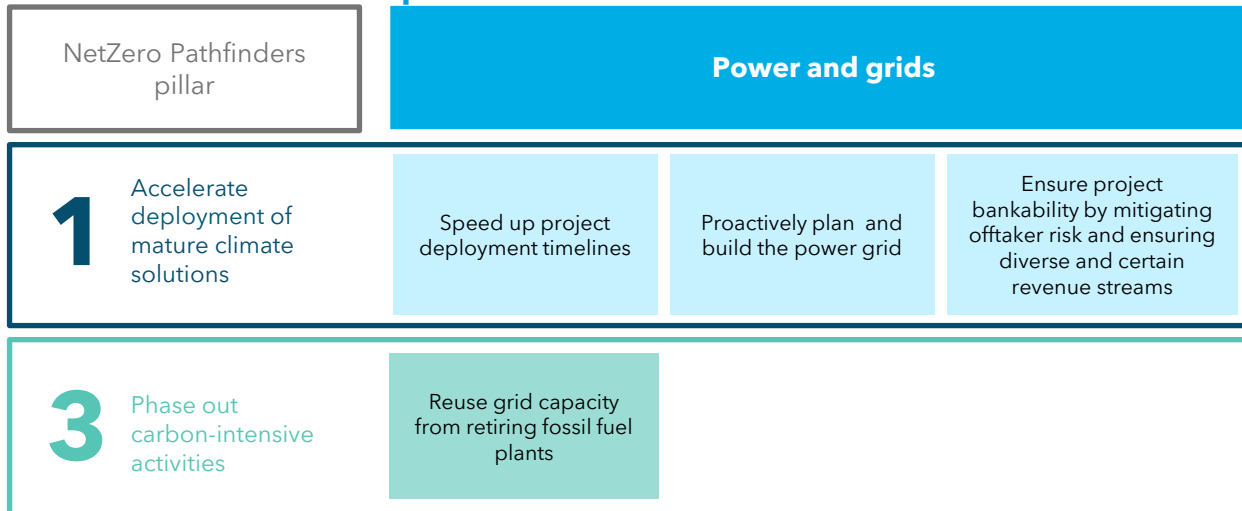
NetZero Pathfinders Quarterly

Power and grids

Welcome to the second edition of the NetZero Pathfinders Quarterly, a publication highlighting the most effective policies and regulations in a particular sector. By showing what really works through success stories, Pathfinders equips decisionmakers to implement impactful solutions and mitigate climate change.

The Pathfinders framework identifies the four pillars of the energy transition. This Quarterly encompasses actions in Pillar 1 – “accelerate deployment of mature climate solutions” and Pillar 3 – “phase out carbon-intensive activities” – with a focus on power and grids. Through a series of eight case studies across three continents, we highlight best practices for proactive grid planning, connection and permitting reforms, and ensuring project bankability.

Climate solutions and pillars covered in this edition



Pillars covered in this edition



Contents

Proactively plan and build the power grid



- [The EU's Action Plan for Grids](#)
- [Great Britain's Holistic Network Design](#)

Reform connection and permitting processes



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Ensure project bankability



- [Brazil's transmission financing](#)
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Proactively plan and build the power grid

Proactively plan and build the power grid

Putting grids high on the policy agenda

Climate solutions covered

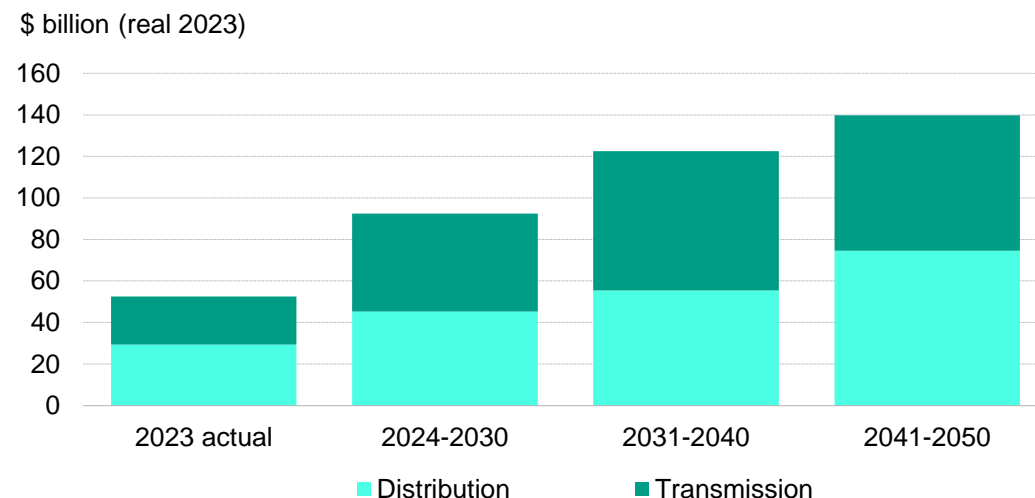


European Union Action Plan for Grids

- The European Union Action Plan for Grids presents a strategy for building out the region's electricity grids to achieve net-zero emissions by 2050. The EU needs rapid deployment of renewable energy and electrification of transport, heating and other industry. The transmission and distribution networks are crucial for realizing these goals, which has prompted policymakers to make grids a central part of the agenda.
- BNEF expects EU* power grids to need around \$3.1 trillion (€2.9 trillion) of cumulative investment over 2024-2050. The Action Plan, published in November 2023, identified several challenges that need to be solved in the power grids sector to unlock this money. It has spurred discussion and collaboration across EU network companies, and it supports EU legislators in incorporating the identified solutions into legislation.
- The EU electricity market reform, proposed in early 2023 and adopted in April 2024, partially addresses challenges identified in the action plan, as power market flexibility can improve grid utilization. Several other pieces of legislation are still being planned or drafted. For example, rules on offshore network development and connection processes for demand and generation.
- *(Second bullet point corrected on June 24, 2024, to read “3.1 trillion (€2.9 trillion)” and clarify that this investment figure is cumulative.)*

*EU spend estimated from BNEF's modeled Net Zero Scenario spend for EU-27, Norway and Switzerland, assuming the two non-EU countries account for 5% of cumulative spend.

Europe's average annual grid investment



Source: BNEF's New Energy Outlook 2024. Note: Includes EU-27, Norway and Switzerland.

Key themes covered by the EU Action Plan for Grids

Long-term grid needs	<ul style="list-style-type: none"> • Incentivize anticipatory grid investment • Increase time horizon of planning for transmission and distribution grids
Faster buildout	<ul style="list-style-type: none"> • Speed up grid permitting processes • Rapidly implement large transmission 'projects of common interest' • Strengthen grid component supply chains
Better grid utilization	<ul style="list-style-type: none"> • Secure EU financing for smart grid projects • Increase data sharing and smart tariffs

Proactively plan and build the power grid

Future-proofing through proactive transmission funding

Climate solutions covered



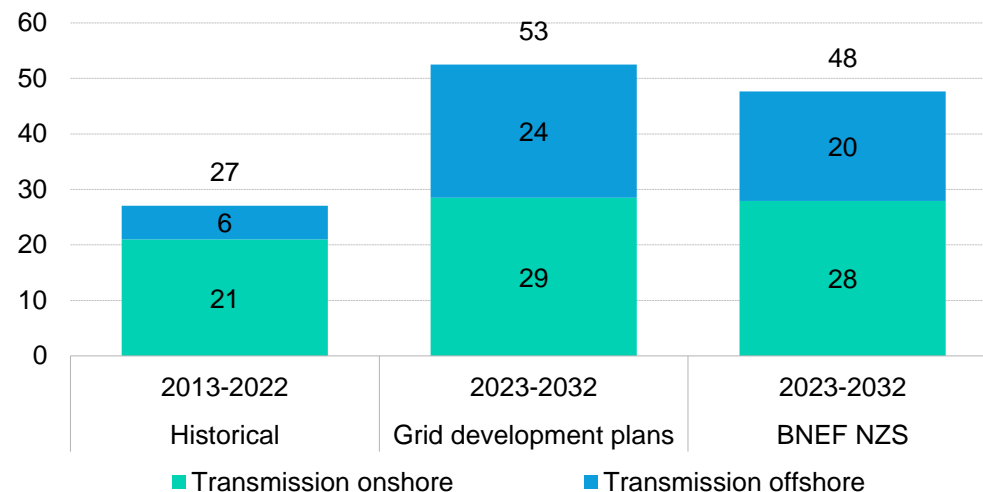
Great Britain's transmission grid buildout

- Great Britain's National Grid Energy System Operator (ESO)* is planning transmission grid buildout in line with the market's ambitious offshore wind targets. The Holistic Network Design (HND), which sets out a plan to connect 23 gigawatts of new offshore wind by 2030, was released in 2022.
- The ESO's subsequent Beyond 2030 plan, published in March 2024, integrates the offshore and onshore grid planning processes, improving coordination between grid and energy generation projects.
- Transmission grid companies must balance building the grid either proactively or reactively. Until recently, the British grids were typically strengthened only after the existing grid became frequently overloaded. The HND shows a shift towards proactive grid build out, to prepare for anticipated and targeted growth of renewable energy generation. This proactive approach supports Britain's target of a 100% carbon-free electricity sector by 2035.
- To enable proactive grid investment, the Britain's energy regulator, Ofgem, has revised the regulation concerning cost-recovery and risk management for offshore grid projects, allowing them to build before offshore wind projects are ready to connect.

*The National Grid ESO will be replaced by the National Energy System Operator (NESO) in summer 2024

Great Britain transmission grid investment plan and BNEF scenario

£ billion (real 2021)



Source: BloombergNEF, Ofgem, National Grid ESO. Note: Based on Networks Options Assessment and Holistic Network Design reports from 2022. NZS refers to the Net Zero Scenario from BNEF's New Energy Outlook 2022.

- The connection of offshore wind requires significant strengthening of the onshore grid, with new transmission lines from the shores to large centers of power demand.
- The ESO recommends that grid investment double in this decade, compared with last decade. In 2022, the system operator proposed a total of £53 billion in investment by 2030. With inflation, this has risen to almost £60 billion. In April 2024, a further £58 billion of investment over 2031-2038 was recommended in the Beyond 2030 plan.

Reform connection and permitting processes

Reform connection and permitting processes

“Get on, get back or get out of the queue”

Climate solutions covered

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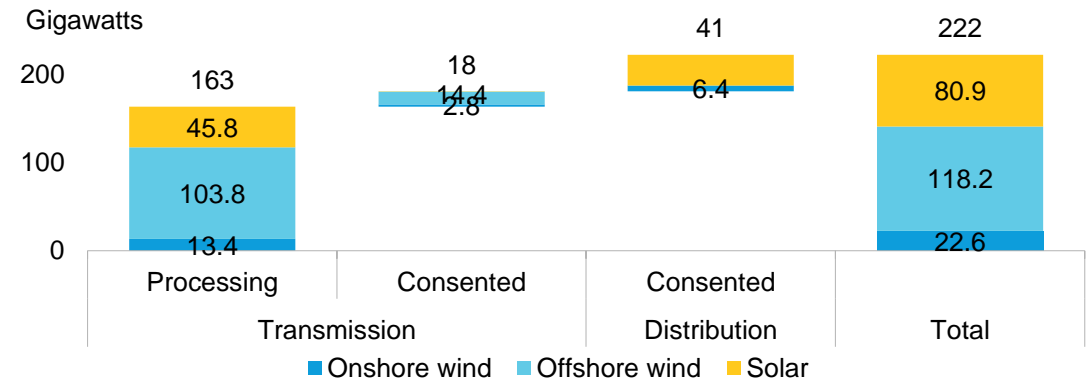
Accelerate deployment of mature climate solutions

Speed up project deployment timelines

Milestone requirements for connection queues

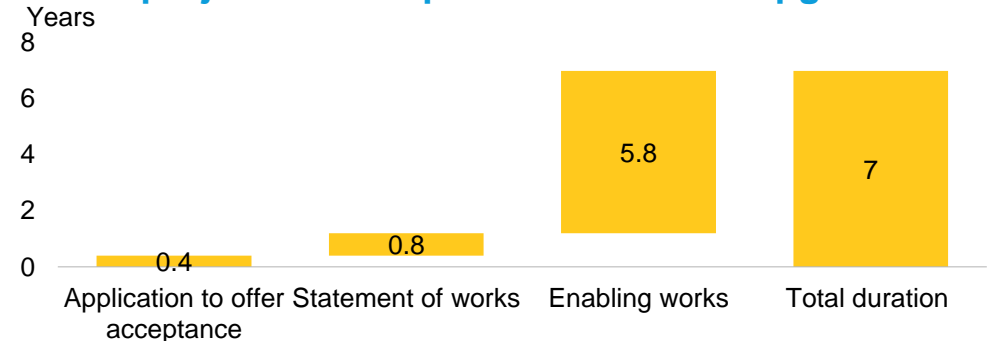
- The UK’s distribution and transmission networks are heavily congested, and significant improvement works, which are costly and take time, are needed to connect new projects. Gigawatts of renewable projects are stuck in the UK’s transmission and distribution network connection queues. The connection process for projects currently takes around seven years, with some projects going even further beyond this timeline.
- One of the solutions the UK has implemented for addressing its grid connection struggles is to determine which stalled projects in its long connection queue are not progressing. This would allow the allocated capacity for these projects to be transferred to others that are more likely to come online, reducing some of the need for upgrades for new projects and speeding up the connection process.
- To address distribution and transmission congestion challenges, distribution network operators (DNOs) now impose a number of milestone requirements through the connection agreement to ensure the projects in the queue are progressing. On the transmission level, reforms were introduced in June 2023, whereby projects that are not progressing either move backwards in the queue or leave, making space for other projects to connect.

Renewable capacity queue for the UK’s transmission and distribution grids



Source: BloombergNEF, Transmission Entry Capacity and Embedded Capacity Registers of Distribution Network Operators (DNOs).

Indicative distribution network connection times in the UK for projects that require transmission upgrades

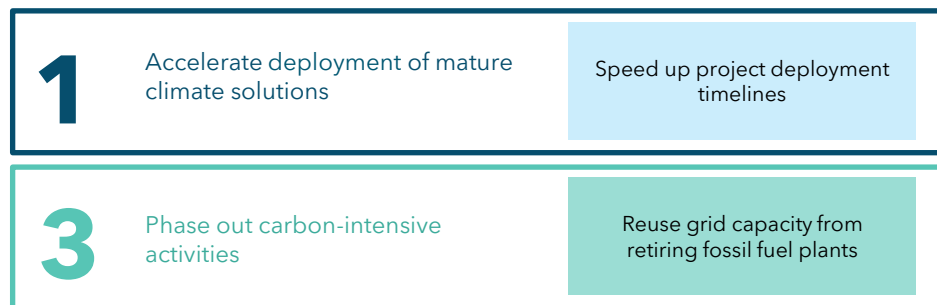


Source: BNEF, Roadnight Taylor, developer interviews. Note: Statement of works is a process to understand the impact of the new generation source on the transmission grid and assess whether any upgrades are needed. Typically all projects over 1 megawatt need to go through this process.

Reform connection and permitting processes

Spain innovates its processes to conquer the queue

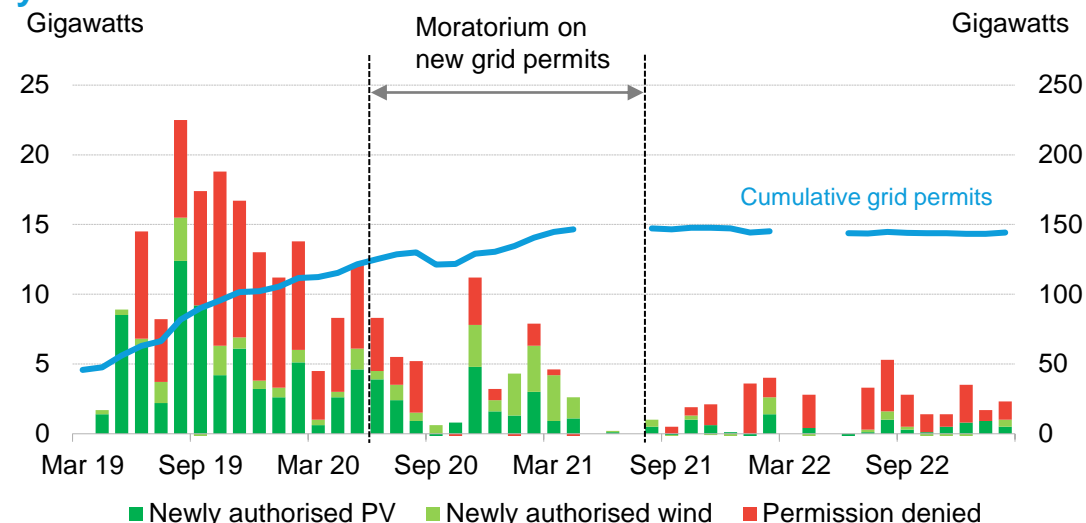
Climate solutions covered



Spain's Royal Decree-Law

- Spain legislated a requirement in 2022 for the government to hold auctions and tenders for grid connection capacities at transmission substations. The grid connection capacity from retiring coal power plants did not remain with the incumbent utilities by default, and was instead reallocated by auction. New developers can bid for these capacities and are evaluated based on a scoring matrix which considers generation technology, socio-economic impact, environmental impact and project maturity.
- In March 2021, Spain held a tender in the Andorra region, offering 1.2 gigawatts (GW) of network capacity for renewable energy projects, along with an additional 100MW for smaller projects connecting to the distribution grid. Developers participating in the tender had to provide a guarantee of €120,000 per megawatt (MW), with one-third of the guarantee returned after three years if the impact criteria were met, and the remaining two-thirds returned after six years. A subsequent tender in June 2022 offered 5.8GW of grid capacity, reducing the guarantee requirement to €40,000 per MW.
- These auctions were designed to streamline grid connection requests in highly active areas, but they also presented challenges for developers.

Spain's connection permit decisions for PV and wind by year of award



Source: Red Eléctrica de España (REE), BloombergNEF. Note: Data unavailable for May 2021, June 2021, March 2022 and September 2022. Cumulative series refer to secondary y-axis. No data available for May 2021, July 2021, March 2022 and May 2022. PV is photovoltaic solar.

- Traditional methods of grid capacity allocation, where developers submit requests and capacity is allocated based on availability, provide crucial signals to utilities about where grid upgrades are necessary. By shifting to an auction-based system, there is a risk that utilities may not receive accurate signals, leading to investments in suboptimal locations.
- Despite these concerns, if there is broad and uniform need for additional capacity, auctions can still play a useful role in prioritizing projects over periods of time and offering opportunities to new developers. Spain's experience with these auctions highlights both the potential and the limitations of using market mechanisms to allocate grid capacity efficiently.

Reform connection and permitting processes

Germany fast-tracks wind permits as EU policies kick in

Climate solutions covered

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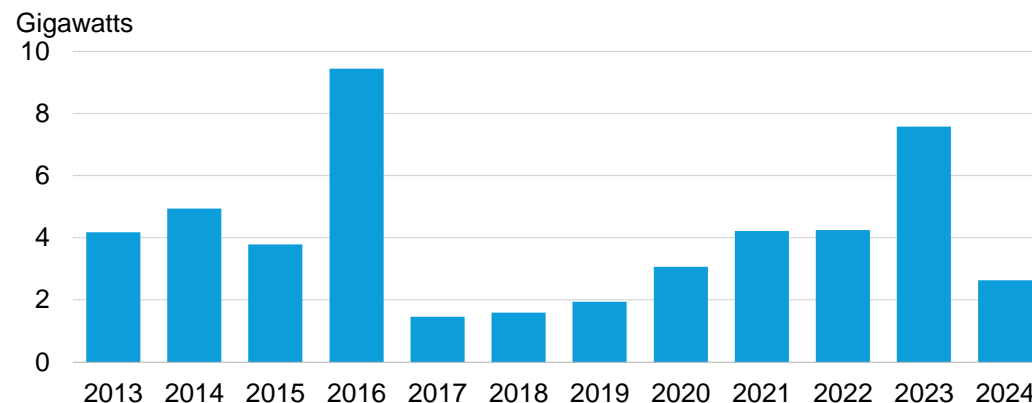
Accelerate deployment of mature climate solutions

Speed up project deployment timelines

Germany's wind permit overhaul

- Securing consent for building an onshore wind farm in Europe takes longer than the building process itself. Lawsuits, land-use conflicts and bureaucratic burdens have all slowed permitting rates, holding back Europe's onshore wind growth.
- In response, the EU has been laying down measures to shorten permitting procedures to two years, from five years or longer in some member states. In late 2022, the bloc adopted a temporary 18-month regulation to streamline the permitting process by limiting lawsuits against wind farms or fast-tracking certain permitting stages. Some of the provisions have been extended until mid-2025.
- Germany is one of the early adopters of some of the measures, which have helped the country cut its permitting pipeline from 11GW to 3GW from 2019 to 2023. Permitting activity has increased, with over 7.5GW of projects approved in 2023, up 80% from 2022. Almost 3GW of onshore wind projects were permitted in the first quarter of 2024.

German onshore wind capacity permitted each year



Source: BloombergNEF, FA Wind (German Onshore Wind Energy Agency). Note: Year 2024 shows capacity permitted in January through March.

- To limit the basis for lawsuits, Germany has designated renewable energy as 'of overriding public interest', meaning legal rulings can favor renewable energy projects over other matters such as species protection or landscape impacts.
- Securing an environmental permit is one of the most time-consuming stages of permitting. Germany temporarily exempted projects from this stage, providing they are located in pre-identified dedicated areas that have already been assessed or that pose low ecological risks.
- In 2022, Germany eased permitting rules around species protection for onshore wind repowers, meaning developers do not have to restart the laborious consenting process when replacing a project. The country has one of the oldest wind fleets in Europe, with over 26GW set to have reached their design life of 20 years by 2030. Developers commissioned 1.1GW of repowers in 2023, the highest since 2014. For more see *Europe's Wind Permit Overhaul Is Working* ([web](#) | [terminal](#)).

Reform connection and permitting processes

Illinois sets a standard for clean energy permitting

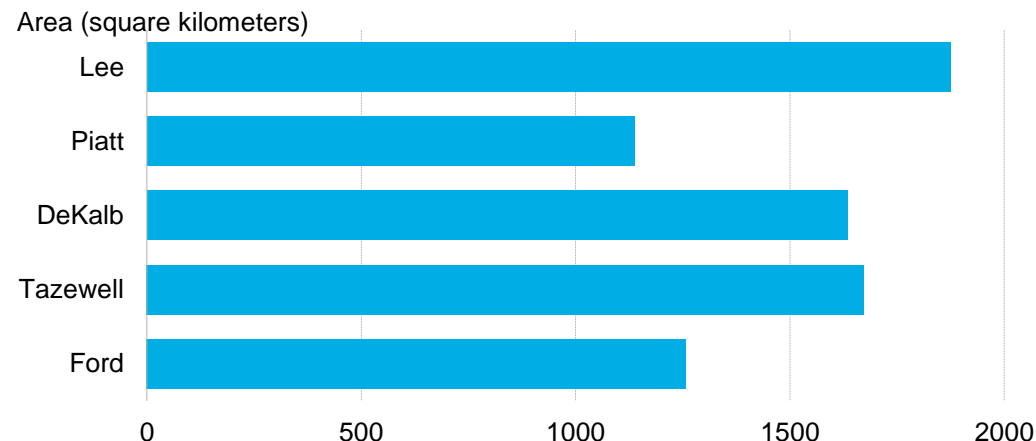
Climate solutions covered



Local project rules in Illinois

- In 2023, Illinois reacted to a wave of local laws and proposals restricting renewables development by codifying state-wide standards for wind and solar project permitting. The rules do not overrule local decisions about project applications submitted before the law’s enactment, but they do provide a more stable and unified business environment for developers in the future.
- [Public Act 102-1123](#) prohibited towns and counties from outright banning or imposing moratoriums on commercial wind and solar projects on agricultural or industrial land. Since 2018, at least five Illinois counties have paused or restricted new clean power projects.
- The new law also outlaws local standards that would have effectively precluded new renewables projects, such as exorbitant registration fees and restrictions targeting “supporting facilities” like energy storage equipment, substations and power lines.
- Local rules for project attributes like sound impacts, wind tower height and setback from other properties can be no more restrictive than state-level standards. Decision timelines for permits have also been standardized to no more than 90 days after an application has been submitted to the relevant county.

Illinois land area with renewables permitting restrictions pre-2023, by county



Source: BloombergNEF, [Columbia University Sablin Center for Climate Change Law](#), [US Census Bureau](#).

- Local rules like those banned by Public Act 102-1123 can severely limit new clean power generation: the US Natural Renewable Energy Laboratory (NREL) has [found](#) that local setback rules alone could reduce available wind capacity by up to 87%, and solar capacity by up to 38%.
- The law makes room for local community voice in key areas. In addition to mandating public hearings within 60 days of an application, it also allows counties to set their own standards for permitting solar projects on former coal mines, and for factors like solar panel height and plant cover.
- Still, tying the hands of local governments has been understandably controversial. A proposed referendum to overturn the law is gathering signatures, and the state legislature amended the rules at least twice in 2023. Developers, and the state government, must do more to earn local trust.

Ensure project bankability

Ensure project bankability

Brazil's grid auctions underpin a renewables boom

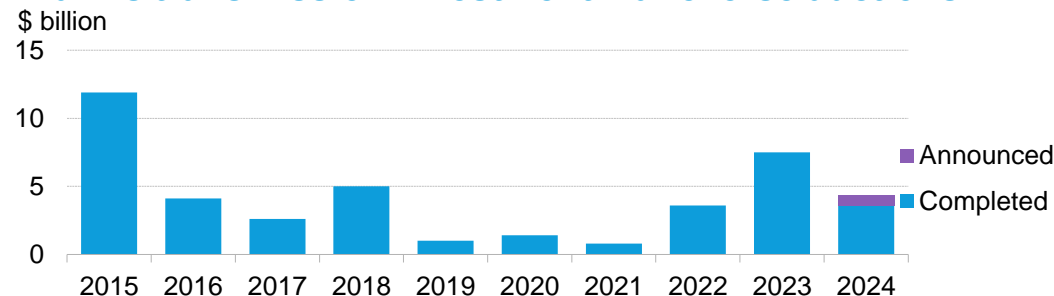
Climate solutions covered

1	Accelerate deployment of mature climate solutions	Ensure project bankability by mitigating offtaker risk and ensuring diverse and certain revenue streams
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Brazil's transmission auctions

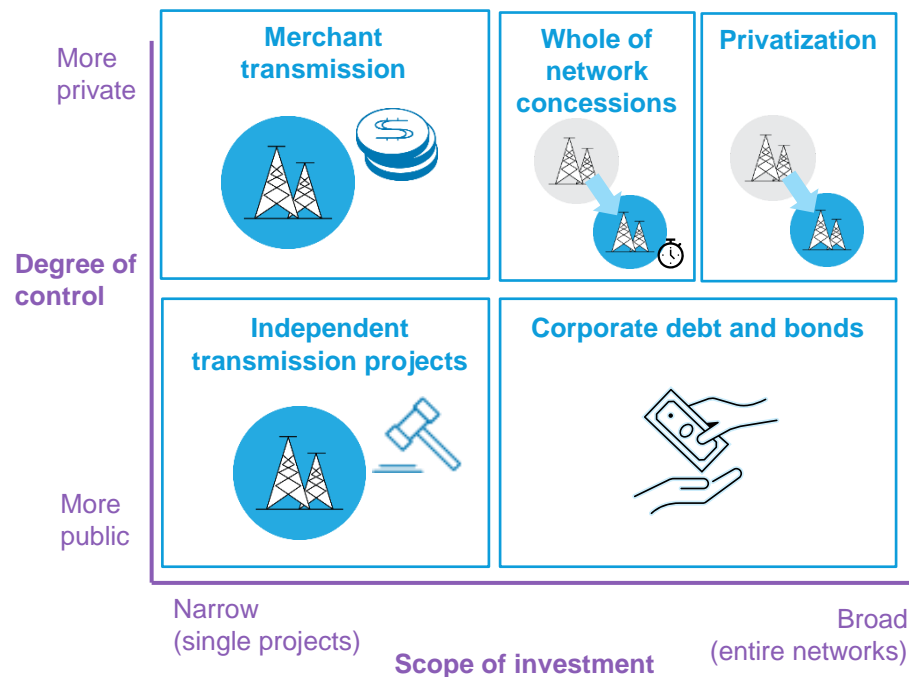
- Brazil has been running tenders for independent transmission projects for decades. In these reverse auctions, companies bid to build transmission projects in the country in exchange for annual revenue payments. This business model is known as the independent transmission project model and is gaining attention in others markets, such as South Africa.
- The most recent auction, held on March 28, attracted 18.2 billion reais (\$3.6 billion) of planned investment. It offered 15 lots totalling some 6,464 kilometers of transmission lines, which together are capable of delivering a power of 9,200 megavolt-amperes.
- The process was dominated by domestic players. Eletrobras and Fund Warehouse–owned BTG Pactual each invested over \$1 billion, while EDP and Energisa bid \$0.6 billion and \$0.2 billion, respectively. Together, these four companies were responsible for 89% of the total investment.
- Brazil's transmission auctions have driven \$43 billion into the wires that carry electrons over the last 10 years. This has helped reduce bottlenecks and enable wind and solar generation to flow from where it is produced, largely in the northeast, to where it can be used in industrial areas in the southeast of the country. Another auction round is planned for September 2024.

Brazil's transmission investment via reverse auctions



Source: Agência Nacional de Energia Elétrica (ANEEL), BloombergNEF.

Business models for private investment in power grids



Source: BloombergNEF, Grid Works.

Ensure project bankability

Proactive policies saved some US offshore wind projects

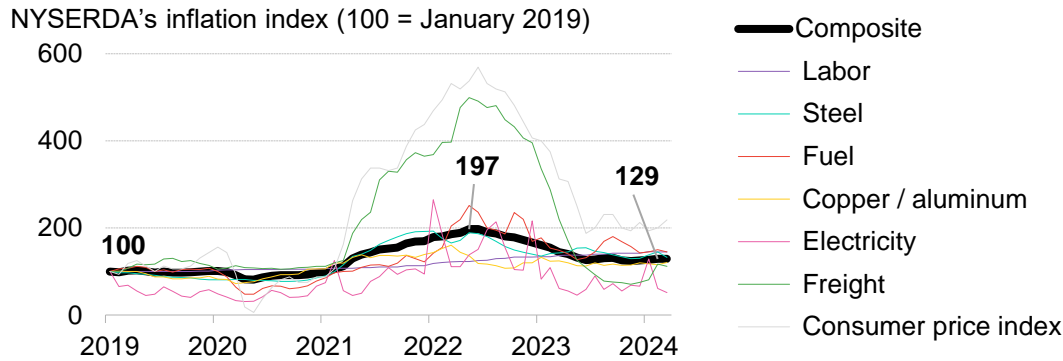
Climate solutions covered

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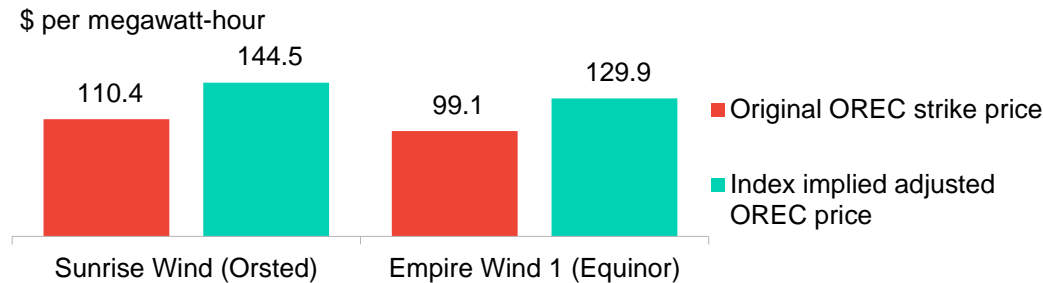
Accelerate deployment of mature climate solutions

Ensure project bankability by mitigating offtaker risk and ensuring diverse and certain revenue streams

Monthly index based on NYSERDA's revised inflation adjustment formula



Theoretical tariff impact due to contract indexation



Source: BloombergNEF, New York State Energy Research and Development Authority (NYSERDA), Bloomberg Terminal, US Bureau of Labor Statistics, New York Independent System Operator, US Energy Information Administration. For shipping sub-index, we used Xeneta's Shipping Index between North Europe and US East Coast, which is comparable to Freightos' index that NYSERDA suggests.

New York's transparent indexing

- US offshore wind developers canceled 8.9GW, or about 35% of all signed offtake contracts, in the last 12 months, due to high costs , surging interest rates and supply chain delays. Prior US offtake deals did not have adequate indexation measures, which could have partially protected against these effects and de-risked projects.
- Developers highlighted these challenges while trying to renegotiate signed deals with the states, and asked for inflation adjustments to be included in future bids. New York introduced a one-time price adjustment in its third offshore wind auction for the period between a project's bid submission and receiving its final federal permit. The round 3 index included labor, material (steel, copper and aluminum) and fuel, but the new index proposed for round 5 also includes electricity, freight and general inflation (consumer price index) benchmarks. The adjustment in round 3 helped de-risk projects, leading to the state getting bids from six projects totaling ~8.5GW during a period of high uncertainty.
- BNEF estimates that the developers of two New York projects that sought renegotiations – Sunrise Wind and Empire Wind – would have received prices 30% higher than their original deal had the index been applied to their contracts. The two developers managed to cancel their original offtake deals, however, and won new contracts in the round 4 auction that featured inflation adjustment provisions.
- Transparent indexes like those adopted in New York distribute risk more evenly between project developers and governments. When widely implemented, such policy measures may prevent a repeat of the contracting nightmare suffered by several early-moving US states and offshore wind projects.

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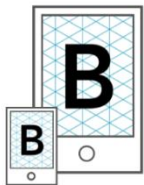
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