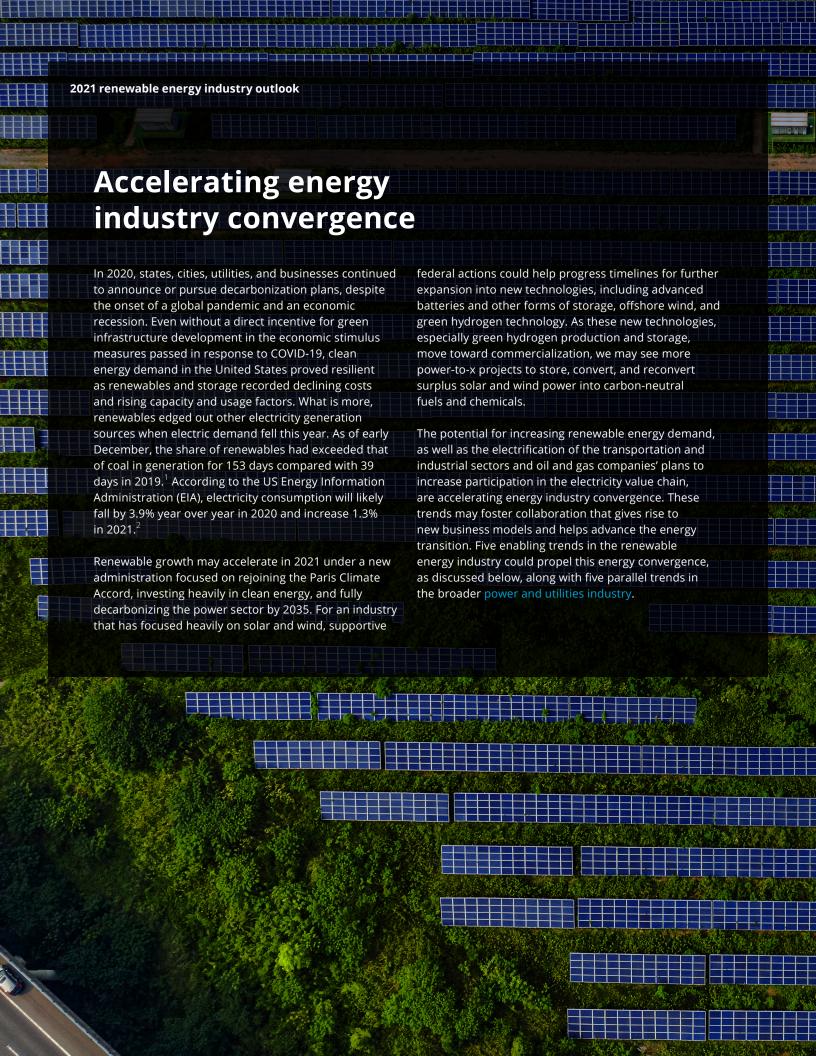
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2021 renewable energy industry outlook





Consolidate: Competitive landscape

Deal activity rises across the value chain as stakeholders consolidate positions

Renewable energy dealmaking will likely rise in 2021 as companies, utilities, and governments prepare to meet ambitious climate targets. Different types of industry players will likely consolidate their positions across the value chain. A growing number of special-purpose acquisition companies (SPACs) entering the clean energy space may also boost investment in renewables companies.

Rising state renewable portfolio standards, increasing levels of corporate and residential demand, and improving economic competitiveness continue to be the key drivers for utilities' and other energy companies' interest in renewables. Federal support, mandates, and stimulus could provide additional powerful drivers in 2021. The renewables segment continues to capture a significant share of deal activity in the power and utilities industry: 144 of the 174 merger and acquisition deals announced through early December involved renewable energy assets or companies.³

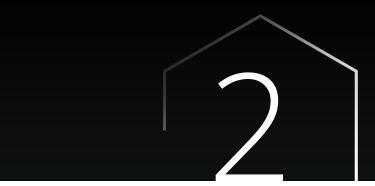
Additionally, increasing challenges to gas pipeline projects may serve as an incentive for electric companies to bypass plans to invest in natural gas as a bridge fuel and double down on potentially less risky investments in renewables. In the most significant harbinger of this trend in 2020, Dominion Energy and Duke Energy canceled their joint Atlantic Coast Pipeline project due to high costs and legal challenges, and Dominion sold its gas transmission and storage business to focus on its state-regulated, sustainability-focused utilities.^{4,5}

For investors, renewable energy assets may enhance their portfolios by generating steady cash flows and providing asset diversification. Developers and installers may see opportunities for consolidation among distributed energy resource (DER) providers to lower costs, restructure projects to better handle delays, and gain efficiencies from complementary businesses. One such major consolidation deal, announced in July, was Sunrun's acquisition of Vivint solar, which will help consolidate the residential solar market, provide operational and financing cost benefits, and yield complementary business efficiencies. 6 Industry stakeholders may seize



on additional opportunities to capitalize on DER growth. For example, Generac Power Systems, a provider of backup generators, acquired Enbala Power Networks, gaining access to its behind-the-meter, solar-plus-battery fleet and its virtual power plant and DER management platform to work as a power grid resource.7

The competitive landscape is also consolidating as FERC enables competition through regulation.



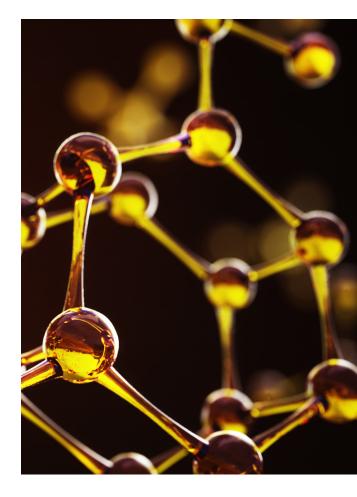
Create: New economies

Emerging hydrogen economy expands clean energy infrastructure

As decarbonization proceeds, many industry stakeholders are considering hydrogen production and storage projects, in addition to wind and solar, to find ways to cut carbon emissions. Power-to-gas involves producing green hydrogen through electrolysis using renewable-sourced electricity. This could reduce renewable energy curtailment, support renewable energy integration, provide long-duration seasonal electricity storage, and aid gas decarbonization. As a part of their decarbonization strategy, many electric and gas utilities announced pilots to ramp up renewable hydrogen production to be used in power generation, providing momentum to green hydrogen projects in the United States.⁸ In July, NextEra piloted a \$65 million project to produce hydrogen from solar energy to replace a portion of the natural gas needed to fuel a power plant slated to come online by 2023.9

In 2021, as renewable penetration on the grid increases, green hydrogen development is expected to follow because of its potential to act as seasonal storage of fuel available on demand to generate power for grid balancing. 10 San Diego Gas & Electric Co. is planning to place two long-duration green hydrogen storage projects into service by 2022, the first such storage projects in the United States. 11 Hydrogen, like natural gas, lies at the intersection of electric and gas networks. Blending hydrogen with natural gas can support utilities' decarbonization of gas distribution systems. National Grid, ConEdison, and Orange & Rockland Utilities have started researching the potential for hydrogen blending in their natural gas systems. 12 This would support other potential major opportunities for utilities to provide green hydrogen as a fuel for the transportation sector and as a feedstock for the industrial sector. In 2021, a new administration may help accelerate the timeline for green hydrogen to reach cost-competitiveness through its plans to invest in electrolyzer technologies.

DER aggregation platforms can further help integrate renewables by integrating both stationary and vehicular battery storage.





Reinvent: Battery business models

New battery business models emerge at both utility and residential scale

Energy storage is becoming one of the fastest-growing asset classes in the energy industry. Falling costs and maturing technology are making use cases for storage more economical, which could enable storage to provide multiple functions, from ancillary grid services to on-demand power. As noted in our 2020 renewable energy outlook, 13 utilities and their customers are expected to increasingly turn to microgrids, often including solar and storage, to build resilience, especially in the wake of recent extreme weather events and the pandemic.

The cost synergies and operational efficiencies of pairing storage with solar offer significant value, boosted by the opportunity to reduce the capital costs of storage with the solar investment tax credit (ITC). Nearly 32% of the storage projects slated to come online in 2021 are solar-plus-storage. 14 The trend toward colocating supersized batteries is increasing as US solar-plus-storage prices fall. The Gemini Solar project in Nevada is part of a trend of mega-solar projects coming online, with 380MW of storage attached. 15 Further, as new wind technologies continue to provide new repowering opportunities, adding batteries to wind projects may become more attractive to many developers. 16

Utilities are increasingly looking to energy storage to meet capacity shortfalls and have included it as a capacity resource in their integrated resource plans (IRPs) and issued requests for proposals for it. This could be bolstered by storage mandates in multiple states, including New York, New Jersey, and Arizona, which will likely ramp up storage procurement.

Renewable deployments continue to grow despite the challenges of installing battery storage systems amid shelter-in-place orders, customer concerns about social distancing, and permitting and inspection challenges from COVID-19. Moreover, resilience is emerging as a key driver going forward, especially in the wake of public-safety power shutoff events in California, even as some customers and developers continue to look at opportunities for storage to generate revenue via utility demand response programs and grid and wholesale market services. EV storage can further complement the role of utility and residential stationary battery storage.





Scale up: New entrants and frontiers

Wind is going offshore

The wind industry's frontiers are expected to increasingly move offshore in 2021. After entering 2020 on a wave of supportive state and federal policy initiatives, the US offshore wind industry experienced a few hiccups with the delay of the first major utility-scale offshore wind project. 17

However, the industry demonstrated resilience as construction of the first turbines ever installed in US federal waters was completed safely and on schedule despite the pandemic: in June, Dominion Energy completed installation of the two-turbine, 12 MW Coastal Virginia Offshore Wind (CVOW) pilot project. 18 A new administration could help streamline the approval process that requires multiple local, state, and federal permits, paving a smoother pathway for the 15 active commercial wind energy leases currently in the pipeline. 19

As utilities focus on decarbonization and create net-zero targets, offshore wind holds great promise for many thanks to its high capacity factors and deployment potential. In its recent IRP, Duke's most aggressive case to reach its goal includes 2,650 MW of offshore wind by 2035. However, it would likely require federal policy changes to end a moratorium on offshore leasing in the Carolinas (a moratorium that also covers other East Coast states and the Gulf of Mexico) and increased investment in transmission capacity.²⁰

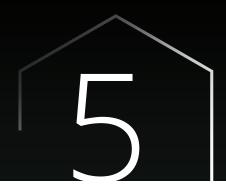
Despite the pandemic, states are proceeding with plans to develop supply chain infrastructure that would shape the industry's growth in 2021. New York state announced the country's largest-ever combined renewable energy solicitation, 60% of which consists of offshore wind—that is, approximately 2.5 GW. The state also committed \$400 million in public and private funding for port infrastructure to support the nascent industry and create local jobs. ²¹ Other states are considering similar infrastructural investments. In June, New Jersey announced plans for the first-in-the-nation offshore wind port, positioning the state as a hub for the US offshore wind industry. The facility would serve as a hub for staging, assembly, and manufacturing of offshore wind projects on the East Coast and could create more than 1,600 jobs in manufacturing, operations, and construction.²² Most recently, Maryland, Virginia, and North Carolina announced a collaboration to facilitate offshore wind manufacturing and infrastructure development across the three states.

In 2021, the industry is expected to continue to boost efficiency with larger turbines, taller towers, and longer cables. Wind turbine manufacturers are using higher-capacity turbines to boost efficiencies. For example, Dominion Energy is using the world's largest turbine from Siemens Gamesa for its CVOW project, and Siemens is considering the United States as the site of its first factory



to produce its new 14 MW offshore turbine. 23 Floating offshore wind is also becoming increasingly competitive, which would unlock an even greater frontier for offshore wind power. The technology's LCOE has halved since the first pilot project, and it is on the cusp of consideration for nonrecourse financing, which would further lower costs.²⁴ The University of Maine's floating wind project achieved a milestone this year when Japan's Mitsubishi Corp. and German utility RWE bought the \$100 million demonstration project, which could be built as soon as 2023.²⁵

Oil and gas companies are poised to make significant investments in both fixed and floating offshore wind thanks to their vast experience in offshore environments.²⁶ Some large oil and gas companies are shifting their focus toward a new, consistent revenue source in an emerging low-carbon business. In September, oil and gas giant BP took a 50% stake in Equinor's Empire Wind and Beacon Wind projects, which are located off the coasts of New York state and Massachusetts respectively.²⁷



Fortify: Disaster readiness

Supply chain strategies: Onshoring to address COVID-19 disruptions and digitalizing supply chains

Review of supply chains is likely to become a priority for stakeholders as the renewable energy industry strives to thrive in the postpandemic era. In fact, shifts in sourcing have already been underway since 2018, as many installers have started diversifying their supply chains outside of China to seek tariff-friendly sources, and at least a dozen companies launched or announced new manufacturing plants in the United States. ²⁸ The recent increase in tariffs from 15% to 18% in 2021 and the elimination of the exemption for bifacial solar panels could drive additional onshoring.

Though the US Treasury's extension of the safe harbor for the wind production tax credit (PTC) and solar ITC provided some relief to projects struggling with construction delays due to the pandemic, it is yet to be seen if Congress will extend the PTC, which is currently scheduled to expire at the end of 2020.²⁹ For those projects which have not been safe-harbored, the solar ITC steps down to 22% in 2021 and 10% for utility and commercial installations in 2022, when it expires for residential installations.³⁰

In 2021, a shift in US policy and regulation is expected, from stronger measures to safeguard technology and data from cyberattacks to a national imperative to reduce US dependence on other countries for strategic materials and products. Two subtrends are likely to accelerate next year. First is the diversification of supply to build resilience, including onshoring. The new administration could boost the domestic manufacturing sector through a proposed 10% "Made in America" tax credit to incentivize onshoring. In addition, a new administration could launch comprehensive supply chain reviews, use the Defense Production Act to build capacity, and work with allies to shore up critical international supply chains.

Second is the increasing use of digital technologies at both ends of developers' supply chains. Applying robotics, automation, and analytics solutions such as asset tracking and predictive maintenance can help track supply chain disruptions, understand "at-risk" supplies, and assist with warehousing decisions and contingencies. At the other end of the supply chain, many residential solar developers are increasing remote interactions using digital permitting and interconnection procedures and drones to



survey sites.³¹ SunPower has shifted to digital sales, with about three-quarters of consultations now using virtual videoconferencing, up from 10% before the pandemic.32



Renewable energy will likely experience significant growth in the coming year

As the timeline to commercialize green hydrogen and new storage technologies accelerates, more power-to-x projects may emerge at the intersection of the power sector and adjacent industries. The resulting increased participation of multiple cross-sectoral players may accelerate energy industry convergence and increase deal activity across the electricity value chain. Battery storage business models could proliferate at the front of the meter due to increasingly efficient hybrid projects, as well as behind the meter thanks to FERC's recent order

enabling distributed energy resources to participate in wholesale markets. In addition to state initiatives, federal support may help the offshore wind sector overcome the complexity of multiple permit levels that can cause potential delays. Finally, the renewables industry is expected to become increasingly resilient as it invests in safeguarding technology and data from cyberattacks and in mitigating the risks of supply chain disruption via onshoring and digitalization.

Let's talk



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