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2022 renewable energy industry outlook

New avenues are opening

In 2021, the renewable energy sector remained remarkably resilient, driven largely by strong core fundamentals combined with a supportive policy environment. Rapid technology improvements and decreasing costs of renewable energy resources, along with the increased competitiveness of battery storage, have made renewables one of the most competitive energy sources in many areas. Despite suffering from supply chain constraints, increased shipping costs, and rising prices for key commodities, capacity installations remained at an all-time high. Wind and solar capacity additions of 13.8 GW in the first eight months of 2021 were up 28% over the same period in 2020.[1] Cities, states, and utilities continued to take action to power the transition to renewable energy, with several setting ambitious clean energy goals, increasing renewable portfolio standards, and enacting energy storage procurement mandates. As of mid-November 2021, 48 out of 55 US large investor-owned utilities had committed to reduce carbon emissions, many by 2050 (see the *Deloitte 2022 power and utilities industry outlook*). Additionally, states enacted more than 70 renewable energy and climate related policies through mid-October 2021.[2]

Renewable energy growth is poised to accelerate in 2022, as concern for climate change and support for environmental, social, and governance (ESG) considerations grow and demand for cleaner energy sources from most market segments (residential, commercial, and industrial consumers) accelerates. At the same time, the Biden administration's vision to fully decarbonize the US economy is helping spur activity in the renewable sector that will likely drive further growth. Provisions in the recently approved Infrastructure Investment and Jobs Act (IIJA), could promote renewable energy growth, as could the Build Back Better (BBB) Reconciliation Act, still under consideration in Congress. The following five trends are expected to move to the forefront in 2022, opening new avenues in the renewable energy growth story.

About the Deloitte survey

To understand the outlook and perspectives of organizations across the energy, resources, and industrials industries, Deloitte fielded a survey of more than 500 US executives and other senior leaders in September 2021. The survey captured insights from respondents in five specific industry groups: chemicals and specialty materials, engineering and construction, industrial products, oil and gas, and power and utilities.

New technologies

Growing interest in next-generation clean energy technologies

Activity is heating up in next-generation technologies, and renewable energy industry stakeholders are considering investments in them, which can eventually help to more confidently integrate variable renewables such as wind and solar into the electric grid. For an industry that has largely focused on solar and wind, private investment and pilot projects combined with federal research support could help expedite commercialization of emerging technologies such as green hydrogen, advanced batteries, and other forms of long-duration storage.[3] These technologies can provide zero-carbon electricity and longer-term seasonal electricity storage, ease grid congestion, stem renewable curtailment, boost reliability, and facilitate integration of solar and wind into the grid while supporting goals for 100% clean energy.

A major driving force behind the rise of green hydrogen has been the decreasing costs of renewable energy—a critical input in the production process. In 2022, as renewable energy penetration on the grid increases, green hydrogen development is also expected to grow, owing to its potential to act as long-duration and seasonal storage of fuel available on demand to generate power. The recently approved IIJA allocates $9.5 billion for clean hydrogen projects and proposes regional clean hydrogen hubs to expand hydrogen infrastructure.[4] The BBB Reconciliation Act being considered in Congress includes a hydrogen tax credit,[5] and would likely encourage the technology's growth if passed. Launched recently, the US Department of Energy's (DOE) "Energy Earthshots" initiative aims to reduce the costs of green hydrogen and long-duration energy storage by 80% and 90%, respectively, by 2030.[6]

States, municipalities, and energy companies are also responding to this opportunity and ramping up renewable hydrogen production for multiple use cases. Los Angeles aims to be the first green hydrogen hub with a goal to drive down the fuel's cost premium over natural gas. In May, HyDeal North America—a commercialization platform by the Green Hydrogen Coalition to launch green hydrogen ecosystems—launched a new initiative, HyDeal LA, which aims to cut green hydrogen fuel costs to $1.50/kg by 2030 from the current $3 to $6/kg. As its first project, it will partner with the Los Angeles Department of Water and Power (LADWP) to convert Utah's coal-fired Intermountain Power Project into a combined-cycle gas turbine facility, which will burn natural gas and green hydrogen to provide power to LADWP's service territory.[7]

Interest is also high in a host of evolving mechanical and battery storage technologies offering long-duration energy storage options and supporting the grid. The DOE's Energy Security Grand Challenge includes Pacific Northwest National Laboratory's Grid Storage Launchpad—a facility for experimenting with long duration storage options, which can help strengthen grid resilience.[8] The industry is also exploring new long-duration energy storage solutions to help smoothly integrate renewables into the electricity grid. In August 2021 alone, private investments of about $650 million were made in a number of energy storage companies exploring new technologies.[9] One such company was Form Energy, which recently unveiled a breakthrough, long-duration energy storage iron-air battery that can provide over 100 hours of energy at a cost of $20/kWh—about one-tenth the cost of the more common lithium-ion batteries in use today. It received a $240 million financing round with investors, including steel company ArcelorMittal.[10]

New business models

Solar championing new configurations

After an 85% cost decline over the past decade,[11] solar photovoltaic (PV) systems are among the most cost-competitive energy resources in the market. As it flexes its competitive muscle, the solar industry will likely boost efforts to explore new configurations and business models. And 2022 could well see the industry growing solar-plus-storage buildouts, exploring floating solar PV modules, and expanding community solar projects to new markets.

Pairing storage with solar offers cost synergies, operational efficiencies, and the opportunity to reduce storage capital costs with the solar investment tax credit. We will likely see increasing demand for solar paired with energy storage for multiple use cases, including minimizing curtailment risk and enabling solar to look more like baseload power.[12] If all of the large-scale battery projects planned for 2021 to 2025 become operational, the share of US battery storage co-located with solar would increase from 24% to 50%. Similarly, the share of solar projects co-located with battery storage would increase from 3% to 14%.[13] This is well supported in a recent Deloitte survey (see "About the Deloitte survey"), where 62% of the power and utility executive respondents are either building or procuring grid-scale solar that includes storage. To develop better technologies, the DOE Grid Modernization Laboratory Consortium along with three national laboratories is setting up a demo project to identify synergies between the technologies in hybrid configurations,[14] which could help develop optimized power plant designs.

A second trend is the expansion of community solar projects to new markets in the United States. Twenty-two states, plus Washington, DC, have enabling policies for community solar.[15] With more than half of US households unable to purchase rooftop solar due to lack of sufficient sun, credit access, homeownership, or other factors, these programs allow residential customers to enjoy the benefits of shared solar power. Further, this model is uniquely positioned to aid in the pandemic recovery, as it provides new employment opportunities and helps achieve energy cost savings. New York State recently announced plans to build 40 community solar projects, part of New York Power Authority's larger goal to reach 75 MW of community solar projects by 2025.[16] These projects are expected to create more than 1,250 short- and long-term jobs.[17] Newer community solar markets such as Illinois, Maine, and New Jersey are also adding capacity, expanding community projects' reach beyond historically active states such as New York and Massachusetts.[18]

Although a nascent technology, floating solar photovoltaics (FSPV) are gaining attention in the United States, and several developers are exploring these projects either separately or as hybrids with hydro, which could benefit from a shared substation and transmission. In Massachusetts, BlueWave Solar is planning to build floating solar panels on ponds and reservoirs, which could help address the shortage of land for solar projects, especially greenfield sites.[19] The state also offers a compensation rate add-on of $0.03/kWh for FSPV projects under its Solar Massachusetts Renewable Target (SMART) program.[20] Once successfully implemented, such projects could carve a new growth path for the solar energy industry.

3

Infrastructure development

Transmission infrastructure is becoming a key priority, especially for offshore wind

Transmission development, which is key for connecting new, often remotely located renewable energy capacity to electricity consuming centers, is expected to be an important part of the renewable energy industry's agenda in 2022. Policy and regulatory support, investments, and innovation will likely help unlock progress, which has often been stymied by siting and permitting delays. Transmission projects, especially interregional, have so far remained a major challenge for renewable growth as they face difficulty in gaining regulatory approval from every state they cross, as well as refusal from landowners, and opposition from environmental groups. About 844 GW of proposed capacity—90% of which is renewables or energy storage—is stuck in transmission interconnection queues.[21] This holds especially true for offshore wind, which is poised for significant growth and must be connected to coastal infrastructure. Both enhancing the capacity of existing lines and building new lines could be key in solving the transmission challenge. In fact, 76% of the power and utility respondents to a recent Deloitte survey are either planning or depending on new transmission projects to boost renewable energy access.

Regulatory and policy support to help streamline the permitting process for interstate transmission lines can help move renewables to demand centers. The Federal Energy Regulatory Commission (FERC) in June 2021 established a task force in partnership with the National Association of Regulatory Utility Commissioners (NARUC) to address transmission barriers. In July, the agency also began the rulemaking process to improve transmission planning, cost allocation, and interconnection processes for renewable energy projects.[22] Actions taken through this collaboration and rulemaking are expected to shape future transmission development. The recently approved IIJA's Transmission Facilitation Program authorizes the DOE to effectively act as an anchor tenant, by owning up to 50% of the planned capacity on certain transmission projects, thus expediting their development. Additionally, FERC will be granted the authority to accelerate permits in DOE-designated transmission corridors, in some cases overruling state regulators.[23] In the case of offshore wind, the administration is streamlining the environmental review process by improving interagency coordination.

Investments will also be crucial to support transmission capacity planning and expansion. In April 2021, the DOE announced $8.25 billion in loans for efforts to expand and improve the nation's transmission grid.[24] Additionally, states are playing their part by designing new approaches for expanding the transmission network. In April, PJM Interconnection, a regional transmission organization, launched the State Agreement Approach seeking potential solutions for development of offshore transmission infrastructure.[25] As part of the IIJA, the Biden administration will allocate about $27 billion for investment in grid strengthening and modernization, including transmission.[26]

Finally, different siting approaches and increasing existing line capacity are also being tested. A siting approach that involves building underground high-voltage direct-current transmission lines along existing transportation corridors linking the Midcontinent Independent System Operator Corporation (MISO) with PJM Interconnection's electricity markets is in progress.[27] Once completed, this approach can become a model for new interregional transmission projects. A growing number of utilities are also testing grid-enhancing technologies that can track power-line capacity in real time, costs about 5% of the total relative unit cost of building new transmission, and boosts the transfer capacity of existing power by up to 40%.[28]

4

Supply chain ecosystem

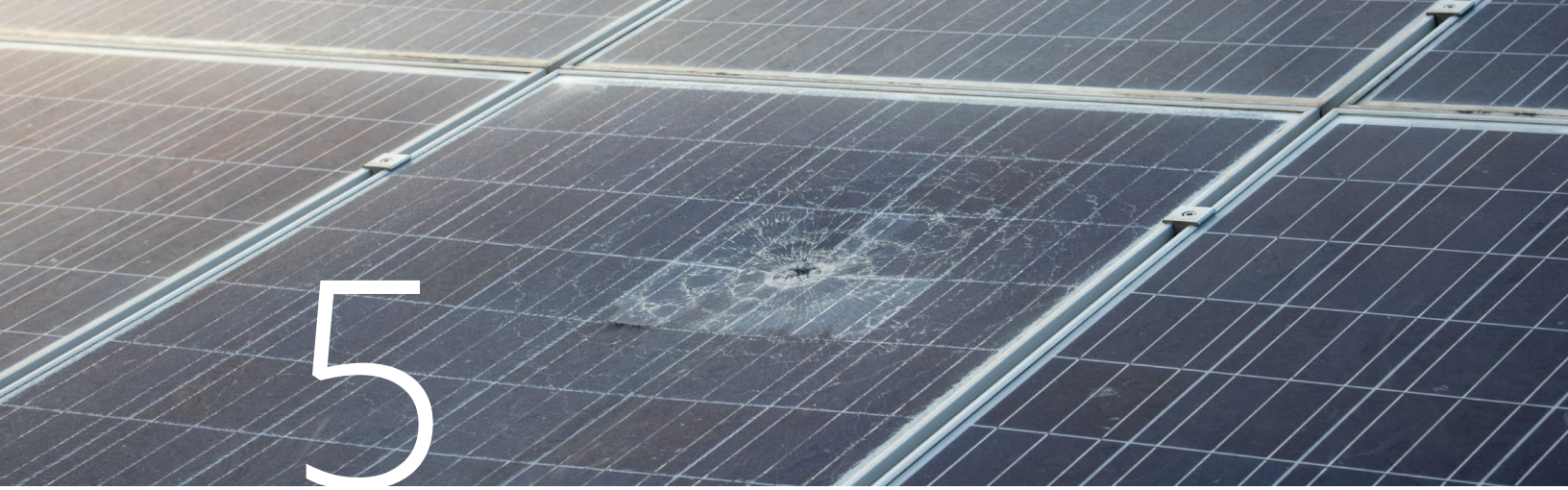
Supply chain strategies continue to evolve

The renewable energy industry is likely to continue to evolve supply chains, as profits have suffered recently amid logistics-related cost pressures and US-China trade tensions. In 2021, the solar industry remained under pressure and prices increased year over year for the first time in seven years due to supply shortages of components (semiconductors, modules), raw materials (polysilicon, commodities), and labor as well as rising shipping costs.[29] For example, in May, SolarEdge faced a 100% increase in ocean freight costs from the previous year, impacting its margins.[30] Moreover, the United States seeks to avoid overreliance on a limited number of supply sources for clean energy imports, as detailed further in our recent article on the renewable energy transition.[31] This, along with other trade actions including the import ban on a key solar panel material from a Chinese company,[32] as well as the risk of Section 201 and Section 301 tariff extensions, could further impact the renewable energy supply chain.[33]

In 2022, US renewable energy developers will likely continue to seek alternative suppliers, including domestic manufacturers, where available; reassess supply needs; and develop substitutes to help alleviate these pressures. In fact, efforts to support renewable energy supply chains address not just the clean energy components themselves, but also the raw materials. A recent executive order supports the development of an end-to-end domestic supply chain for advanced batteries and seeks to strengthen supply chains for multiple critical production materials.[34] Provisions discussed for inclusion in the BBB Reconciliation Act being considered in Congress contain additional domestic source requirements that could impact developer's supply chain strategies.[35] In 2022, many solar installers and developers will likely also ramp up their compliance monitoring activity, as they try to adhere to the Solar Energy Industries Association's Solar Supply Chain Traceability Protocol—a set of guidelines intended to trace the origin of solar materials, especially to prove their procurement is free of unethical labor practices.

In the wind sector, the United States has increased domestic turbine component production with more than 500 manufacturing facilities in 40 states.[36] But the industry still depends on offshore manufacturers for many components. To further boost domestic production, advanced energy manufacturing tax credits are being considered in the BBB legislation before the Congress.

Additionally, developers are exploring substitute materials and different manufacturing practices for renewable energy components to reduce dependence on foreign markets. Wind turbine manufacturers are exploring a shift to smaller and lighter permanent magnet generators that use fewer rare earth elements (REEs); gearless, REE-free designs for wind turbines; and replacing permanent magnets with high-temperature superconductors. The alternative pathway for solar PV (with silicon) could be scaling up perovskite solar-cell manufacturing in tandem with existing silicon cells to reduce silicon demand and boost efficiency. In June, 1366 Technologies and Hunt Perovskite Technologies merged to form CubicPV to build high-efficiency tandem solar modules with a target to deploy 2 GW by 2022.[37] In addition, manufacturers are developing low- or no-cobalt cathodes to offset the high costs of battery production and address ethical concerns around current cobalt mining.



5

Sustainable growth

Circular economy critical for renewable energy industry's sustainable growth

In 2022, end-of-life (EoL) management strategies for renewable energy industry products and materials are likely to capture attention, as early installations approach the end of their useful life. This could help reduce waste, increase resource security, and provide additional financial value as well as sustainability credentials. As solar, wind, and battery installations are expected to climb to new highs, waste generation in the renewable energy industry will likely soar as well and require urgent solutions. By 2030, decommissioned PV modules could total one million tons of waste,[38] and there could be 80 metric kilotons of lithium-ion batteries (LiBs) to recycle[39] in the United States. In the case of wind, about 8,000 aging wind blades are expected to be removed in 2022 alone,[40] and the accumulated blade waste through 2050 could total about 2.2 million tons.[41] Technology, infrastructure, and processes for EoL management are continuously being assessed.

Industry stakeholders, regulators, and policymakers have started exploring solutions for extending the life and increasing the performance, recovery, and reuse of products and materials. For instance, First Solar has developed in-house PV recycling capabilities in the United States,[42] and Good Sun and Recycle PV Solar LLC sell used crystalline silicon PV modules and balance of system equipment at discounted rates for secondary uses.[43] Some states, including New Jersey and North Carolina, as well as Washington, DC, enacted PV module recycling policies in 2020, while others, including Rhode Island, Hawaii, and California, have pending PV module recycling legislation.[44] Momentum is also building to find ways to recover material from wind blades. Last year, GE Renewable Energy announced a multiyear deal with Veolia North America for a blade recycling program that involves shredding blades at Veolia's Missouri facility and using the output as raw material for cement.[45] Other possible ways to recycle old blades can include repurposing them for pedestrian bridges and playgrounds, or creating products such as warehouse pallets, flooring material, or parking bollards.[46]

The case for building a circular economy for batteries involves deeper collaboration among industries and between businesses and policymakers, given battery demand in a range of applications. A secondary market for repurposed EV LiBs includes bulk energy storage system applications. However, regulations for reusing and recycling batteries are in early development, and incentives are required to attract private investors. Currently, there is no federal policy that directly addresses decommissioning, or mandates or incentivizes reuse/recovery of LiBs. At the state level, North Carolina and California have policies that address reuse and EoL management options for LiBs.[47] These policies signal a growing trend to prioritize sustainable material management practices.

Renewable energy industry ready to branch out

The year ahead promises new growth paths for the renewable energy industry, with some potential headwinds. The industry will likely explore new avenues against a backdrop of potentially supportive policies from an administration focused on combatting climate change.

Next-generation clean energy technologies will likely continue on a path toward commercialization, buoyed by support from investors and DOE programs. The ability of these technologies to address multiple use cases, as they ease renewable integration, has boosted their appeal. As the solar power industry aims to lead the energy resource competition, it will likely continue to explore new ways to create value, such as expanding the solar-plus-storage market. At the same time, state expansion of community solar policies, along with experiments in floating solar PV projects, could mark new frontiers for solar growth in the United States.

Building new interstate transmission lines and boosting existing line capacity utilization will be critical to bringing these renewable energy resources to energy consumers. FERC has begun to address these goals, supported by proposed rules to improve the transmission planning process. The IIJA provides FERC with greater transmission approval authority—similar to existing rules for natural gas pipelines. This, along with investments in technologies such as dynamic line ratings, can help develop transmission infrastructure.

Significant industry focus on supply chain security will likely continue, as stakeholders explore multiple options to tackle recent disruptions, especially for solar. Some developers will likely also resort to strategies such as renegotiating power purchase agreements, while some are taking a wait-and-see approach. At the other end of the supply chain is the industry's goal to enhance sustainability by recovering and recycling renewable energy waste. With PV module recycling legislation pending in some states, this trend will likely pick up in the coming years and create new opportunities for the renewable energy industry.

Going forward, we will also be watching progress on implementation of the IIJA, which includes investment in wind, solar, battery, and EV supply chains; green hydrogen; long duration energy storage; transmission; and other sectors key to renewable energy growth. In addition, we'll be monitoring progress of the BBB Reconciliation Act, which could greatly benefit the renewable energy industry with PTC and ITC extensions for wind and solar, and expansion of tax credits to other assets such as standalone energy storage, transmission, and green hydrogen. The industry will likely benefit as fresh capital becomes available, the transmission process is streamlined, and new technologies are commercialized.

Let's talk

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