Deloitte.

2022 power and utilities industry outlook

Tackling a tall order

In 2021, the power and utilities industry tackled tough challenges, made measurable progress, and received clean energy encouragement from a new administration. As the US economy began to emerge from its pandemic-induced recession, electricity sales rose 3.8% through August 2021 over the prior year.[1] At the same time, unprecedented and unpredictable extreme weather events challenged the grid's reliability and resiliency, and cyberattacks on critical infrastructure increasingly made headlines. Addressing such challenges, a group of the largest utilities broke annual capex records again, spending an estimated $142 billion to upgrade and modernize the grid and add renewables in 2021, up 9.2% from 2020.[2] In addition, spiking wholesale natural gas prices helped drive average retail electricity prices up 4.4% through August compared with full year 2020.[3]

Natural gas continued to dominate the generation mix, fueling 35% of electricity generated in the first half of 2021, with renewables second, at 23%.[4] The industry took a big step forward in its quest to provide cleaner electricity, adding 13.8 GW of wind and solar capacity in the first half of 2021, up about 28% from the same period in 2020.[5] And the Biden administration sought to accelerate decarbonization by rejoining the Paris Agreement, targeting 100% carbon-free electricity by 2035, and providing further support through executive orders, regulatory rulings, and a massive injection of infrastructure spending.[6]

In 2022, the tough challenges remain—boosting clean energy, ensuring reliability and resiliency, and maintaining security, while keeping costs down. To tackle this tall order, the electric power industry will likely continue to advance in its "3D" transformation: decarbonization, digitalization, and decentralization. We'll be watching for technology deployments to advance and markets to evolve. Industry spending will likely remain high, and renewable penetration could accelerate further. And capital injections from federal or state governments could further amplify industry progress.

Below, we explore five trends that will likely impact the industry in 2022, from enhancing decarbonization and resiliency strategies, to deploying 5G and cloud technologies, to harnessing flexible load and supporting building electrification. In the policy arena, while state mandates such as Renewable Portfolio Standards and federal renewable tax credits have underpinned the clean energy transition to date and will likely evolve further in 2022, we'll also be watching the potential impact of additional federal policy, investment, and regulatory support.

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.

Sustainability

Utilities expected to further flesh out decarbonization plans

As of mid-November 2021, 48 out of 55 US large investor-owned utilities had committed to reduce carbon emissions, many by 2050.[7] And nearly three out of four customer accounts were served by an entity with a 100% carbon reduction target—either an individual utility or a utility owned by a parent company with a 100% target.[8] In 2022, more utilities will likely jump on board and firm up commitments and strategies, driven by consumer support; opportunities for value creation;[9] environmental, social, and governance (ESG) goals;[10] evolving state clean energy mandates, and federal legislation. Even outside of state mandates, 24 utility parent companies have adopted voluntary carbon-reduction targets, with 20 aiming for 100%.[11] The administration's goal to reach 100% clean electricity by 2035 is another key driver, and we'll be watching federal policy, investment, and research support that could help make it happen.

Are utilities on track? The US electric power sector has reduced carbon emissions 40% since 2005. Progress has come largely from retiring coal-fired generation and replacing it with natural gas, wind, and solar; 56% of new generation capacity added in the five years from 2016–2020 was wind and solar, rising to 86% in the first eight months of 2021.[12] That progress may be why 86% of our power and utilities industry survey respondents said their company is on track to meet its decarbonization goals. But over 60% of US electricity is still generated by carbon-emitting sources,[13] so there's a long way to go. And, for many utilities, significant gaps between their decarbonization targets and their scheduled fossil fuel plant retirements, renewable additions, and flexibility requirements needed to achieve full decarbonization mean the math does not yet add up to reach their goals.[14]

What's holding them back? Utilities are trying to thread the decarbonization needle while maintaining reliability and affordability, a difficult task as they boost variable renewables. To do it, they're building a more flexible, modern grid—and that requires investment. In addition, some utilities may face stranded costs of retiring fossil fuel-based generation earlier than planned. And according to the Smart Electric Power Alliance, utilities will need to further transform their culture internally to manage these changes.[15] What's more, digital skills gaps are widening as the power sector digitizes, mirroring gaps in the broader economy and sparking fierce competition for talent.[16] Finally, as the power sector approaches 80% to 85% clean electricity in the coming years, progress could slow unless new technologies, such as long-duration energy storage and green hydrogen, have been commercialized. US Department of Energy programs are already investing in reducing the cost of these technologies (see the *Deloitte 2022 renewable energy industry outlook*). We'll be watching as the federal government moves forward with Infrastructure Investment and Jobs Act (IIJA) investment of about $23 billion into these technologies as well as advanced nuclear and carbon capture and storage.

In the next year, more utilities will likely announce decarbonization goals and interim targets, increase existing targets, and flesh out their decarbonization strategies with strategic plans for implementation as stakeholder interest grows. Overall utility ESG reporting may become more detailed and consistent as well. Federal policies will likely become more clear, as well as the impact they may have on the transition. And technological advances are a wild card worth watching.

2

Resiliency

Unprecedented weather events driving new resiliency strategies

The unprecedented frequency, intensity, and unpredictability of extreme climate and weather events in 2021 point toward an increasing focus on utility resiliency strategies in 2022. A recent report counted 3,165 extreme weather events globally during the 2010s and 3,536 events between 2000 and 2009, compared to just 711 in the 1970s.[17] In the first three quarters of 2021, the United States experienced 18 weather and climate disasters with losses exceeding $1 billion per event. The annual average for the last five years (2016–2020) was 16.2 disasters surpassing $1 billion, and the 1980–2020 annual average was 7.1, inflation-adjusted.[18] A US interagency report projected that due to climate change, future extreme events that can cause power outages will be more frequent and last longer.[19] The majority of our power and utilities industry survey respondents have already noticed an impact, with 51% saying extreme weather has affected the reliability of electricity delivery in their territory more than usual in the past year, while 38% saw the impact unchanged.

For electric utilities, resiliency planning is key because extreme events such as wildfires can impact both electricity supply and demand—a costly double whammy. In addition to wildfires, events may also include heat waves, deep freezes, sea-level rise, floods, and more intense storms. Experts have made it clear that global weather patterns are in uncharted territory and planners can no longer use the past to predict the future.[20] In 2022, utilities are expected to continue proactively preparing for that uncertain future.

One critical resiliency strategy is grid hardening, which ranges from replacing and reinforcing transmission and distribution infrastructure to burying wires underground. Non-wire alternatives are also increasingly common, including distributed energy resources (DER) such as rooftop solar, battery storage, and microgrids. Some utilities are mapping optimal DER locations to support grid resiliency, and many are looking to third-party DER ownership to reduce costs. In addition, utilities are expected to increasingly rely on smart meters and other control systems that can help reduce demand during an emergency, combined with flexible load programs.

One of the biggest challenges is the cost of resiliency investments, which can be a subject of debate between utilities, state and local governments, and regulators. Yet community resilience plans can also be a source of cooperation, and public-private partnerships can help fund resilience projects. For example, a $500 million project to bury some of the most vulnerable power distribution lines within the District of Columbia is funded by a public-private partnership, with $250 million coming from the city and $250 million through local utility Pepco's rates.[21] At the federal level, policies such as the Federal Energy Regulatory Commission's (FERC) Order 2222 aim to ultimately bring more DER onto the grid, which could contribute to longer-term resiliency. We'll learn more as grid operators file implementation plans by the end of April 2022. And the recently approved IIJA allocates nearly $27 billion for investment in electric grid infrastructure security, reliability, and resilience.[22]

In 2022, many utilities will likely revisit their disaster readiness and resiliency plans, sometimes under new state regulatory requirements. We'll also likely see additional utility data collection and long-term system modeling, as well as increased collaboration with state and local stakeholders to plan and fund resiliency projects.

Digital transformation

5G and cloud could expedite the clean energy transition

As the electric power sector continues modernizing the grid, companies are envisioning how 5G communications technologies and cloud can help them harness the power of the growing wave of connected devices and data. 5G refers to the fifth generation of mobile communications technology, which can support up to a hundred times more connected devices transmitting a thousand times more data at much faster speeds than current wireless technologies.[23] It enables utilities to move data from smart meters, sensors, and other devices to the cloud, where they can more effectively and efficiently analyze and act on it.

In the year ahead, many utilities will likely prepare to benefit from 5G technologies by planning for the services they can provide. According to a 2021 Deloitte survey of networking executives across industries globally, 58% of respondents are already deploying 5G or running pilots.[24] Twenty-six percent of our power and utilities industry survey respondents report that 5G communications technologies are incorporated into their company's strategy, while 36% plan to incorporate it. Another industry study found that 39% of utility respondents were prototyping 5G solutions, but only 13% had moved to commercial execution.[25] Some of the most compelling areas where 5G can add value for utilities include:

- **IoT** – 5G can help utilities decentralize energy infrastructure and manage the grid more nimbly as they connect devices and assets through the Internet of Things.
- **Smart grid modernization, automation, and control** – 5G's low-latency capabilities allow for the adoption of more smart devices and interconnectivity of the grid.
- **Utilities in the cloud** – 5G helps drive cloud adoption, which can improve efficiency through always-on availability and faster access to more data, assets, and systems.
- **Cybersecurity compliance considerations** – As utilities integrate a cloud infrastructure across their IT environment, 5G can assist in integrating operational workloads, such as Bulk Electric System Cyber System Information (BCSI).
- **Digital twins** – Digital twins allow utilities to visualize and control resources from an interactive one-to-one map. High-speed 5G data transmission can improve response times and overall system management.
- **Unmanned aircraft** – 5G can enhance unmanned aircraft system (UAS), or drone, programs by establishing a permanent and reliable connection and faster data transfer.

One challenge to implementing 5G technologies can be cost, as the system is being built out.[26] We'll likely see more utility planners stacking use cases to create more value from 5G technology. And some utilities will likely contribute to the 5G build-out by allowing transmitters to reside on utility poles and other infrastructure. Security is another consideration. Keeping in mind that 5G networks are software-based and wireless, system designers can build in robust cyber risk management from the start.

4

Smart grid operations

Utilities increasingly turning to flexible load programs

Yesterday's energy efficiency and demand response programs are beginning to transform into real-time flexible load offerings that could become a cornerstone of utility resource planning, cost reduction, decarbonization, and resiliency strategies. In 2022, more utilities will likely include flexible load in their resource planning as a supply-side resource and to help meet decarbonization targets. Reducing electricity demand through such programs is a low-cost and carbon-free alternative to other supply resources, and can help avoid the cost of building new generation or transmission. Flexible load programs can also provide the dispatchability needed to balance variable wind and solar output. In California, utilities and regulators see flexible load as a key tool for riding out events such as heat waves and wildfires without widespread outages.[27]

Flexible load is enabled by new technologies, market developments, and policies. Currently, about 70% of demand response capability comes from traditional commercial and industrial load reduction.[28] But growing residential customer adoption of smart automated home technologies such as smart meters, smart thermostats, battery storage, smart appliances and electric vehicles is paving the way for a new wave of flexible residential load programs. In 2022 and beyond, more smart devices will likely be connected to software and analytics automated to respond to time-based utility rates.

Legislators and regulators are supporting energy efficiency programs at unprecedented levels, and programs are growing rapidly.[29] But dynamic load flexibility programs are not growing as fast as they could.[30] Growth can be hampered by the need for improved distribution system control technologies, communications standards, and incentives for stakeholders. Some have suggested that the cost savings and grid benefits these programs provide could justify utility cost recovery for the grid modernization and customer incentives required.

Flexible load programs will likely continue to grow in the coming year, with increasing deployment of distributed energy resource management systems (DERMS) and advanced distribution management systems (ADMS) to manage resources. In fact, 89% of our power and utilities industry survey respondents said their company plans to make greater use of flexible load programs. We'll also be watching for utilities to file for additional time-of-use rates and to collaborate more closely with regional grid operators and DER aggregators to revise market rules and potentially unleash more growth. The value of load flexibility will likely rise as renewables penetration increases and the economy continues to electrify energy end uses.

Electrification

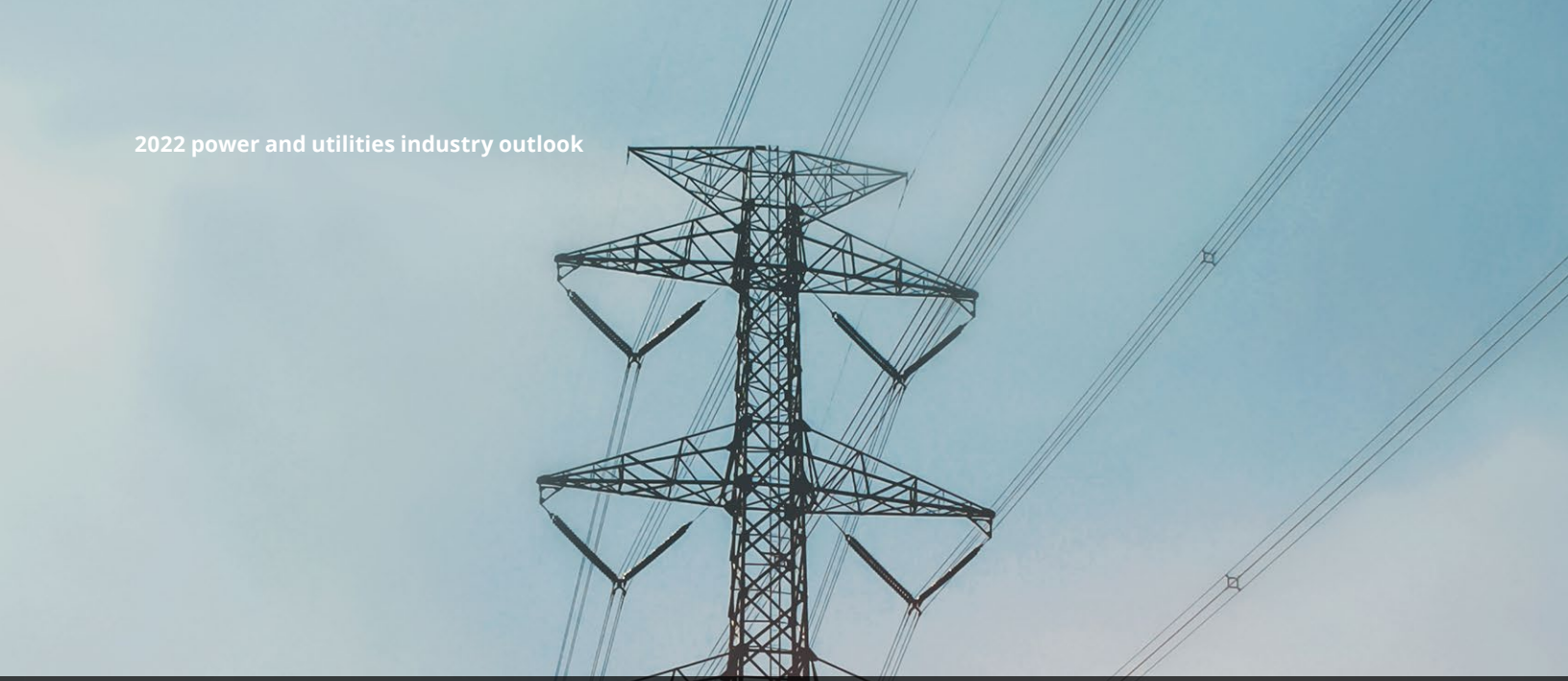
Building electrification is already impacting utility planning

While we know building electrification has enormous potential to boost electricity demand, many see the impact as far in the future. But building stock, building codes, and related policies vary widely across the country—and as with electric vehicles, the future is arriving sooner in some areas. In California and the Northeast, some utilities are already adjusting operations to support growing building electrification, and more will likely follow in 2022. More than three-quarters of our power and utilities survey respondents (76%) said their company is preparing for increased electricity demand as building electrification rises.

US buildings account for nearly 40% of the country's energy use and greenhouse gas emissions,[31] and nearly half of homes are heated primarily with natural gas.[32] So, many states and municipalities with net-zero carbon emissions goals see building electrification as critical. In August 2021, California became the first state to pass building standards that make electric heat pumps and appliances the default choice for new homes and small commercial buildings.[33] The state's 2022 building energy efficiency standards make electric heat pumps a more cost-effective choice than natural gas heaters and boilers in new homes or for major renovations starting in 2023.[34] The code also requires all new homes to be wired for electric appliances, including electric vehicles.[35]

Across the country, dozens of cities and counties, mostly in California and the Northeast, have passed ordinances that either encourage or mandate all-electric buildings in new construction.[36] This trend will likely continue in 2022. New York State has approved nearly half a billion dollars in funding for heat pumps through 2025.[37] New Jersey's Energy Master Plan states that electrifying 90% of the state's buildings by 2050 is required to meet its climate goals.[38] In some northeastern cities where much of the new housing is electric, winter peak demand is already higher than in previous years. And some utilities are already changing selected substations from summer peaking to winter peaking. Utilities in these areas are beginning to plan for a future with two annual electricity demand peaks: summer and winter. In 2022, more utilities will likely reconsider maintenance schedules for assets that may be utilized for more of the year and therefore potentially have shorter life cycles.

Looking into 2022 and beyond, many expect that the grid will be able to handle increased electricity demand, but additional investment may be needed in home weatherization and grid-responsive appliances to help manage energy use and shape load. Additional energy storage will likely be needed as well, both in front of and behind the meter. Behind-the-meter energy storage capacity in the United States is projected to grow about 74% year over year in 2022, to more than one gigawatt, while utility scale storage is projected to increase about 23% to 5.4 GW.[39] Utilities will likely continue to develop new rates and implement flexible load programs to incentivize behavior. In the long run, many utilities see electrification as a way to increase electricity sales while reducing customer bills since the cost of system upgrades would be spread across a broader base.



The clean energy transition powers on, with a potential policy boost

In 2022, the electric power industry will continue forging a path to a cleaner, more reliable and resilient grid. While today's challenges will likely persist, digital technologies; market developments; and state and federal policies, investment, and research into next-generation energy technologies can help pave the way. Corporate ESG goals and growing scrutiny from investors, customers, employees, regulators, and others may prompt electric power companies to further refine decarbonization plans. Many will likely set more specific decarbonization goals, including interim targets and implementation timelines. And more power companies could align executive compensation with decarbonization goals and milestones.

With more than half of our survey respondents confirming extreme weather's impact on reliability, many companies will likely reevaluate weather and climate risk and recalibrate their strategies to address it. New state regulatory policies could also emerge that incentivize and enable cost recovery for resiliency investments. In addition, recently approved federal infrastructure legislation is expected to provide grants or loans to support grid resiliency and security projects. On the technology front, utility pilots and use cases for 5G are expected to grow. Advanced communications and cloud capabilities can enable the analytics, artificial intelligence, and other applications that could expedite the clean energy transition.

Flexible load programs, and DER in general, will likely play a growing role in integrating variable renewable energy, helping meet peak load, and providing resilience from weather-related outages. We'll be following progress on FERC Order 2222 implementation in regional transmission organizations and its role in enabling aggregated DER access to wholesale electricity markets. It could boost grid flexibility and enable further decarbonization and resilience, while saving costs. Building electrification may be spreading unevenly across the country, but for utilities that see the additional electricity demand and revenue, it can help spread the costs of grid upgrades and keep customer rates lower in the longer term.

In the near term, we'll be watching the implementation and impact of the IIJA as well as the progress of the BBB Reconciliation Act in Congress. The IIJA could unlock tens of billions of dollars to help strengthen and decarbonize the grid, develop next-generation energy technologies, secure clean energy supply chains, accelerate electric vehicle adoption, and fund additional energy efficiency investment.[40] The Build Back Better Reconciliation Act, if passed, would likely extend and expand clean energy tax credits and other incentives that could accelerate the clean energy transition. Together these enabling technologies and policies would go far to help the electric power industry tackle a tall order.

Let’s talk

Jim Thomson
Vice Chair – US Power, Utilities & Renewables Leader
Deloitte LLP
jamthomson@deloitte.com
+1 813 230 3714

Kate Hardin
Executive Director
Deloitte Research Center for Energy & Industrials
Deloitte Services LP
khardin@deloitte.com
+1 617 437 3332

Key contributor

Suzanna Sanborn, senior manager, Deloitte Research Center for Energy & Industrials, Deloitte Services LP

Endnotes

1. US Energy Information Administration (EIA), "Electric Power Monthly, Sales of Electricity to Ultimate Customers," accessed October 27, 2021.
2. S&P Global Market Intelligence, "RRA Financial Focus, Utility capital expenditures update," April 8, 2021.
3. EIA, Electric Power Monthly, Average Price of Electricity to Ultimate Customers, accessed October 27, 2021.
4. EIA, Electric Power Monthly, Net Generation by Energy Source, accessed October 27, 2021.
5. Federal Energy Regulatory Commission, "Energy infrastructure update," August 2020, p. 4 and August 2021, p. 4.
6. The White House, "Updated Fact Sheet: Bipartisan Infrastructure Investment and Jobs Act," August 2, 2021.
7. Smart Electric Power Alliance, "Utility Carbon-Reduction Tracker™," accessed November 2021.
8. Ibid.
9. Stanley Porter and Kate Hardin, Navigating the energy transition from disruption to growth, Deloitte Insights, May 27, 2020, p. 4.
10. ZPryme and National Public Utilities Council, *Utility decarbonization has an air of uncertainty*, September 2021, p. 3. According to the study, 55% of investor-owned utility respondents said utility shareholders apply ESG criteria to their business, and 60% report their investors are asking for decarbonization investment action.
11. Smart Electric Power Alliance, "Utility Carbon-Reduction Tracker™."
12. Federal Energy Regulatory Commission, Office of Energy Projects, "Energy Infrastructure Update – New generation in-service (New build and expansion)," August 2021 and December 2020, 2019, 2018, 2017, and 2016.
13. EIA, Electric Power Monthly, Net Generation by Energy Source, accessed October 27, 2021.
14. Stanley Porter et al., *Utility decarbonization strategies: Renew, reshape, and refuel to zero*, Deloitte Insights, September 2020, p. 8.
15. Smart Electric Power Alliance, *2021 Utility transformation profile executive summary*, p. 1.
16. Jim Thomson et al., *The decarbonized power workforce: Digital and diverse*, Deloitte Insights, June 2021, pp. 10–11.
17. World Meteorological Organization, "Weather-related disasters increase over past 50 years, causing more damage but fewer deaths," August 31, 2021.
18. National Centers for Environmental Information, "Billion-dollar weather and climate disasters," noaa.gov, accessed November 10, 2021."
19. United States Global Change Research Program, "U.S. Climate Resilience Toolkit," June 14, 2021.
20. Ethan Howland, "MISO, ISO-NE execs stress need for new power supply planning framework at FERC reliability meeting," *Utility Dive,* October 21, 2021; Brad Plumer, "A glimpse of America's future: Climate change means trouble for power grids," *New York Times,* February 16, 2021.
21. District of Columbia Power Line Undergrounding (DC PLUG), "Resources," dcpluginfo.com, accessed October 2021; DC.gov Office of the City Administrator, "Mayor Bowser, Pepco break ground on $500 million to underground power lines in the District," press release, June 14, 2019.
22. 117th US Congress, H.R.3684 – Infrastructure Investment and Jobs Act, accessed October 2021.
23. U.S. Department of Energy, Office of Science, "How 5G may boost science research," August 18, 2021.
24. Jack Fritz et al., *Accelerating enterprise innovation and transformation with 5G and Wi-Fi 6: Deloitte's Study of Advanced Wireless Adoption,* Global edition, 2021, p. 7.
25. Gaurav Gopal, Semra Barutchu, and Christine Calhoun, "5G powered utility transformation," Infosys Limited, January 2020, p. 6.
26. State utility regulatory commissions are approaching utility requests to include 5G investments in rate base on a case-by-case basis, and results vary so far.
27. Ben Hertz-Shargel, "Energy reliability, resilience, extreme weather and other updates from the grid edge in Q3," Wood Mackenzie, August 3, 2021; California Public Utilities Commission (CPUC), "CPUC continues efforts to help ensure grid reliability this summer," press release, March 25, 2021.
28. Ryan Hledik et al., *The national potential for load flexibility: Value and market potential through 2030*, The Brattle Group, June 2019, p. 25.
29. American Council for an Energy-Efficient Economy (ACEEE), "Energy efficiency as a resource," accessed October 2021.
30. Herman K. Trabish, "Two barriers to utility and customer savings with flexible loads and how regulators can help," *Utility Dive*, January 6, 2021.
31. Environmental and Energy Study Institute, "Buildings and built infrastructure," accessed October 2021.
32. Chrishelle Lawrence and Chip Berry, "U.S. households' heating equipment choices are diverse and vary by climate region," *Today in Energy*, EIA, April 6, 2017.
33. Jeff St. John, "California takes bold steps to make electricity the fuel of choice for new buildings," *Canary Media*, August 11, 2021.
34. Ibid.
35. California Energy Commission, "Energy Commission adopts updated building standards to improve efficiency, reduce emissions from homes and businesses," press release, August 11, 2021.
36. Talor Gruenwald and Mina Lee, "2020: Watt a year for building electrification!," RMI contributed content in *GreenBiz*, December 30, 2020.
37. Justin Gerdes, "So, what exactly is building electrification?", *Greentech Media*, June 5, 2020.
38. Gruenwald and Lee, "2020: Watt a year for building electrification!"
39. Wood Mackenzie, *US energy storage monitor, Q3 2021*, accessed September 2021.
40. 117th US Congress, H.R.3684 – Infrastructure Investment and Jobs Act and H.R.5376 - Build Back Better Act, accessed October 2021.

Deloitte.

About this publication

This publication contains general information only and Deloitte is not, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional adviser. Deloitte shall not be responsible for any loss sustained by any person who relies on this publication.

About the Deloitte Research Center for Energy & Industrials

Deloitte's Research Center for Energy & Industrials combines rigorous research with industry-specific knowledge and practice-led experience to deliver compelling insights that can drive business impact. The Energy, Resources, and Industrials industry is the nexus for building, powering, and securing the smart, connected world of tomorrow. To excel, leaders need actionable insights on the latest technologies and trends shaping the future. Through curated research delivered through a variety of mediums, we uncover the opportunities that can help businesses move ahead of their peers.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States, and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.