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An electrifying opportunity: Investing in the global energy transition

As the world moves to a green power paradigm, a cross-disciplinary team of Columbia Threadneedle analysts has developed a framework for analyzing the investment implications and identifying winners and losers in the energy transition. Electrification of the economy is key to decarbonization, and in this paper we examine the central role of the U.S. electric utility sector.

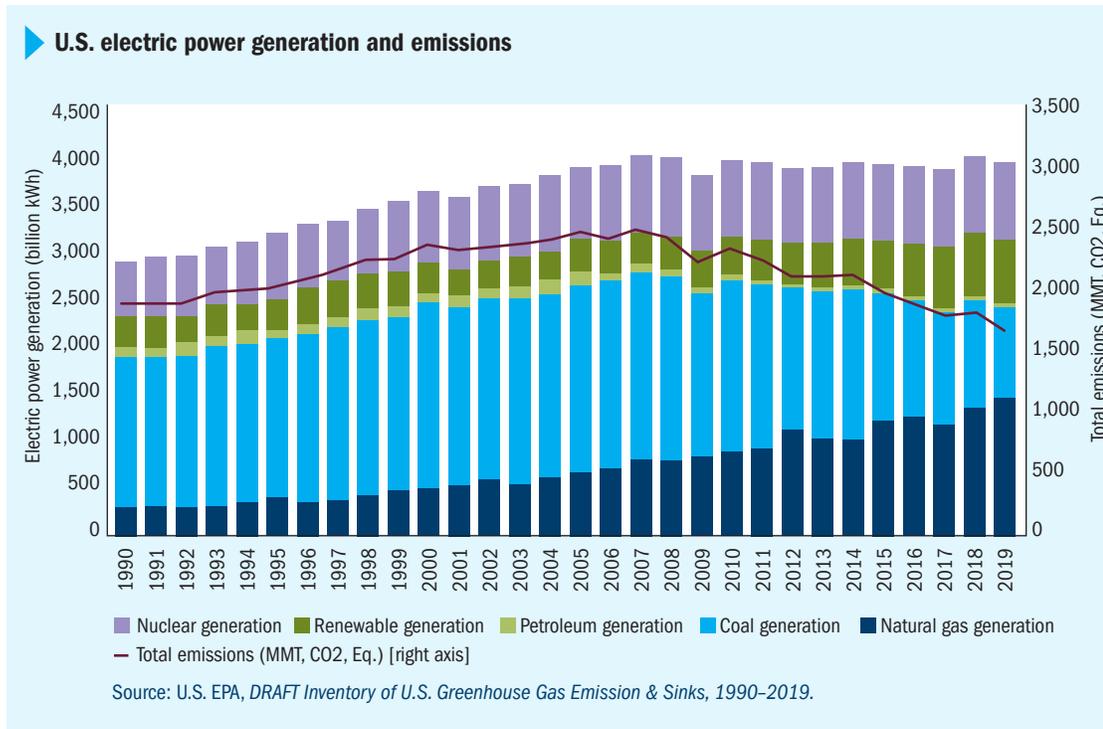
Key points:

- U.S. electric utilities provide a low-risk opportunity to invest in decarbonizing the economy.
- Greener power generation and electrification of buildings, transportation and industry are key to reaching net-zero emissions goals.
- Supportive regulation, declining costs of renewables and policy incentives support this trend.

Reducing reliance on carbon-based fuel and the level of domestic emissions are at the forefront of U.S. policy once again, and central to achieving these goals are U.S. electric utilities. Companies that can lead the way on decarbonization of power generation as well as electrification of the economy are an area of significant opportunity for investors.

U.S. electric utilities are leading emissions reduction

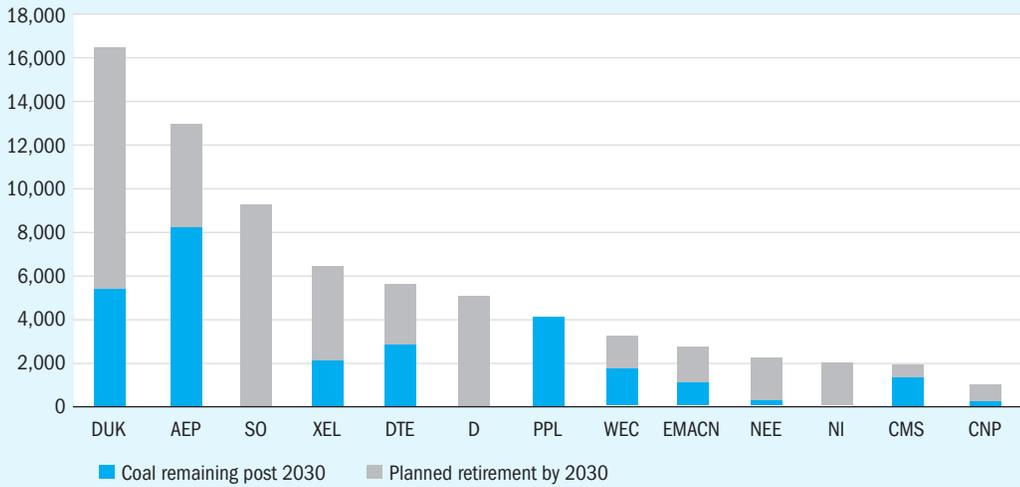
Monumental transformation is underway in the US electric utilities industry. Carbon emissions from power generation are already down by a third since 2010 and on a path to down 80% by 2050.¹ Comparing the largest emitting sectors of the U.S. economy, the electric power sector has produced the most significant drop in emissions. A shift away from coal-fired generation in favor of natural gas and renewables is the primary driver. This trend began in the mid-2000s with tighter emissions standards and the availability of low-priced natural gas. While not carbon-free, natural gas-fired generation provides dispatchable, low-emitting² power that complements renewables, making it an important power source for the next decade plus.



More recently, power generation changes are being driven by improved technology and declining costs of renewable energy. Given the intermittency of renewables, changing electricity usage patterns and more frequent extreme weather events, investment in both the power grid and long-duration utility-scale battery storage (likely a decade from commercial viability³) is necessary to ensure the evolution towards clean power continues. While a sizable investment opportunity, the challenge for the U.S. electric industry is to deploy capital efficiently while maintaining reliability, customer affordability and credit quality.

With investors, regulators, consumers and other stakeholders aligned in the push toward lower emissions, U.S. electric utility management teams are focused on outlining their paths to reduce emissions and mitigate climate risk. Companies have identified significant coal retirements over the next decade, which will drive improving ESG scores. The graph below is a current snapshot of planned coal retirements for the largest companies in the sector. We expect some management teams to increasingly pull forward coal plant retirements and replace the capacity with a combination of renewables, gas-fired generation and energy efficiency.

► **2020 coal capacity and planned retirements by 2030 (MW)**

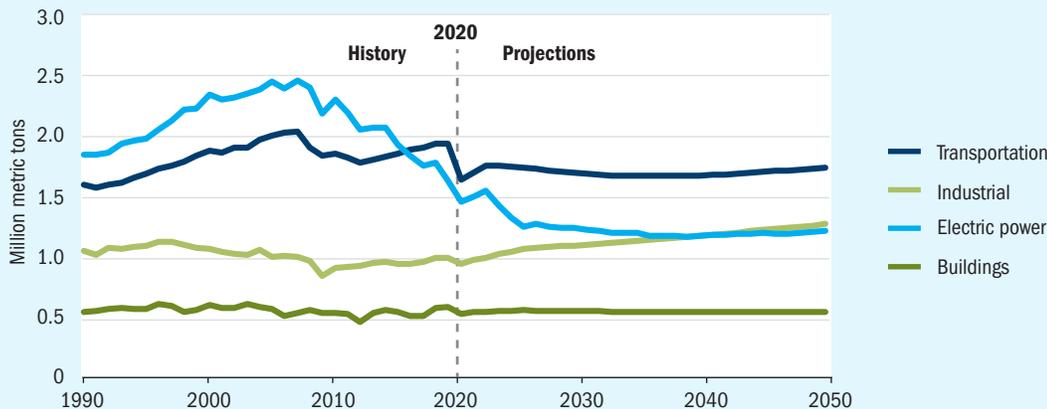


Source: Columbia Threadneedle Investments based on SNL Financial data. 2020 active nameplate capacity and planned coal retirements based on company reports and news releases.

Electrification of transportation, industrial and buildings reduces emissions

As major energy-consuming sectors of the economy move to reduce emissions, we expect electrification to be the primary means to achieve that goal. The timing of electrification will vary by end-use sector. Technological breakthroughs and/or more stringent standards and incentives could accelerate the transition. The transportation sector offers the greatest opportunity to reduce emissions through electrification, as can be seen in the graph below. Within industrials, declining emissions could require capital turnover and the adoption of new technology, and some industry participants may be hesitant to retire assets before the end of their useful lives. Residential and commercial buildings, which currently account for 70% of emissions produced by the electric sector,⁴ are expected to decarbonize by both improved efficiency of appliances and a shift toward electricity for space and water heating and cooling.

► **Energy-related carbon dioxide emissions by sector**



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2021* (AE02021) reference case.

Investing in decarbonization without sacrificing credit profiles

In the pursuit of a cleaner model, we are modeling a multi-decade period of elevated capital investment by U.S. electric utilities, which will require continued access to capital markets. As of March 31, 2021, electric utilities comprise 7% of the Bloomberg Barclays U.S. corporate investment-grade benchmark but contribute nearly two-thirds of the carbon emissions intensity⁵. For investors measuring their carbon footprint, decarbonization of U.S. electric utilities will drive an overall improvement in the emissions intensity of the benchmark and investor portfolios with exposure to the space.

With capital expenditures expected to remain elevated for the next several decades, U.S. electric utilities require timely capital recovery to maintain credit quality. The regulatory construct for U.S. utilities generally provides a fair return of and on invested capital in return for affordable, reliable service. Individual state regulators differ in the application of this construct as well as the relative importance of decarbonization, with some more supportive of investment than others. Similarly, differing access to resources and customer usage trends can affect affordability and the pace of investment. While most utilities have outlined plans to decarbonize, the pace at which companies can execute depends in large part on regulatory support. In the chart below, our proprietary state regulatory ranking shows the relative level of support in select regulatory jurisdictions.

Columbia Threadneedle Investments regulatory jurisdiction rankings

Tier 1 <i>Most supportive</i>	Tier 2	Tier 3	Tier 4 <i>Least supportive</i>
Alabama ^A Florida ^A Indiana ^A Michigan ^A Pennsylvania ^A Wisconsin ^A	Arkansas ^A California ^A Colorado ^A Georgia ^E Idaho ^A Iowa ^A Maryland ^A Minnesota ^A North Dakota ^E Oregon ^A Utah ^A Virginia ^A Wyoming ^A	Connecticut ^A Illinois ^A Kansas ^A Kentucky ^A Louisiana ^E Massachusetts ^A Mississippi ^E Missouri ^A Nevada ^A New Jersey ^A New Mexico ^E North Carolina ^A Ohio ^A Oklahoma ^E South Carolina ^A Tennessee ^A Texas ^A Washington ^A	Arizona ^E D.C. ^A Hawaii ^A Maine ^A Montana ^E New Hampshire ^A New York ^A Vermont ^A West Virginia ^A

■ Attributes of supportive ratemaking

- Forward-looking test year
- Consistent/predictable outcomes
- Rider/tracker recovery
- Performance links
- Straight fixed variable rate design
- Revenue decoupling from volume
- Incentive-based rates
- Formula ratemaking

■ Attributes of weak jurisdictions

- Litigated rate cases
- Historic test year
- Limited trackers/riders
- No statutory decision timeline
- Below average ROEs

A - Appointed commission E - Elected commission

Source: Columbia Threadneedle Investments as of 03/31/2021.

Winners and losers within U.S. electric utilities and along the power value chain

As the sector transitions to lower emitting generation, there will be winners and losers along the value chain. In the chart below we identify key winners and losers across the catalysts driving change.

Catalyst	Winners	Losers
Electric generation: coal-to-gas switching	Electric utilities Natural gas producers	Coal producers Coal-fired power generators
Electric generation: growth in renewables and renewables + storage	Renewable power developers Electric utilities Solar module manufacturers Inverter manufacturers	Oil producers Displaced fossil fuel generators
Transmission and distribution grid upgrade	Electric utilities Grid equipment suppliers Smart grid chip developers Inverter manufacturers	Displaced fossil fuel generators
Electrification of vehicles	Electric utilities Grid equipment suppliers Raw material producers: nickel, lithium, copper, cobalt Hydrogen developers	Oil producers Gasoline and diesel refiners Internal combustion engine vehicle manufacturers
Carbon capture and storage paired with gas-fired generation	CO2 pipeline and storage Carbon capture and storage developers Natural gas producers	
Electrification of industry	Renewable power developers Electric utilities Natural gas producers Hydrogen developers	Oil producers
Electrification of buildings	HVAC manufacturers Utilities Residential heat pump manufacturers Smart appliance manufacturers	

Source: Columbia Threadneedle Investments.

Outlook

We expect the energy transition from fossil fuels to create compelling investment opportunities for U.S. electric utilities. At a high level, the regulatory construct and improving emissions profile of the industry is expected to drive a prolonged period of elevated, relatively low-risk growth. We anticipate differentiation based on how successfully companies navigate the transition. Balancing the pace of transition with the impact on company balance sheets is important. The market has not yet formed a consensus on how to frame the role electric utilities play in decarbonizing the economy, which could lead to temporary dislocations given current emissions profiles.

From an ESG perspective, U.S. electric utilities are improving their direct emissions intensity as well as facilitating the decarbonization of the economy. Portfolio strategies that exclude U.S. electric utilities based on current emissions intensity could create opportunities for investors able to decipher the forward path of decarbonization. Achieving this understanding requires frequent engagement with management teams, regulators and other stakeholders. A mosaic approach enables investors to identify companies best positioned to meaningfully impact emissions without sacrificing credit quality.

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¹ Edison Electric Institute. *Electric Transmission: Enabling the Clean Energy Transformation*. 2021. https://www.eei.org/issuesandpolicy/transmission/Documents/Transmission_Enabling_Clean_Energy.pdf.

² The combustion of natural gas results in approximately 52 million metric tons of CO₂ for every quadrillion British thermal units (MMmtCO₂/quad Btu) versus 95 MMmtCO₂/quad Btu for coal. Source: U.S. EIA.

³ Utility scale battery storage is currently dominated by short-duration applications (i.e., 1–4 hours). A variety of long-duration energy storage technologies are in various stages of development and commercial viability. Source: Lazard's Levelized Cost of Storage Analysis – Version 6.0, 2020.

⁴ Source: U.S. EPA, *DRAFT Inventory of U.S. Greenhouse Gas Emissions & Sinks, 1990–2019, Table ES-3: CO₂ Emissions from Fossil Fuel Combustion by End-Use Sector (MMT CO₂ Eq.)*.

⁵ Emissions intensity in terms of metric tons of CO₂ per million sales in USD. The data is latest available from MSCI.

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