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Power Shift: Top Five Private Equity Investment Trends in US Energy

How Leading Private Equity Investors View Deal Opportunities Across the U.S. Energy Sector in 2025 and Beyond

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Private equity companies are investing in a wide range of opportunities in the U.S. energy sector — and, as far as individual deals are concerned, 2025 started with a bang.

On January 10, Constellation Energy Corporation agreed to buy natural gas and geothermal operator Calpine Corporation for $16.4 billion from Energy Capital Partners (ECP) and its co-investors CPP Investments and Access Industries. The deal is due to close in January 2026 and is one of the largest in the U.S. power industry in nearly two decades.

ECP's exit tells an interesting story. The company sold Calpine to capitalize on surging demand for the electricity produced by its power assets and realize a four-times return on its investment in a mixture of cash and Constellation stock. ECP initially invested $5.6 billion in Calpine in a $17 billion take-private deal that concluded in March 2018.

But recent activity is not all about private equity exits. For example, on March 18, Swiss private equity firm Partners Group agreed to buy a 1.9GW portfolio of 11 natural gas plants in California from Middle River Power in a deal that valued the portfolio and Middle River at $2.2 billion. The buyer said it wanted to meet growing power demand by optimizing existing generation.

Surging power demand will be a key driver for private equity activity in the energy sector in 2025, and the Trump administration's policies will ensure most sectors are included. The administration has committed to unleashing investment in affordable and reliable sources, from boosting oil and gas production to expanding baseload electricity generation.

But how is the private equity sector responding? For this report, we talked to a combination of private equity investors, market experts, and Troutman Pepper Locke partners to get their views on the major energy-related trends affecting deal activity. They shared insights into their investment strategies and their analysis of the market.

1. DATA CENTER GROWTH REQUIRES MANY SOURCES

The U.S. data center market is fueling massive growth in electricity demand as fast-growing data center operators are seeking clean baseload power 24/7.

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In January 2025, Boston Consulting Group reported that U.S. data centers in 2020 needed 20GW of power-generating assets to keep them operational, and this doubled to 40GW by the end of 2024. It forecast this will expand again to 81GW in 2028.

Private equity investors interviewed for this report highlighted the rapid expansion of data centers, underpinned by the exploding use of generative artificial intelligence (AI), as their greatest source of confidence to invest in U.S. energy companies and assets.

Matt Kestenbaum, managing director at EQT Partners, said the company does not bet on preferred technologies and sees the potential to meet this growing demand with a combination of renewable and conventional power sources.

He said: “We take a lot of confidence in persistent load growth being here in the U.S. market. We own a data center business as well, so I’m spending a lot of time at the intersection of data centers and power. Our view is that demand is real, it’s going to be persistent, and it’s going to need an ‘all of the above’ power solution to satisfy that demand.”

EQT Infrastructure invested in data center developer EdgeConneX in November 2020 to back its strategy to build and operate purpose-built data centers for hyperscale customers, such as Amazon, Google, Meta, and Microsoft. These four hyperscalers are currently responsible for around 75% of the U.S. corporate off-take market for electricity.

An “all of the above” solution would align with the Trump administration’s strategy of “energy dominance,” which was announced in February 2025 to unlock investment in reliable and cheap energy sources.

Kestenbaum added that focusing on long-term trends such as demand growth will insulate private equity investors from short-term political swings at either federal or state level.

“As long as you’re positioning yourself to invest in long-term sustainable trends, minimizing the reliance on subsidies that do have a ‘stroke of pen’ risk and can change administration to administration and Congress to Congress, that’s really where we want to be focusing our resources and capital,” he said.

Sam Veselka, managing director at Pelican Energy Partners, agreed that the data center industry may be a big driver of electricity demand growth in the U.S. but is not the only important factor.

He explained: “Energy demand growth is not solely dependent on data centers being built. We believe energy consumption per person is rising, as we are digitizing everything around us and consuming more electricity.”

2. USING GAS TO BEAT COAL INTERNATIONALLY

The U.S. has been at the forefront of using natural gas to replace coal generation, as it is generally considered “greener” due to producing less carbon dioxide and fewer pollutants when burned. Some private equity companies see a chance to extend this globally.

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Jason Downie is co-founder and managing partner at Tailwater Capital, a Texas-headquartered private equity firm. Tailwater's investment platform spans three core verticals: energy infrastructure, environmental infrastructure, and upstream energy, including non-operated working interests and mineral and royalty assets.

Given Tailwater's long-term focus on foundational energy assets, Downie emphasized that natural gas remains central to the firm's investment thesis, offering both stability and strategic relevance in today's evolving global energy landscape.

"Over the next decade and likely over the next two or three, we see U.S. natural gas playing an increasingly critical role in the global energy mix," he said. "Its ability to displace coal offers a path to decarbonization while providing reliable baseload power. Natural gas is also a strategic export product, crucial amid ongoing global trade volatility."

Downie added that growing electricity demand from the "magnificent seven" stocks of Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, and Tesla is also shaping the outlook. These companies are increasingly turning to natural gas, alongside renewables, to meet their substantial energy needs.

He explained: "If you had asked me five years ago whether these tech giants would be advocating for natural gas, I'd have said no way. But now they understand that energy reliability is non-negotiable."

Demographic trends further reinforce this outlook. "Texas is on track to double its population over the next 25 years," he added. "That kind of growth creates durable energy demand, and we're investing to help meet it."

But other experts said investors should be cautious about which natural gas opportunities they pursue, as developing new natural gas assets over the timeline of the current Trump administration will be extremely difficult.

Pat Eilers, managing partner at Transition Equity Partners, does not invest in gas drilling or extraction operations, and instead focuses on storage and supporting infrastructure: "We don't pull it out of the ground but we do invest in storage midstream assets, which includes investments into LNG development companies. As the grid evolves in the energy transition, we think gas is a bridge fuel and…it is pushing coal off the stack."

3. TRUMP BOOSTS INVESTOR INTEREST IN OIL INDUSTRY

While President Trump retained the presidency with a commitment to "drill, baby, drill," the U.S. oil industry has suffered since January due to weakening demand and lower prices.

For example, analyst S&P Global Commodity Insights on May 12 forecast that U.S. crude oil output would average 13.46 million barrels a day in 2025 before slipping to 13.33 million barrels a day in 2026. It attributed this to a "declining demand outlook and expected supply surplus" exacerbated by OPEC decisions to increase production.

Even so, private equity companies see oil as a sector with great long-term potential.

Tailwater Capital's Downie said he is confident in the continued relevance of oil, pointing to its resilience during the COVID-19 pandemic.

“We literally shut the world down during COVID — no flights, no commuting, and oil demand fell from 104 to around 82 million barrels per day,” said Downie. “Now we’re back at record levels. There may be price volatility, but the need for energy remains, and there is no wealthy society that consumes little of it.”

Tailwater’s strategy centers on resolving infrastructure bottlenecks that impede efficient energy delivery. “We are looking for ways that capital can solve problems where we see these constraints building,” Downie said.

One private equity investor, who did not want to be named, said Trump’s re-election has started to reverse a trend from the early 2020s when more private equity groups pulled away from oil and gas in response to demands from their clients. He expected to see more investment in oil and gas in response to Trump’s policies.

He said: “With Trump coming in, a lot of offshore wind has already died. Onshore wind is in question. I do get the sense that there is going to be a little bit of a reset on how and where people can make money.”

4. SOLAR AND STORAGE SOAR – BUT WIND STRUGGLES

The U.S. renewable energy sector enjoyed a record year for installations in 2024 with 49GW of projects installed, according to the American Clean Power Association annual statistics published on March 5, 2025. That is an overall increase of 33% year on year.

But the statistics also show the health of solar and wind are wildly different. A record 33GW of utility-scale solar capacity was commissioned in the U.S. in 2024, along with 11GW of energy storage and less than 5GW of wind. This made 2024 the worst year for onshore wind installations in the U.S. for a decade — but private equity companies still see opportunities nonetheless.

Nick Hertlein, managing director at Stonepeak, where he focuses on power generation, said both the solar and wind industries have faced disruption in supply chains. This has raised costs for project developers but has opened investment opportunities too.

“On the back of that volatility, we’ve seen a lot of opportunity to step in and provide growth capital for sponsors who may have exhausted their capital for a particular development or investment. In some cases, we’re also helping to partner with corporates in ways that help them to manage their global programs and their balance sheets,” he explained.

Hertlein said tariffs between the U.S. and Asian markets, including China, may also have an impact on solar developers.

He said: “You still have a very healthy new-build environment for solar, notwithstanding the potential impact of tariffs. More solar was built in 2024, and looks to be built in 2025, than in prior years. The market is continuing to chug along, and the valuation and capital structure reset that we’re seeing is driving opportunities.”

By contrast, wind is harder to build because sites with “the best resources in the U.S. have already been spoken for,” whereas solar can be rolled out far more widely. This is a benefit for energy storage too, as most new development-stage solar farms also have storage.

Pat Eilers, managing partner at Transition Equity Partners, said this could boost U.S. solar panel makers as well. TEP invested in solar manufacturer Heliene in October 2024 because of already strong demand, but tariffs could strengthen this even further.

“It’s been provided with more of a tailwind, which is an upside for us, but not something we were depending on to make a successful investment,” he said. “We attempt to avoid making bets on any piece of legislation — the deal should be resilient regardless of who’s elected.”

Eilers added that the wind sector finds it tougher to compete with the scalability of solar due to fewer attractive sites for wind farms and the enormous footprints they need.

Peter Durante, managing director at Cogitare Advisors, and advisor to various companies, including private equity-backed firms in solar and other clean energy sectors, agreed that tariffs are likely to support more private equity investment in the U.S. solar manufacturing sector: “There is going to be a bit of a boom in solar manufacturing as demand for solar will continue to be robust and developers need domestic content for their projects. There is still a lot being built or developed.”

Durante added that “contained American investments” are still very attractive for private equity companies because they are not exposed to international trade risks. That includes power utilities, distribution assets, pipelines, and other types of core infrastructure.

In addition, the rapid expansion of renewables is also likely to open opportunities for investment in transmission infrastructure. Raj Mahagaokar, chief financial officer at Grid United and a former private equity investor at companies including Riverstone Holding, said transmission projects would be an attractive asset class as power production rises.

“Massive, interregional electric transmission continues to be a large constraint to a more efficient and reliable grid, which has become more acute in the face of rapidly expanding power demand from data centers (AI). While legislative action is likely required to meaningfully increase capital formation in the space, a few of these types of projects are starting to make meaningful progress.”

He said investment in transmission might also get a boost as Energy Secretary Chris Wright is exploring the potential for permitting reform to help accelerate U.S. grid upgrade projects.

5. NUCLEAR MAINTENANCE ATTRACTS NICHE INVESTORS

The often-overlooked nuclear energy sector is also gaining fresh impetus under the Trump administration.

On May 23, President Trump signed an executive order to expedite and promote the production and operation of nuclear energy, with a goal of facilitating 5GW of uprates to existing nuclear reactors and construction of 10 new large reactors by 2030. It aims to boost the U.S. nuclear industry with incentives including federal loans and loan guarantees for new nuclear production; take steps to strengthen the domestic nuclear supply chain; and to increase the number of people in the nuclear workforce in the U.S.

For private equity investors that specialize in the nuclear sector, supporting companies that will keep existing nuclear plants running is a bigger attraction.

Pelican Energy Partners raised $450 million in capital commitments for its fund focused on nuclear energy services, of which around one-third is already deployed, and far exceeded its $300 million target. Pelican's Veselka says the fund's core thesis is "that there are 94 ageing nuclear reactors at 54 power plants that are going to continue to run 24 hours a day, seven days a week, for years on end. Who are all the companies servicing those nuclear plants?"

Specifically, Veselka said that Pelican acquires operating industrial services businesses, from engineering or consultancy firms to those that provide services such as welding, that specialize in supporting the operation of nuclear power plants. Pelican typically seeks to invest up to $40 million of equity per transaction.

"The fund is not predicated on new nuclear reactors being built now. We've been in it for two or three years, there are a lot of people trying to change the narrative to build even larger-scale reactors, especially internationally. I think that's going to happen sooner in Europe than in the U.S."

He said the attraction of nuclear is that it can provide baseload power without the same intermittent production as wind or solar farms, but he is also sceptical about small modular reactors as an investment proposition currently: "I think some will get built, but what is the ultimate regulatory environment that really allows that to flourish? I have no idea," he said.

Cogitare's Durante agreed that new nuclear plants in the U.S. will not be built for more than a decade: "Nuclear is not going to happen for another decade. If you're lucky an individual plant, and let alone a national buildout program," he argued.

CONCLUSION

The new Trump administration has been making major changes to the U.S. energy industry. This upheaval is set to open new opportunities for savvy private equity investors.

However, the main appeal of the energy sector to the private equity community is its long-term growth potential. Jennie Simmons, partner at Troutman Pepper Locke, said: "As our leading private equity investors have so articulately noted, despite recent changes in policy and market volatility, the U.S. energy sector is surging. As seen in the investment trends, which are consistently evolving, there are a number of diverse economic opportunities for investments across renewables, natural gas, and nuclear."

Simmons said there was also "significant potential in energy infrastructure and storage, particularly as demand from data centers and other high-consumption sectors rises."

Analysts have shown that oil and gas demand will remain strong this decade even if some of the pessimistic predictions of a dip in 2026 come true. Meanwhile, electricity demand is only set to increase for technologies that enjoy support at federal and state level such as solar power. This has led the administration to bring technologies like nuclear back into mainstream discussion and will open new opportunities for private equity companies.

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She explained: “Investors who embrace technological advancements in energy efficiency, smart grids, and storage will see operational and competitive advantages, which will provide flexibility and adaptability in this dynamic market. By focusing on these strategic considerations, private equity investors can effectively navigate challenges and capitalize on both immediate and long-term opportunities in the U.S. energy sector.”

This convergence of short-term changes and supportive long-term trends makes for a very attractive outlook for private equity investors in U.S. energy. Troutman Pepper Locke is, as always, poised and ready to assist with any of these opportunities.

Read the full report here.

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