

Tracking Smart Grid Infrastructure's Leading Role in the Clean Energy Transition

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The electric grid is modernizing to accommodate new demands and technologies, such as integrating renewable energy sources, electrifying transportation and heating, supporting AI and data centers, combating the effects of climate change, and keeping up with cryptocurrency energy demands. The Nasdaq Clean Edge Smart Grid Infrastructure™ Index selects companies at the forefront of this transformation, providing investors with a unique opportunity to track the smart grid and electric infrastructure sector. The growth potential of the smart grid sector remains robust, with the International Energy Agency projecting that global investments in grid infrastructure will need to exceed \$14 trillion by 2040.

The electric grid, a critical infrastructure that powers modern economies, is at a crossroads. Built 40 to 50 years ago in the United States, it was originally designed to support a centralized, one-way flow of electricity from fossil fuel-based power plants to consumers using the system architecture and demands of the 1960s and 1970s.¹ Today, the grid faces the challenge of accommodating new demands and technologies. These include integrating decentralized and variable renewable energy sources, the electrification of transportation and heating, the rising energy consumption of artificial intelligence (AI) applications and associated data centers, and reinforcement against climate change risks. To address these challenges, the grid is under significant pressure to transition into a "smart grid" that leverages technologies to enhance efficiency, reliability, and sustainability.

Launched in September 2009, the Nasdaq Clean Edge Smart Grid Infrastructure™ Index (QGRD™) offers investors a unique opportunity to track companies at the forefront of this critical transformation with an industry-leading live track record. The index, designed to act as a transparent and liquid benchmark for the smart grid and electric infrastructure sector, includes companies listed globally that are primarily engaged in activities related to the construction and maintenance of the electric grid; electric meters, devices, and networks; energy storage and management; connected mobility; and enabling software. It includes both pure play companies focused on the smart grid sector and diversified multinationals with meaningful smart grid sector exposure.

The Need for Grid Modernization

The traditional electric grid is increasingly inadequate for the demands of the 21st century economy. Several factors drive the need for grid modernization:

¹ <https://www.powermag.com/building-a-better-grid-infrastructure-upgrades-require-ingenuity-innovation-and-investment/>

- Integration of Renewable Energy:** As countries commit to reducing carbon emissions, the share of renewable energy in the electricity mix is growing rapidly. The transition to renewable energy sources and economic growth will cause electricity demand to soar—increasing by 40% from 2020 to 2030 and doubling by 2050². Unlike traditional power plants, renewable energy sources such as wind and solar are decentralized and intermittent. This variability challenges grid operators, who must balance supply and demand in real-time. Renewables must be transported and connected properly to the grid. According to the Berkeley lab, over 1,570 gigawatts of zero-carbon generating capacity are seeking transmission access in the US alone. Solar, storage, and wind make up 95% of the share of generation capacity waiting to connect. Active capacity in queues (~2,600 GW) is twice the installed capacity of the U.S. power plant fleet (~1,280 GW)³. A smart grid, equipped with advanced sensors and control systems, can better manage the integration of renewables, ensuring a stable and reliable electricity supply. Solar and wind power are now the most cost-effective forms of new electricity generation in many regions – beating out coal, nuclear, and even natural gas.⁴
- Electrification of Transportation and Heating:** According to Goldman Sachs, electric vehicles (EVs) could make up nearly half of global car sales by 2035⁵. EV sales increased 60% yearly in the US, from 1 million in 2022 to 1.6 million in 2023.⁶ The electrification of transportation and heating is a key strategy for reducing greenhouse gas emissions. Data shows that electric vehicles (EVs) and electric heat pumps are becoming more popular, increasing electricity demand in the US in a meaningful way after more than a decade of flatlining. However, the current grid infrastructure was not designed to handle the high loads associated with widespread electrification. Grid modernization is necessary to expand capacity, enhance reliability, and support the transition to a low-carbon economy.
- Artificial Intelligence and Data Centers:** AI applications and data centers are placing new demands on the grid due to their high energy consumption. Training AI models, processing large datasets, and running digital services require vast amounts of electricity. A single ChatGPT query, for example, uses nearly 10 times the electricity of a typical Internet search⁷. Moreover, data centers operate around the clock, necessitating a constant and reliable power supply. Smart grid technologies, such as demand response and energy storage, are essential for managing the energy needs of AI and data centers, optimizing energy use, and reducing the strain on the grid. Data center power demand is estimated to grow at least 160% by 2030, per Goldman Sachs – and perhaps as much as 5x per McKinsey's most aggressive demand scenario analysis.
- Resilience Against Extreme Weather and Cyber Threats:** Climate change is increasing the frequency and severity of extreme weather events, posing a threat to grid reliability. Between 2012 and 2023, data from Swiss Re Institute suggests that more than 1 in 3 power outages were associated with severe weather-related events, and that number is expected to increase⁸. Global warming projections of a 2-4-degree temperature increase could mean transformer lifetime (typically 40 years) decreasing by 20-40% by the end of the century, a particularly damaging statistic for countries with older grids⁹. The

² <https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023>

³ https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf

⁴ <https://www.visualcapitalist.com/sp/americas-cheapest-sources-of-electricity-in-2024/>

⁵ <https://www.goldmansachs.com/insights/articles/the-future-of-four-wheels-is-all-electric>

⁶ <https://www.marketwatch.com/guides/insurance-services/electric-vehicle-statistics-2024/>

⁷ <https://www.goldmansachs.com/insights/articles/AI-poised-to-drive-160-increase-in-power-demand>

⁸ <https://www.swissre.com/institute/research/topics-and-risk-dialogues/climate-and-natural-catastrophe-risk/impact-of-climate-on-electric-grids.html>

⁹ <https://news.mit.edu/2017/mit-study-climate-change-effects-large-transformers-1205#:~:text=Therefore%2C%20end%2Dof%2Dcentury,of%2020%20to%2040%20percent>

electric grid is also vulnerable to cyberattacks that could disrupt critical infrastructure. Grid resilience and security are major focuses of the current White House administration, which recently released new priorities for safeguarding clean energy infrastructure from cyberattacks¹⁰. Modernizing the grid with advanced monitoring, automated response capabilities, and cybersecurity measures is crucial for enhancing resilience and protecting against these threats.

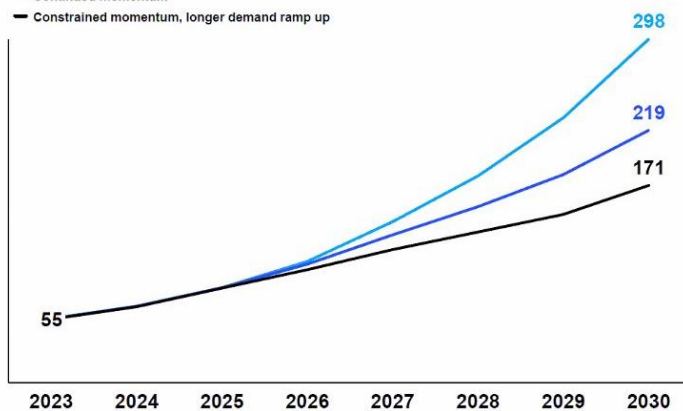
Global data center demand will more than triple to at least ~170 GW by 2030 at 19% CAGR

Estimated Global Data Center Demand, in GW

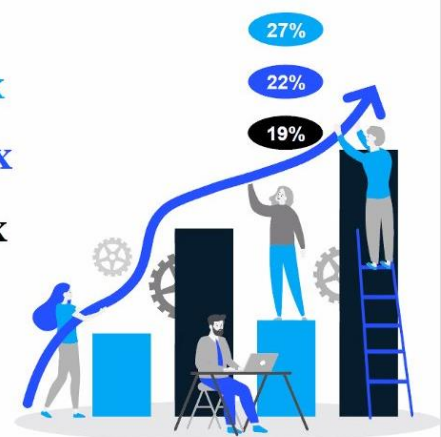
CAGR

Demand scenario

- Accelerated demand, unconstrained
- Continued momentum
- Constrained momentum, longer demand ramp up



5.4X
4.0X
3.1X



Source: McKinsey Proprietary datacenter demand model

McKinsey & Company 2

Nasdaq Clean Edge Smart Grid Infrastructure Index Overview

The Nasdaq Clean Edge Smart Grid Infrastructure Index is the only thematic index in the market that explicitly tracks the smart grid and electric infrastructure sector. The index includes companies across various segments, such as:

- **Advanced Metering Infrastructure (AMI):** Companies that provide smart meters and communication networks that enable real-time data collection and analysis.
- **Energy Storage Solutions:** Companies that develop battery storage systems critical for managing the variability of renewable energy and providing backup power during outages.
- **Grid Automation and Control:** Companies that offer technologies for automating grid operations, improving efficiency, and reducing operational costs.
- **Renewable Energy Integration:** Companies specializing in integrating renewable energy sources into the grid, ensuring a stable and reliable electricity supply.

¹⁰ <https://www.theverge.com/2024/8/9/24216329/cybersecurity-clean-energy-biden-administration-priorities>

Index Eligibility Criteria

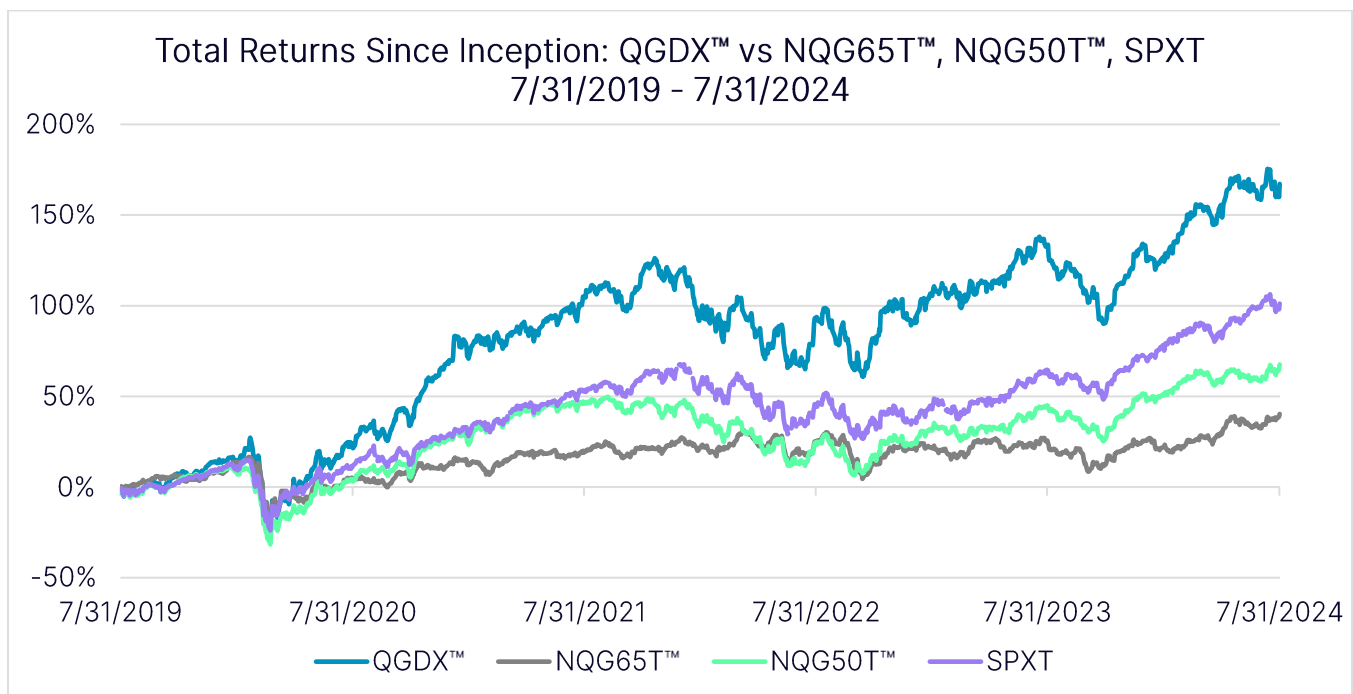
To be included in the index, a security must meet the following criteria:

- Be classified as a smart grid, electric infrastructure, EV network, smart building, software, and/or other grid-related activities company according to Clean Edge;
- Be listed on an index-eligible global stock exchange;
- Have a minimum worldwide market capitalization of \$100 million;
- Have a minimum three-month average daily dollar trading volume of \$500,000; and
- A minimum free float of 20%.

For complete eligibility criteria, please visit the [index methodology](#).

Performance Analysis

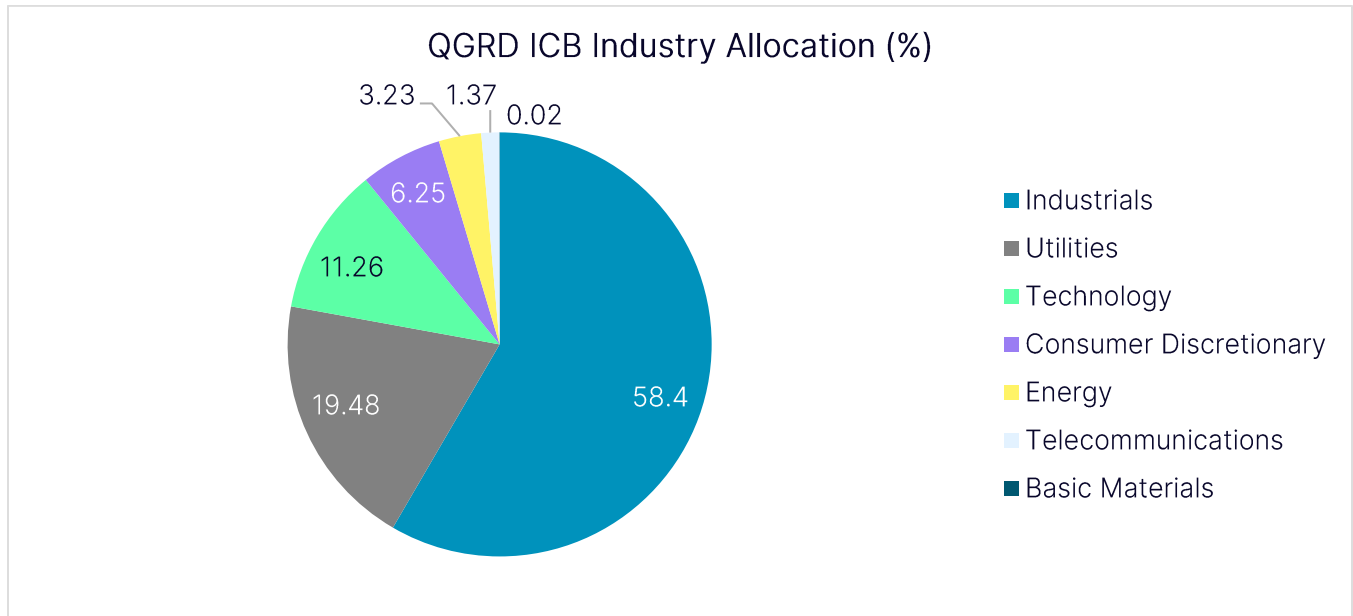
Over the last five years (7/31/2019 – 7/31/2024), the Nasdaq Clean Edge Smart Grid Infrastructure Total Return™ Index (QGDXTM) has generated a cumulative return of 167.10%, with an annualized return of 21.69% and an annualized volatility of 23.45%. This represents an annualized outperformance of 6.7% vs. the S&P 500 Total Return Index, which was up 100.94% on a cumulative basis over this timeframe. Outperformance vs. the two sectors that make up the bulk of index exposure – Industrials & Utilities – illustrates the potential of the index to function not only as a powerful thematic overlay but as a sector replacement strategy. The Nasdaq Global Industrials Total Return™ Index (NQG50TM) generated a cumulative return of 67.56%, with an annualized return of 10.86% and an annualized volatility of 18.10% over the same period, while the Nasdaq Global Utilities Total Return™ Index (NQG65TM) gained only 40.30% on a cumulative basis with an annualized return of 7.00% and annualized volatility of 17.17%.



Data from 7/31/2019 – 7/31/2024. Source: Nasdaq, Bloomberg.

QGRD ICB Industry Allocations (%)

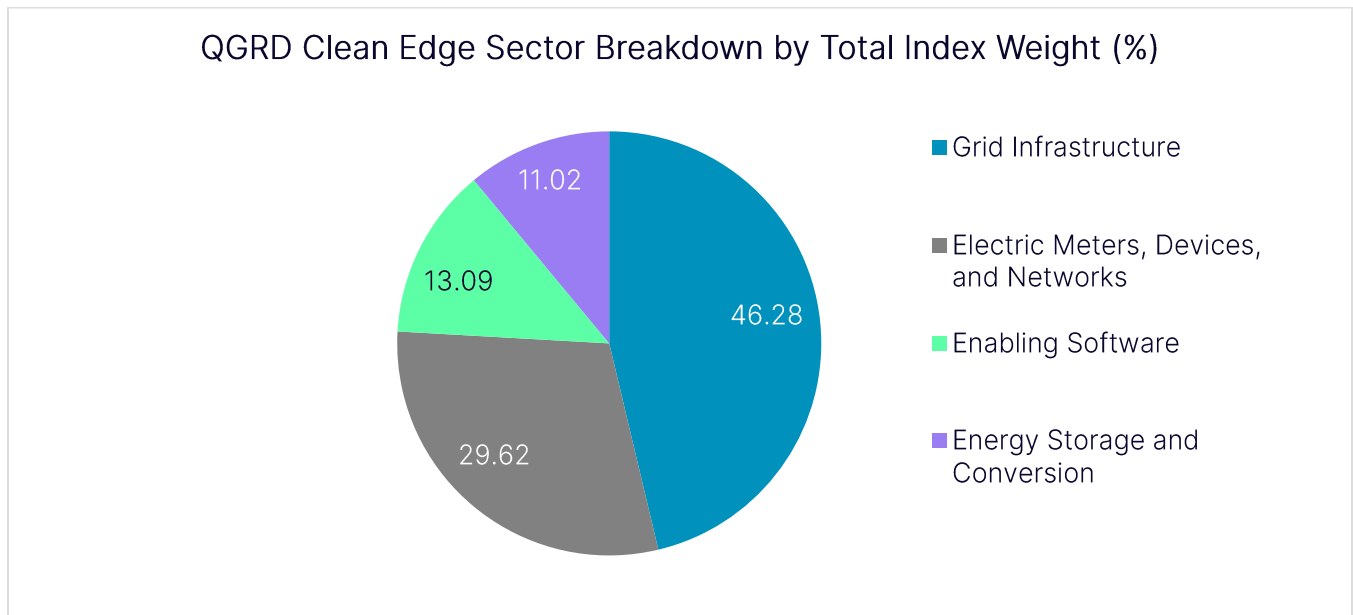
The index is currently allocated to seven of the 11 ICB industries, with the most significant weights across Industrials (58.40%), Utilities (19.48%), and Technology (11.26%).



Data as of 7/31/2024. Source: Nasdaq.

QGRD Clean Edge Sector Allocations (%)

Per Clean Edge’s proprietary classifications, the index currently has the largest allocation to the Grid Infrastructure sector at 46.28%, followed by Electric Meters, Devices, and Networks at 29.62%. Enabling Software (13.09%), along with Energy Storage and Conversion (11.02%), round out the remaining exposure.



Data as of 7/31/2024. Source: Nasdaq and Clean Edge.

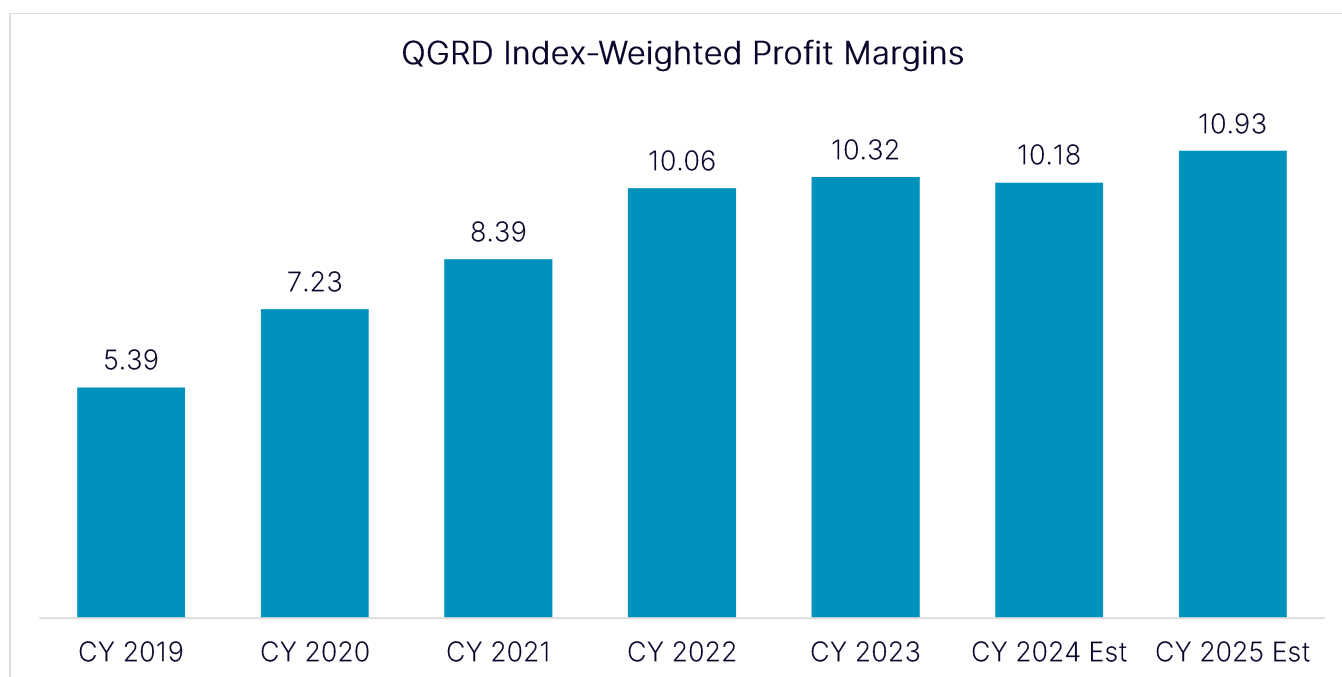
Top 10 Constituents

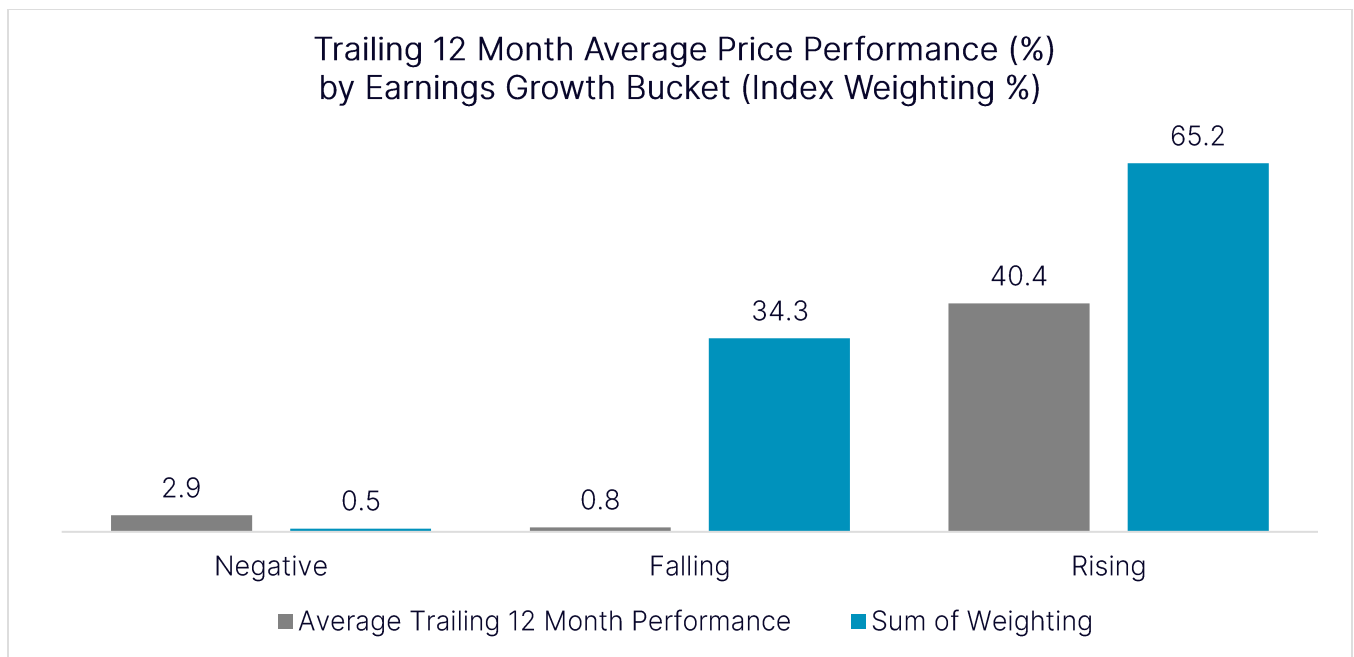
Name	Weight (%)	ICB Industry	Clean Edge Classification
National Grid	9.06	Utilities	Grid Infrastructure
ABB	8.13	Industrials	Grid Infrastructure
Johnson Ctr Int	7.88	Industrials	Electric Meters, Devices, and Networks
Schneider Electric	7.85	Industrials	Electric Meters, Devices, and Networks
Eaton	7.36	Industrials	Enabling Software
Quanta Services	3.86	Industrials	Grid Infrastructure
Hubbell	3.55	Industrials	Grid Infrastructure
Prysmian	3.35	Industrials	Grid Infrastructure
Aptiv	3.16	Consumer Discretionary	Electric Meters, Devices, and Networks
Tesla	2.62	Consumer Discretionary	Energy Storage and Conversion

Data as of 7/31/2024. Source: Nasdaq, Bloomberg.

Fundamental Analysis

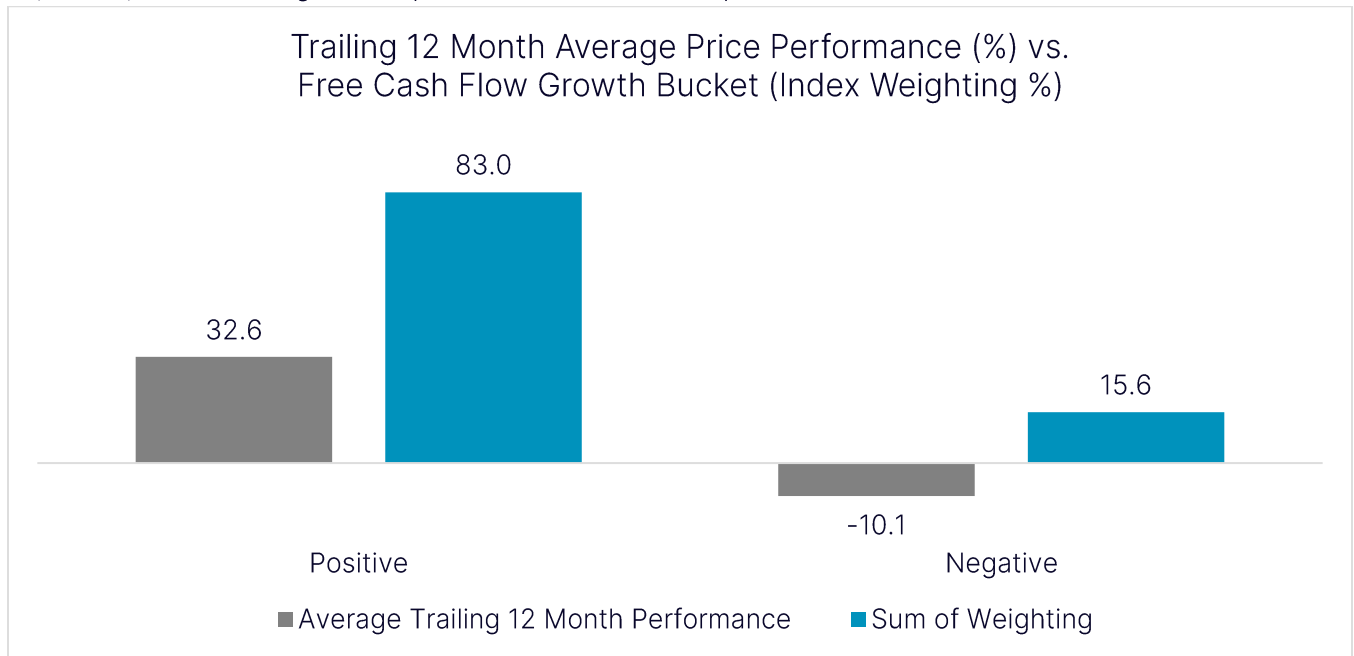
The companies that make up the QGRD Index have shown significant strength in fundamentals over the past few years despite a challenging macroeconomic backdrop of rising interest rates, recession fears, high inflation, and supply chain challenges. Perhaps most impressively, profit margins did not decrease in 2022/2023 when historically high inflation was having its most significant impacts, especially on companies operating in heavy industrial subsectors with heightened sensitivity to raw material input costs. Overall, index-weighted profit margins have approximately doubled over the past five years, and are forecasted to meaningfully expand again in 2025 (latest consensus estimates as of September 30, 2024, per Bloomberg).





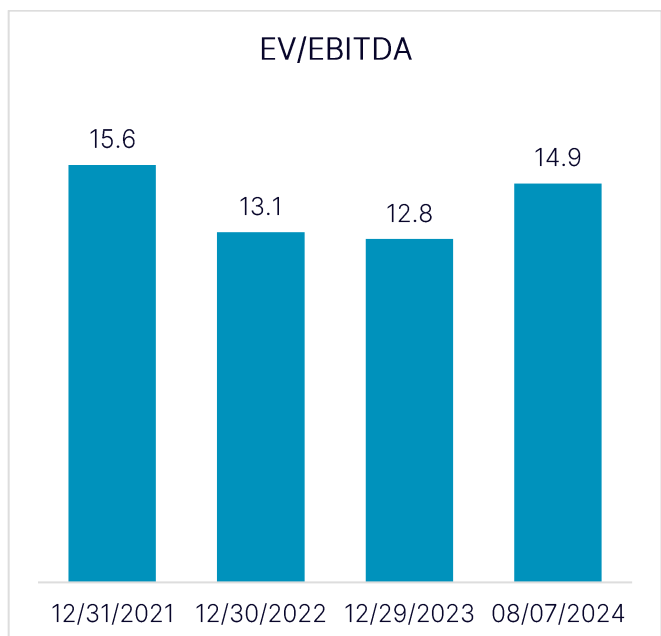
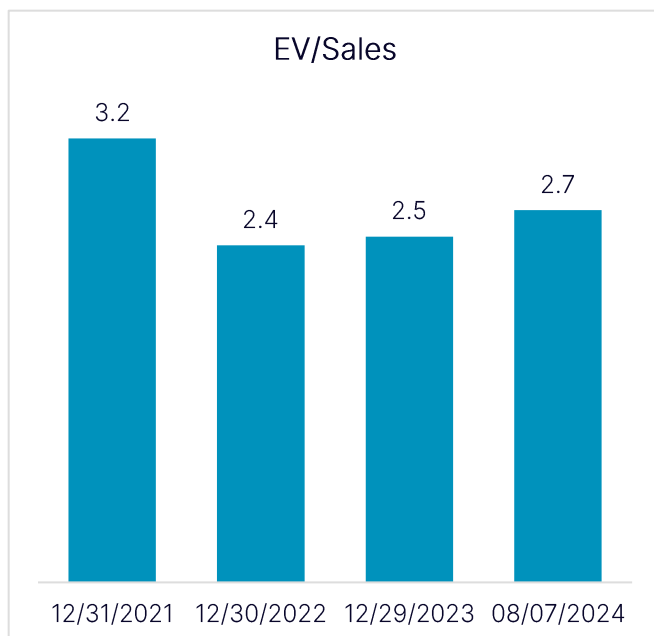
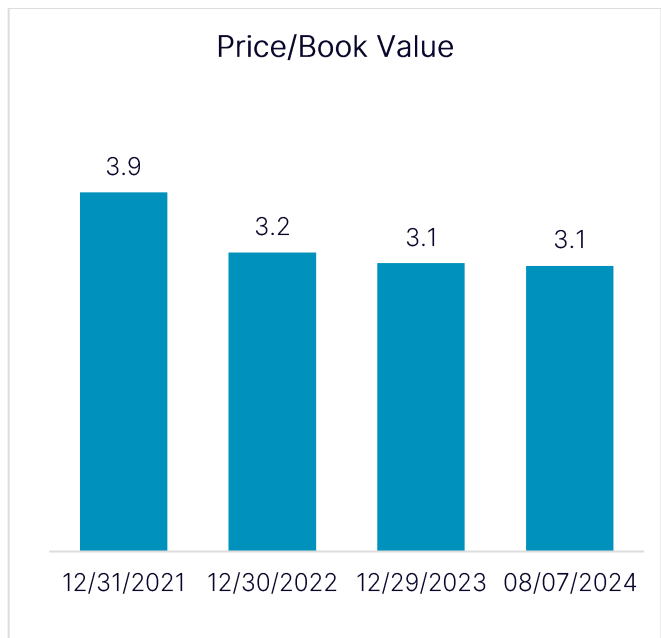
Data as of 7/31/2024. Source: Nasdaq, Factset.

In terms of the breadth of earnings quality, the index scores very highly with only three companies (representing 0.5% of index weight) posting losses in the most recent trailing 12-month period (as of July 31, 2024); the remaining 99 companies in the index were profitable.



In terms of cash flow, 65 out of 102 companies (representing 83% of index weight) were free cash flow positive over the last 12 months due to factors including stronger working capital inflows and earnings growth. This sub-group was up 32.6% on average in terms of stock price performance, outperforming free cash flow negative companies by over 42 percentage points. Only 17 out of 102 companies (representing 15.6% of index weight) were free cash flow negative.

Valuation Analysis



Data as of 8/7/2024. Source: Bloomberg.

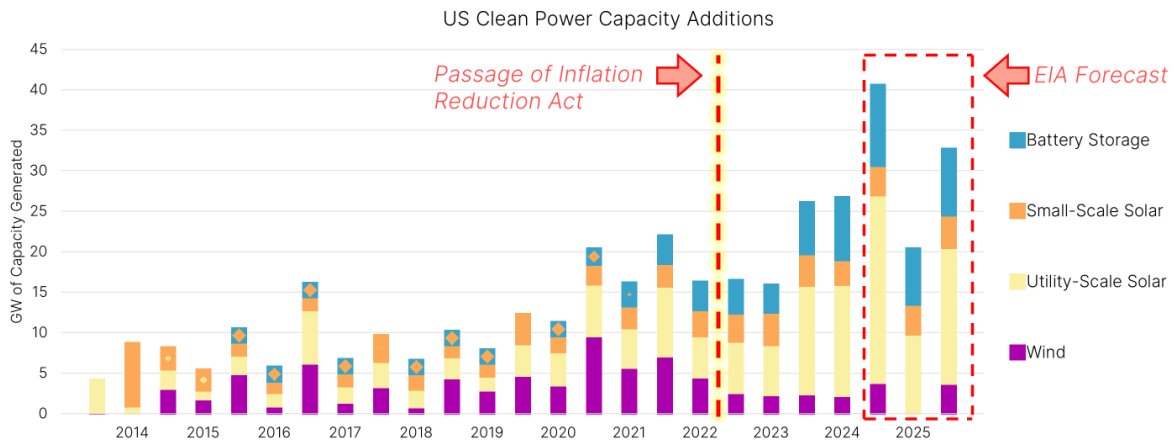
Over the course of the last few years, the Nasdaq Clean Edge Smart Grid Infrastructure Index (QGRD) has generally become cheaper on a wide variety of index-weighted valuation metrics, including price-to-earnings, price-to-book, enterprise value-to-sales (EV/Sales) and enterprise value-to-EBITDA (EV/EBITDA). On a price-to-earnings basis, the index is 29% cheaper vs. peak valuations at year-end 2021 – despite a run of strong performance in 2023 & 2024YTD. On a price-to-book basis, the index is 20% cheaper; on an EV/Sales basis, 16% cheaper; and on an EV/EBITDA basis, 4% cheaper.

Long-Term Growth Drivers, Short-Term Accelerators

Looking ahead, the growth potential of the smart grid and electric infrastructure sector remains robust. As governments and corporations commit to achieving net-zero emissions, the demand for smart grid technologies is expected to accelerate. The International Energy Agency (IEA) projects that global investments in grid infrastructure will need to exceed \$14 trillion by 2040 to meet the growing electricity demand and integrate renewable energy sources¹¹. In addition to this long runway of growth, there are also short-term tailwinds from the ramping up of investments authorized under the US Inflation Reduction Act in August 2022. In the second half of 2024 alone, over 40GW of clean power capacity additions are forecast, more than 50% above the prior 6-month record set in the first half of 2024. This creates significant near-term, as well as long-term, market opportunities for companies within the Nasdaq Clean Edge Smart Grid Infrastructure Index.

The Inflation Reduction Act (IRA) In Action

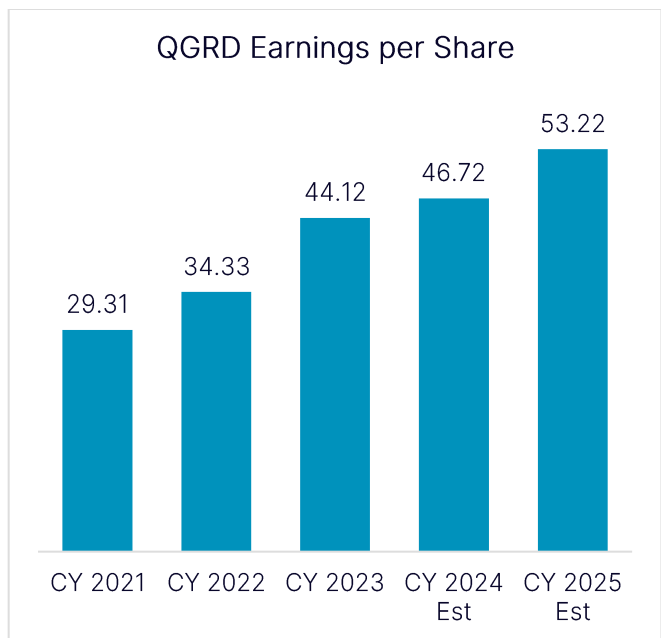
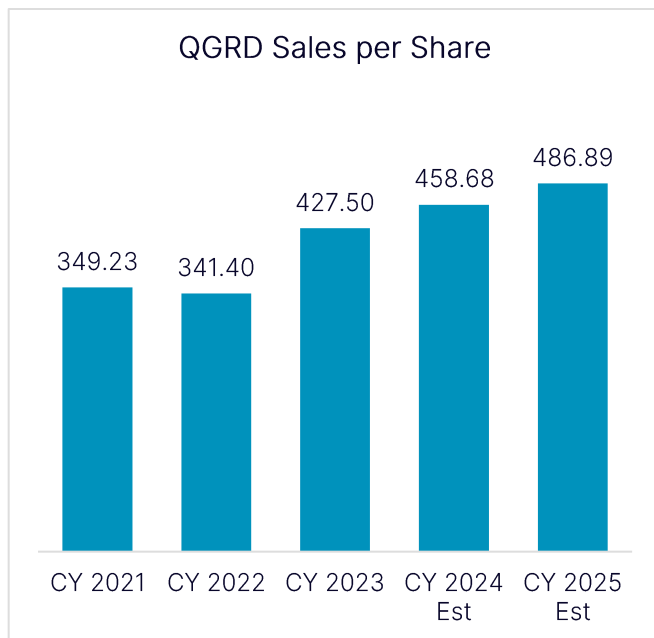
US EIA data suggests that the second half of 2024 will mark the fastest pace of clean power additions in American history by a large margin, over 40 GW driven by Utility-Scale Solar and Battery Storage. The IRA aims to reduce carbon emissions by ~40% by 2030 via >\$300 billion in clean energy investments, including energy transmission



Source: US Energy Information Administration Data for the Period between 2013 and Projections through 2025

On an index-weighted basis, Sales per Share is forecast to continue growing at a solid pace after rising 25% YoY in 2023. Based on latest consensus estimates, FY 2025 Sales will have grown by a CAGR of 8.7% vs. FY 2021. Earnings growth will be even more impressive, producing a 4-year CAGR of 16.1% by FY 2025.

¹¹ <https://www.iea.org/news/lack-of-ambition-and-attention-risks-making-electricity-grids-the-weak-link-in-clean-energy-transitions>



Conclusion

In conclusion, the Nasdaq Clean Edge Smart Grid Infrastructure Index offers investors a unique opportunity to track one of the most important infrastructure transformations of our time. The index provides exposure to a diversified portfolio of companies in charge of grid modernization and smart grid technology development. As the world continues to move towards a more sustainable and electrified future, the importance of a robust and adaptable grid will only grow, making investments in this sector more critical—and potentially more rewarding—than ever. For investors seeking to align their portfolios with the future of energy, the Nasdaq Clean Edge Smart Grid Infrastructure Index is tracked by the First Trust Nasdaq Clean Edge Smart Grid Infrastructure ETF (Nasdaq: GRID) and the First Trust Nasdaq Clean Edge Smart Grid Infrastructure UCITS ETF (London: GRDU).

Additional Sources: Nasdaq, Bloomberg, Factset.

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