Next Economy Index

March 31, 2023

Investment Philosophy

The greatest growth drivers of today's economy are high-functioning, inventive companies creating and accelerating solutions to system-level risks—the climate crisis, resource degradation, widening inequality, and human disease burdens. Those companies are our best investment opportunity to preserve and grow clients' capital.

Green Alpha's philosophy is simple: seek enterprises creating scalable and rapidly evolving, economically-competitive solutions, rigorously evaluate their fundamentals, and acquire them at reasonable valuations.

Our investments seek to de-risk the global economy (which in turn reduces clients' long-term investment risks) while striving to grow faster than underlying GDP.

Why Invest in the Next Economy Index?

- Active research and stock selection
- Passively managed through an annual rebalance
- Demonstrates the diversity, growth, breadth, and depth of the rapidly-developing Next Economy™
- ~142 global, market-leading companies developing solutions to core economic and environmental risks

Inception Date: December 31, 2008

Vehicle: Separately Managed Accounts

Research

Across our portfolios, we seek companies:

- with products and/or services lowering the global economy's risk profile by creating solutions to our most pressing economic and environmental risks
- committing more capital to R&D and owning more intellectual property than their peers
- run by effective, diverse executive teams and boards of directors with track records of increasing revenues and expanding margins, leading to earnings growth
- exhibiting sound financial fundamentals
- trading at compelling valuations relative to proven and anticipated growth, within acceptable levels of risk

Portfolio Construction

The Next Economy Index utilizes active research and stock selection, and passive portfolio construction to reflect the Next Economy – the innovation-driven, highly efficient, solutions-oriented sustainable economy that is rapidly displacing the legacy economy.

All companies that pass Green Alpha's top-down and bottom-up research processes with sufficiently high proprietary scores are included in the Next Economy Index portfolio. All other Green Alpha portfolios contain subsets of companies held in the Next Economy Index.

Largest Positions

How The Next Economy Index is driving progress toward the Next Economy

Company Name	Ticker	Weight
First Solar	FSLR	2.37%
NVIDIA Corporation	NVDA	1.51%
Array Technologies	ARRY	1.22%
Cadence Design Systems	CDNS	1.14%
Arista Networks	ANET	1.14%
Cisco Systems	CSCO	1.14%
Apple	AAPL	1.12%
Infineon Technologies	IFNNY	1.12%
Seagen	SGEN	1.10%
STMicroelectronics	STM	1.09%
% of Portfolio		12.95%

First Solar *(Sector: Energy, Industry: Renewable Energy)*

- First Solar manufactures solar panels and provides utility-scale PV power plants and supporting services, including finance, construction, maintenance, and end-of-life panel recycling. They employ rigid thin-film modules for its solar panels and cadmium telluride (CdTe) as a panel semiconductor.
- Unique among large solar manufacturers, First Solar is a U.S.-headquartered company and does not use crystalline silicon (c-Si) semiconductors. That means they have fewer supply chain dependencies than traditional c-Si solar PV makers and avoid dependencies on China, which dominates the c-Si industry.
- Catalysts driving performance results are already-strong order flow and the passage of the Inflation Reduction Act (“IRA”).
  - ✓ Under the IRA, First Solar could earn subsidies as high as 17 cents per watt of capacity, which is more than half of their reported production cost.
- The company plans to grow revenues by investing $1.1 billion in a new, 3.5 GW module factory in Alabama, the company’s fourth domestic facility, while an additional $185 million will add 1 GW of new manufacturing to the company's plant in Ohio.
- First Solar has a vertically integrated manufacturing process providing the lowest carbon footprint and fastest energy payback time available.
- The board of directors is 25% women, including the Lead Independent Director and Audit Committee Chair. The Chief People & Communications Officer is also female. Importantly, the executive team boasts an above-average age spread of 32 years.

NVIDIA *(Sector: Technology, Industry: Semiconductors)*

- NVIDIA Corporation specializes in designing and manufacturing graphics processing units (GPUs) and system-on-a-chip units (SoCs).
- NVIDIA’s processors are dominant in datacenters, machine learning, and AI. Their processors are used by many of the most advanced companies for hundreds of advanced products and applications. NVIDIA is critical for cloud computing companies AWS, Google Cloud, and Microsoft’s Azure, largely because its processors are among the fastest and highest throughput, factors that are key as cloud companies offer more AI-based capabilities.
- Their industry-leading software and hardware technology has made its products among the go-to options for leading edge applications. For example, to run ChatGPT and other AI applications, Microsoft Azure says they use up to “thousands of NVIDIA H100 GPUs interconnected by NVIDIA Quantum-2 InfiniBand networking.”
- The company also provides professional-grade GPUs utilized in a wide range of industries, including automotive, aerospace, healthcare, entertainment, and gaming.
- Half of NVIDIA’s executive Officers and 25% of the board of directors are women, including the Compensation Committee Chair.

__Array Technologies__, __Cadence Design Systems__, and __Arista Networks__’ Next Economy attributes are continued on the following page.

Largest Positions *continued*

Array Technologies *(Sector: Energy, Industry: Renewable Energy)*

- Array Technologies is a global leader in solar tracker technology. The company's products are used by solar power plants around the world to improve efficiency and generate more power. The company has over 2,000 employees and operates manufacturing facilities in the United States, Mexico, and Europe.
- In January 2022, Array acquired one of Europe's leading tracker manufacturers, STI Norland. Together, they became the largest solar tracker company in the world with manufacturing capacity, design, and engineering resources on three continents.
- Array Technologies' products are used by some of the world's largest solar power plants, including the Agua Caliente Solar Project in Arizona, the Topaz Solar Farm in California, and the Desert Sunlight Solar Farm in California.
- Array Technologies is benefiting from three major sections of the Inflation Reduction Act ("IRA"), which together represent significant benefit to the company:
    - ✓ The IRA subsidy of $0.87 per kilogram for torque tubes gives a $789 subsidy per ton to what appears to cost $630-$740 per ton – torque tubes are the largest cost input for trackers.
    - ✓ In addition to torque tubes, Array makes and sells the structural fasteners that hold panels in place as they rotate to face the sun. These have a subsidy from the IRA of $2.28 per kilogram.
    - ✓ As an American solar parts provider, Array contributes to a project's eligibility for the 10% income tax credits.

Cadence Design Systems *(Sector: Technology, Industry: Software)*

- Cadence Design Systems is an American multinational company developing software, hardware, and intellectual properties (IP) used to design chips, systems and printed circuit boards, as well as IP covering interfaces, memory, analog, systems on chips (SoCs) peripherals, data plane processing units, and verification.
- Cadence's software is used in the design of all types of integrated circuits, from simple microcontrollers to complex microprocessors. Their hardware is used in the fabrication of integrated circuits, and its IP is used in the design of SoCs.
- Cadence is a leading provider of electronic design automation (EDA) software, which is used to design and analyze electronic circuits and systems. Cadence's solutions are used by a wide range of companies, from small startups to large multinationals. They are also a leading provider of IP cores. IP cores are pre-designed components that can be used in the design of new electronic systems. Cadence offers a wide range of IP cores, including cores for memory, logic, and analog circuits.
- Cadence's customers include some of the world's largest semiconductor companies, such as Intel, Samsung, and TSMC. The company's products are also used by smaller companies in the semiconductor industry.

Arista Networks *(Sector: Technology, Industry: Technology Hardware)*

- Arista Networks specializes in the development of networking hardware, software, and cloud-based services. The company was founded in 2004 by former Cisco executive Jayshree Ullal and her team of experienced networking professionals.
- Arista Networks' core product line is its network switches, which are designed for use in data centers and cloud computing environments. These switches are known for their low latency, high performance, and scalability, making them ideal for large-scale computing and networking applications.
- In addition, Arista Networks offers a variety of software and cloud-based services, including its CloudVision platform, which provides centralized management and monitoring of network infrastructure. The company also offers a range of support and consulting services to help customers optimize their network performance and security.
- Arista Networks' President/CEO and CFO are women, as is 33% of the board of directors (three female directors).

Macroeconomic Commentary

> In the first quarter of 2023, the global economy continued to be characterized by the key challenges of 2022, including the ongoing COVID-19 pandemic, the war in Ukraine, rising inflation, and interest rate hikes. These challenges have had a significant impact on economic growth, trade, and investment, which has led to continued high market volatility.

For Green Alpha strategies, January 2023 provided double-digit performance gains as some of the above-listed concerns seemed to be easing, and then tougher markets in February and March as some issues seemed to reassert themselves, capped off by a positive rally at quarter-end as markets reverted to a more January-like dynamic. And yet, in context, inflation, interest rate concerns, and even geopolitical conflicts have historically been short-to-medium term sources of market volatility. As always, we endeavor to think about the longer term, and position our portfolios to preserve and grow our clients' purchasing power over multi-cycle periods.

And yes, the global economy is also facing long-term challenges, such as the climate crisis, inequality, and technological change. These challenges will require governments, businesses, and individuals to work together to find solutions, and, in overcoming them, the world will make significant—it is not an exaggeration to say unprecedented—investments in the best of these solutions. The patient, forward-looking investor therefore stands to benefit. To illustrate, let's look at a couple of sectors that saw big changes in Q1.

Carefully Navigating Tech's Rapidly Evolving Landscape

The way we understand the tech economy is changing dramatically. Large language models (LLM) are exponentially improving, seemingly by the week, and traditional search and ad serving businesses are looking less like the indefinite cash cows that they did just last year. The codes for these models are improving so fast, in part, because the models themselves are becoming partially self-recursive in that they produce content not only in natural language but in code itself, meaning software engineers now have very capable "co-pilots" to help them develop the next LLM iteration faster than the last (this is part of why we don't buy the general argument that productivity gains have flatlined). Ultimately, these models will be capable of generating ever-improving versions of themselves without direct human intervention and will be limited only by the capabilities of their underlying hardware.

Speaking of which, we can't let this subject pass without acknowledging a key vulnerability to the global economy: utter dependence on the Taiwan Semiconductor Manufacturing Company (TSMC). According to recent reporting in Wired, TSMC is home to "the world's biggest logic chip manufacturing capacity and produces, by one analysis, a staggering 92 percent of the world's most avant-garde chips…Perhaps more to the point, TSMC makes a third of all the world's silicon chips, notably the ones in iPhones and Macs. Every six months, just one of TSMC's 13 foundries—the redoubtable Fab 18 in Tainan—carves and etches a quintillion transistors for Apple. In the form of these miniature masterpieces, which sit atop microchips, the semiconductor industry churns out more objects in a year than have ever been produced in all the other factories in all the other industries in the history of the world." Unfortunately, this stunning and so far, singular capability resides on one island whose government believes it is a sovereign nation, but that is also claimed as territory by China.

Let's face facts: the wonders we see from the LLMs don't occur in isolation. OpenAI, Microsoft, Google, Nvidia, Apple, and many more tech titans are utterly dependent on this one island with its N-of-One capabilities. The complex code that gives us ChatGPT and its kin have been made possible by the technological achievements at TSMC that brings forth the hardware capable of running these monster programs.

Continued on the following page

Macroeconomic Commentary *continued*

To run ChatGPT and others, Microsoft Azure says they leverage up to “thousands of NVIDIA H100 GPUs interconnected by NVIDIA Quantum-2 InfiniBand networking,” all made at TSMC. We’re not big on fossil fuel analogies here at Green Alpha but imagine a world where Saudi Arabia has 92%of the world’s oil reserves and is at the same time struggling to maintain its independence from a determined world superpower. This overwhelming dependency on TSMC means the world’s economy is far more vulnerable to disruption than is generally assumed, and of course also means that TSMC is a significant holding in many Green Alpha investment strategies. Challenge and opportunity, hand-in-hand, as always.

Volatility is Unlocking Opportunities: Investing in REITs

Tech isn’t the only place where the challenge/opportunity dynamic exists. We can also see it in the more prosaic field of real estate. Real Estate Investment Trusts (REITs) have had a tough time in 2022 and Q1 2023 in the face of unprecedented Federal Reserve rate hikes and the ongoing phenomenon of work-from-home catalyzed by COVID-19. This pair of headwinds has caused even some of the highest quality REITs to be down more than 70% in the trailing year at the end of Q1 ’23, and, clearly with some justification. Looking more closely, though, we can see that not all REITs are, by any means, equal. While many mid-tier and lower quality office REITs are reporting occupancy levels not much better than 50%, the highest quality office REITs, with AAA space, great sustainability profiles, and in desirable markets, are more than 90% occupied with relatively strong lease pricing power.

Moreover, specialty REITs like those providing lab space for biotechnology are actively growing. The predilection of traders and algorithms to bid down the entire sector is basically a scorched earth approach that has resulted in some amazing value opportunities among the gems in the space. Benefitting from these low entry points requires patience, but is not, in our opinion, particularly risky for the long-term investor. It’s all about waiting for markets to appreciate that not all REITs are created equal, and the quality names have been oversold. Meanwhile, REITs compensate us for this patience with returns in the form of a dividend while we wait. This approach isn’t new in investing, it is a straightforward example of time-arbitrage; while we can’t be sure if it is or is not too soon to enter the highest-quality REIT space, we know for sure it is not too late. At some point, it will be.

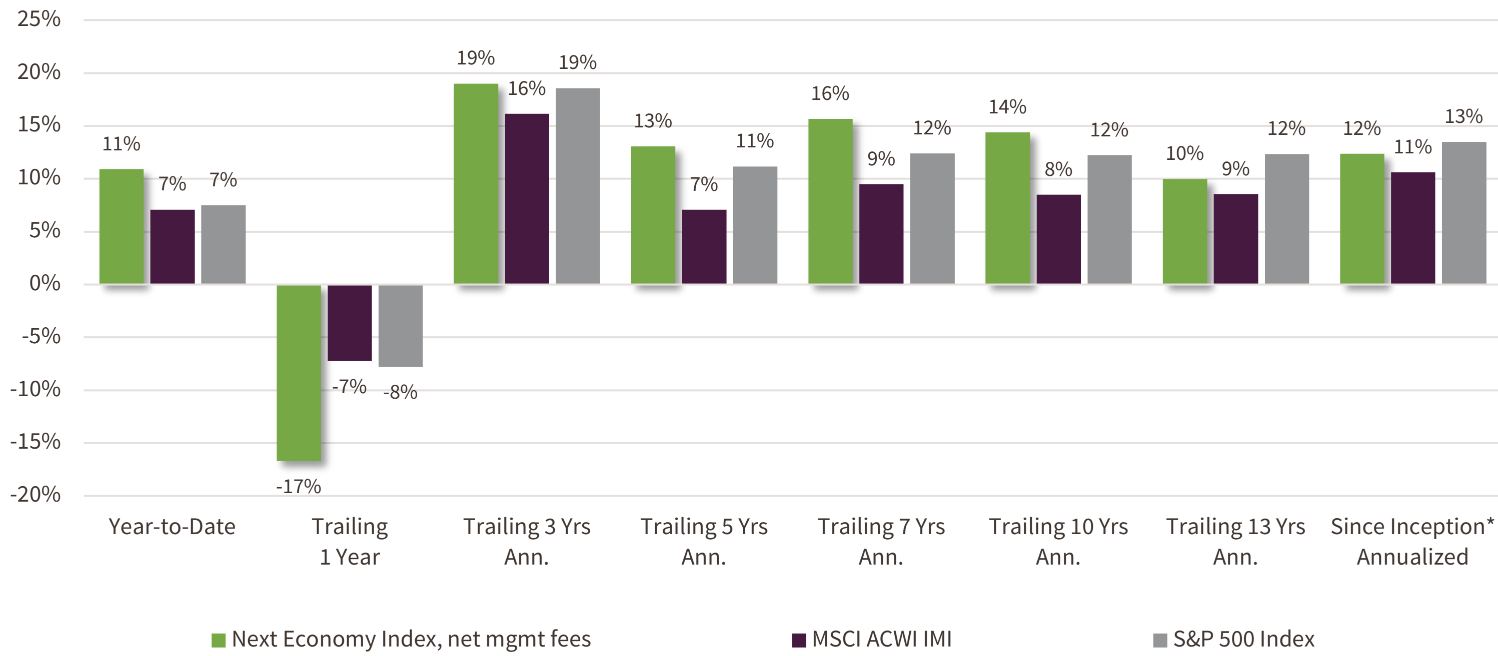
Remain Focused

Tech and REIT stocks are not often particularly correlated. As we’ve seen, they have very different dynamics, dependencies, and fundamentals; holding both is generally considered wise diversification. And yet, we have seen the global leaders in both industries lose share price value recently, even sometimes when their business results were good and improving.

The best thing an investor can do in volatile environments like these is maintain thesis conviction and convert the nearer term challenges into long-term opportunities via a carefully curated basket of securities. Near-term challenges create volatility, long-term challenges show us where to look for growth.

If you are a Green Alpha client, contact betsy@greenalphaadvisors.com to inquire whether your account(s) holds any of the securities listed in this macroeconomic commentary. At the time this commentary was written, Green Alpha held shares in Taiwan Semiconductor Manufacturing Co (TSM), NVIDIA (NVDA), and Apple (AAPL) in some client accounts. No Green Alpha client accounts held shares in Microsoft (MSFT) or Google (GOOG) at the time of authorship. Please see the final page of this document for additional related disclosures.

Portfolio Performance & Commentary



For Q1 2023, Green Alpha's Next Economy Index returned 10.90% net of management fees, versus its benchmark, the MSCI All Country World Investable Market Index (MSCI ACWI IMI), which returned 7.09%.

The strategy's best performing sectors were Technology and Energy.

- Within Technology, gains were led by the hardware industry, particularly the semiconductors value chain, from chip designers, upstream capital equipment providers, foundry manufacturing, to devices. Catalysts for semiconductors' performance included early implementation of the CHIPS Act, growing recognition of the importance of semis to the global economy, and multiple announcements related to expansion of global production capacity. The software industry, including engineering and design software, also contributed to returns.
- In the Energy sector, returns were derived from renewable energy equipment, with solar equipment representing the lion's share of upside contribution. Specifically, the world's leading thin-film solar PV maker had an outstanding quarter, as it announced benefits from the Inflation Reduction Act ("IRA") and capacity expansion plans. Other renewable contributions were from traditional C-Si PV makers, balance-of-system providers, and battery storage. From wind energy, America's largest advanced composite materials maker for turbine blades also contributed positively.

The sole sector detracting from the strategy's returns in the quarter was Real Estate, while returns within the Financials sector were neutral.

- The strategy's Real Estate Investment Trust ("REIT") exposure saw losses in Q1, primarily in office REITs, which were partially offset by gains in data center and logistics-related REITs. Office REITs were under pressure given the interest rate environment and the narrative around work-from-home. However, we believe the highest-quality sustainable office REITs have been oversold vs. industry peers and currently present attractive long-term buying opportunities.
- In Financials, the strategy benefitted from lack of exposure to banking, outperforming the benchmark significantly in this sector. The Financial exposure in the strategy is related to an innovation-oriented venture debt financing firm, which effectively had unchanged returns for the quarter.

**Portfolio Inception: December 31, 2008. All returns presented above that are greater than 1 year in length have been annualized. Performance data quoted represents past performance. Past performance does not guarantee future results and current performance may be lower or higher than the data quoted. Please see the final page of this document for additional important disclosures.*

Next Economy Index

How our portfolios compare to their benchmark, the MSCI All Country World Investible Market Index

Characteristics

- **Largest Next Economy basket** – by definition, the Index is the most diversified Green Alpha portfolio by number of stocks; all stocks that pass Green Alpha's top-down and bottom-up investment processes enter the Index
- **Fundamentals-driven:** the underlying quality of companies and the price paid for their shares are key drivers of LT returns
  - ✓ **High growth:** indicated by Sales Growth, and a decrease from Current P/E to Forward P/E as revenue and earnings grow
  - ✓ **Compelling valuation:** demonstrated by Price/Sales and Price/Book metrics relative to growth expectations
  - ✓ **Strong balance sheet and management execution:** conveyed by capital stewardship, LT Debt/Equity, and Current Ratio
- **Fossil fuel free since inception:** we have never invested in companies that prospect, extract, refine, or transport fossil fuels, nor in fossil-fired utilities or internal combustion engine manufacturers
- **Diversified – we seek solutions wherever we can find them:** across the globe, in companies of all sizes, and every industry
- **Public equities, long-only:** most investors' largest asset class; largest opportunity for impact

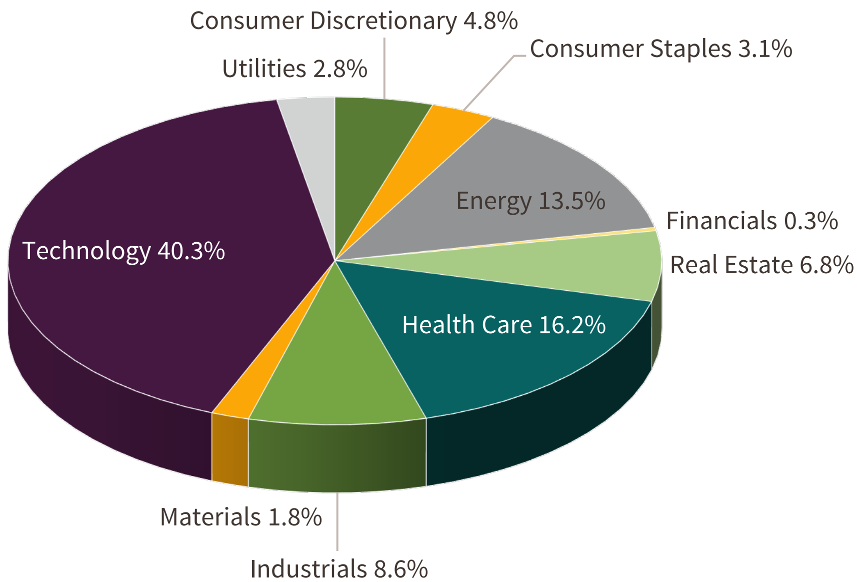
Characteristics	Next Economy Index	Benchmark: MSCI ACWI IMI (SPGM)	Social Index	Next Economy Select	Growth & Income	Sierra Club Green Alpha	DiversiTerra
# of Securities	142	2,488	99	63	35	47	57
Active Share	93%	-	94%	96%	97%	96%	95%
Sales Growth, Trailing 3-Yr	47%	14%	57%	42%	23%	45%	53%
P/E, Current	19.8	16.1	21.0	16.0	15.9	18.7	19.9
P/E, 1-Year Forward	20.3	15.4	22.1	17.0	16.0	19.8	21.7
Price/Sales	2.1	1.6	2.0	1.6	1.6	1.2	1.9
Price/Book	3.0	2.4	2.8	2.1	1.7	2.4	2.6
LT Debt/Equity	105%	138%	92%	93%	63%	95%	97%
Current Ratio	3.2	2.0	3.8	4.0	2.7	2.7	3.2
Dividend Yield	1.19%	2.29%	1.10%	1.96%	4.42%	1.46%	1.46%
Market Cap., Wtd Avg ($B)	$88.08	$326.62	$86.65	$103.96	$84.35	$104.71	$109.88
Market Cap., Median ($B)	$8.06	$2.53	$7.76	$3.79	$29.04	$12.65	$7.41
Turnover, Trailing 2-Yr Avg	12%	Not Available	43%	12%	18%	21%	32%
Beta, Trailing 2-Yrs	1.26	1.00	1.30	1.26	1.20	1.28	1.26
U.S.-Domiciled Companies	76%	57%	84%	65%	66%	68%	80%
% Revenue Derived in U.S.	48%	43%	53%	43%	45%	45%	58%

All characteristics are sourced from FactSet, are based on a representative account and include cash. Please see the final page of this document for additional important disclosures.

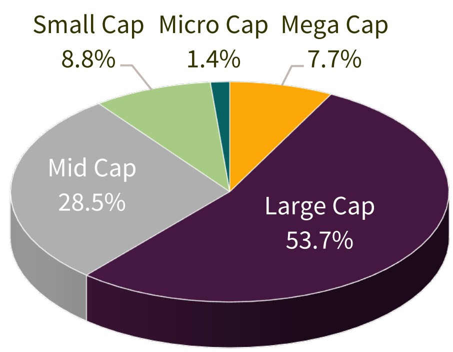
Portfolio Allocations

Our search for Next Economy companies is unconstrained. For the Next Economy Index, we seek solutions to systemic risks wherever they exist – across sectors, market caps, and geographies.

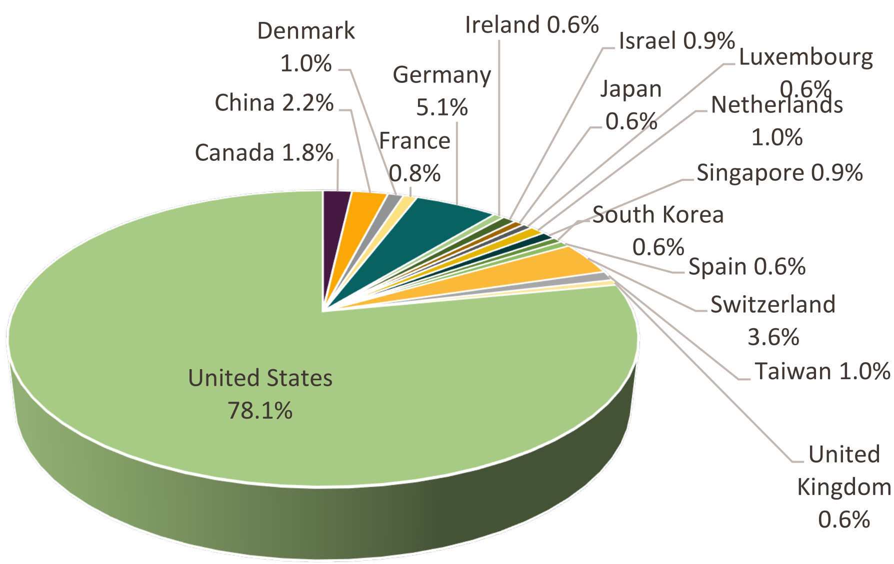
Economic Sectors



Market Capitalizations



Companies' Main Headquarters



Allocation data is sourced from FactSet and is based on a representative account. The exception is the sector chart, which utilizes the Bloomberg Industry Classification Standard from Bloomberg. All charts on this page are shown as percent of equity. Please see the final page of this document for additional important disclosures.

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- Performance quoted throughout this document represents past performance. Past performance does not guarantee future results, and current performance may be lower or higher than the data quoted. Investment returns and principal will fluctuate with market and economic conditions, and investors may have a gain or loss when shares are sold.
- Beginning November 30, 2021, the Next Economy Index performance results are a composite of discretionary client accounts invested in the strategy on specific custodial platforms. Green Alpha’s discretionary client accounts that are not included in the composite are those custodied at Folio Institutional due to operational limitations of Folio’s data feeds to Green Alpha’s portfolio accounting system Advent APX. The Next Economy Index composite performance results reflect actual performance for a composite of discretionary client accounts, net of actual management fees and transaction costs. Some assets managed in the Next Economy Index strategy within the composite receive a reduced fee from the standard management fee schedule. Actual client returns experienced will vary from the composite returns based on a variety of factors, and we encourage you to ask about specific factors. Accounts are included in the composite for full-month periods under management with Green Alpha Investments. The Next Economy Index performance results do not reflect the reinvestment of dividends and interest.
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- From the strategy’s inception through November 30, 2021, Next Economy Index performance results reflected the actual performance of a representative account, net of actual management fees and transaction costs. Assets managed in the Next Economy Index strategy representative account received a reduced fee from the standard fee schedule. Next Economy Index representative account performance results did not reflect the reinvestment of dividends and interest. Please contact Green Alpha for information about the representative account selection process.
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- The MSCI All Country World Investable Market Index (ACWI IMI) captures large, mid, and small cap representation across 23 developed markets and 27 emerging markets countries. With more than 8,750 constituents, the index is comprehensive, covering approximately 99% of the global equity investment opportunity set. Investors cannot invest directly in this index.
- The SPDR MSCI Global Stock Market ETF (ticker: SPGM) seeks to provide investment results that, before expenses, correspond generally to the price and yield performance of the MSCI ACWI IMI. Investors can invest directly in SPGM.
- The S&P 500 Index is an unmanaged index of 500 common stocks chosen for market size, liquidity, and industry group representation. It is market-value weighted. The S&P 500 Index figures do not reflect any fees, expenses, or taxes. Investors cannot invest directly in this index.
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