# Alternative Energy: Key Themes, Trends, and Investment Considerations

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# Summary

- The Ardour Global Alternative Energy Extra-Liquid Index (AGIXL) can provide investors with broad, globally-inclusive alternative energy exposure with the benefit of a liquidity screen.
- Alternative energy is positioned to become an increasingly important part of the global energy landscape given the push towards carbon-neutrality, representing a growth opportunity for clean energy companies.
- Renewable energy, such as wind and solar energy, accounted for roughly 9% of total US electricity generation in 2019.
- Solar energy is expected to grow at an even more rapid pace than the rest of the clean energy space due to declining costs, improving technology, and residential installations.
- The sales share of electric vehicles is forecasted to grow significantly over the next decade while also driving demand for electricity, which could benefit renewables.
- Semiconductors and batteries, while often overlooked as a clean energy investment, play a critical role in improving the efficacy of renewable energy.
- An investment in alternative energy can provide investors with growth potential while satisfying any ESG preferences.

As world governments and corporations become increasingly focused on moving away from fossil fuels and mitigating carbon emissions, an environmentally friendly energy transition has begun to take shape. Alternative energy is poised to become an important part of the US and global energy landscape. From an investment perspective, clean energy presents an opportunity for investors to add growth and diversification to their portfolios while participating in the push towards a carbon-neutral world. This report provides an introduction to the <u>Ardour Global Alternative Energy Extra-Liquid Index</u> (AGIXL), an overview of current trends in the industry, and key considerations for investing in the alternative energy space. AGIXL serves as the underlying index for the VanEck Vectors Low Carbon Energy ETF (SMOG).

# Introducing AGIXL.

The <u>Ardour Global Alternative Energy Indexes</u> were the first global alternative energy indexes available, providing international, alternative energy exposure. AGIXL represents the investable subset of the broader <u>Ardour Global Alternative Energy Composite Index</u> (AGIGL) through the inclusion of minimum liquidity requirement for at least 90% of the index by weight. The table below provides a summary of AGIXL's top ten constituents as of November 13, which represent 67.8% of the index by weighting. The majority of the index's 30 constituents are US-listed securities, but 31.5% of the index by weighting is allocated to non-US equities, including companies in Denmark, Sweden, and Canada. In addition to providing broad geographic exposure, AGIXL captures a wide range of clean energy companies. Electric vehicle manufacturers, wind power plant and turbine developers, solar battery storage and microinverter producers, and semiconductor manufacturers are represented in the top ten constituents alone, among other sectors.

Name	Ticker	Country	Primary Business Activity	Index Weight
Nio	NIO	United States	Electric Vehicles	9.56%
Orsted	ORSTED	Denmark	Wind Energy	8.89%
Microchip Technology	MCHP	United States	Semiconductors	8.69%
Vestas Wind Systems	VWS	Denmark	Wind Energy	8.59%
Eaton Corp	ETN	United States	Power Management	7.85%
Tesla	TSLA	United States	Electric Vehicles	7.62%
Enphase Energy	ENPH	United States	Solar Energy	4.77%
SolarEdge Technologies	SEDG	United States	Solar Energy	4.51%
Nibe Industrier	NIBEB	Sweden	Electrical Equipment	3.72%
Plug Power	PLUG	United States	Fuel Cells	3.56%

### AGIXL Top 10 Constituents

Bloomberg as of 11/13/2020

Given the variance in composition among alternative energy indexes, it is important to understand AGIXL within this broader framework. Alternative energy indexes tend to either provide broad clean energy exposure, like AGIXL, or more narrowed thematic exposure focused on one subsector, such as solar, wind, or battery technology. AGIXL provides greater diversification compared to the narrowed thematic indexes. Since many large alternative energy companies, such as Vestas Wind Systems (VWS: 8.59% of AGIXL)<sup>1</sup> and Orsted (ORSTED: 8.89% of AGIXL), are listed on foreign exchanges, most indexes have some international exposure. This provides the dual benefit of geographic diversification and better representation of the entire alternative energy universe. While semiconductor companies or electric vehicle manufacturers are a natural fit for these indexes given their importance to the energy transition, other holdings may either dilute or conflict with the desired clean energy exposure. As an example, while many electric utility companies have committed to increasing their renewable energy exposure to those companies may not align with ESG preferences. Given AGIXL's broad geographic exposure and pure-play alternative energy focus, the index serves as a suitable benchmark for the space.



# What is alternative energy, and why is it important?

While definitions vary, alternative energy, for the purpose of this discussion, is energy that is derived from sources other than oil, natural gas, coal or wood and includes the technologies that are associated with it. Per the AGIXL methodology, this universe consists of five primary sectors: Alternative Energy Sources, Distributed Generation, Energy Efficiency, Enabling Technologies, and Environmental Technologies. Most investors associate alternative energy with renewable energy, which is classified as Alternative Energy Sources. Put simply, renewable energy is energy that is derived from inexhaustible resources. Some forms of renewable energy, such as hydropower, have been a part of the energy mix for centuries, while other clean energy sources, such as wind and solar power, have gained traction around the world more recently due to improvements in technology. Investments in solar and wind energy are accelerating, and significant growth in solar and wind electricity generation is expected going forward. Other renewable energy, sources, which <u>represented</u> 8.7% of total US electricity generation in 2019, include hydropower, geothermal energy, tidal energy, and biofuels. Growth is also expected in these areas both globally and in the US. However, among renewable energy sources, this report primarily discusses wind and solar energy given their prominence in AGIXL. By weighting as of November 13, wind and solar companies represented 24.7% and 14.7% of AGIXL, respectively.

While the majority of electricity in the world is still generated from fossil fuels, namely coal and natural gas, renewables are poised to become increasingly important in the global energy mix going forward. The primary driver for the adoption of renewable energy is the growing focus on reducing carbon emissions, underscored by the <u>Paris Agreement</u>. Adopted in late 2015, the accord aims to limit the global temperature increase to 2 degrees Celsius above preindustrial levels, with an additional goal of keeping the temperature rise as close to 1.5 degrees Celsius as possible, by holding its 197 signees to "nationally determined contributions" to greenhouse gas emissions. In order to prevent further temperature increase, member nations will have to move away from fossil fuels with worse emission profiles, such as coal and oil, and towards low-carbon energy sources. While not an immediate concern, the finite supply of fossil fuels is further support for the broad adoption of alternative energy.

Forecasts from industry organizations help contextualize renewable energy's growth potential over the next several decades. In its 2019<sup>2</sup> World Energy Outlook, the International Energy Agency (IEA), a non-governmental provider of energy analysis, data, and policy recommendations, outlines significant growth in renewable energy, even when using more conservative assumptions around adoption. The organization's Stated Policies Scenario incorporates current stated government policy intentions and targets, while the Sustainable Development Scenario assumes that the global emissions goals established under the Paris Agreement are met. Under the Stated Policies Scenario, renewable electricity capacity is expected to grow 4.9% annually through 2040 as two-thirds of all new global power capacity is renewable. The Sustainable Development Scenario forecasts a more rapid growth rate of 6.8% annually with renewables representing nearly 80% of new power capacity. This was reiterated in the 2020 report, which estimated that 80% of the growth in global electricity demand over the next decade would be met by renewables under the current set of policy goals and intentions. In a report released in November 2020, the IEA <u>expects</u> renewables to become the largest source of electricity generation globally by 2025. By 2040, renewables are expected to account for two-thirds of all electricity generation and over one-third of final energy usage under the Sustainable Development Scenario in the 2019 report.

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# Renewable electricity capacity by region and scenario, 2018-2040

# Source: International Energy Agency's World Energy Outlook 2019

Renewable energy is poised to see significant growth in the coming decades as the world continues to focus on combatting climate change. While further adoption of low-carbon energy policies by governments could help accelerate the transition to clean energy, the use of renewables is expected to grow significantly regardless of government intervention, and investors stand to benefit from these forecasts by investing in the shift to a low-carbon future.

# What are key themes within alternative energy?

The alternative energy story goes far beyond an increase in clean electricity generation and extends to several sectors adjacent to green energy. There are many major trends and themes that investors should understand when becoming acquainted with the alternative energy sector.

# The Growth of Solar Energy

Renewable electricity generation has seen notable growth in recent years and is expected to continue to grow in the coming decades, as seen in the above forecasts from the IEA. However, not all areas of clean energy are equal in this regard. Per the <u>Solar Energy Industries Association</u> (SEIA), solar installations in the US <u>grew</u> at a staggering 49% annually over the last decade. While some of this growth can be attributed to tax benefits and rising demand for clean energy, declining costs have also played a significant role in the rising adoption of solar energy. As clean energy costs decline, it becomes more competitive with traditional forms of power generation and provides consumers with an economic incentive to transition to low-carbon electricity. Installation costs have fallen by nearly 75% during the 2010s from \$5.58/watt to \$1.41/watt, which has supported growing solar installations, as shown in the chart on the following page. Solar photovoltaic (PV) system prices were at alltime lows across market segments in 2Q20, and the SEIA expects prices to be down 5.0% on average for full-year 2020 relative to 2019 levels, which is expected to result in over 37% annual growth and record high capacity installations this year.



Declines in PV Solar Installation Costs Have Driven Growth

The long-term forecasts discussed previously indicate solid momentum for solar energy adoption in the coming years. The IEA <u>predicts</u> that wind and solar will account for nearly all of additional global electricity generation through 2040 under its Sustainable Development Scenario. Under the more conservative Stated Policies Scenario, solar PV alone is expected to represent the largest portion of all power capacity additions in most regions, including 44% in China, 53% in Japan, and 46% in India. The EIA's Annual Energy Outlook tells a similar story for the US. The report's reference case assumes that 117 GW of solar and wind capacity will come online from 2020 through 2023, citing tax credits, state government renewable electricity targets, and declining costs as the primary drivers of growth. For context, the US had 71 GW of <u>solar capacity</u> and 100 GW of <u>wind capacity</u> at the end of September 2019. Both large-scale and small-scale solar capacity installations are expected to continue to grow due to ongoing cost declines through 2050, even as wind capacity additions slow in contrast.

Solar is unique among renewable energy sources in that smaller-scale residential projects are a key part of the market. PV solar panels can be installed on roofs, sometimes accompanied by battery storage, to meet the electricity needs of a single family. This year was expected to be a banner year for US residential solar instillations, with 810 megawatts (MW) of capacity installed in 1Q20 according to a report from the SEIA and Wood Mackenzie. Despite colder weather historically resulting in lackluster 1Q data, this was a record-breaking quarter for residential solar representing a 31% year-over-year installation increase. However, the impact of COVID-19 began to show up in the data in mid-March as states initiated stay-at-home orders. Residential installations fell 23% for 2Q20 on a sequential basis as a result of stay-at-home measures. Despite this setback, 2020 may still be an important year for residential solar. On October 8, Sunrun (RUN: 2.58% of AGIXL), the market share leader in residential solar, completed its \$3.2 billion enterprise value all-stock acquisition of Vivint Solar, which was the third largest residential solar player prior to the transaction. This increased RUN's market share from roughly 9% to 15%. RUN estimates that only 3% of US homes are equipped with solar panel systems despite the majority of Americans supporting use of solar power, leaving significant room for growth for the new combined company and other residential solar developers. As of November 13, RUN's share price has increased by 301.2% year-to-date.

Source: SEIA/Wood Mackenzie Power & Renewables US Solar Market Insights 3Q20



### The Transition to Electric Vehicles

The rise of electric vehicles (EV) may be the most widely recognized indicator of the shifting energy landscape. While an EV may not have tailpipe emissions, the electricity used to charge the vehicle currently may not be as clean. However, as renewable energy's share of global electricity generation grows, so will the portion of election vehicles that get their charge from clean energy. As a result, the adoption of EVs will have major implications for the energy landscape and green investment going forward. Investors have recognized this trend already. In July, Tesla (TSLA: 7.62% of AGIXL) overtook Toyota (TOYOF) as the world's largest automaker by market capitalization, and the company is set to join the S&P 500 index on December 21. Chinese EV manufacturer Nio (NIO: 9.56% of AGIXL) has seen its stock price jump by over 11x year-to-date as it has emerged as a leader in the Chinese auto market.

Electric vehicles may currently only be a sliver of the global auto fleet, but that share is expected to grow significantly over the next decade. The IEA's <u>Global EV Outlook 2020</u> report applies the World Energy Outlook's Stated Policies and Sustainable Development Scenarios to EV forecasts. In this report, the Sustainable Development Scenario also incorporates the <u>Clean Energy Ministerial's EV30@30 Campaign</u>, which aims to bring the global sales share of EVs to 30% by 2030. Under this set of assumptions, the global EV fleet grows by 30x from 2019 to 2030 and reaches 245 million total EVs. This would result in 1,000 terawatt-hours (TWh) of additional electricity demand, which would increasingly be met with renewable energy sources based on IEA expectations. While the total number of EVs and electricity consumption is lower in the Stated Policies Scenario, as seen in the chart below, both scenarios show a significant growth opportunity for EVs through 2030. However, overall EV penetration remains low with EVs only accounting for 7% of the global market share in the Stated Policies Scenario, leaving ample room for growth in the decades to come.



# Forecasts for Electric Vehicles in 2030

\*Excludes 2 and 3-wheelers. Includes ~46 million and ~74 million plug-in hybrid electric vehicles in the SPS and SDS scenarios, respectively. Includes light-duty vehicles, buses, and trucks. Not to scale.

Source: International Energy Agency, Global EV Outlook 2020. Design: Alerian

Government incentives will likely play a major role in this expected growth in EV adoption. The UK recently <u>moved up</u> its ban on the sale of new petrol and diesel cars from 2035 to 2030 and announced significant funding to support EV charging infrastructure, costs, and battery development. France will also <u>stop</u> the sale of internal combustion automobiles by 2040. The recently passed EU COVID-19 stimulus package also contains several measures designed to boost EV usage. The package <u>calls</u> for the installation of 2 million electric and hydrogen charging stations by 2025 and €20 billion to support cities in the transition to clean public transit. EV costs in the EU are expected to be competitive with that of traditional petroleum vehicles <u>by 2022</u>, further supporting adoption across Europe. In the US, President-elect Joe Biden has <u>proposed</u> greater support for EVs by working with state and local governments to enhance charging infrastructure and restoring tax credits for purchasing EVs.

## The Role of Semiconductors and Batteries

Headlines surrounding alternative energy typically focus on renewable energy projects, electric vehicles, or government regulation. The importance of semiconductors is often overlooked despite the critical role played in facilitating the growth of alternative energy. In short, semiconductors are required to move renewable energy to the electric grid as efficiently as possible. Semiconductors are also directly utilized in solar panels and wind turbines to ensure optimal energy production. Given their critical role in the deployment of alternative energy, semiconductor manufacturers are included in AGIXL. For example, Cree (CREE: 3.16% of AGIXL) produces power devices, silicon carbide and gallium nitride materials, and wide bandgap semiconductor materials used in EVs and solar panels through its Wolfspeed subsidiary. In order to compete with the stability of fossil fuel power generation, alternative energy will rely heavily on semiconductors to efficiently connect green infrastructure to the power grid.

Battery storage plays an equally important supporting role for renewable energy, particularly in regard to solar power. Variability in weather patterns results in inconsistent production from wind turbines and solar panels, requiring storage to continue meeting electricity demand during periods of unfavorable weather. A recent <u>study</u> from three public utility companies called for by the <u>California Public Utilities Commission</u> that assessed the effective load carrying capacity (ELCC)<sup>3</sup> of different energy sources highlights the significant role that batteries will play in ensuring reliable power generation from alternative energy. Based on 2022 estimates, wind power's ELCC jumps from 19.9% to 50.5% when a 4-hour battery storage component is added. The impact is even more dramatic for solar energy given its ability to charge the battery more reliably due to the consistency of sunlight relative to wind. Tracking solar PV<sup>4</sup> will have an ELCC of 6.2% in 2022, but with the addition of battery storage, solar ELCC jumps to 99.8%. Even with battery storage, some baseload power generation, most likely in the form of natural gas, will be required to meet electricity demand for the near future. However, based on the results of this study, battery storage can play a vital role in increasing the reliability of wind and solar energy, helping them compete with and supplement traditional power generation.

One interesting trend surrounding battery storage is the role electric vehicle manufacturers have played in technological improvements. One of the main limitations of EVs today is their range and lack of widespread charging infrastructure. TSLA's Model S Long Range Plus has the longest EPA estimated range for all EVs sold in the US today at 402 miles, which is still <u>short</u> of the internal combustion 2016 model vehicle median of 412 miles. However, improvements in battery technology from EV companies in recent years have benefited both EV range and utility-scale battery storage. In 2017, TSLA <u>installed</u> the world's largest lithium-ion battery at the Hornsdale Power Reserve to support the 315 MW Hornsdale Wind Farm and help remedy a power crisis in Southern Australia. The 100 MW battery was recently <u>expanded</u> by another 50 MW, adding further support for Australia's clean energy transition. Going forward, additional improvements in battery technology among EV manufacturers will not only make EVs more appealing to consumers but will likely help improve clean energy storage as well.

3 // ELCC is a measure of how much of a facility's nameplate capacity can be depended on during peak demand without raising loss of load expectation. Please see page 5 of Report 1 of the study for a calculation example.

<sup>4//</sup> Tracking PV adjusts the positioning of the solar panel throughout the day to best capture sunlight.



# Why invest in alternative energy?

Given the long-term outlook for growth in the sector, many investors have explored an allocation to alternative energy. In addition to playing a part in the energy transition, an investment in clean energy comes with several unique considerations that screen favorably relative to broader equities. This section serves to highlight the key investment considerations and benefits of an allocation to alternative energy using the AGIXL Index to represent the sector.

The nature of renewable energy project contracts can provide companies with a stable stream of cash flows. Generally, renewable infrastructure <u>operates</u> under long-term, fee-based contracts, much like oil and gas pipelines or REIT lease agreements. These contracts may also contain take-or-pay provisions. Under these take-or-pay contracts, the customer agrees to accept a set amount of power from the project and must pay for that specific amount regardless of their actual offtake. This provides investors with an additional layer of cash flow resiliency and protects the project when energy demand is weak. As an example, ORSTED has <u>noted</u> that corporate power purchase agreements for its offshore wind farms off the US East Coast are backed by a roughly 20-year fixed price agreement. Additionally, renewable energy projects are not dependent on the price of a commodity or the operations of a producer, setting them apart from traditional energy infrastructure, which could see lower volumes or reduced growth opportunities when oil or natural gas prices fall.

Performance of alternative energy has been very compelling over the last two years, especially relative to the broader market. The chart below compares the total return of AGIXL to that of the S&P 500 since 2018. Over that time period, AGIXL has nearly tripled the S&P 500's performance, returning 123.7% through November 13. While the S&P 500 was more resilient<sup>5</sup> during the sell-off in 1Q20, AGIXL quickly rebounded and returned to pre-pandemic levels by mid-July. Much of this rally can be attributed to NIO, the index's largest constituent, which has seen its stock price appreciate by over 11x year to date. However, several other constituents, notably TSLA, RUN, and solar PV battery storage and microinverter producer <u>Enphase Energy</u> (ENPH: 4.77% of AGIXL), have also significantly contributed to recent performance.



# AGIXL Has Significantly Outperformed the S&P 500 Since 2018

AGIXL is the underlying index for the VanEck Vectors Low Carbon Energy ETF (SMOG).

Going forward, alternative energy may also benefit from a further focus on Environmental, Social, and Governance (ESG) investing. Including ESG considerations in an investment decision used to be a niche concept, but the trend has been gaining popularity among both retail and institutional investors for some time. Even tech giant Amazon (AMZN) is <u>focusing</u> on ESG investments through its \$2 billion green energy venture capital fund, which aims to invest in energy generation, battery storage, and transportation, among other climatefriendly initiatives. Per the <u>Global Sustainable Investment Alliance</u>, \$17.5 trillion of assets globally were tied to ESG integration as an investment strategy in 2018, representing 69% growth from 2016. This amount will most likely increase in the coming years as interest grows. Roughly 74% of global investors intend<sup>6</sup> to <u>increase</u> their exposure to ESG exchange-traded products in 2020, and 20% of investors plan on allocating 21-50% of their overall portfolios to ESG funds in the next five years, per <u>Brown Brothers Harriman</u>. By lessening the dependence on fossil fuels and reducing global emissions, alternative energy companies are at the center of the ESG movement and stand to benefit from increased interest in sustainable investing.

# Conclusion

The future is bright for alternative energy. Domestic and global forecasts for energy consumption show clean energy sources, particularly solar, wind, and hydroelectric, playing an increasingly vital role in the energy mix in the coming decades as the world focuses on combating climate change and lessening the dependence on fossil fuels. To that same end, semiconductors will play an important role in facilitating the use of alternative energy, while electric vehicles will also be key to cleaner transportation, particularly as power generation tilts more towards renewables. These structural tailwinds support continued growth opportunities for alternative energy, adding to a compelling investment case that also screens attractively from an ESG standpoint. For investors, alternative energy represents strong growth potential and leverage to the technologies that represent the present and future of global energy.



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