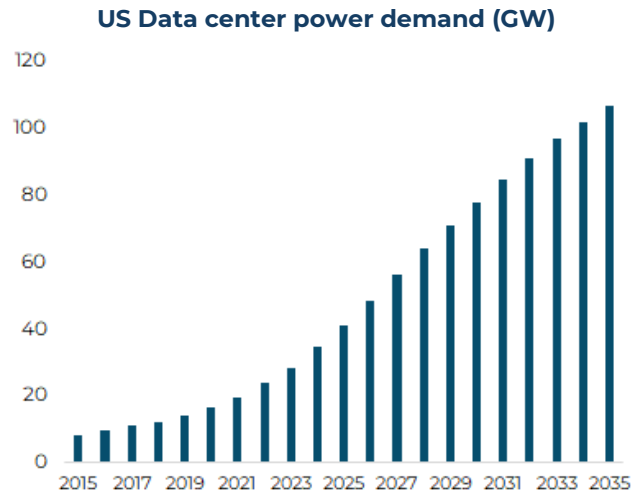


Chart of the Month: Global Renewable Investment

Bloomberg New Energy Finance (BNEF) see power demand from US data centers growing by 106GW over the next decade, up from 41GW in 2025. At the same time, the proliferation of AI means that inference and training will account for nearly 40% of data center capacity, driving up overall utilization from 59% to 69%.



Source: BNEF, November 2025

News

- In another sign of the vast investment required to support accelerating AI growth, Brookfield Asset Management, alongside Nvidia and the Kuwait Investment Authority, has launched a \$100 billion AI infrastructure program. The capital will be used to acquire and develop critical assets including land, power generation, data centers and compute capacity. Brookfield estimates that AI-related infrastructure could require as much as \$7 trillion of global investment over the coming decade, underscoring the unprecedented scale of the build-out. With energy consumption now a central bottleneck for AI expansion, the partnership highlights how securing reliable, large-scale power will be as essential as compute in meeting future demand.
- In November, the U.S. government granted Constellation Energy a \$1 billion loan to restart the Three Mile Island reactor, underscoring its support for the domestic nuclear sector. The move builds on recent federal efforts to rebuild infrastructure, secure supply chains, and accelerate deployment timelines to meet rapidly rising power demand. Constellation is restarting the plant to supply electricity to Microsoft, reflecting a broader trend of reactor restarts and life extensions. It also comes on the heels of last month's announcement of an \$80 billion U.S. government deal with Westinghouse to deploy a new fleet of reactors nationwide.
- In November, British utility SSE announced a £2 billion equity raise to support its five-year, £33 billion investment plan aimed at upgrading the UK's electricity networks and expanding its renewables portfolio. The company expects around 80% of this spending to go toward strengthening its regulated networks business, with the remainder directed to new renewable and flexible-generation assets. The move follows similar capital raises by Iberdrola and National Grid in recent years and underscores the scale of investment required to modernize aging UK infrastructure, integrate renewables at pace, and meet rising electricity demand as the country accelerates its transition to a decarbonized energy system.
- Global electric vehicle (EV) sales increased 23% year-on-year in October, reaching 1.9 million units, according to research house Rho Motion. Sales in Europe experienced the strongest growth, up 36% in the month, with strong demand seen in Germany, France, and the UK. Sales in China reached approximately 1.3 million units, with buying expected to accelerate further ahead of subsidy cuts in the new year. In contrast, the phase-out of North American tax credits has pushed regional sales lower, leaving the market trailing other major regions.

- The International Energy Agency (IEA) released their latest World Energy Outlook, which for the first time included a “Current Policies Scenario” in which oil demand continues to grow through 2050. The report highlighted the strong structural drivers of energy use, including economic growth in emerging markets and rapidly rising electricity demand from industry, mobility and data centers. While renewables and nuclear continue to expand at record pace, they are not yet scaling fast enough to offset demand growth, leaving fossil fuels entrenched in the energy mix.

MANAGERS' COMMENTS

30th United Nations Climate Change Conference (COP30) and the energy transition

This month, we review some of the key outcomes of COP30 and the implications for the energy transition. While the long-held goal of limiting global temperature increases to 1.5°C was reaffirmed, updated nationally determined contributions (NDCs) still imply warming well in excess of 2°C. We assess the conclusions of COP30 and discuss the changes that would be required across the sustainable energy subsectors to deliver a net zero transition.

COP30 concluded on the 21st of November, marking the tenth anniversary of the Paris Agreement and the adoption of global efforts to limit warming to 1.5°C. As part of the Paris Agreement’s five year “ambition-raising” cycle, COP30 also required members to submit their updated nationally determined contributions (NDCs), with mitigation targets and measures to 2035.

While this year’s summit delivered incremental progress in key areas such as adaptation financing and developing emerging frameworks to support a just transition, it ultimately fell short in delivering the material step up in ambition needed to realign global emissions with a 1.5°C scenario. In our view, the absence of a concrete commitment to phase out fossil fuels means that COP30 will ultimately be viewed as a missed opportunity to build on the achievements of previous climate conferences.

However, from the perspective of investing in the energy transition, we found the following developments to be particularly interesting:

Progress on Climate Financing

Climate finance had a lesser role on the COP30 agenda than in previous years, yet the summit delivered a handful of noteworthy developments. Chief among these was a commitment to “at least triple adaptation finance by 2035,” signaling a growing recognition that resilience investment must scale significantly as climate impacts intensify. Delegates also reaffirmed the New Collective Quantified Goal (NCQG) to channel \$300 billion per year in climate finance to developing economies, alongside the release of a report outlining a strategy to mobilize the \$1.3 trillion referenced in the “Baku to Belém Roadmap to \$1.3T.” framework in COP29.

Renewed commitment to renewables and efficiency

Building on the commitments made at COP28, a coalition of more than 80 countries, including the EU and its member states renewed their pledge to transition away from unabated fossil fuels, triple renewable capacity and double energy efficiency by 2030. This reaffirmation of one of COP28’s central outcomes points to the growing recognition of the importance of not only accelerating clean energy deployment, but in driving substantial efficiency gains across buildings, industry and transport.

Within the area of efficiency, there was also explicit action taken with the release of Mission Efficiency’s detailed implementation plan. Mission Efficiency is a global coalition that’s backed by governments, international organizations and industry partners, with the mandate to support delivery of the COP28 goal to double global energy-efficiency

improvements by 2030. Its COP30 plan sets out concrete policy, technology and financing measures to accelerate efficiency gains across the built environment, industry and transport.

As well as the headline announcements, other commitments included:

- **Transition investment:** Members of the Utilities for Net Zero Alliance, a coalition of major power and grid companies, announced commitments to increase transition investment by 25% to \$150bn per annum, split as \$66bn in renewables and \$82bn in grids. The updated investment plan means the members of the Alliance will mobilize more than \$1 trillion in energy transition investments by 2030.
- **Sustainable Fuel:** commitment to quadruple the production and use of sustainable fuels by 2035, endorsed by a group of 23 countries including Brazil, Italy, Canada and Japan.

Recognition of the need to work outside the COP timelines

Another interesting development from COP30 was a willingness among countries, and indeed the presidency itself, to create transition plans and roadmaps outside the formal COP negotiation process. Brazil's commitment to develop voluntary frameworks on fossil-fuel transition and deforestation underscores a pragmatic move toward implementation, even when consensus cannot be reached within the usual negotiating channels. While non-binding, these parallel initiatives can still play a role in advancing clean-energy strategies and accelerating planning cycles.

Implied warming from NDCs, pledges and targets

According to the UN:

- **Updated NDCs still leave the world on a 2.3-2.5°C warming path:** even if all announced unconditional NDCs are fully implemented, estimated global warming will reach 2.3-2.5°C, well above the 1.5°C target of the Paris Agreement.
- **Under existing policies, warming could approach 2.8°C:** existing policies imply a warming trajectory closer to 2.8°C, assuming no further tightening. Even then, many countries are not on track to deliver their 2030 pledges, meaning that temperature rises could exceed 2.8°C.
- **The updated NDCs have had a marginal impact:** The modest improvement from last year's 2.6-2.8 °C (NDC scenario) to 2.3-2.5 °C mostly reflects methodological updates; the underlying ambition increase in new pledges is limited and will potentially be offset by the departure of the US in 2026.

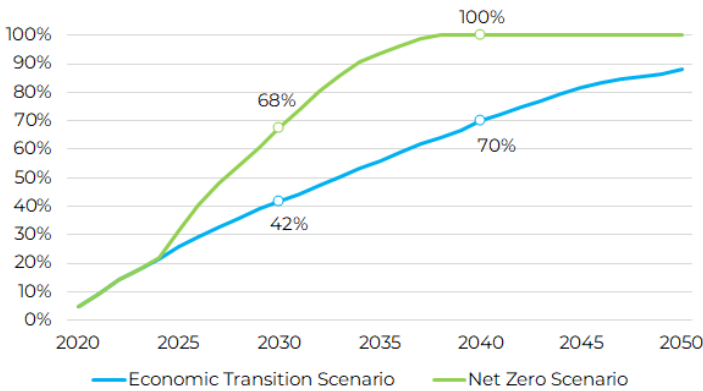
Implications of a net zero scenario

The UN's Emissions Gap Report points to many of the same conclusions as our base-case energy transition scenario. As we understand it, the industry's current capacity and plans to provide decarbonization solutions have accelerated meaningfully in the last decade but still fall short of the level required to meet the goals of the Paris Agreement. We highlight the following changes across our subsectors that would be required to deliver a net zero transition:

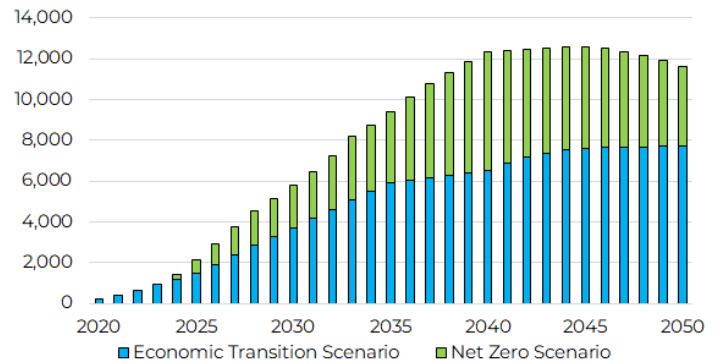
- Within **efficiency**, the IEA estimate that annual energy intensity improvements must quadruple from ~1% in 2024, and average 4% per year throughout the rest of the decade. For buildings, this means that efficiency investments grows from \$240bn today to reach \$600bn per year to 2035. For transport and industry, average energy efficiency investment must nearly double, reaching ~\$160bn and ~\$70bn per year. It is worth noting that our base case scenario already assumes significant energy efficiency gains with world energy demand forecast to grow at 1% per year, half the historic rate of 2% per year.

- **Alternative fuel** production growth would need to more than double by 2030 from 2023 levels (implying 11% per year growth) and then double again by 2050. Sustainable Aviation Fuel (SAF) would need to grow from 0.3% of global jet fuel in 2024 to around 10% in 2030 (substantially higher than our base case 2030 estimate of around 2%), before reaching 20% in 2050.
- For **electric vehicles** and **batteries**, BNEF estimate that in a net zero scenario, global EV penetration rates must hit 68% by 2030 with 100% of vehicles sold being electric by 2040 (versus their current 'base case' economic transition estimates of 42% and 70% respectively). This translates into global battery demand of 11.6 TWh (terawatt hour) in 2050 compared to 1.2 TWh in 2024, almost 50% higher than their base case assumptions.

EV sales penetration forecasts (%)



Lithium-ion battery demand forecasts (GWh*)



Source: BNEF, Guinness Global Investors, December 2025

*gigawatt hour

- **Solar** and **wind** installed capacity would need to triple 2022 levels by 2030. In doing so, renewable generation would see its share of total generation increase from 32% to 75% by 2035. While investment levels in solar are almost in line with a 1.5°C scenario, IRENA estimate that investment levels in onshore and offshore wind need to be scaled up by 3x and 8x respectively.
- For **power grids**, the International Renewable Energy Agency (IRENA) estimate that net zero would require annual investment to almost double by 2030, reaching ~\$620bn per year. As it stands, only 16% of grid investment in 2024 was directed towards new connections, with the majority going towards replacing aging assets (44%) and reinforcing the existing grid (40%). At the same time, investment into battery storage needs to more than triple by the end of the decade, growing from ~\$50bn in 2024 to \$170bn per year in 2030.
- Under a net zero scenario, installed **nuclear power** capacity needs to grow 70% by 2035, adding 290GW of new generation. By 2050, capacity needs to more than double. New installations must also outpace a wall of retirements from power plants installed in the 1970s and 1980s which are approaching the end of their useful life. Current industry ambitions to triple nuclear capacity by 2050 would see global capacity reach 1,240GW, around 160GW higher than the IEA's net zero capacity target and would require an additional \$900bn of investment.
- According to the IEA, energy **investment** in the net zero scenario would need to increase from about \$3.3trn to \$5.6trn by 2035. Overall investment in the power sector would need to almost double by 2035, reaching \$2.5trn, with the bulk of that investment (\$1.3trn) going toward renewable generation.

Energy displacement: efficiency and alternative fuels

It is a common misconception that achieving rapid growth in renewable power generation will be enough to deliver government targets for pollution, energy security and decarbonization. Renewable power generation is a key part of the solution, but we see the displacement and more efficient use of existing energy sources as just as critical, and arguably more urgent, in achieving these goals. The IEA refers to the theme of energy efficiency as being the 'first fuel' that should be considered in delivering the energy transition. It is the one energy source that every country can access in abundance today.

In our base case, we assume global energy demand growth over the next 30 years of around 1% per annum. This assumes significant efficiency improvements relative to a historical energy demand growth rate of around 2% per annum. Within the energy displacement sector, the key areas of focus are **efficiency** and **alternative fuels**.

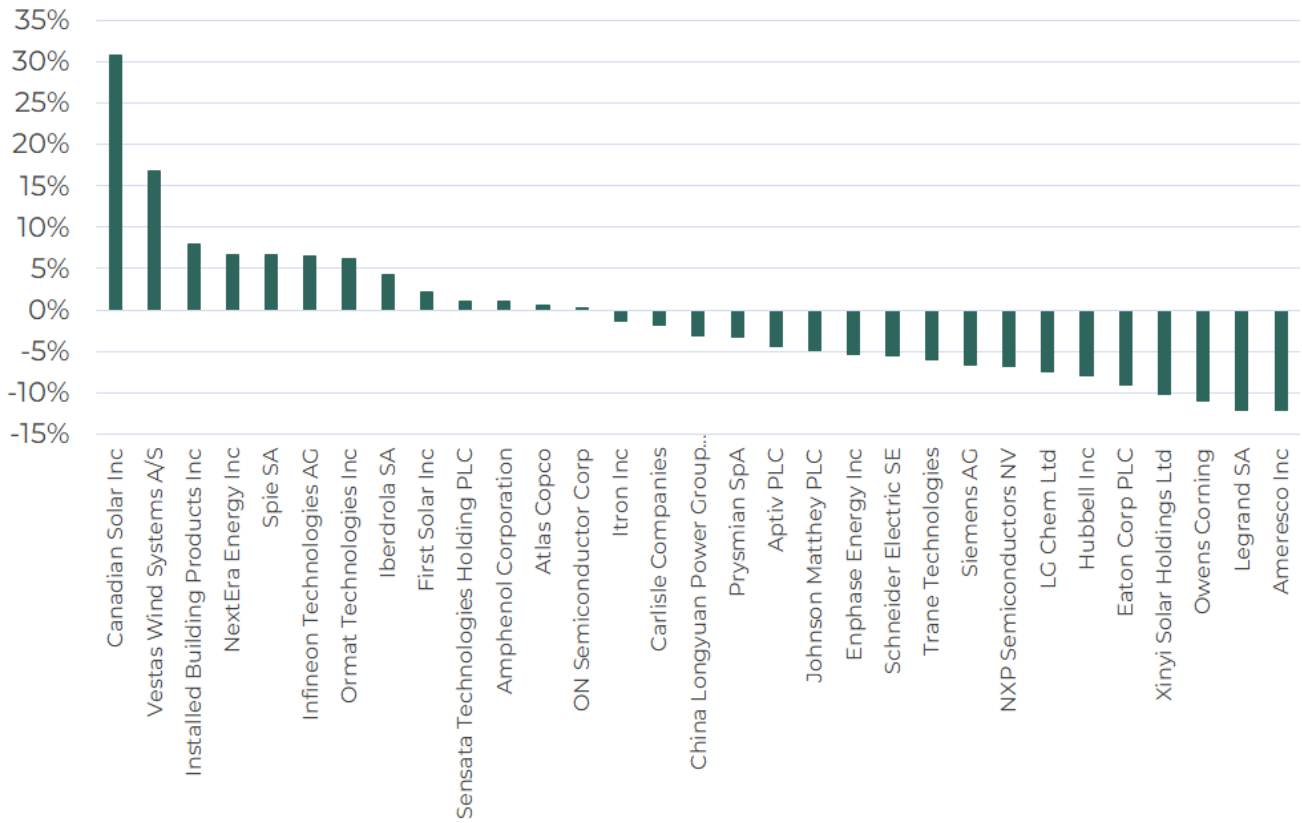
Conclusion

Investment in the energy transition continues to accelerate, even if current spending remains short of what's required for a net-zero pathway. COP30, together with this analysis, offers a timely reminder of the scale of capital still needed to realign global emissions with long-term climate goals. Encouragingly, with investment continuing to grow, the backdrop for sustainable energy investing remains constructive.

PERFORMANCE

Within the Fund, the strongest performers were Canadian Solar Inc, Vestas Wind Systems A/S, Installed Building Products Inc, NextEra Energy Inc and Spie SA while the weakest performers were Ameresco Inc, Legrand SA, Owens Corning, Xinyi Solar Holdings Ltd and Eaton Corp PLC.

Stock by Stock performance over the month, in USD



Source: Bloomberg. As of November 30th 2025

GAAEX

Guinness Atkinson Alternative Energy Fund
December 2025 Update



| As of 11/30/2025 | YTD | 1 Year | 3 Years | 5 Years | 10 Years |
|----------------------------|--------|--------|---------|---------|----------|
| GAAEX | 27.63% | 16.80% | 0.55% | 3.53% | 8.49% |
| MSCI World Index NR | 20.12% | 16.99% | 19.09% | 12.89% | 11.87% |

| As of 9/30/2025 | YTD | 1 Year | 3 Years | 5 Years | 10 Years |
|----------------------------|--------|--------|---------|---------|----------|
| GAAEX | 24.06% | 3.91% | 6.01% | 7.05% | 8.41% |
| MSCI World Index NR | 17.43% | 17.25% | 23.69% | 14.40% | 12.42% |

All returns after 1 year annualized.

Inception 03.31.2006 Expense ratio*1.10% (net); 1.76% (gross)

Performance data quoted represents past performance; past performance does not guarantee future results. The investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. Current performance of the Fund may be lower or higher than the performance quoted. Performance data current to the most recent month end may be obtained by visiting www.gafunds.com or calling 800-915-6566.

* The Advisor has contractually agreed to reduce its fees and/or pay Fund expenses (excluding Acquired Fund Fees and Expenses, interest, taxes, dividends on short positions and extraordinary expenses) in order to limit the Fund's Total Annual Operating Expenses to 1.10% through June 30, 2028. To the extent that the Advisor absorbs expenses to satisfy this cap, it may recoup a portion or all of such amounts absorbed at any time within three fiscal years after the fiscal year in which such amounts were waived or absorbed, subject to the expense cap in place at the time recoupment is sought, which cannot exceed the expense cap at the time of the waiver. The expense limitation agreement may be terminated by the Board of the Fund at any time without penalty upon 60 days' notice.

Top 10 Fund Holdings as of 11/30/25:

| | |
|---------------------------|-------|
| 1. Amphenol Corp | 5.33% |
| 2. Legrand SA | 4.89% |
| 3. Iberdrola SA | 4.72% |
| 4. Nextera Energy Inc | 4.50% |
| 5. Prysmian SpA | 4.45% |
| 6. Siemens AG | 4.29% |
| 7. Ormat Technologies Inc | 4.28% |
| 8. Schneider Electric SE | 4.23% |
| 9. Hubbell Inc | 4.18% |
| 10. Eaton Corp PLC | 4.13% |

MSCI World Index captures large and mid cap representation across 23 Developed Markets countries. With 1,546 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.

The MSCI World Index (Net Return) measures the performance of large and mid-sized companies across 23 Developed Markets countries. It reflects both share price movements and dividends, with dividends reinvested after accounting for local withholding taxes.

Capital expenditure (capex) are funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment.

Fund holdings and/or sector allocations are subject to change at any time and are not recommendations to buy or sell any security.

One cannot invest directly in an index.

Earnings Growth is not a measure of future performance.

Opinions expressed are subject to change, are not guaranteed and should not be considered investment advice.

The Guinness Atkinson Alternative Energy Fund's investment objectives, risks, charges and expenses must be considered carefully before investing. The statutory and summary prospectuses contain this and other important information and can be obtained by calling 800- 915-6565 or visiting www.gafunds.com. Read and consider it carefully before investing.

The Fund invests in foreign securities which will involve greater volatility and political, economic and currency risks and difference in accounting methods. The risks are greater for investments in emerging markets. The Fund also invests in smaller and mid-cap companies, which will involve additional risks such as limited liquidity and greater volatility than larger companies. The Fund's focus on the energy sector to the exclusion of other sectors exposes the Fund to greater market risk and potential monetary losses than if the Fund's assets were diversified among various sectors.

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