



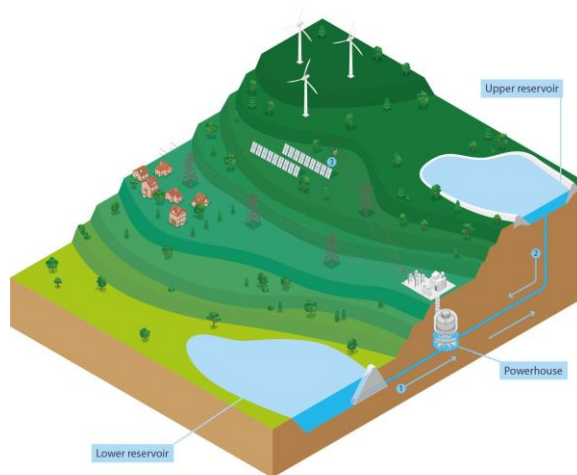
## PUMPED STORAGE IS THE FUTURE OF HYDROELECTRIC POWER. ANDR, DUK, AND GE ARE THE WINNERS

**Key takeaway:** Traditional hydroelectric power, while effective and low-cost, faces limitations like geographical constraints, environmental impact, inflexibility, and lack of storage capability. Pumped Storage Hydropower (PSH) overcomes these challenges and is proving essential in today's energy landscape marked by growing and intermittent demands. Globally, PSH's potential is expanding, with significant developments in countries like the USA, China, and India, and a projected market growth from \$348.3 billion in 2023 to \$554.2 billion in 2030. Companies like DUK, GE, and ANDR are primed to benefit from this trend.

**Traditional Hydroelectric power plants, while highly effective and low cost, have prevented their deeper penetration.** In the renewable energy space, traditional hydropower has long been a cornerstone, harnessing the natural flow of water to generate electricity. However, as the world grapples with the escalating demands of an ever-growing population and the erratic nature of renewable energy sources, the limitations of traditional hydropower have become increasingly apparent. Traditional hydropower relies on the consistent flow of water from higher to lower elevations to generate electricity. This dependence poses several limitations:

- **Geographical constraints:** Suitable locations are often remote, requiring extensive transmission infrastructure to deliver electricity to urban centers.
- **Environmental impact:** The construction of large dams and reservoirs can lead to significant ecological and social disruptions, including habitat destruction and community displacement.
- **Inflexibility in production:** Traditional hydropower is subject to fluctuations in water availability due to seasonal changes and climate variability, leading to inconsistent power generation.
- **Lack of storage capability:** Conventional hydropower cannot store energy for later use, making it less adaptable to fluctuating demand.

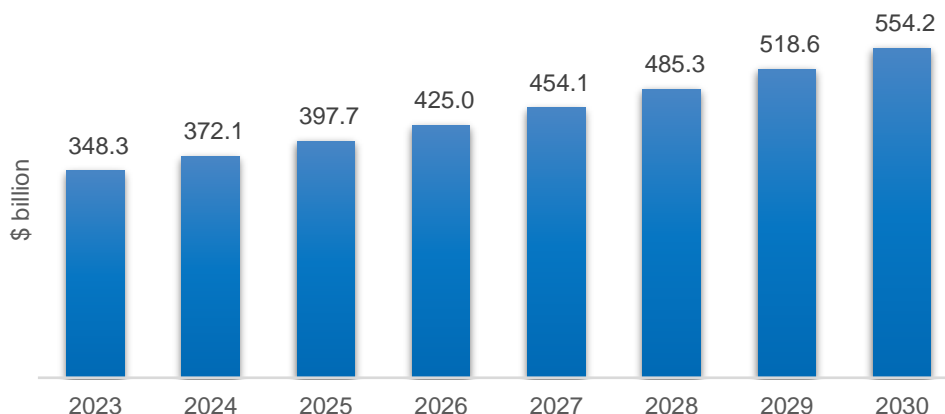
### Chart 1: Illustration of Pumped Storage Hydropower System



Source: Intro-act, International Hydropower Association

**Pumped Storage Hydropower (PSH) systems can overcome the constraints of conventional hydropower methods.** A PSH system involves two water reservoirs at different elevations and operates on a simple yet effective principle: using excess energy to pump water to the higher reservoir and releasing it back to generate electricity when demand peaks. The modern energy landscape is marked by a growing demand and an increasing reliance on intermittent renewable energy sources. PSH provides a buffer against the unpredictability of these sources. By storing excess energy during periods of low demand or high renewable output and releasing it during shortages or peak demand, PSH ensures a consistent and reliable energy supply. As the limitations of traditional hydropower become more pronounced in the face of evolving energy demands, the role of PSH in ensuring grid stability, energy storage, and environmental sustainability is becoming increasingly crucial.

**Chart 2: Global Pumped Hydro Storage Market (2023-30, CAGR: 6.9%)**



Source: Intro-act, Coherent Market Insights

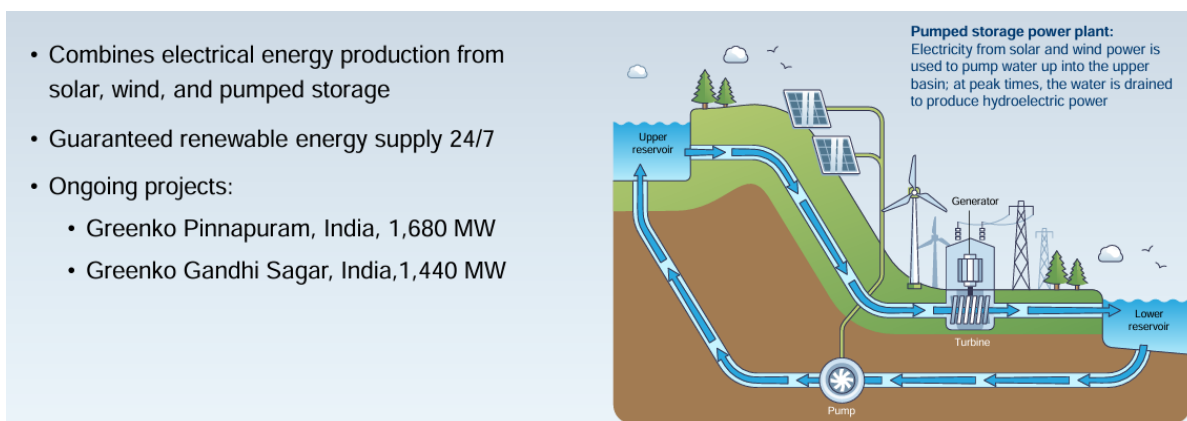
**PSH offers a \$550 billion TAM and stands out as a well-established, low cost, and reliable technology with significant potential for energy storage.** PSH often presents a more cost-effective option for large-scale storage compared to alternative energy storage methods. Its efficiency in energy conversion and longevity are key advantages, making it suitable for both short-term and long-term energy storage needs. Globally, the prospects for PSH are on the rise, even in regions with limited traditional hydropower potential. In 2021, the Australian National University released the first global atlas of off-river PSH opportunities. This atlas pinpointed over 500,000 potential sites, offering a collective storage capacity of 23 million GWh — equivalent to the planet's yearly electricity usage. A separate study estimated the global energy storage capacity at costs below US\$50/MWh to be 17.3 million GWh, covering about 68% of global electricity consumption in 2021. In the U.S., the National Renewable Energy Laboratory (NREL) suggests the potential for up to 2,300 GW of 10-hour PSH storage capacity. China has ambitious PSH objectives, with an aim to achieve over 62 GW by 2025 and 120 GW by 2030. Meanwhile, in India, the government has recognized the potential of PSH, revising its capacity estimate to 103 GW, with current operational capacity at 4.7 GW. The strong potential of this technology is also reflected in its growing market size. According to Coherent Market Insights, the global Pumped Hydro Storage market is expected to grow from \$348.3 billion in 2023 to \$554.2 billion in 2030.

**We believe that sustainability-focused utilities that are leveraging PSH, and technology providers who can set-up PSH operations are best placed benefit from this trend.** The growing adoption of PSH is likely to propel several companies that are involved in promoting sustainable energy infrastructure. First, utility and energy companies, such as Duke Energy (NYSE: DUK) and EDF (EPA: EDF) that own and operate large-scale PSH projects or have them in their development pipeline could see direct benefits. Second, companies specializing in the engineering and construction of hydroelectric facilities, including PSH, such as General Electric (NYSE: GE) and Voith (Private), are integral to the development of these projects, and can get new contracts. Third, renewable energy developers such as NextEra Energy (NYSE: NEE) and Iberdrola (BME: IBE) that focus on renewable energy projects may integrate PSH into their portfolios

as a complementary technology and can benefit from the growth of this technology. Finally, technology and equipment providers, such as Andritz (VIE: ANDR) and (SWX: ABBN) that manufacture turbines, generators, and other equipment necessary for PSH systems, will also benefit from the growth of this market.

- **Andritz AG (VIE: ANDR)**, an Austrian-based multinational group, has a robust global presence, particularly in the hydropower, pulp and paper, metals, and solid/liquid separation industries. The company is renowned for its wide-ranging product and service offerings, including systems, equipment, and services for various sectors. Andritz's hydro division stands out for its deep commitment to pumped storage hydropower (PSH), providing cutting-edge electromechanical equipment and services for PSH plants worldwide. This focus on PSH underscores Andritz's dedication to sustainable energy solutions, leveraging its expertise to enhance energy storage and grid stability, and positioning itself as a key contributor to the renewable energy sector. In 3Q23, the company reported a revenue of EUR 2.1 billion, up 11.3% from EUR 1.9 billion, a year ago. The EBITDA margin improved from 8.1% to 8.4%, while ANDR's net profit increased by 23.8% to EUR 124.8 million.

**Chart 3: Intelligent 24/7 Green Energy Supply Illustration by Andritz**



Source: Intro-act, ANDR Investor Presentation

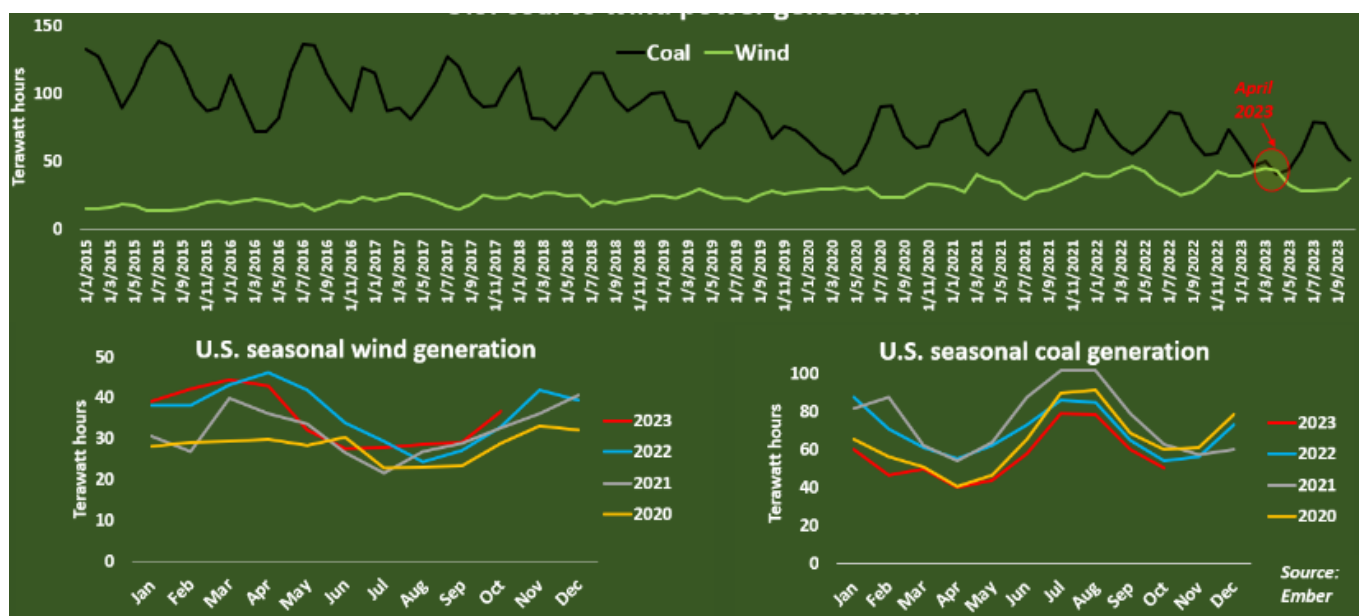
- **General Electric (GE)** commands a vast operational footprint across diverse sectors including aviation, healthcare, power, and renewable energy. Its product and service segments are wide-ranging, encompassing advanced technology and equipment manufacturing sophisticated digital solutions. In the renewable energy space, GE exhibits a strong focus on pumped storage hydropower (PSH). The company is a leader in providing essential PSH technology, including hydro turbines and generators, as part of its efforts toward developing sustainable energy solutions. GE is a world leader in pumped storage plant equipment and supplies in-house capabilities not only for turbines and generators but also the full electrical balance of plant, with an 80% overall cycle efficiency. GE Renewable Energy has the largest installed base of hydropower storage units in operation and 30%+ of hydro storage plants are equipped with GE technology. The company recently released its 4Q23 and Full year results, reporting a quarterly revenue of \$19.5 billion, growing 15% y/y. The renewable energy segment of the company clocked \$4.2 billion in revenue and showed a growth of 23% y/y. The company has an order book of \$22.6 billion for its renewable energy segment, as of December 31, 2023.
- **Duke Energy (NYSE: DUK)**, a prominent U.S.-based energy company, holds a significant position in the utility sector with a broad geographic footprint, primarily in the Southeast and Midwest regions. Offering a diverse array of products and services, the company specializes in electricity generation, transmission, and distribution. A key player in sustainable energy solutions, Duke Energy focuses on the PSH market by leveraging this technology to enhance energy storage and grid stability. Duke Energy operates two pumped-storage plants – Jocassee and Bad Creek. Duke Energy's first pumped-storage plant, Jocassee Hydroelectric Station, was completed in 1975. This was followed by Bad Creek Hydroelectric Station, which began commercial operation in 1991.

## CLEANTECH NEWS

### INDUSTRY TRENDS

**US wind power generation on course to surpass coal.** The United States' wind power generation is poised to surpass coal-fired electricity production, potentially by 2026, due to a surge in wind supply growth while coal-fired generation diminishes. Despite coal being the second-largest electricity source after natural gas, wind output is rapidly increasing, set to outstrip coal in the U.S. energy mix. In the last decade, coal-fired capacity decreased by 30%, while wind capacity increased by over 90%, making wind power the primary source of clean electricity. By the end of 2023, wind output might only trail coal by 50%, as wind generation typically intensifies in late months. [Read More](#) (Reuters)

Chart 4: US Coal vs Wind Power Generation



Source: Intro-act, Ember, Reuters

**COBRA project researchers develop cobalt-free lithium battery for the automotive industry.** Researchers from the Catalonia Institute for Energy Research (IREC) and CIDETEC Energy Storage, along with seventeen European partners, have developed Spain's first cobalt-free lithium-ion battery prototype under the COBRA project. This prototype, in its pre-commercial phase, features a cobalt-free cathode, anode composite from recycled silicon, and a carbonate-based electrolyte with flame-retardant additives. [Read More](#) (Green Car Congress)

**BYD closing in on top spots in battery & EV production vs. CATL, Tesla.** BYD, a major EV battery supplier, reached a noteworthy achievement with the production of its 6 millionth new energy vehicle (NEV) in November. Competing with CATL in EV battery production, BYD excels in manufacturing lithium iron-phosphate batteries, positioning itself as a strong contender in the market. The company aims to surpass Tesla as the world's largest EV manufacturer by the end of 2023, leveraging its dual role as an EV and battery maker. [Read More](#) (Battery Tech Online)

**Report: Solar poised for record-setting 2023 as economic challenges mount.** In Q3 2023, the U.S. solar industry expanded significantly, adding 6.5 GW of capacity, a 35% YoY increase, driven by federal clean energy policies. Forecasts from the U.S. Solar Market Insight Q4 2023 report project a record 33 GW to be added in 2023. Despite economic challenges, solar energy is expected to dominate the U.S. grid by 2050. However, regulatory hurdles, economic constraints, and supply chain issues pose growth obstacles. [Read More](#) (Solar Builder)

**Global wind power outlook takes hit from US weakness, China slowdown.** According to consultancy Wood Mackenzie, the global wind power sector faces reduced growth projections over the next decade due to several key issues. Financial difficulties in the U.S. offshore wind industry and delays in project approvals and execution in China are contributing factors. Major players like Orsted, BP, and Equinor are experiencing setbacks, with significant impairments in their U.S. offshore wind portfolios due to financing challenges and supply delays. [Read More](#) (Reuters)

**Nano One could reduce GHGs by up to 60% for NMC, 50% for LFP and reduce water use by up to 80%.** Nano One's One-Pot Process demonstrates substantial greenhouse gas (GHG) reductions, according to an independent life cycle assessment by Minviro Ltd. The innovative method could potentially cut GHGs by up to 60% for nickel-rich NMC811 and 50% for LFP CAM in lithium-ion battery cathode material production, aligning with global commitments like UN's Climate Change COP21. [Read More](#) (NanoOne)

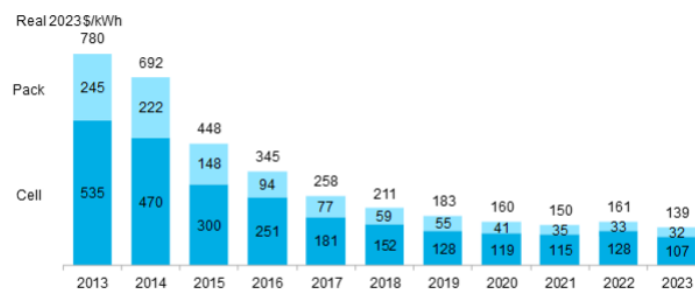
**Germany's budget crisis leaves struggling solar industry in limbo.** Germany's budget crisis jeopardizes planned government aid for domestic solar manufacturers, threatening the industry's survival against cheaper Chinese imports. With a goal to produce 80% renewable electricity, Germany relies on imported components like solar cells from China. Berlin aimed to support local solar production with a €2.5 billion program, but a court ruling blocking the allocation of €60 billion to the climate fund jeopardizes this plan. [Read More](#) (Reuters)

**World's largest concentrated solar power project launched in Dubai.** Dubai inaugurated the world's largest concentrated solar power (CSP) project, part of the 950MW fourth phase of the Mohammed bin Rashid Al Maktoum Solar Park. Led by Noor Energy 1, the initiative integrates a 600MW parabolic basin complex, a 100MW CSP tower, and 250MW photovoltaic solar panels, along with 70,000 heliostats. With a 5.9 gigawatt-hour thermal energy storage capacity and a 263m CSP tower, the project, costing Dh15.8bn (\$4.3bn), aims to power 320,000 homes and reduce 1.6 million tonnes of carbon emissions annually. [Read More](#) (Power Technology)

**Charging times & energy use go way up when charging's free.** The U.S. Department of Energy has revealed that free charging for electric vehicles (EVs) leads to resource congestion and longer wait times at charging stations. Data from June 2020 to June 2023, encompassing 2.4 million charging sessions, shows free sessions are twice as long, consuming double the electricity. EV batteries charge rapidly up to 50-60%, slowing afterward for safety. Charging times decrease significantly after 80%, causing frustration and longer waits. [Read More](#) (CleanTechnica)

**Lithium-ion battery pack prices hit record low of \$139/kWh.** BloombergNEF's analysis reveals a remarkable 14% decline in lithium-ion battery pack prices, hitting a record low of \$139/kWh, attributed to increased production capacity and reduced raw material costs. Despite a projected 53% YoY growth in battery demand for electric vehicles and energy storage, major manufacturers faced lower plant utilization and revenue below expectations, impacting production targets and prices. Notably, China showcased the lowest prices, and the industry's shift to cost-effective cathode chemistry like lithium iron phosphate (LFP) contributed to a 32% reduction compared to lithium nickel manganese cobalt oxide (NMC) cells. [Read More](#) (BloombergNEF)

**Chart 5: Volume-Weighted Average Lithium-Ion Battery Pack and Cell Price Split from 2013-2023**



Source: Intro-act, BloombergNEF

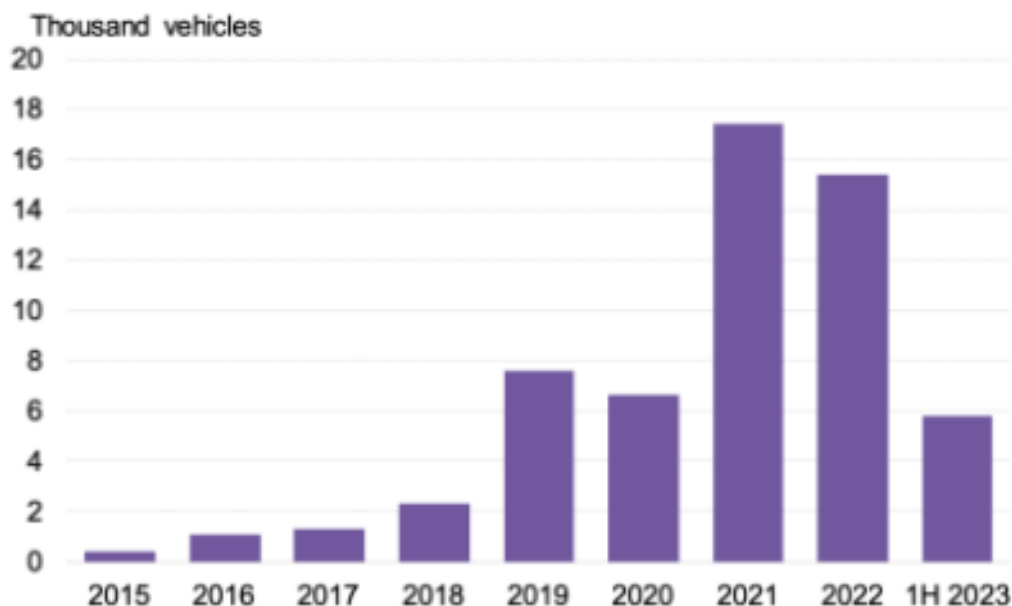
**China solar panel costs plunge in 2023, 60% cheaper than US.** China's significant investments have led to a sharp decline in solar panel production costs, dropping by 42% to as low as 15 cents per watt, giving Chinese manufacturers a notable edge over US and European competitors. The US, concerned about China's burgeoning production, is incentivizing its own solar industry. India, despite rising as a solar power producer with state-driven growth initiatives, still imports a considerable amount of solar modules, primarily from China. Despite a 76% decrease in China's solar module shipments to India, it remains the largest supplier, dominating 80% of the global solar manufacturing capacity. [Read More](#) (Asia Financial)

**Largest BESS in the Netherlands online.** SemperPower has activated its second major Battery Energy Storage System (BESS) in the Netherlands within a month, unveiling the 68MWh 'Pollux' project, the country's largest. Located alongside the slightly smaller Castor BESS, both are on the same site. Alfen, a Dutch system integrator, provided the turnkey solution for the Pollux project, handling civil works, electrical integration, and automation. The Netherlands faces grid congestion and challenges with BESS projects treated as both consumers and producers. [Read More](#) (Energy Storage News)

**SolarEdge sees moderate growth in U.S. solar industry this year.** SolarEdge's CFO, Ronen Faier, predicts a modest growth for the U.S. solar industry in 2024, attributing it to decreasing electricity prices and support from the Inflation Reduction Act (IRA). Faier notes a recent market bottom due to macroeconomic uncertainties in the latter part of the year affecting demand. Anticipating improved demand with lower interest rates, SolarEdge sees incentives from the IRA positively impacting solar economics, particularly in key markets like California. [Read More](#) (Reuters)

**BNEF's charts showing tiny hydrogen vehicle sales.** BloombergNEF (BNEF) released the Zero-Emission Vehicles Factbook for COP28, showcasing a 71-page report. Among the data presented, charts reflecting zero-emission vehicle sales from 2015 to 2023 were notably amusing. The charts compared sales of battery electric vehicles (BEVs) with fuel cell vehicles (FCVs). Over the past decade, BEVs thrived while FCVs struggled. Despite previous debates favoring FCVs, the charts depict a minimal purple line representing FCV sales, highlighting their insignificance in the zero-emission vehicle market. [Read More](#) (CleanTechnica)

### Chart 6: Sales of Hydrogen Fuel cell Passenger Vehicles are Falling



Source: Intro-act, BloombergNEF, Marklines, HYARC, Japan Ministry of Economy, Trade and Industry

**21 gigawatts of US coal to retire in next 3 years, 88–211 gigawatts of solar to join grid.** The latest reports on US power capacity and electricity generation highlight a significant shift towards renewables and away from coal. In October 2023, renewable energy comprises 30.7% of total installed power capacity, a slight increase from 29% in October 2022. Solar power accounts for 10.2%, wind power for 11.3%, hydropower for 7.7%, and nuclear power for 7.8%. Fossil gas, the predominant source, constitutes 42.8%, down from 43.1% in 2022, while coal has decreased to 15.8%. [Read More](#) (CleanTechnica)

**US energy storage installations set new record in Q3 2023.** The U.S. storage market achieved a record-high in Q3 2023, installing 7,322 megawatt hours (MWh) of capacity, a 27% increase quarter-on-quarter (QoQ) in the grid-scale segment. This growth underscores energy storage's pivotal role in the national energy mix, enhancing reliability and security. Despite an 80% project delay, cumulative installations for Q1-Q3 surpassed 2022 totals. Residential installations rebounded with a 29% QoQ increase, led by California, while community, commercial, and industrial (CCI) storage saw a 7% QoQ decline. [Read More](#) (EV Winds)

**Chart 7: Quarterly Storage Deployments (in MWh)**

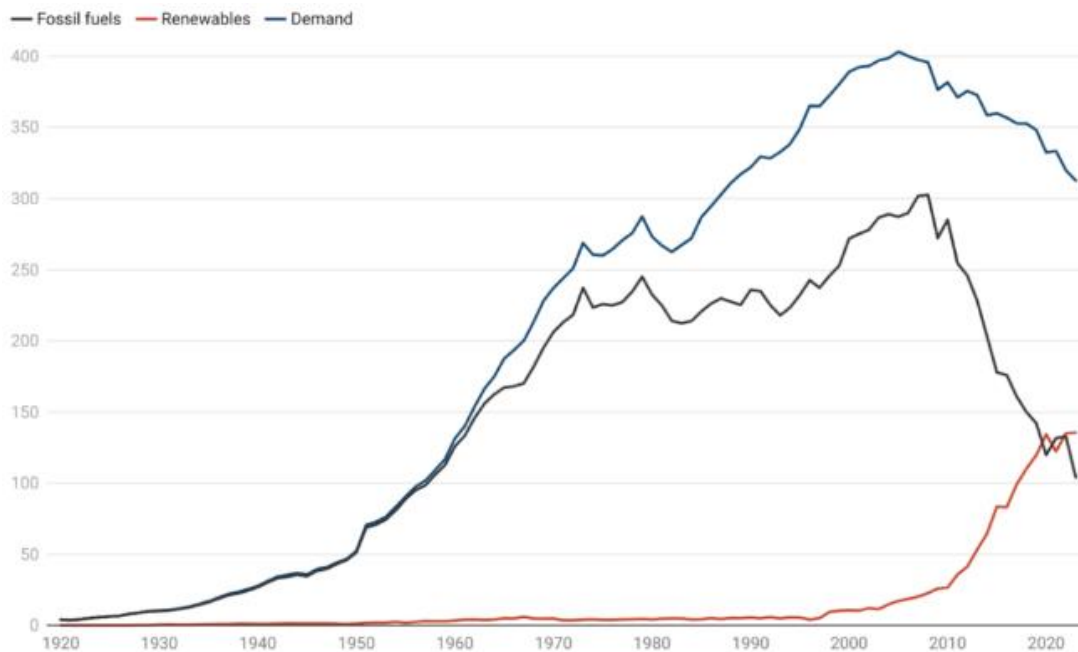


Source: Intro-act, Wood Mackenzie

**Membrane-Free green hydrogen to chase the fossil fuel blues away.** Fossil fuel stakeholders face a threat from green hydrogen technology, challenging their reliance on petrochemicals amid the rise of renewable energy. Although the initial high cost shields fossil energy, advancements, including a membrane-free electrolysis system by H2Pro, are driving down green hydrogen costs. The Israeli startup's breakthrough, backed by investors like Breakthrough Energy Ventures and Sumitomo Corporation, achieves 95% conversion efficiency, avoiding the need for a costly membrane. [Read More](#) (CleanTechnica)

**UK electricity from fossil fuels drops to lowest level since 1957.** In 2023, the UK witnessed a significant 22% YoY drop in electricity generated from fossil fuels, reaching its lowest level since 1957, totaling 104 terawatt hours (TWh). Fossil fuel-generated electricity has plummeted by two-thirds since its 2008 peak, with coal decreasing by 97% and gas by 45%. This decline results from the rapid growth of renewables (up six-fold since 2008) and decreased electricity demand (down 21% since 2008). Fossil fuels constituted just 33% of the UK's electricity supply in 2023, the lowest ever, while low-carbon sources comprised 56%, showcasing progress towards cleaner energy. [Read More](#) (CarbonBrief)

### Chart 8: Annual Electricity Generation by Source (in TWh)



Source: Intro-act, BM Reports, DESNZ, Carbon Brief

**Renewable energy's share on German power grids reaches 55% in 2023.** Germany's renewable energy share on power grids increased by 6.6% to reach 55% in 2023, aligning with the country's goal of achieving 80% green power by 2030. Offshore wind comprised 31.1%, solar 12.1%, and biomass 8.4%, while hydropower and other renewables contributed 3.4%. The rise was attributed to capacity expansion and favorable weather conditions. Economy Minister Robert Habeck noted the achievement, emphasizing the impact of simplified planning and approvals. [Read More](#) (Reuters)

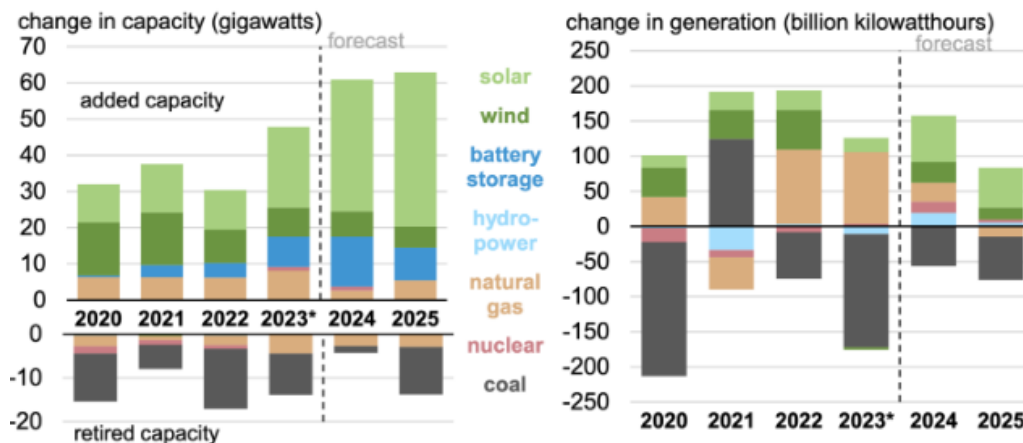
**Electrified transport market outlook 4Q 2023: growth ahead.** In 3Q 2023, global electric vehicle (EV) sales reached 3.7 million units, constituting 18% of total passenger vehicle sales worldwide. BloombergNEF predicts a surge to 14 million EVs in 2023 and 16.7 million in 2024, but anticipates a slowdown due to European regulations, Chinese market saturation, high US interest rates, slow US Big Three automaker adoption, and Tesla's stagnant model lineup. China's 27% YoY growth in 3Q 2023 exceeded 2.2 million EVs, set to reach 8.1 million in 2023, but a 2024 slowdown is expected. [Read More](#) (BNEF)

**'Global surge' in large-scale energy storage deployments predicted this year by EnergyTrend.** Analysis firm EnergyTrend predicts a significant surge in global large-scale energy storage system deployments in 2024. While commercial and industrial storage systems are expected to grow, the focus will be on large-scale battery storage, with up to 53GW/128.6GWh of utility-scale installations. This forecast surpasses BloombergNEF's predictions for 2023. China and the US are projected to be major demand centers, with China's 2024 installs estimated at 24.8GW/55GWh. [Read More](#) (Energy Storage News)

**U.S. EIA: solar will supply almost all growth in u.s. electricity generation through 2025.** The U.S. electric power sector is poised for substantial growth in solar electric generation, reaching 5.6% in 2024 and 7.0% in 2025, up from 4.0% in 2023, according to the January Short-Term Energy Outlook (STEO). The report also anticipates a slowdown in U.S. crude oil and natural gas production growth, though both will set new records. OPEC+ is expected to produce 36.4 million b/d in 2024 and 37.2 million b/d in 2025, below pre-pandemic levels. Gasoline and diesel prices are projected to decrease due to lower refinery margins. [Read More](#) (CleanTechnica)



Chart 9: Annual Change in US Electric Power Sector Capacity and Generation by Source till 2025



Source: Intro-act, US Energy Information Administration

**Biofuel to make up 6% of road transport by 2030, new report.** The International Energy Agency (IEA) projects a surge in biofuel demand, reaching 6% of the predicted road transport energy demand by 2030. This 6% share, equivalent to 5.3 exajoules, is fueled by policies and planned projects, with road transport constituting nearly all liquid biofuels use in 2022, expected to dip only slightly to 98% by 2030. In October, the IEA noted biofuels accounting for 2.2 million b/d of oil demand in 2022, anticipating a rise to 7% of total road transport demand in 2030. [Read More](#) (Biofuels News)

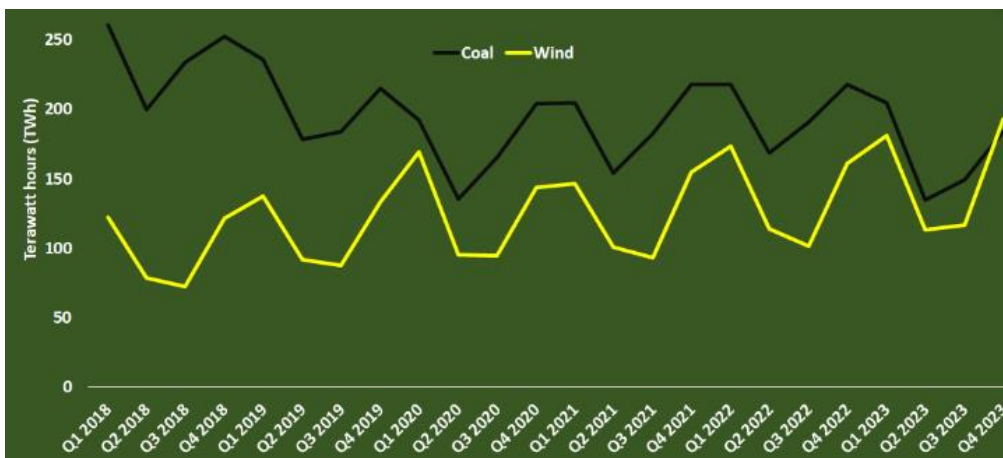
**US developers plan to add 15GW of utility-scale battery storage in 2024.** Developers in the US are set to install 15GW of new utility-scale battery storage in 2023, doubling the cumulative base to over 30GW by year-end, according to the Energy Information Administration (EIA). The EIA's analysis indicates a consistent near-doubling of the installed base for battery energy storage systems (BESS) for the second consecutive year. California and Texas lead in installations, with the latter benefiting from the ERCOT merchant energy storage market, contributing to around half of all new additions. [Read More](#) (Energy Storage News)

**Installation of rooftop solar panels in UK hits 12-year high in 2023.** The UK witnessed a surge in rooftop solar panel installations, reaching the highest level in 12 years, with nearly 190,000 setups in 2023. Concurrently, heat pump installations hit a record high of almost 40,000, a 25% increase from the previous year, totaling over 200,000 certified heat pumps nationwide. The MCS Foundation noted a late spike in heat pump demand following government grants, yet emphasized the need for more substantial growth to meet the 2028 target of 600,000 installations annually. [Read More](#) (The Guardian)

**World's largest green hydrogen plant will take a poke at Russian gas.** Mitsubishi is investing \$690 million in building the world's largest green hydrogen plant in the Netherlands, with an envisioned capacity of 80,000 tons annually—almost 30 times greater than existing facilities. This move aims to address Europe's energy independence challenges, particularly reducing reliance on Russian gas. The project, part of the Eneco Diamond Hydrogen joint venture, plans to use wind and solar power for electrolysis, producing green hydrogen for industrial use and power generation. [Read More](#) (CleanTechnica)

**Wind overtakes coal for electricity generation in Europe.** In the last quarter of 2023, Europe achieved a significant milestone as wind power surpassed coal in electricity generation, with 193 TWh from wind compared to 184 TWh from coal. Despite challenges in the wind sector due to costs, new policies in late 2023 are expected to boost wind generation in 2024. The outlook for coal remains uncertain, especially in Germany, Poland, and Turkey, crucial for Europe's energy transition. While coal use increased in late 2023 due to heating demand, the future depends on economic momentum. [Read More](#) (Reuters)

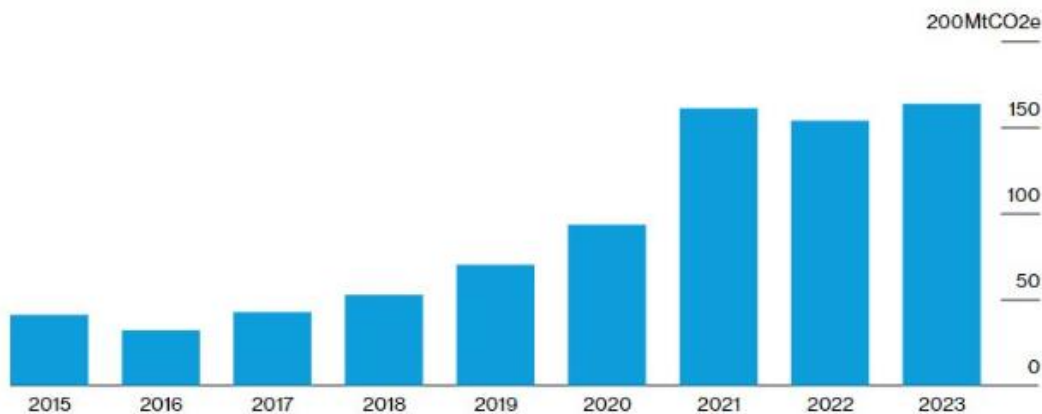
Chart 10: Europe Electricity Generation from Coal and Wind



Source: Intro-act, Ember

**Carbon offset demand hits record in 2023 off huge december.** In 2023, despite a tumultuous year marred by scandals and accusations of fraudulent carbon offset projects, companies purchased and retired a record 164 million offsets, a 6% increase from 2022. The carbon offset market, initially facing a potential second consecutive year of decline, witnessed a December surge with 37 million credits retired, a remarkable 43% higher than the previous record. Notable companies contributing to this surge include Shell, Salesforce, HP, Microsoft, and Nestle. [Read More](#) (BNEF)

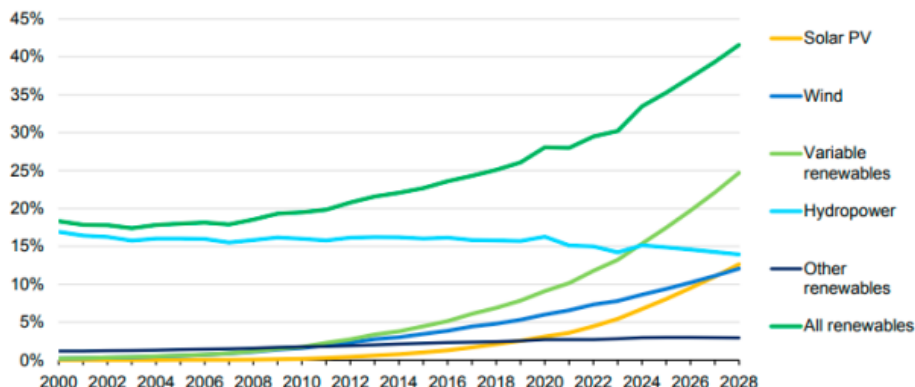
Chart 11: Carbon Offset Retirement by Year



Source: Intro-act, BloombergNEF, Verra, Gold Standard, American Carbon Registry, Climate Action Reserve

**Global renewable capacity surges, setting new records in 2023.** In 2023, global renewable capacity surged by almost 50%, reaching an unprecedented 510 GW, the fastest growth in two decades. Noteworthy increases occurred in Europe, the U.S., Brazil, and notably, China, which commissioned as much solar PV capacity in 2023 as the entire world in 2022. Solar PV dominated, contributing three-quarters of global additions. The International Energy Agency stressed policy implementation for COP28 goals, aiming to triple global renewable capacity by 2030. Despite a trajectory to reach 7,300 GW by 2028, challenges like policy uncertainties and financing need addressing for successful global tripling. China remains pivotal, contributing 60% of new capacity by 2028. [Read More](#) (GreenTech Lead)

Chart 12: Electricity Generation by Technology 2000-2028

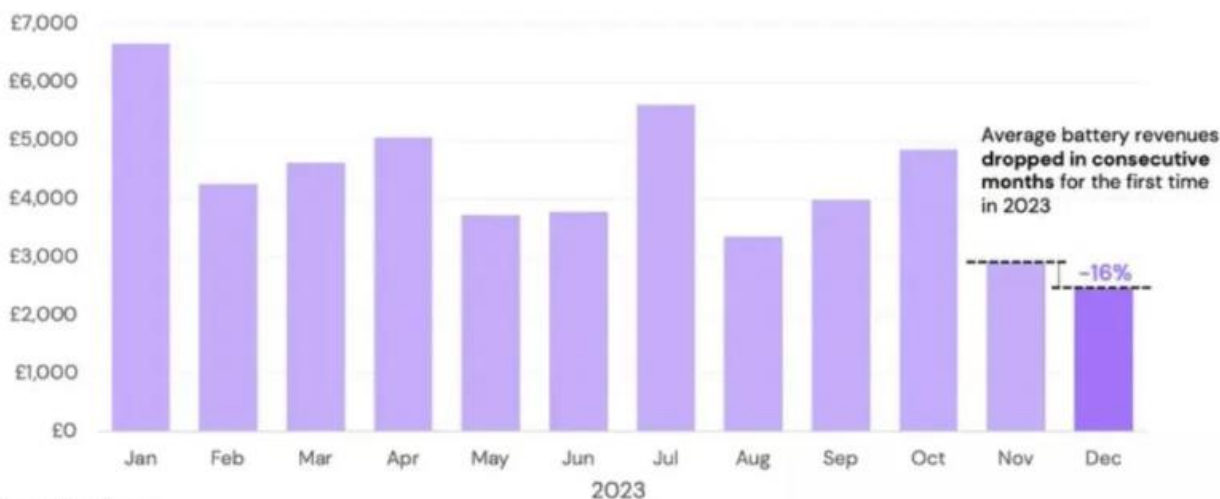


Source: Intro-act, International Energy Agency

**BYD further solidifies its EV dominance with the development of sodium-ion batteries.** Chinese automaker BYD is driving a transformative shift in the electric vehicle (EV) battery landscape by pioneering sodium-ion battery technology in Xuzhou, China. The move seeks to address challenges posed by lithium-ion batteries, such as resource concentration, ethical mining concerns, and safety risks. BYD, originally a mobile phone battery producer since 1995, has diversified into EVs, battery production, and renewable energy solutions. [Read More](#) (Topspeed)

**Modo: Battery storage revenues falls by 16% in December.** In December 2023, Modo Energy reported a 16% decline in average battery energy storage revenue for the balancing mechanism, reaching £2.5k/MW. This trend continued from the launch of the enduring auction capability in November, impacting frequency response revenues. Modo's research revealed that assets over 1.5 hours earned an average of £3.3k/MW, while those under 1.5 hours saw £2.1k/MW. This contributes to a broader market decline, as battery revenues dropped 67% YoY to £51k/MW. [Read More](#) (Solar Power Portal)

Chart 13: Modo Energy BESS Index fell 16% to £2.5k/MW for December 2023



Source: Intro-act, Modo Energy

### REGULATORY UPDATES

**EV tax credit rules would clarify restrictions on foreign-made batteries.** The Treasury and Energy departments proposed rules to define electric vehicles eligible for tax credits, aiming to limit battery materials sourced from adversarial nations like China. However, these proposals fall short of strict interpretations of the climate law, which aims to reduce reliance on entities from China, Russia, North Korea, or Iran. The tax credit, crucial for boosting electric vehicle adoption, requires domestically sourced minerals and North American battery assembly. Temporary transition rules seek to track small amounts of minerals and exempt certain materials until 2026. [Read More](#) (Rollcall)

**Japan plans 10-year tax breaks for EV and chip production.** The Japanese government plans to implement a decade-long tax incentive program, targeting strategic sectors such as electric vehicles (EVs), semiconductors, sustainable aviation fuels, green steel, and green chemicals. Aimed at boosting mass production, the Liberal Democratic Party aims to finalize these measures in the fiscal 2024 tax reform framework. Tax breaks will be linked to production and sales volumes of eligible products, with semiconductor businesses potentially receiving a 20% annual corporate income tax reduction. [Read More](#) (Nikkei Asia)

**First UK green hydrogen funding round awards just half of 250 MW capacity.** The UK government granted funding to 11 electrolytic hydrogen projects in its initial hydrogen allocation round (HAR1), totaling 125 MW, which is half of the proposed capacity. These projects secured at a GBP241/MWh average strike price, supported by over GBP2 billion from the Hydrogen Production Business Model. This pricing is competitive with other emerging technologies like floating offshore wind and tidal stream. Platts estimated the UK's alkaline electrolysis hydrogen production cost at GBP5.36/kg (\$6.79/kg) and GBP6.28/kg for PEM electrolysis. [Read More](#) (S&P Global)

**Biden backs ethanol industry on low-emission aviation fuel tax credits.** The aviation industry, expecting \$20 billion in profits in 2023, grapples with decarbonization challenges due to the difficulty in electrifying its equipment. Sustainable Aviation Fuel (SAF) offers a 50% reduction in emissions but remains pricier than traditional jet fuel, prompting calls for incentives. Biden's administration seeks to bridge this cost gap by endorsing the GREET model for tax credits, drawing attention from ethanol groups eager for recognition. Agriculture Secretary Tom Vilsack highlights the potential of farmers in meeting a 36-billion-gallon market for SAF feedstocks. However, concerns persist about the GREET model's alignment with emissions standards set by the International Civil Aviation Organization (ICAO). The IRS plans updates for GREET, factoring in new emission sources and reduction strategies. [Read More](#) (Reuters)

**India to allow diversion of up to 1.7 million tons of sugar for ethanol.** India has authorized sugar mills to redirect 1.7 million metric tons of sugar for ethanol production to stabilize its biofuel program. Previously restricted due to concerns over production amid droughts in key cane-producing states like Maharashtra and Karnataka, the government has now permitted the use of cane juice and B-heavy molasses for ethanol, effective from October 1 in the 2023/24 marketing year. Officials plan to allocate quotas for sugar mills and distilleries to facilitate this diversion, ensuring adequate sugar supply for local demand. [Read More](#) (Reuters)

**EU clears 17.7 bln Euro Italian state aid scheme for power storage.** The European Commission has approved a 17.7 billion-euro (\$19.4 billion) Italian state aid scheme to bolster the creation of a centralized electricity storage system for renewables. The multi-year plan involves annual payments to storage developers, facilitating the integration of renewable energy into Italy's grid. The scheme enables the storage of excess energy during peak production and its release during scarcity, reducing reliance on fossil fuel-based plants. The Commission deems the plan crucial for accelerating investments in energy storage, aligning with climate goals. [Read More](#) (Reuters)

**US Treasury proposes rules to incentivise clean energy manufacturing.** The US Department of the Treasury and IRS have unveiled proposed rules for the Advanced Manufacturing Production Credit, part of the Inflation Reduction Act, designed to boost local production of clean energy components. The guidelines specify eligible components, including solar and wind energy parts, inverters, qualifying battery components, and critical minerals. The Solar Energy Industries Association praised the announcement, emphasizing flexibility for companies using contracted manufacturing and incentives for optimized inverter systems. [Read More](#) (Renewables Now)

**Yellen says strong demand from Americans to boost cost of clean energy tax credits.** U.S. Treasury Secretary Janet Yellen revealed that the Inflation Reduction Act (IRA) tax credits, aimed at promoting clean energy investments, will surpass initial estimates due to robust demand. Yellen, in Boston to advocate for the green energy tax credits, didn't disclose the updated figure but acknowledged the increase, emphasizing positive responses from the private sector. Some forecasts, like Goldman Sachs', suggest a potential rise to \$1 trillion from the initial \$369 billion over a decade. [Read More](#) (Investing.com)

**EU energy ministers agree to extend price cap on gas until January 2025.** The EU Energy Ministers agreed to prolong the gas price cap until January 2025, a measure initiated in response to the energy crisis causing soaring gas bills and inflation. This move, initially proposed in December the previous year, led to a split among member states. Some, like France and Spain, supported market intervention, while others such as Germany and the Netherlands opposed disrupting established rules. Energy experts criticized the proposal, fearing its impact on free markets and supply distribution signals. [Read More](#) (Euronews)

**Denmark introduces green tax on airline passengers.** Denmark's government has unveiled plans for a green tax on air travel, set to commence in 2025. This tax will be imposed on plane tickets, aiming to promote eco-friendly aviation practices. The country urges other European Union members to adopt similar measures. The tax rates will vary, starting at approximately \$7.35 per passenger for European flights by 2030, escalating for medium and long-haul flights. Revenue generated will fund sustainable fuel adoption in domestic air travel and augment pension benefits. This initiative aligns with Denmark's objective of introducing a fully green-fueled domestic route by 2025. [Read More](#) (EcoWatch)

**Treasury department adopts updated GREET model for SAF tax credit.** The U.S. Department of Treasury and International Revenue Service have permitted the use of an updated version of the Department of Energy's GREET model for calculating lifecycle greenhouse gas (GHG) reductions, qualifying for the Sustainable Aviation Fuel (SAF) tax credit. The credit, established by the Inflation Reduction Act, rewards SAF producers achieving at least a 50% GHG reduction compared to petroleum-based jet fuel. [Read More](#) (Ethanol Producer Magazine)

**EU to investigate Chinese biodiesel dumping allegation.** The European Union initiated an anti-dumping inquiry into biodiesel imports from China following claims by the European Biodiesel Board (EBB) that the influx of Chinese biodiesel has severely impacted EU production. This investigation, set to last 14 months, comes after a prior inquiry into whether Indonesian biodiesel was evading EU duties by passing through China and Britain. The European Commission acknowledged evidence provided by EU producers, citing that the low-priced Chinese imports were harming the local industry. [Read More](#) (Reuters)

**Canada finalizes regulation requiring 100% zero emission new car vehicle sales by 2035.** Canada's government has unveiled a new standard promoting electric vehicles (EVs), requiring annual rises in the percentage of new zero-emission light-duty vehicles, aiming for 100% ZEV sales by 2035. Initially proposed in 2022, it aligns with the 2030 Emissions Reduction Plan, striving for a 40%-45% reduction by 2030. Targets commence in 2026, mandating 20% ZEV sales, escalating to 60% by 2030 and 100% by 2035. [Read More](#) (ESG Today)

**Brazil to raise mandatory biodiesel mix, halt imports.** Brazil's CNPE has decided to accelerate the mandatory biodiesel mix in diesel, advancing blending targets and suspending biofuel imports. These actions aim to bolster the oilseed crushing industry, mostly reliant on soybeans for biodiesel production. CNPE revised the mandatory blend, raising it to 14% by March 2024 and 15% by 2025 from the current 12%. A 1% increase in biodiesel mix equals approximately 1 billion liters more consumption. [Read More](#) (Reuters)

**France sees potential for 14 new nuclear reactors.** France may need over 14 new nuclear power plants, surpassing the current six planned, to achieve its energy transition goal of reducing fossil fuel dependence from 60% to 40% by 2035. Energy Transition Minister Agnes Pannier-Runacher emphasized nuclear's crucial role, stating that the existing nuclear park is not everlasting. The new energy strategy, set for parliamentary debate in late January, aims to be enshrined in law. [Read More](#) (Power Technology)

**UK calls to increase nuclear generation by four times by 2050.** The UK Government has unveiled plans to quadruple its nuclear power capacity to 24GW by 2050, outlined in a road map that includes the construction of a large-scale plant comparable to Hinkley C and Sizewell C. The government asserts nuclear energy is crucial for achieving net-zero emissions. Minister Andrew Bowie acknowledged the expense but deemed it necessary. The announcement coincides with EDF's decision to prolong the lifespan of its existing UK nuclear fleet. [Read More](#) (Power Technology)

### EARNINGS

**PlasCred Circular Innovations Inc. announces Q3 2023 results.** PlasCred Circular Innovations Inc. disclosed its Q3 2023 financial and operational results. Notable highlights include their Verra registration for plastic credit trading, a collaboration with Adelaide Capital to bolster market presence, and progress with their Primus pilot plant, achieving an 80% yield rate in Calgary. The Primus plant undergoes rigorous testing using diverse plastic waste sources, ensuring the technology's effectiveness across various plastics. [Read More](#) (Yahoo Finance)

**Deep Green Waste & Recycling reports record third quarter earnings.** Deep Green Waste & Recycling Inc. (OTC PINK: DGWR) reported robust financial growth for Q3 and nine months ended Sept. 30, 2023. Revenues soared by 145% to \$902,987, attributed to organic growth and recent acquisitions. The company achieved an 82% gross margin, marking significant profitability. Operating income rose to \$327,751 from a previous loss. Although reporting a net loss of \$226,090 due to non-cash derivative liability expenses, the adjusted net income stood at \$227,138. [Read More](#) (GlobeNewswire)

**FuelCell Energy reports fourth quarter and full fiscal year 2023 results.** FuelCell Energy, Inc. released its Q4 and fiscal year results, emphasizing operational success and strategic advancements for future growth. The company achieved milestones with its distributed hydrogen platform in Long Beach, providing renewable energy to Toyota. Collaboration with ExxonMobil in testing carbonate fuel cell technology for carbon capture marked another significant achievement. [Read More](#) (Press Release)

### CAPITAL MARKETS

**Italy's ERG enters US renewable energy market with \$270 mln deal.** Italian renewable energy group ERG (ERG.MI) is venturing into the U.S. market by acquiring two wind and solar assets from Apex Clean Energy for \$270 million. ERG will establish a U.S. holding company with Apex, holding 75% and 25%, respectively. The assets, in Iowa and Illinois, have a combined capacity of 317 megawatts and are expected to generate 1 terawatt hour. ERG plans to reveal its U.S. growth strategy in the first half of the next year. The deal, operationalized by Apex, awaits clearance from U.S. and European authorities and includes collaboration on 1 gigawatt of new projects. [Read More](#) (Reuters)

**BlackRock to invest up to \$400 million in Dubai decarbonisation firm Positive Zero.** BlackRock will invest up to \$400 million in Positive Zero, a Dubai-based decarbonisation company, aiding its efforts to bolster energy transition projects in Gulf countries. Positive Zero, a decentralized infrastructure business, was established by Creek Capital, merging solar company SirajPower, energy efficiency firm Taka Solutions, and battery business HYPR Energy. Creek Capital's co-founders are Mohammed Abdulghaffar Hussain and David Auriou. [Read More](#) (Investing.com)

#### Chart 14: Positive Zero Highlights



Source: Intro-act, Positive Zero

**Indian solar panel maker Waaree Energies to raise \$361 mln in IPO.** India's leading solar panel manufacturer, Waaree Energies, has filed for a \$361 million initial public offering (IPO) to capitalize on the booming stock market and India's push for renewable energy amid rising power demand. The IPO involves the sale of 3.2 million shares, with Waaree Sustainable Finance, the company's major shareholder, offering up to 2.7 million shares. Waaree Energies aims to raise 30 billion rupees by selling new shares, intending to fund a 6 GW manufacturing facility in Odisha. [Read More](#) (Reuters)

**Radial Power raises US\$80 million for commercial and industrial and community solar projects.** Radial Power, a US renewables developer, has secured \$80 million in tax equity financing from Bank of America to advance its 96MW commercial, industrial, and community solar projects in nine states. The funding will support the development and installation of both asset and portfolio-level projects, primarily rooftop solar facilities, such as the 3.4MW project in Austin, Texas, and a 4.7MW facility in Essex, Maryland. [Read More](#) (PV Tech)

**\$800m investment to accelerate Octopus Energy's global clean energy growth.** Octopus Energy Group, a prominent UK power supplier, has secured an additional \$800 million investment, raising its valuation to almost \$8 billion. The funding, led by existing investors like Origin Energy and Tokyo Gas, aims to fuel international expansion and advance low-carbon technologies, particularly heat pumps. Anticipating the creation of 3,000 green jobs in the UK by 2024, founder Greg Jackson emphasizes Octopus Energy's commitment to customer service, technology, and sustainability. [Read More](#) (Press Release)

**ADNOC acquires 10% stake in carbon capture developer Storegga.** ADNOC has acquired a 10.1% stake in London-based carbon capture and storage (CCS) developer Storegga, marking the company's first international equity investment in carbon management. Storegga leads the Acorn CCS project in northeast Scotland, targeting subsurface storage of up to 10 MM metric tons/year of CO<sub>2</sub> by 2030. The recent partnership with Shell, Harbour Energy, North Sea Midstream Partners, and Uniper involves transporting CO<sub>2</sub> captured from Uniper's Grain power station in England to Scotland's Peterhead Port and subsequent storage 2.5 km below the North Sea. [Read More](#) (Offshore Magazine)

**NineDot Energy raises \$225 million in equity financing to build and operate distributed battery energy storage projects.** Manulife Investment Management and Carlyle are bolstering NineDot Energy with an additional \$225 million equity commitment. Manulife leads with a \$135 million commitment, simultaneously acquiring an equity interest. This capital injection is set to propel NineDot's community-scale battery energy storage systems (BESS) projects in the New York City area, supporting Governor Hochul's ambitious energy storage targets. [Read More](#) (Business Wire)

**Soly raises €30 million for intelligent control of solar panels, home batteries and charging stations.** Soly, a solar energy company, secured €30 million in growth capital, aiming to expand globally. The funds support Soly's Soly Brain®, an intelligent system controlling solar panels, home batteries, and charging stations. It optimizes energy consumption, allowing users to earn extra income by leveraging renewable sources efficiently. Co-founder and CEO Patrick van der Meulen emphasizes Soly's mission to make solar energy accessible worldwide. [Read More](#) (Innovation Origins)

**Energy storage startup Tiamat raises €22 million for lithium-free battery tech, backed by Stellantis, Arkema, MBDA.** French battery technology startup Tiamat has secured €22 million in funding to advance its lithium-free sodium-ion battery technology. A spin-off from France's CNRS in 2017, Tiamat specializes in sodium-ion solutions for energy storage, featuring attributes such as rapid charging, durability, high power density, and safety. The technology, utilizing abundant sodium, eliminates lithium and cobalt, addressing sustainability and supply chain concerns. Notable investors in the funding round include Stellantis, Arkema, and MBDA. [Read More](#) (ESG Today)

### M&A

**Nordic Capital acquires majority share in Sesol, a green tech frontrunner within renewable energy.** Sesol, a prominent Swedish solar PV installer, is set for a significant transformation following Nordic Capital's majority share acquisition. Established in 2019, Sesol has rapidly grown, boasting a workforce of over 1,000 and forecasted revenues nearing SEK 3 billion for 2023. Specializing in solar PV, batteries, and EV chargers, Sesol targets residential, agricultural,

and commercial sectors to facilitate the transition to renewable energy solutions, having installed over 500,000 solar panels. Nordic Capital's partnership aims to leverage its expertise for Sesol's organic growth, geographic expansion, and operational enhancement, aligned with its focus on green transition investments. [Read More](#) (Press Release)

**IsoEnergy and Consolidated Uranium complete merger creating a leading, diversified uranium company in tier one jurisdictions.** IsoEnergy Ltd. and Consolidated Uranium Inc. have completed a successful merger, with IsoEnergy acquiring all outstanding shares of Consolidated Uranium. This acquisition results in IsoEnergy holding 100% of CUR Shares not previously owned. Consolidated Uranium becomes IsoEnergy's wholly owned subsidiary. Under this merger, CUR Shareholders received 0.500 IsoEnergy Shares for each CUR Share, totaling approximately 52.2 million IsoEnergy Shares. Additionally, IsoEnergy fulfilled conditions for its private placement offering, converting Subscription Receipts into common shares, backed by key investors. [Read More](#) (GlobeNewswire)

**Ember completes take private of H2O Innovation.** Ember Infrastructure Management, LP has completed the acquisition of H2O Innovation Inc. for \$C395 million. This acquisition, led by Ember and backed by funds managed by Ember, Ontario Power Generation Inc. Pension Fund (OPG), Investissement Québec (IQ), Caisse de dépôt et placement du Québec (CDPQ), and the Company's key executives, marks a new chapter for H2O Innovation. The President, CEO, and co-Founder, Frédéric Dugré, expressed enthusiasm for the partnership, citing the potential for organic growth and strategic acquisitions. [Read More](#) (Business Wire)

**Waste Connections announces agreement to acquire Secure Energy's waste disposal-centric asset divestitures in western Canada.** Waste Connections, Inc. announced its subsidiary's agreement to acquire 30 energy waste treatment and disposal facilities in Western Canada from Secure Energy Services Inc. for CAD\$1.075 billion. The assets include 18 treatment and recovery facilities, six landfills, four saltwater disposal wells, and two disposal caverns. These acquisitions meet requirements from the Canadian Competition Tribunal following Secure's merger with Tervita Corporation. [Read More](#) (PR Newswire)

**Japan's Infroneer to buy Japan Wind Development from Bain Capital.** In a \$1.4 billion deal, Japanese civil engineering group Infroneer is set to acquire Japan Wind Development from Bain Capital. This strategic move aims to bolster Infroneer's presence in the renewable energy sector. Japan Wind Development manages 293 wind turbines primarily in Japan, generating a total capacity of 570,850 kilowatt hours. Notably, it leads the market in wind power generator maintenance. [Read More](#) (The Japan Times)

## COMPANY NEWS

**Rivian planning new R1 battery pack with simplified design and lower costs in 2024.** In 2024, Rivian intends to unveil a new battery pack for its R1 series vehicles, aiming for a simplified design, reduced costs, and enhanced efficiency. Claire McDonough, Rivian's CFO, shared this announcement at the Barclays' 2023 Global Automotive & Mobility Tech Conference. This revamped battery pack promises a lighter structure, cost-effectiveness, and ease of production compared to the current packs. [Read More](#) (Drive Tesla)

**Geothermal lido shuts for winter due to high energy costs.** The UK's first geothermal lido, Penzance's Jubilee Pool, faces winter closure due to unexpected operational costs and heating system inefficiencies. Originally designed for year-round use, the £1.8 million upgraded facility will now operate only in warmer seasons. Geothermal heating, introduced in 2020, maintained a 30-35°C temperature range using warm water extracted from a geothermal well. [Read More](#) (Energy Live News)

**BYD signs deal with local conglomerate to build sodium battery base with 30 GWh annual capacity.** BYD has partnered with Huaihai Holding Group to construct a sodium battery manufacturing base in Xuzhou, China, with a 30 GWh annual capacity, making it the world's largest sodium battery system supplier for microcars. The deal, valued at RMB 10 billion (\$1.4 billion), marks an expansion of BYD's collaboration with Huaihai, aiming to establish a sodium-ion battery production base. [Read More](#) (Batteries News)



**Qcells to supply Microsoft with 12 GW of solar panels in expanded partnership.** Microsoft and solar panel maker Qcells have expanded their solar energy supply deal, aiming to contribute to Microsoft's goal of becoming carbon-negative by 2030. Qcells will supply Microsoft with 12 GW of solar modules and related services over eight years, building on a previous agreement for 2.5 GW of solar panels. The deal supports the companies' aim to diversify the global solar module supply chain and enhance sustainable manufacturing. [Read More](#) (Utility Dive)

**CATL's new skateboard chassis gets a 621-mile CLTC range rating, EV coming in 2024.** CATL, a leading battery manufacturer, unveiled a groundbreaking skateboard chassis, the CATL Integrated Intelligent Chassis (CIIC), boasting a structural battery pack that powers a remarkable 621-mile range for electric vehicles (EVs). This innovation integrates batteries, motors, and key components into a single platform, aiming to streamline manufacturing, cut costs, and optimize interior space. Expected to debut in 2024 through Hozon Auto's Neta brand in China, this chassis might also support non-Chinese EVs. [Read More](#) (Inside Evs)

**Air New Zealand aims to fly battery-powered plane by 2026.** Air New Zealand plans to lead the electric aviation frontier, partnering with Beta Technologies to introduce the ALIA, an electric plane, in 2026. Initially deployed for cargo services with New Zealand Post on domestic routes, the ALIA offers rapid recharging, covers 480km at 270km/h, and operates at altitudes of 3,000m. After safety certification, it will serve 150km routes, with options to expand. This aligns with the airline's emission reduction goals, targeting larger electric aircraft by 2030. Air New Zealand aims to unveil potential ALIA host airports by early 2024, although the passenger flight timeline remains uncertain. [Read More](#) (FMT)

**Epsilon advanced materials to build \$650-million battery anode manufacturing facility in North Carolina.** Indian battery materials manufacturer, Epsilon Advanced Materials (EAM), plans to construct a \$650 million graphite anode manufacturing plant in Brunswick County, North Carolina. Construction begins in 2024, with operations commencing in 2026 and full capacity expected by 2031. Utilizing eco-friendly technology, the plant aims to produce high-capacity EV battery anodes. EAM is coordinating with local suppliers and transport partners to support operations, projecting an output of 50,000 tons of graphite anode annually. [Read More](#) (Charged Evs)

**Xylem unveils new residential electric meter with advanced grid edge capabilities.** The Stratus IQ+ offers utilities enhanced diagnostic capabilities for their distribution systems and a deeper insight into customer electricity usage. With a robust processor and versatile data set options, it provides comprehensive system health checks. Mike McGann, from Xylem Americas, highlights the increasing importance of data for operational resilience and customer engagement. This technology supports emerging grid needs, including electric vehicle (EV) integration. [Read More](#) (Xylem)

**ERG enters the renewables market in the United States, strategic partnership signed with Apex Clean Energy for the acquisition of a 317 MW portfolio of wind and solar plants in Iowa and Illinois.** ERG has entered the US renewable market through a significant partnership with Apex Clean Energy Holdings LLC. The collaboration establishes a joint holding company under US law, with ERG holding 75% and Apex 25%, managing operational assets. This includes a 317 MW wind farm and solar plant producing an estimated 1 TWh. [Read More](#) (Press Release)

**Panasonic and Sila sign agreement for Titan Silicon, Sila's anode material to deliver enhanced battery performance for Evs.** Panasonic Energy Co. and Sila, a battery materials company, have finalized a collaboration to integrate Sila's Titan Silicon™, an advanced nano-composite silicon anode material, into Panasonic's lithium-ion batteries. The partnership aims to revolutionize electric vehicle (EV) batteries, boosting performance, extending range, and reducing charging times significantly. [Read More](#) (Business Wire)

**Altilium works to transform mine tailings into valuable EV battery materials.** Altilium, a UK-based clean technology group, received £700,000 in government funding for two projects aiming to extract copper and rare earth elements (REE) from mine tailings. Collaborating with CPI and Camborne School of Mines (CSM), Altilium focuses on recycling REE and battery metals from mine waste, turning previously discarded materials into valuable resources. Their efforts target recovering metals from European mine tailings under Altilium's control, delivering these for use in the UK battery supply chain. [Read More](#) (Charged Evs)

**ExxonMobil to build CCS pilot plant with fuelcell energy using carbonate fuel cell technology.** ExxonMobil's affiliate, Esso Nederland BV, plans to test a groundbreaking Carbonate Fuel Cell (CFC) technology at its Rotterdam Manufacturing Complex, a first in an industrial setting. The aim is to reduce CO2 emissions from industries. Developed in collaboration with FuelCell Energy, the pilot plant will assess the technology's performance, addressing operational issues and installation costs for carbon capture. [Read More](#) (Yahoo Finance)

**Plug Power completes first installation of electrolyzer at Amazon fulfillment center.** Plug's 1MW electrolyzer, a collaboration with Amazon, harnesses electricity and water to generate hydrogen, supporting 400 fuel cell-powered forklifts. The electrolyzer produces on-site compressed hydrogen stored in a tank for the forklifts. With over 17,000 fuel cells deployed in Amazon's North American fulfillment centers, this project marks the first on-site electrolyzer system. It leverages surplus electricity, sidestepping emissions from traditional hydrogen production methods. Amazon views hydrogen as pivotal in its goal to decarbonize operations by 2040, aligning with The Climate Pledge. The partnership enhances energy efficiency in specific Amazon locations and facilities. [Read More](#) (Renewable Energy Magazine)

### Chart 15: Forklift trucks at site to use Electrolyzer's Low Carbon-Hydrogen to Fuel



Source: Intro-act, Plug Power

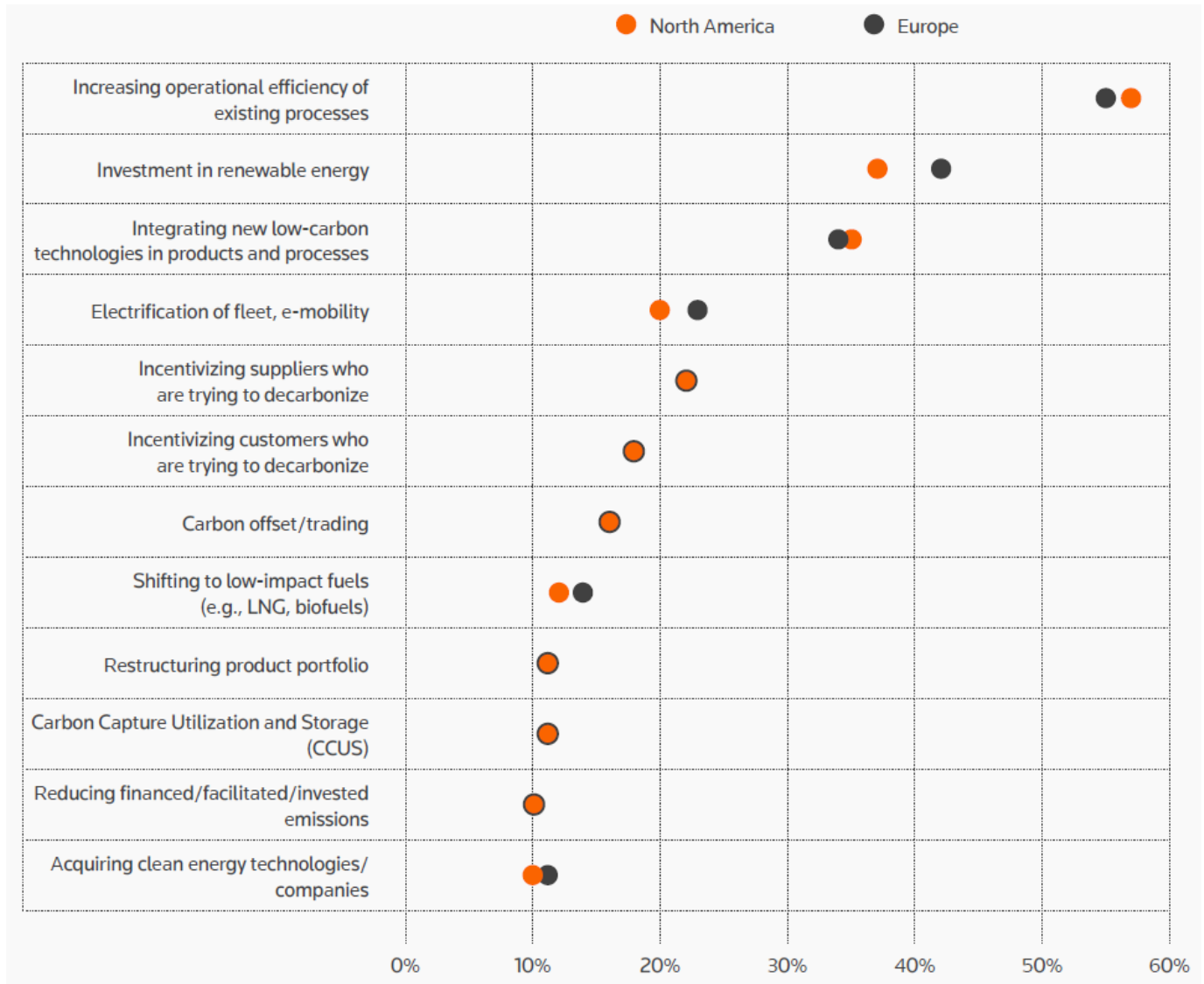
**Graphex Group provides important updates on its Global Mine-to-Battery Solution, including the separation of its US subsidiary Graphex Technologies LLC into a standalone U.S. company, and financing for a 200% production increase over current levels.** Graphex Group Limited and its U.S. subsidiary, Graphex Technologies, are strategically leveraging recent U.S. and China government actions to support their global expansion plan. The company aims to establish independent production systems from mining to battery manufacturing in both markets. [Read More](#) (Business Wire)

**Amazon, Holcim to test Mercedes-Benz hydrogen powered fuel cell trucks.** Daimler Truck is initiating customer trials for its Mercedes-Benz GenH2 Trucks, powered by hydrogen fuel cells, with participation from Amazon, Air Products, INEOS, Holcim, and Wiedmann & Winz. The move aligns with Daimler's 2020 commitment to invest in hydrogen technology, aiming for CO2-neutral long-distance transport by 2039. While battery electric vehicles suit shorter routes, fuel cell trucks, capable of generating electricity from hydrogen, are ideal for long-haul in areas lacking charging infrastructure. [Read More](#) (ESG Today)

**Credit Agricole to stop financing new fossil fuel extraction projects.** Crédit Agricole has announced a decisive shift, ending funding for new fossil fuel extraction projects and committing to carbon neutrality by 2050, aligning with UN COP28 climate goals. The French lender aims for an 80% increase in low-carbon energy investments by 2025, totaling €13.3bn. [Read More](#) (Financial News)

## CLEANTECH CHART OF THE MONTH

Chart 16: Energy Efficiency and Renewable Energy Investments Remain Top Sustainability Priorities across North America and Europe



Source: Intro-act, Reuters Impact Global Sustainability Survey 2023. The above chart depicts share (%) of survey respondents identifying their top sustainability strategies addressing energy and decarbonization, split by region.

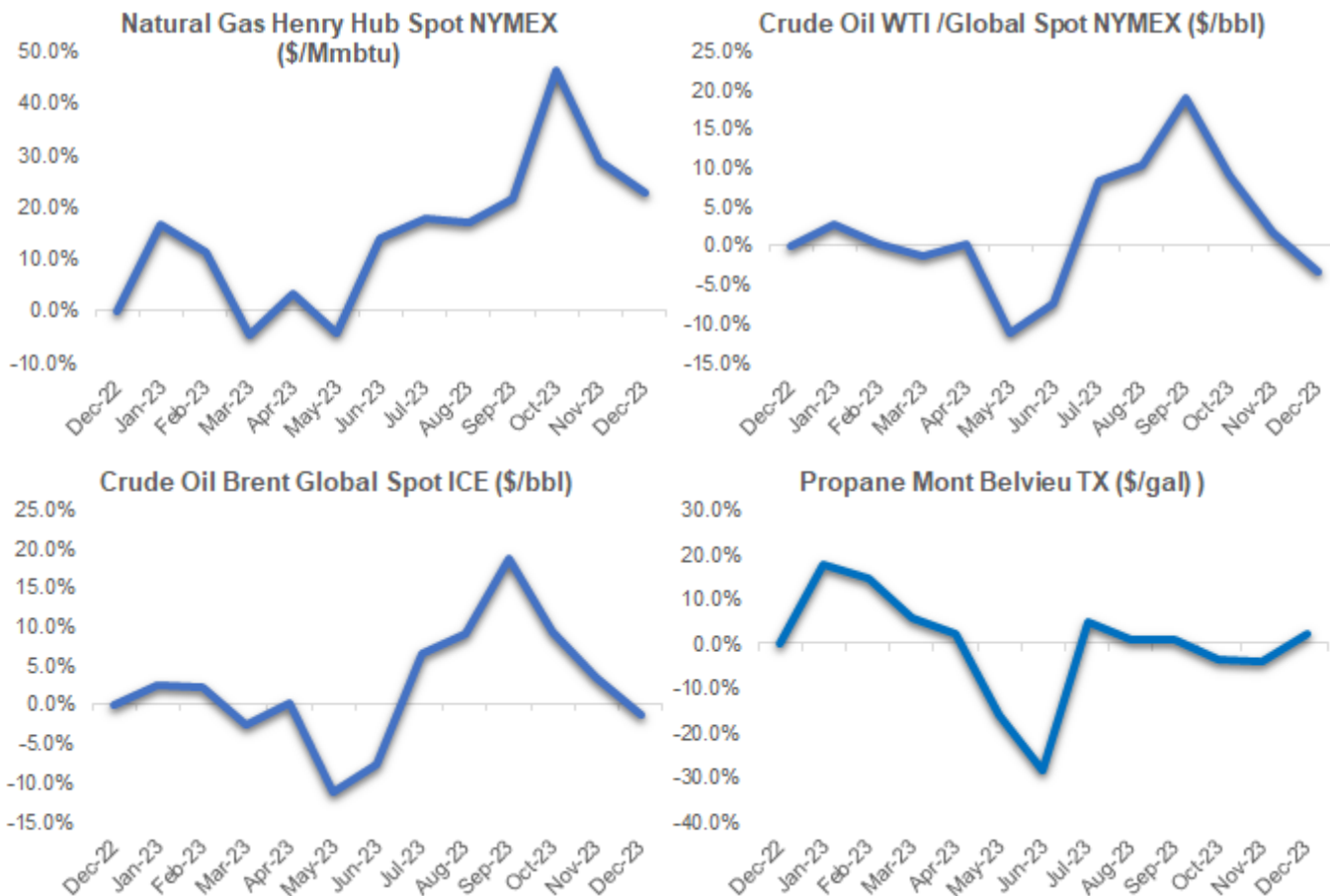
## CLEANTECH COMMODITIES

Chart 17: Cleantech Commodities Price Returns

CleanTech Commodities	Price as of 31st Dec 2023	1M	3M	6M	1Y	YTD
<b>Natural Gas and Crude Oil</b>						
Natural Gas Henry Hub Spot NYMEX (\$/Mmbtu)	2.58	▼ -6.18%	▼ -3.73%	▲ 4.03%	▲ 13.66%	▼ -2.64%
Crude Oil WTI/Global Spot NYMEX (\$/bbl)	71.89	▼ -4.98%	▼ -20.80%	▲ 1.74%	▼ -6.37%	▼ -8.94%
Crude Oil Brent Global Spot ICE (\$/bbl)	77.69	▼ -4.93%	▼ -18.95%	▲ 4.27%	▼ -4.46%	▼ -6.87%
Propane Mont Belvieu TX (\$/gal)	0.70	▲ 5.91%	▲ 0.87%	▲ 29.21%	▼ -7.42%	▼ -21.46%
<b>Refined Products</b>						
Gasoline Conv Regular NY Harbor (\$/gal)	2.16	▼ -5.93%	▼ -22.03%	▼ -17.41%	▼ -18.25%	▼ -18.90%
Diesel No. 2 Low Sulfur NY Harbor (\$/gal)	2.53	▼ -12.63%	▼ -24.49%	▲ 2.14%	▲ 6.70%	▼ -20.66%
Heating Oil No. 2 NY Harbor (\$/gal)	2.44	▼ -12.93%	▼ -24.19%	▲ 4.85%	▲ 11.04%	▼ -18.53%
Jet Fuel Kerosene-Type U.S. Gulf Coast (\$/gal)	2.37	▼ -4.48%	▼ -25.21%	▲ 5.30%	▲ 9.54%	▼ -31.19%
Gasoil Near Term (IFEU \$/mt)	750.75	▼ -6.33%	▼ -25.04%	▲ 5.85%	▲ 8.02%	▼ -17.97%
Ethanol Iowa (CRB \$/gallon)	1.62	▼ -12.65%	▼ -28.97%	▼ -34.39%	▼ -30.04%	▼ -22.49%
WTI USG 3:2:1 Crack Spread	19.43	▲ 16.67%	▼ -34.48%	▼ -35.32%	▼ -19.38%	▼ -49.06%
<b>Carbon Prices</b>						
Carbon Emissions (EUR/ tonne)	83.20	▼ -3.29%	▼ -7.11%	▼ -9.32%	▲ 24.68%	▲ 4.04%
<b>Metals</b>						
Copper Cash Official LME (\$/mt)	8476.00	▲ 1.73%	▲ 2.98%	▲ 3.24%	▼ -1.11%	▼ -6.60%
Lithium Carbonate 99%Min China (CNY/ tonne)	175500.00	▼ -10.23%	▼ -41.98%	▼ -11.59%	▼ -64.51%	▼ -68.12%
Nickel Cash Official LME (\$/mt)	16300.00	▼ -0.21%	▼ -11.94%	▼ -19.01%	▼ -31.43%	▼ -44.56%
Cobalt Cash Official LME (\$/mt)	28710.00	▼ -13.03%	▼ -12.97%	▼ -7.27%	▼ -16.79%	▼ -40.90%
Platinum Indust (Engelhard) (\$/ozt)	1020.00	▲ 8.17%	▲ 9.68%	▲ 12.71%	▼ -5.56%	▲ 0.79%
Uranium Near Term (NYM\$/lbs)	91.25	▲ 13.50%	▲ 37.74%	▲ 81.23%	▲ 81.23%	▲ 79.63%

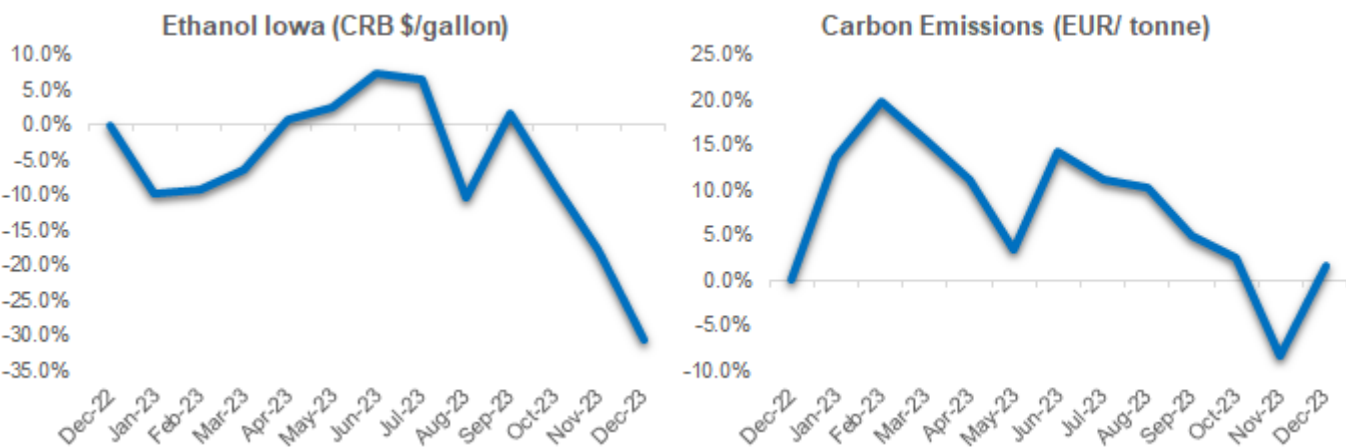
Source: Intro-act, FactSet, Investing.com. Data as of 12/31/23

Chart 18: Indexed Change in Natural Gas and Crude Oil Prices in Last 12 Months



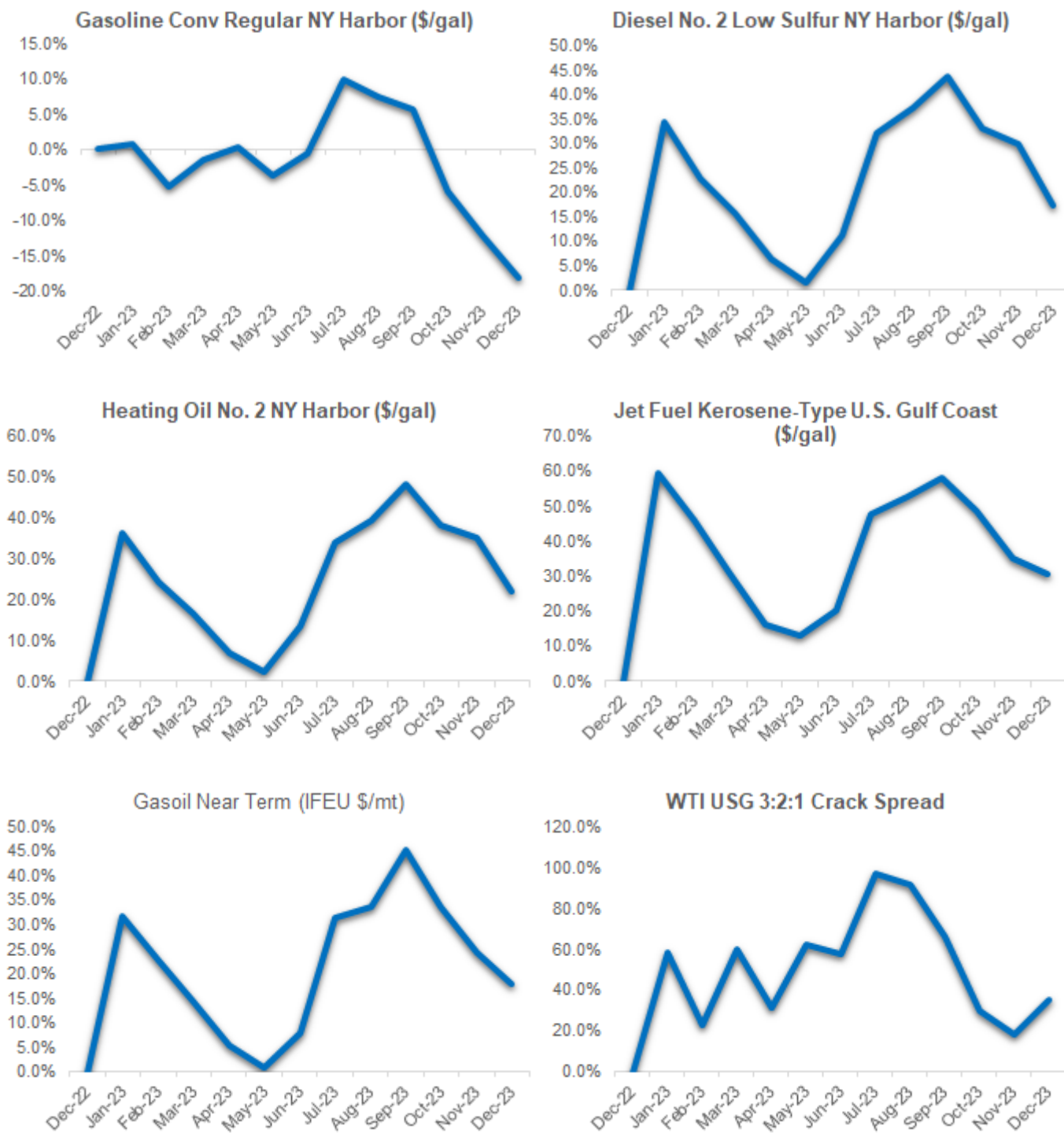
Source: Intro-act, FactSet, Investing.com. Data as of 12/31/23

Chart 19: Indexed Change in Ethanol and Carbon Emission Prices in Last 12 Months



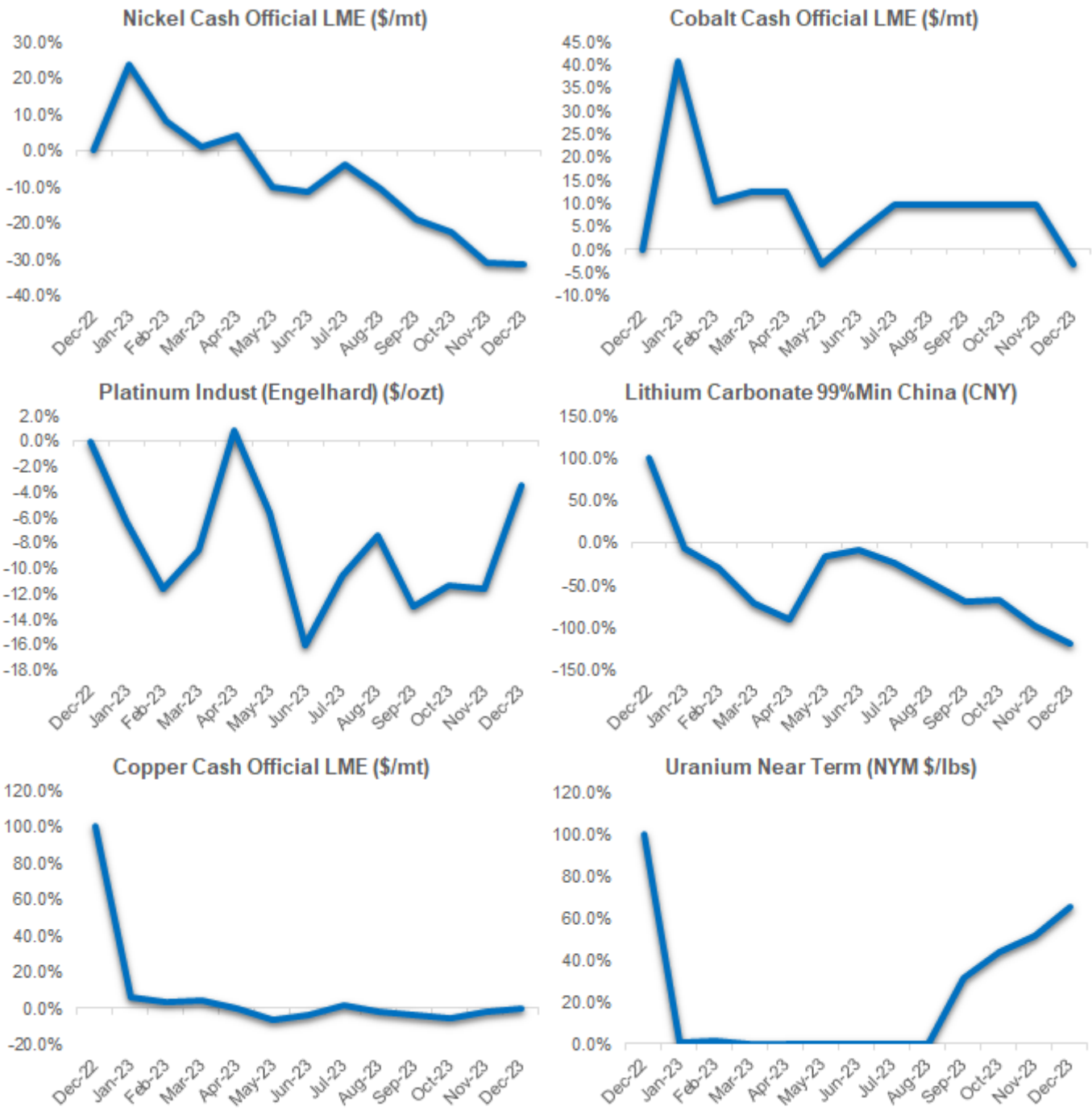
Source: Intro-act, FactSet, Investing.com. Data as of 12/31/23

Chart 20: Indexed Change in Refined Products in Prices Last 12 Months



Source: Intro-act, FactSet. Data as of 12/31/23.

Chart 21: Indexed Change in Cleantech Metal Prices Last 12 Months



Source: Intro-act, FactSet. Data as of 12/31/23

## CLEANTECH INSTALLATIONS

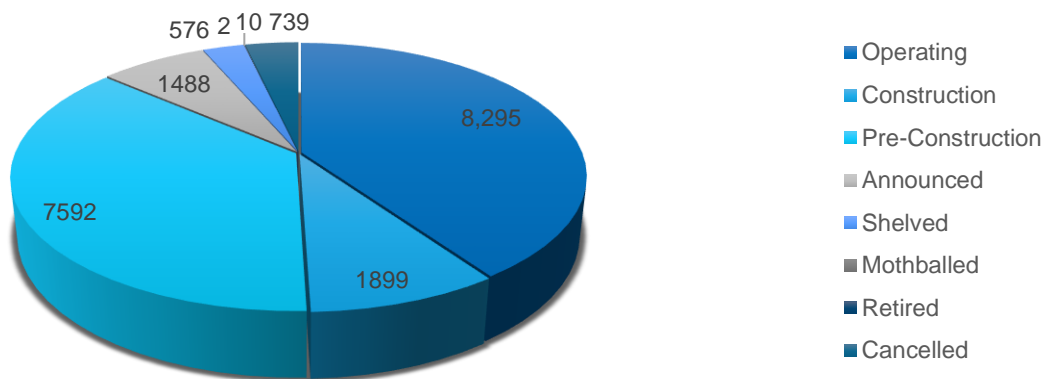
Chart 22: Global Solar Power Tracker (January 15, 2024)



- Operating
- Construction
- Pre-construction
- Announced
- Shelved
- Mothballed
- Retired
- Cancelled

Source: Intro-act, Global Energy Monitor

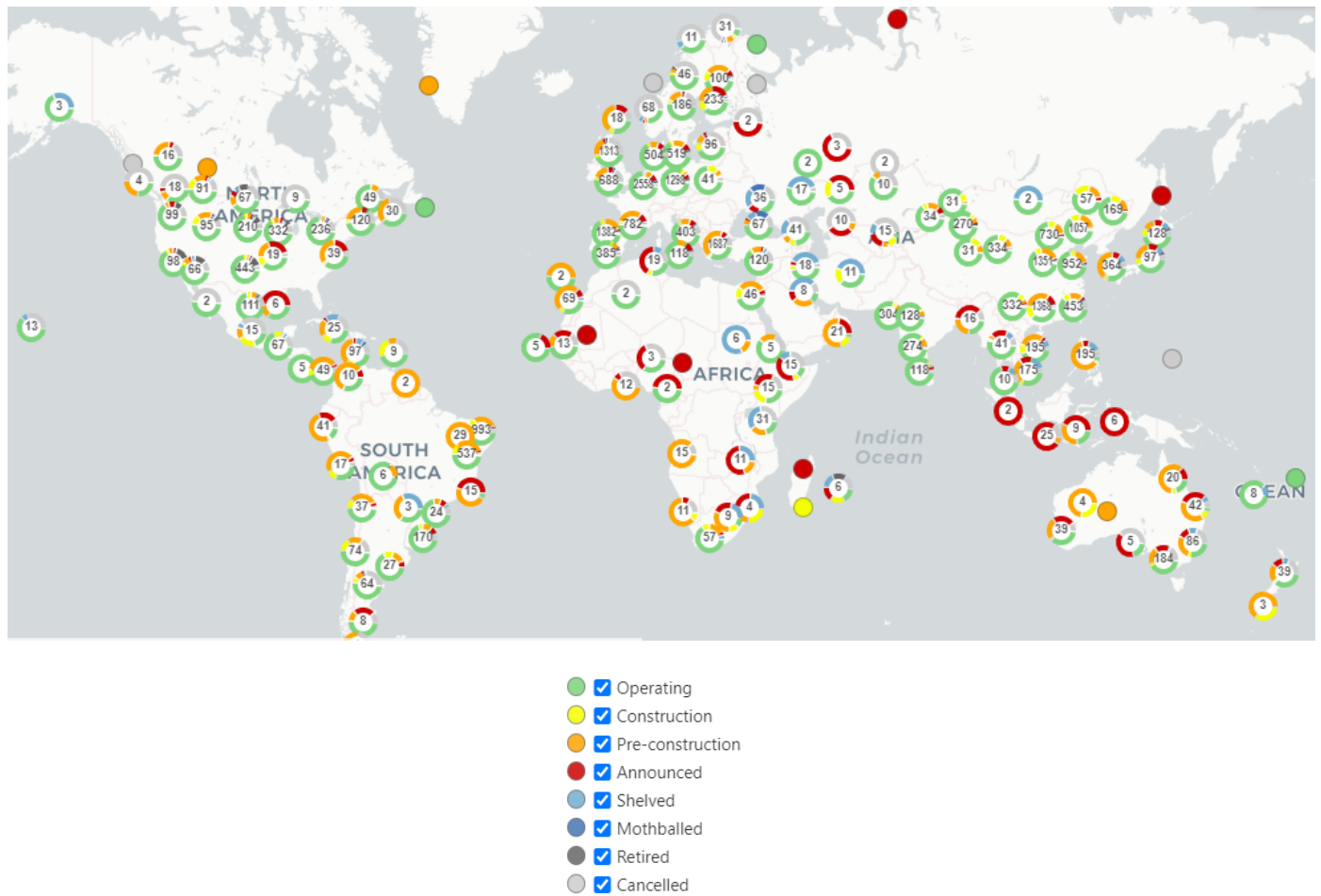
Chart 23: Worldwide Solar Farm Phases. Total Farms: 20,601 as of January 15, 2024



Source: Intro-act, Global Energy Monitor

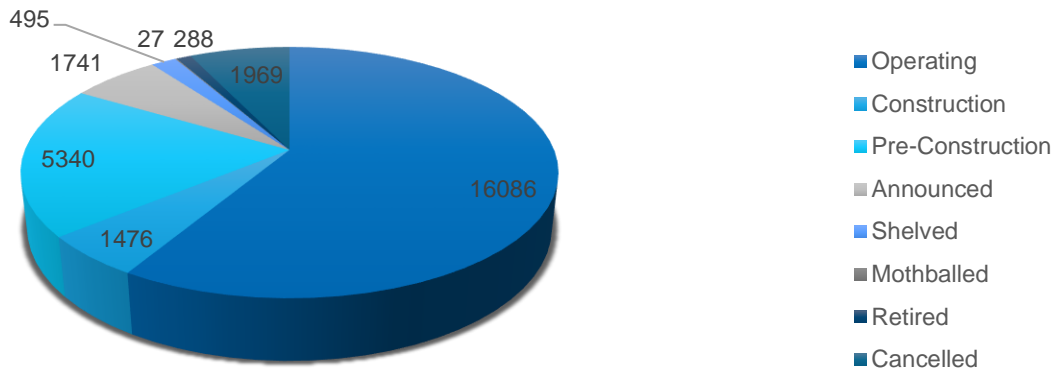


Chart 24: Global Wind Power Tracker (January 15, 2024)



Source: Intro-act, Global Energy Monitor

Chart 25: Worldwide Wind Farm Phases. Total Farms: 27,422 as of January 15, 2024



Source: Intro-act, Global Energy Monitor

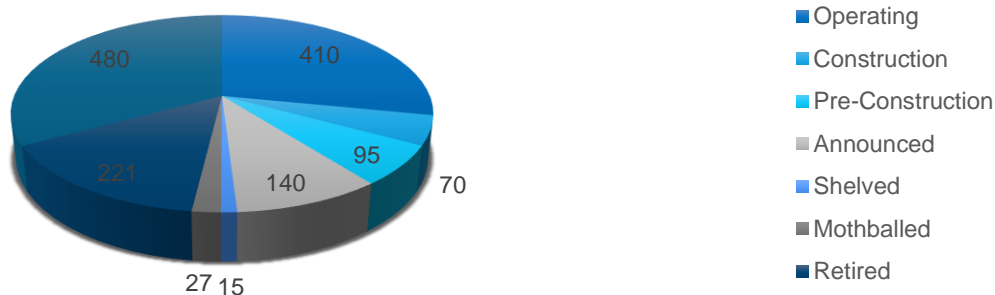
Chart 26: Global Nuclear Power Tracker (January 15, 2024)



- Operating
- Construction
- Pre-construction
- Announced
- Shelved
- Mothballed
- Retired
- Cancelled

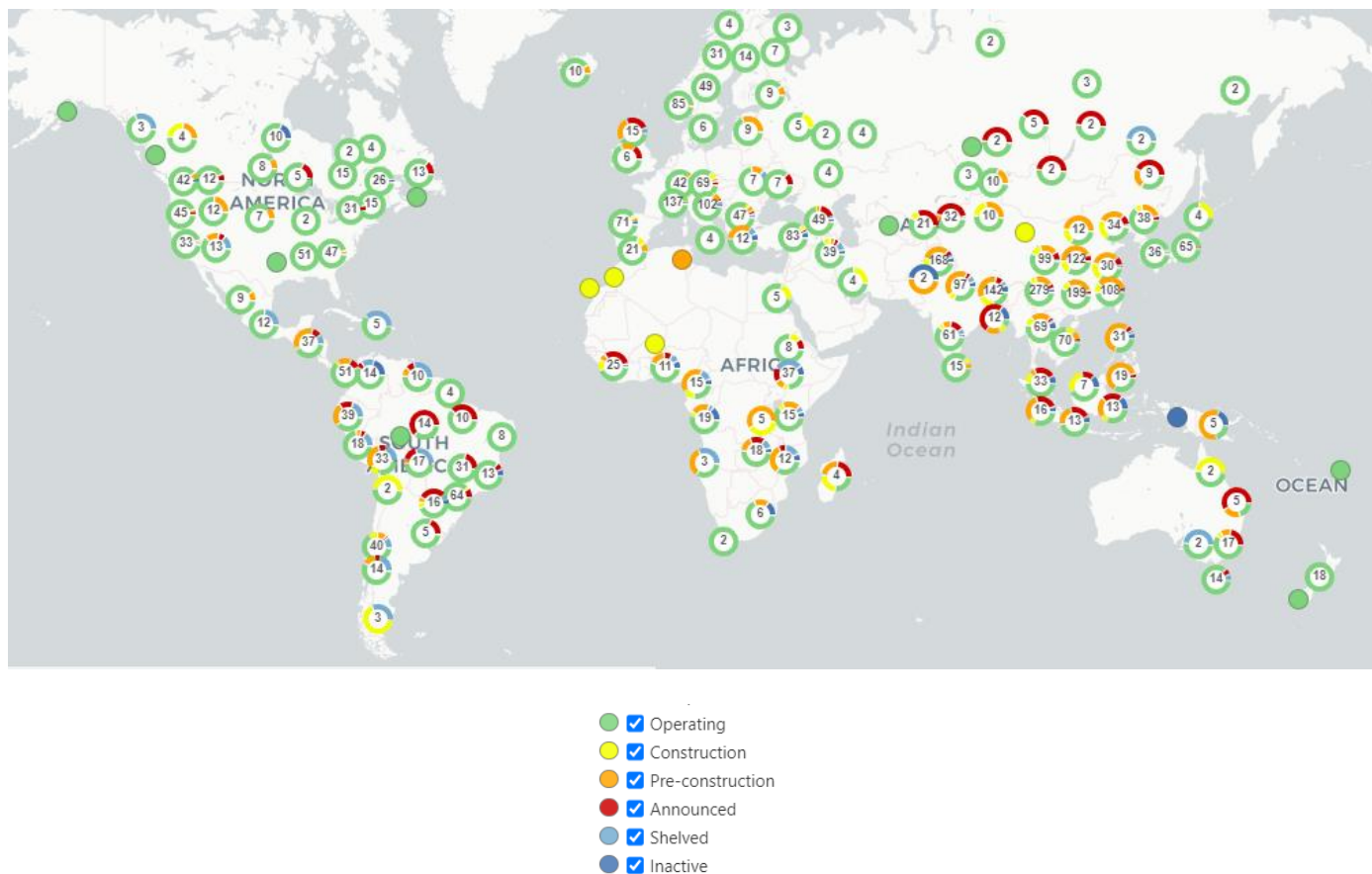
Source: Intro-act, Global Energy Monitor

Chart 27: Worldwide Nuclear Power Plants. Total Farms: 1,458 as of January 15, 2024



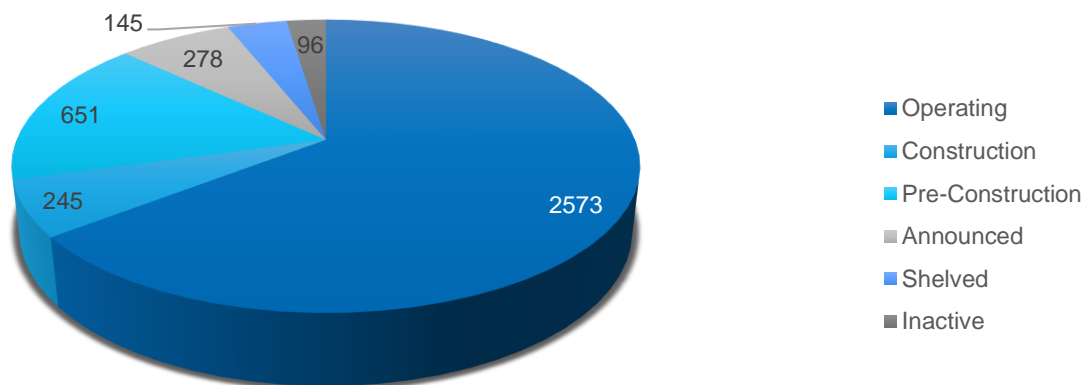
Source: Intro-act, Global Energy Monitor

Chart 28: Global Hydropower Tracker (January 15, 2024)



Source: Intro-act, Global Energy Monitor

Chart 29: Worldwide Hydropower Plants. Total Farms: 3,988 as of January 15, 2024



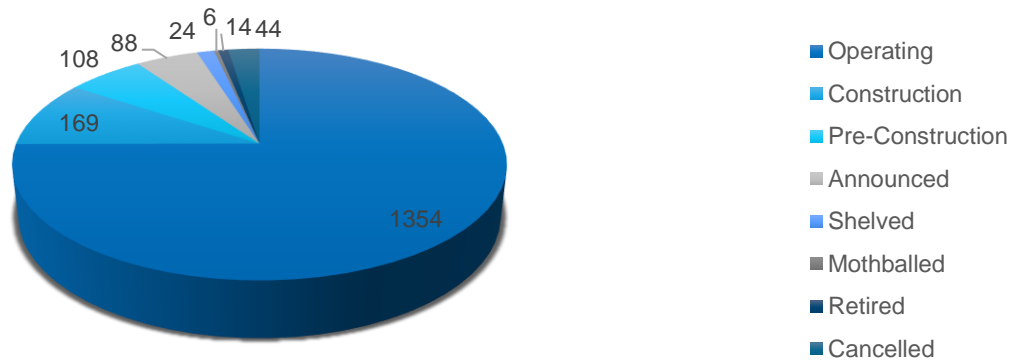
Source: Intro-act, Global Energy Monitor

Chart 30: Global Bioenergy Power Tracker (January 15, 2024)



Source: Intro-act, Global Energy Monitor

Chart 31: Worldwide Bioenergy Power Plants. Total Farms: 1,807 as of January 15, 2024



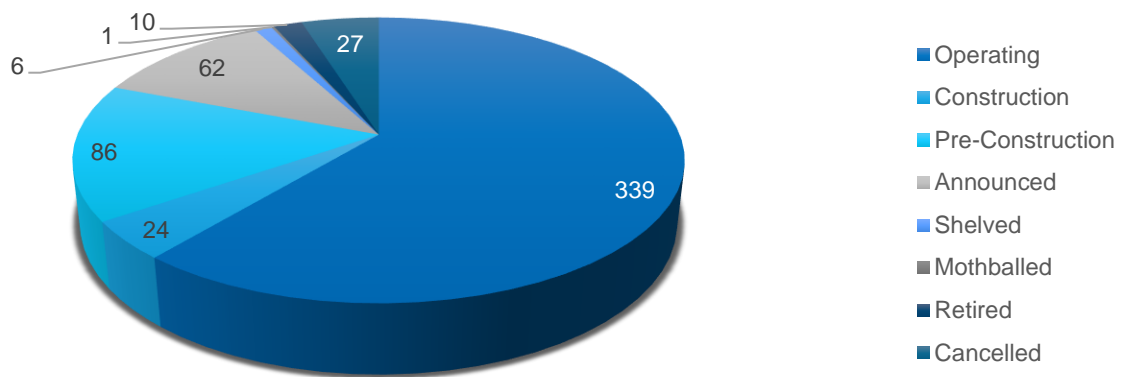
Source: Intro-act, Global Energy Monitor

Chart 32: Global Geothermal Power Tracker (January 15, 2024)



Source: Intro-act, Global Energy Monitor

Chart 33: Worldwide Geothermal Power Plants. Total Farms: 555 as of January 15, 2024



Source: Intro-act, Global Energy Monitor

## CLEANTECH CAPITAL MARKET ACTION (DECEMBER 2023)

### M&A Activity

Target	Target Industry	Target Country	Acquirer	Deal Size (\$m)	Announcement Date
Action Manufacturing & Supply, Inc.	Industrial Machinery	United States	Franklin Water Treatment LLC	-	04-12-2023
Consolidated Uranium	-	-	IsoEnergy	-	05-12-2023
Iowa Northern Railway Co.	Other Transportation	United States	Canadian National Railway Co.	-	06-12-2023
H2O Innovation Inc	Environmental Services	Canada	Ember Infrastructure Management	-	08-12-2023
SolarTempel GmbH	Electric Utilities	Germany	A-Labs Capital IV Corp.	-	11-12-2023
SECURE ENERGY'S	Oil and Gas	Canada	WASTE CONNECTION S	-	11-12-2023
283MW Rtb Solar Assets	Electric Utilities	Poland	Goldenpeaks Capital Holding Ltd.	-	12-12-2023
Be Energy Part SL	Internet Software/Services	Spain	Marguerite Adviser SA	-	12-12-2023
Be Energy Part SL	Internet Software/Services	Spain	Marguerite Investment Management SA	-	12-12-2023
Bain Capital	Financial Services	Massachusetts	Japan's Infroneer	-	12-12-2023
Sesol	Renewable Energy Semiconductor Manufacturing	Sweden	Nordic Capital	-	12-12-2023
Environmental Concepts & Services, Inc.	Trucking	United States	Blue Point Capital Partners LLC; TAS Environmental Services LP	-	12-12-2023
Anemos Res Holdings SA	Alternative Power Generation	Greece	Motor Oil Renewable Energy Single Member SA	134.8	18-12-2023
F & R Cawley Ltd. (Berkshire)	Environmental Services	United Kingdom	SUEZ Recycling & Recovery UK Ltd.	-	18-12-2023
CropEnergies AG	Chemicals: Specialty	Germany	Südzucker AG	337.6	19-12-2023
Permascand Top Holding AB	Industrial Machinery	Sweden	Altor Equity Partners AB	101.3	19-12-2023
Unico Solar Investors LLC	Engineering & Construction	United States	Altus Power, Inc.	-	20-12-2023

Greenvolt – Energias Renováveis SA	Electric Utilities	Portugal	Kohlberg Kravis Roberts & Co. LP	771.4	21-12-2023
Greenvolt – Energias Renováveis SA	Electric Utilities	Portugal	Kohlberg Kravis Roberts & Co. LP	496.1	21-12-2023
Daqing City Shengbu Electric Power Co. Ltd.	Miscellaneous Commercial Services	China (People's Republic)	BEI Development (Beijing) Co. Ltd.	14.1	27-12-2023
Yangzhou Qingchang Solar Energy Technology Co. Ltd.	Alternative Power Generation	China (People's Republic)	Tianjin Tianbao Energy Co., Ltd.	2.1	28-12-2023
Crystal Lagoons U.S. Corp.	Engineering & Construction	United States	Twelve Seas Investment Co. II	384.3	29-12-2023

Source: Intro-act, FactSet

### PE/ VC Funding Activity

Company	Funding Round	Fund raised (\$m)	Investors	Date
Sunsave	Seed	5.76	Norrskan VC, IPGL, Plug and Play, Stuart Rose, Michael Spencer, Roland Rudd, Bill Nussey	05-12-2023
UP Catalyst	Seed	3.66	Extantia, SmartCap, Sunly, Little Green Fund, Scottish Baltic Invest, UniTartu Ventures.	05-12-2023
Ionomr Innovations	Series A 4	20	NGIF Cleantech Ventures, Pallasite Ventures, Shell Ventures, Chevron Technology Ventures, Finindus, N.V. Bekaert, Asahi Kasei, Samsung Ventures, SAIC Capital	05-12-2023
Level Nine	Pre seed	0.91	Zero Carbon Capital, Entrepreneur First, Rockstart, Maarten Alblas, Jonas Ruyter, Ferdinando Randisi	06-12-2023
DigitalPaani	Seed	1.2	Elemental Excelsator, Enzia, Peer Cheque, SAE, DevC, Bharat Founders Fund, Ashish Goel, Alok Mittal, Mohit Sadani, Mohit Tandon	07-12-2023
Ecobase	Seed	2.29	Combiwood Grupp	12-12-2023
Fourth Power	Series A	19	DCVC, Breakthrough Energy Ventures (BEV), Black Venture Capital Consortium	12-12-2023
PLAN-B NET ZERO	Series A	8.42	Yamato Capital AG	12-12-2023
Dimensional Energy	Series A	20	Envisioning Partners, United Airlines' sustainable flight fund, Microsoft's climate innovation fund, RockCreek's smart aviation futures fund, DSC Investment, Delek US, New York Ventures, Elemental Excelsator, Chloe Capital.	12-12-2023
Metafuels	-	8	Energy Impact Partners, Contrarian Ventures.	12-12-2023
Neo Carbon	Seed	2.93	RAISE Seed for Good, PropTech1 Ventures, Speedinvest, Antler	13-12-2023
ChargeZone	-	-	Macquarie Capital	13-12-2023
Exponent Energy	Series B	26.4	Eight Roads Ventures, TDK Ventures, Lightspeed, YourNest VC, 3one4 Capital, AdvantEdge VC, Pawan Munjal	14-12-2023

Positive Zero	-	400	Black Rock	18-12-2023
Octopus Energy	-	800	Origin Energy, Tokyo Gas, Canada Pension Plan Investment Board, Generation Investment Management	18-12-2023
Sweetch Energy	Series A	22.87	Révolution Environnementale et Solidaire, Crédit Mutuel Impact, Sweetch Energy's industrial partners	18-12-2023
BRUDELI	-	1.19	Hexagon Composites ASA, Leax Group AB	18-12-2023
Blue Planet Environmental Solutions Pte. Ltd	-	35	The Investment Fund for Developing Countries	18-12-2023
Exeger	-	32.02	European Investment Bank (EIB)	19-12-2023
Green Eagle Solutions	Series A	5.49	A&G, Kibo Ventures, SET Ventures	19-12-2023
BatX Energies	Pre-Series A	5	Zephyr Peacock, Lets Venture, Lets Venture, Mankind Pharma, JITO Angel Network.	19-12-2023
Hydrogrid	Series A	8.5	Inven Capital, Karma Ventures, CNB Capital, SET Ventures	20-12-2023
HiiROC	-	27.45	Melrose, Wintershall Dea, Centrica, HydrogenOne, Hyundai, CEMEX, Kia	20-12-2023
Suena	Seed	2.74	Santander InnoEnergy Climate Fund, EIT InnoEnergy, Raakwark Kaptaal	20-12-2023
Radial Power	-	80	Bank of America Corporation	21-12-2023
Plenitude	-	457.45	Energy Infrastructure Partner (EIP)	21-12-2023
SolarDuck	-	13.72	Katapult Ocean, Green Tower, Energy Transition Fund Rotterdam, Invest-NL	21-12-2023
Alt Carbon	Pre seed	0.55	Shastra VC	21-12-2023
Zeroe	-	2.2	Owen Rahadiyan	23-12-2023
Waaree Energies	IPO	361		29-12-2023
Biocarbon	-	5	Nexus Development Capital	03-01-2024
NineDot	-	225	Manulife Investment Management, Carlyle	10-01-2024
Australian Premium Solar	IPO	2,334	-	11-01-2024
Cactus	-	23.79	OP Finland Infrastructure LP, Finnish Climate Fund	11-01-2024
Soly	-	27.45		15-01-2024
Tiamat	-	20.13	Stellantis, Arkema, MBDA	15-01-2024

Source: Intro-act, FactSet



## CLEANTECH INSTITUTIONAL INVESTOR LEAGUE

Chart 34: Cleantech Institutional Owners League (Current)

Rank	Institution Name	Invested in Cleantechs (\$)	Q/Q Change (\$)	# Cleantech Positions	% of Instit Ownership
1	The Vanguard Group, Inc.	100,768,074,130	(8,371,176,453)	272	10.9%
2	BlackRock Fund Advisors	56,850,684,230	(4,793,302,719)	247	6.2%
3	SSgA Funds Management, Inc.	39,407,493,288	(3,830,852,337)	290	4.3%
4	Fidelity Management & Research Co. LLC	19,098,645,712	(2,303,788,824)	141	2.1%
5	Geode Capital Management LLC	18,822,585,937	(1,413,574,874)	241	2.0%
6	Capital Research & Management Co. (Global Investors)	15,965,928,634	(1,062,465,609)	21	1.7%
7	T. Rowe Price Associates, Inc. (Investment Management)	13,859,006,492	345,240,696	62	1.5%
8	JPMorgan Investment Management, Inc.	13,001,642,757	(1,239,650,656)	136	1.4%
9	Capital Research & Management Co. (International Investors)	12,804,447,595	(1,209,595,366)	19	1.4%
10	BlackRock Advisors (UK) Ltd.	11,929,541,226	(1,783,863,216)	214	1.3%
11	BlackRock Investment Management (UK) Ltd.	10,733,745,696	(1,819,720,094)	175	1.2%
12	Wellington Management Co. LLP	9,614,728,350	(9,500,654)	73	1.0%
13	Northern Trust Investments, Inc.(Investment Management)	9,123,737,935	(617,730,974)	217	1.0%
14	Capital Research & Management Co. (World Investors)	8,690,962,653	222,502,501	23	0.9%
15	Dimensional Fund Advisors LP	8,195,789,865	(418,613,043)	267	0.9%
16	Charles Schwab Investment Management, Inc.	7,749,380,310	(527,771,399)	220	0.8%
17	State Farm Investment Management Corp.	7,712,953,831	(221,026,660)	4	0.8%
18	National Pension Service of Korea	6,279,081,950	4,474,125,625	22	0.7%
19	Massachusetts Financial Services Co.	6,130,624,086	(716,665,226)	26	0.7%
20	Invesco Capital Management LLC	5,908,210,162	(650,118,248)	208	0.6%
21	Legal & General Investment Management Ltd.	5,712,342,518	(640,990,156)	210	0.6%
22	RBC Global Asset Management, Inc.	5,608,487,222	(313,065,328)	99	0.6%
23	Morgan Stanley Smith Barney LLC (Investment Management)	5,513,254,991	(151,421,998)	114	0.6%
24	1832 Asset Management LP	5,494,222,239	(434,833,777)	57	0.6%
25	Pictet Asset Management SA	5,409,122,562	(970,537,133)	166	0.6%
	Others	707,906,630,098	(72,519,923,007)	60,073	76.8%
	<b>TOTAL</b>	<b>921,265,072,821</b>	<b>(83,982,987,420)</b>	<b>62,788</b>	<b>100.0%</b>

Source: Intro-act, 13F Filings

Chart 35: Top 25 Cleantech Buyers (Q/Q)

Rank	Institution Name	Invested in Cleantechs (\$)	Q/Q Change (\$)	# Cleantech Positions	% of Instit Ownership
1	National Pension Service of Korea	6,279,081,950	4,474,125,625	22	0.7%
2	State Street Global Advisors Ltd.	2,243,053,086	883,492,402	212	0.2%
3	BlackRock Japan Co., Ltd.	2,730,052,644	797,266,144	57	0.3%
4	Goldman Sachs & Co. LLC (Private Banking)	1,907,981,774	603,238,970	104	0.2%
5	HuaAn Fund Management Co., Ltd.	656,907,482	526,360,983	12	0.1%
6	M&G Investment Management Ltd.	1,309,194,534	517,319,164	29	0.1%
7	Pacer Advisors, Inc.	949,039,424	378,361,050	59	0.1%
8	T. Rowe Price Associates, Inc. (Investment Management)	13,859,006,492	345,240,696	62	1.5%
9	Fidelity Investments Canada ULC	2,149,652,000	298,687,861	33	0.2%
10	Envestnet Asset Management, Inc.	1,484,182,728	288,409,081	65	0.2%
11	Comerica Bank (Investment Management Texas)	273,817,455	273,817,455	61	0.0%
12	Wealth Enhancement Advisory Services LLC	290,118,538	270,845,000	48	0.0%
13	The Caisse de depot et placement du Quebec	1,096,113,863	257,469,129	17	0.1%
14	Arrowstreet Capital LP	634,856,596	247,471,628	17	0.1%
15	Capital Research & Management Co. (World Investors)	8,690,962,653	222,502,501	23	0.9%
16	AKO Capital LLP	215,243,724	215,243,724	1	0.0%
17	First Republic Investment Management, Inc.	302,685,269	214,405,407	36	0.0%
18	Putnam Investment Management LLC	1,497,055,251	206,648,380	32	0.2%
19	Nomura Asset Management Co., Ltd.	4,127,857,702	202,523,007	89	0.4%
20	Sylebra Capital LLC	177,735,929	177,735,929	2	0.0%
21	AQR Capital Management LLC	1,371,370,439	170,736,565	96	0.1%
22	Mizuho Markets Americas LLC	186,302,484	164,168,202	9	0.0%
23	Morgan Stanley & Co. LLC	2,441,206,419	163,567,926	110	0.3%
24	Jacobs Levy Equity Management, Inc.	433,921,305	154,943,245	18	0.0%
25	D1 Capital Partners LP	349,550,779	150,181,069	2	0.0%

Source: Intro-act, 13F Filings

Chart 36: Top 25 Cleantech Sellers (Q/Q)

Rank	Institution Name	Invested in Cleantechs (\$)	Q/Q Change (\$)	# Cleantech Positions	% of Instit Ownership
1	The Vanguard Group, Inc.	100,768,074,130	(8,371,176,453)	272	10.9%
2	BlackRock Fund Advisors	56,850,684,230	(4,793,302,719)	247	6.2%
3	SSgA Funds Management, Inc.	39,407,493,288	(3,830,852,337)	290	4.3%
4	Fidelity Management & Research Co. LLC	19,098,645,712	(2,303,788,824)	141	2.1%
5	BlackRock Investment Management (UK) Ltd.	10,733,745,696	(1,819,720,094)	175	1.2%
6	BlackRock Advisors (UK) Ltd.	11,929,541,226	(1,783,863,216)	214	1.3%
7	Brookfield Asset Management PIC Canada LP	4,292,336,306	(1,480,765,208)	3	0.5%
8	Geode Capital Management LLC	18,822,585,937	(1,413,574,874)	241	2.0%
9	JPMorgan Investment Management, Inc.	13,001,642,757	(1,239,650,656)	136	1.4%
10	Capital Research & Management Co. (International Investors)	12,804,447,595	(1,209,595,366)	19	1.4%
11	Capital Research & Management Co. (Global Investors)	15,965,928,634	(1,062,465,609)	21	1.7%
12	Pictet Asset Management SA	5,409,122,562	(970,537,133)	166	0.6%
13	DWS Investment GmbH	3,777,748,977	(879,579,909)	122	0.4%
14	Artisan Partners LP	1,289,593,282	(749,555,278)	19	0.1%
15	Massachusetts Financial Services Co.	6,130,624,086	(716,665,226)	26	0.7%
16	Goldman Sachs Asset Management International	277,643,130	(651,258,994)	7	0.0%
17	Invesco Capital Management LLC	5,908,210,162	(650,118,248)	208	0.6%
18	Legal & General Investment Management Ltd.	5,712,342,518	(640,990,156)	210	0.6%
19	Schroder Investment Management Ltd.	3,821,742,375	(624,216,377)	74	0.4%
20	Northern Trust Investments, Inc.(Investment Management)	9,123,737,935	(617,730,974)	217	1.0%
21	Schweizerische Nationalbank (Investment Portfolio)	2,834,720,915	(608,218,619)	77	0.3%
22	State Board of Administration of Florida Retirement System	776,362,670	(590,804,587)	70	0.1%
23	TD Asset Management, Inc.	3,833,960,517	(582,895,318)	80	0.4%
24	Deka Investment GmbH	2,873,884,131	(556,670,719)	93	0.3%
25	Handelsbanken Fonder AB	1,761,355,322	(545,428,351)	117	0.2%

Source: Intro-act, 13F Filings

## ETF SPOTLIGHT

### Global X Cleantech ETF (CTEC)

Closing Price (\$)	CUSIP	Expense Ratio	Inception
10.54	37954Y228	0.5	27/10/2020
AUM (\$ million)	Shares Outstanding (#)	Fund Flows (1M, \$)	Fund Flows (YTD, \$)
752.7	63,69,780	(34,05,454.75)	(2,25,89,239.65)

#### Fund Description

The CTEC Fund is an environmentally focused investment opportunity, designed to mirror a global index of companies driving technological advancements that mitigate environmental harm. This fund commits at least 80% of its assets to securities within the underlying index, in addition to American Depositary Receipts (ADRs) and Global Depositary Receipts (GDRs) linked to those securities. The underlying index comprises businesses primarily dedicated to Cleantech, including renewable energy, energy efficiency, smart grid solutions, lithium-ion batteries, fuel cells, and pollution prevention. These companies are carefully selected based on their generation of at least 50% of revenues from Cleantech-related activities and must meet specific market capitalization and liquidity criteria. The fund aims to harness the growth potential of Cleantech, and any modifications to the 80% investment policy necessitate a 60-day prior notice to shareholders. With eligibility spanning countries such as the United States, Japan, China, the United Kingdom, and others, this fund offers diversification for eco-conscious investors seeking Cleantech exposure.

#### ETF Returns Annualized (As of 12/31/2023)

1 Year	3 Year	5 Year	Since Inception
-25.57%	-21.61	-	-9.57%

#### ETF Returns Cumulative (As of 12/31/2023)

1 Month	3 Month	YTD	Since Inception
10.29%	-0.60%	-25.57%	-27.37%

#### Top 10 Holdings (updated as of 01/12/24)

Holdings	% Allocation	Market Value
VESTAS WIND SYSTEMS A/S	9.98%	\$ 5,423,671.69
ENPHASE ENERGY INC	6.60%	\$ 3,584,023.74
FIRST SOLAR INC	6.50%	\$ 3,533,209.68
SAMSUNG SDI CO LTD	5.10%	\$ 2,768,865.38
JOHNSON MATTHEY PLC	4.98%	\$ 2,705,548.82
XINYI SOLAR HOLDINGS LTD	4.84%	\$ 2,632,609.77
QUANTUMSCAPE CORP	4.00%	\$ 2,174,489.02
SOLAREDGE TECHNO	3.56%	\$ 1,935,139.84
BLOOM ENERGY CORP- A	3.45%	\$ 1,872,799.41
NORDEX SE	3.37%	\$ 1,830,632.93

Source: Intro-act, FactSet

For more information on CTEC visit: <https://www.globalxetfs.com/funds/ctec/>

## iShares Global Clean Energy ETF (ICLN)

Closing Price (\$)	CUSIP	Expense Ratio	Inception
15.39	464288224	0.41	24/06/2008
AUM (\$ million)	Shares Outstanding (#)	Fund Flows (1M, \$)	Fund Flows (YTD, \$)
333.7	21,65,00,000	(8,56,94,240.00)	(76,51,98,400.00)

### Fund Description

The ICLN Fund offers investors exposure to a carefully curated selection of global companies at the forefront of the clean energy sector. This fund seeks to replicate the performance of the S&P Global Clean Energy Index™, comprising approximately 100 clean energy-related companies. To be eligible for inclusion in this index, companies must meet specific criteria, including a minimum total market capitalization of \$300 million, float-adjusted market capitalization of \$100 million, and a median daily value traded of \$3 million over six months, all on developed market exchanges. The index construction process involves rigorous screening, utilizing classifications such as the Global Industry Classification Standard (GICS) and FactSets Revere Business Industry Classification System (RBICS), along with environmental, social, and governance (ESG) considerations. Clean energy exposure scores are assigned based on a company's primary business, with additional evaluation of carbon-to-revenue footprint to ensure alignment with sustainable and environmentally responsible practices. The result is a diversified fund that offers investors an opportunity to participate in the global clean energy revolution while adhering to stringent ESG criteria.

### ETF Returns Annualized (As of 12/31/2023)

1 Year	3 Year	5 Year	Since Inception
-20.38	-17.04	14.79	-5.47

### ETF Returns Cumulative (As of 12/31/2023)

YTD	1 Month	3 Months	Since Inception
-20.38	10.47	7.38	-58.27

### Top 10 Holdings (updated as of 01/12/24)

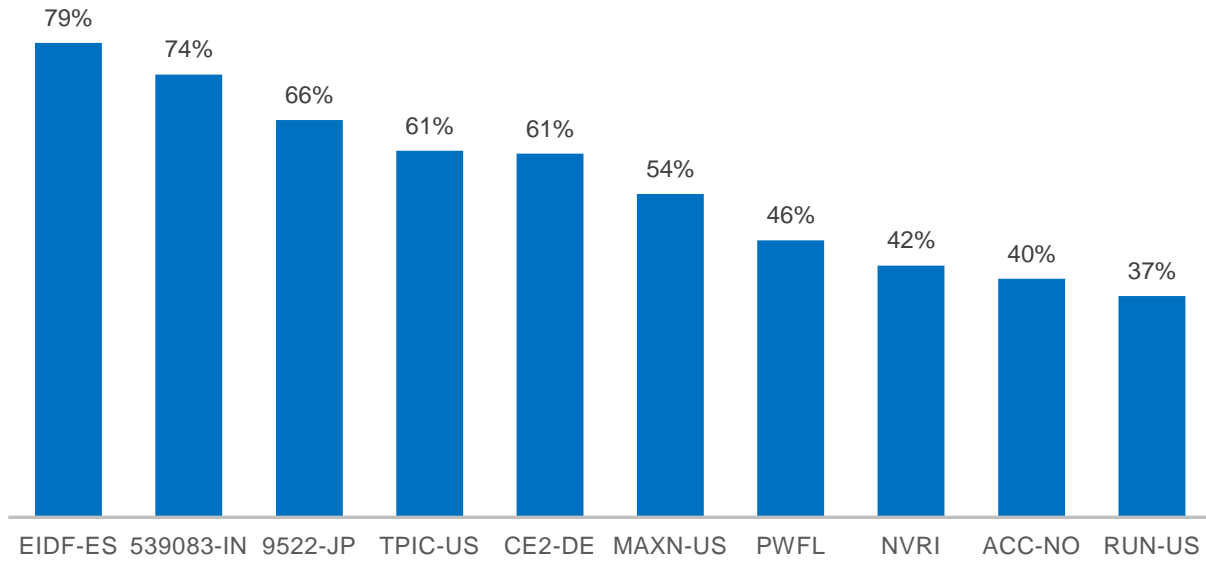
Holdings	% Allocation	Market Value
FIRST SOLAR INC	8.33%	\$ 232,547,832.72
VESTAS WIND SYSTEMS	6.94%	\$ 193,789,131.96
ENPHASE ENERGY INC	6.75%	\$ 188,265,459.36
CHINA YANGTZE POWER LTD A	4.39%	\$ 122,519,797.09
OERSTED	4.03%	\$ 112,347,652.44
EDP ENERGIAS DE PORTUGAL SA	3.49%	\$ 97,522,323.85
SOLAREDGE TECHNOLOGIES INC	2.88%	\$ 80,246,461.44
SUZLON ENERGY LTD	2.79%	\$ 77,887,668.09
ORMAT TECH INC	2.57%	\$ 71,696,091.90
CHUBU ELECTRIC POWER INC	2.37%	\$ 66,013,345.31

Source: Intro-act, FactSet

For more information on ICLN visit: <https://www.ishares.com/us/products/239738/ishares-global-clean-energy-etf>

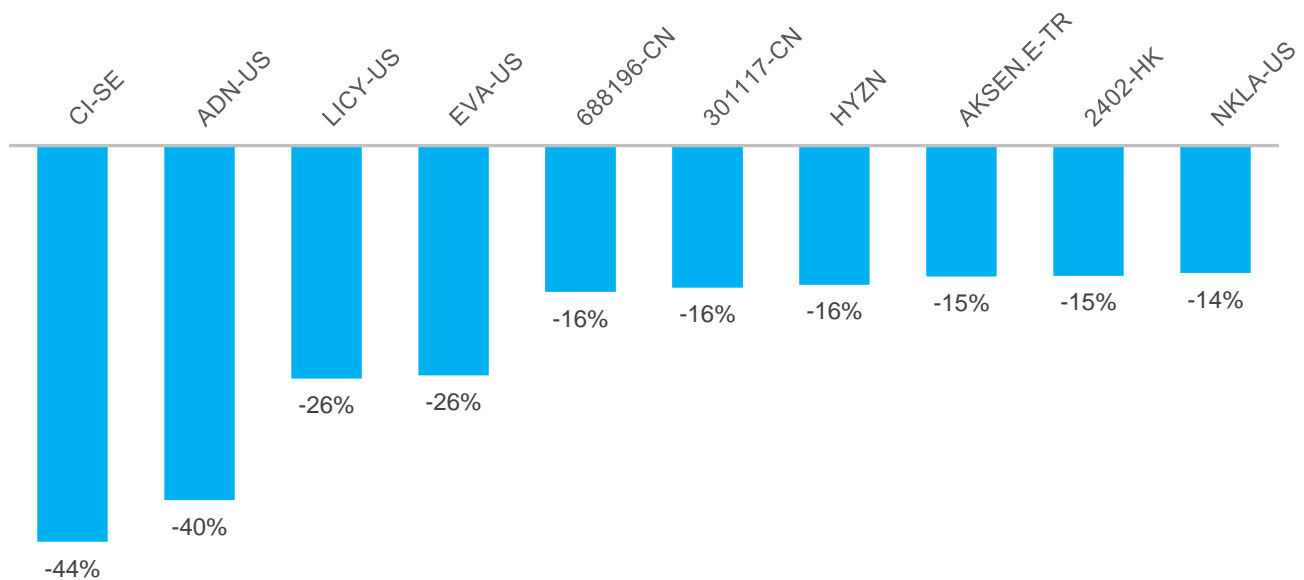
## GAINERS AND LOSERS – CLEANTECH STOCKS

Chart 37: Top 10 M/M Cleantech Gainers (Dec 2023)



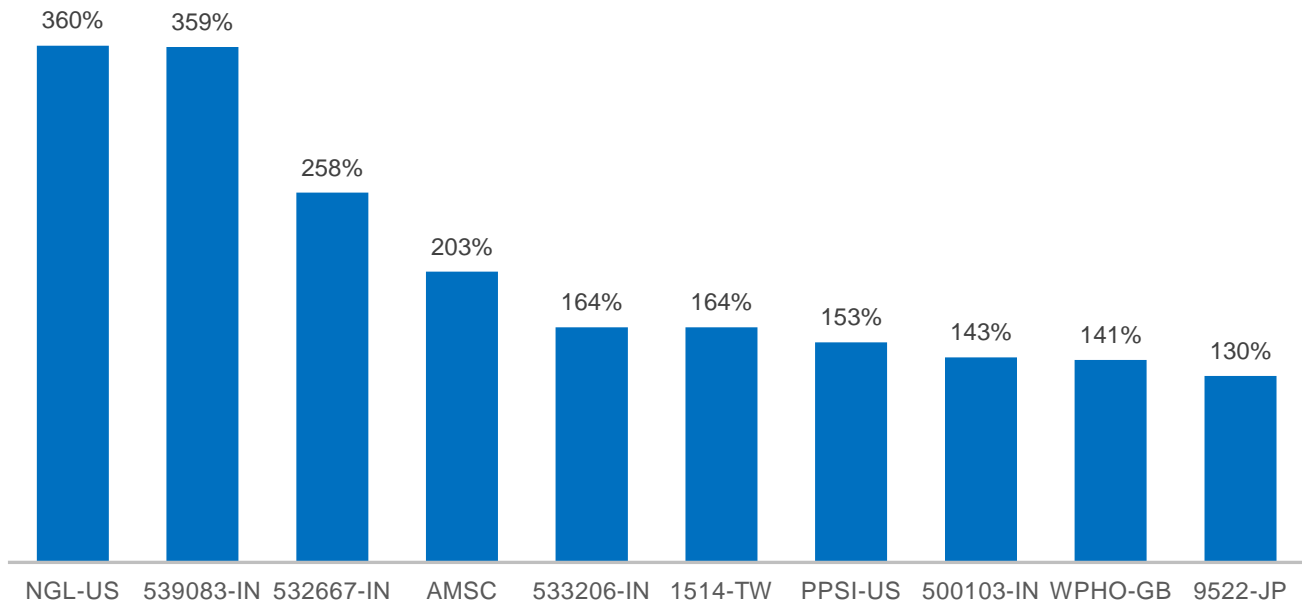
Source: Intro-act, FactSet

Chart 38: Top 10 M/M Cleantech Losers (Dec 2023)



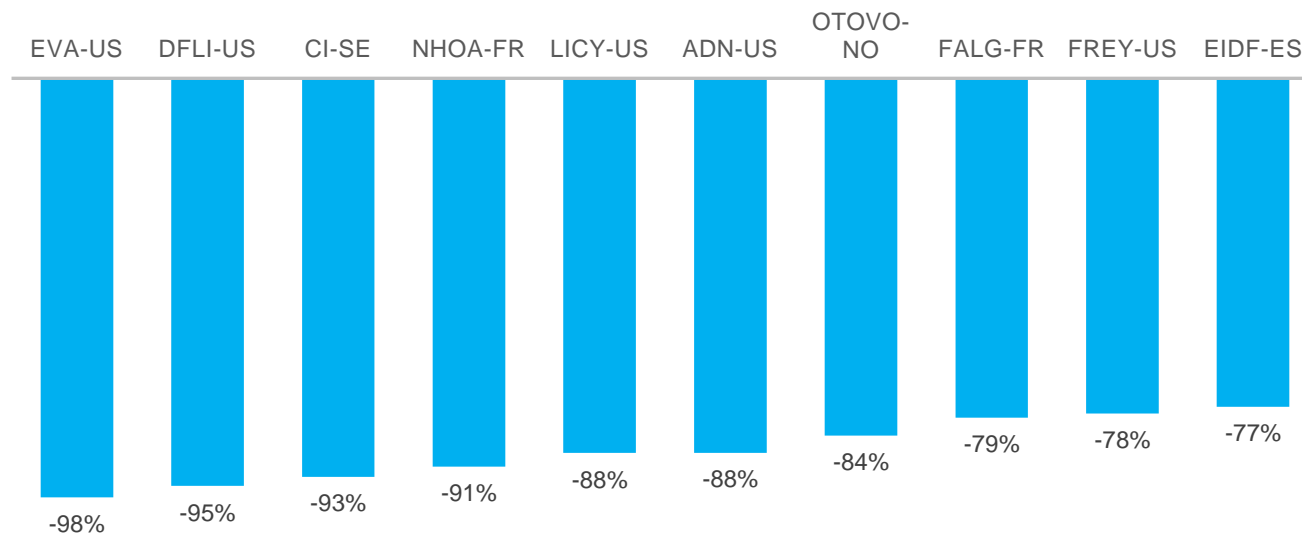
Source: Intro-act, FactSet

Chart 39: Top 10 YTD Cleantech Gainers



Source: Intro-act, FactSet. YTD Data Through end of December 2023.

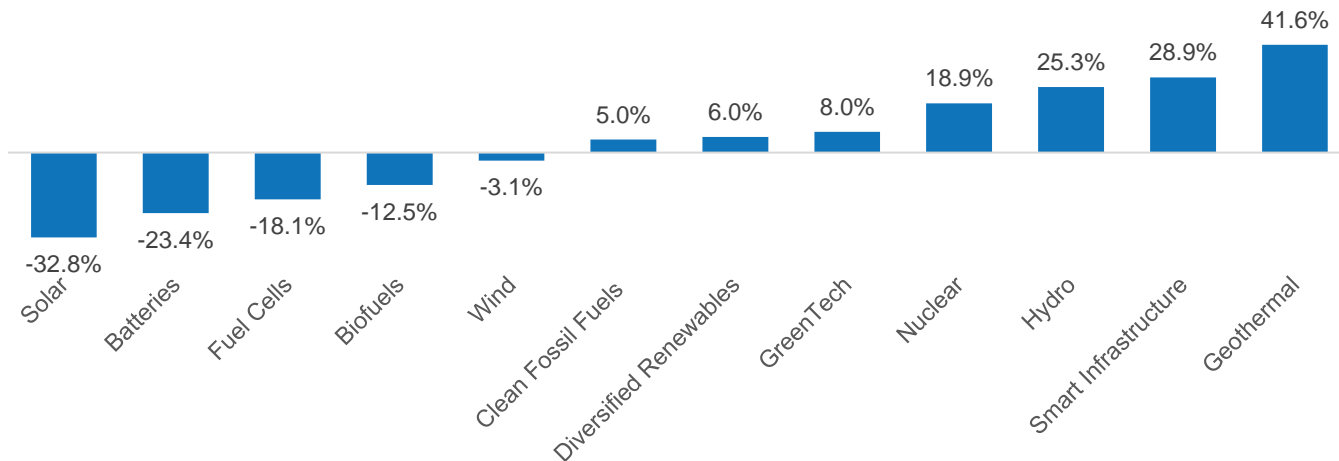
Chart 40: Top 10 YTD Cleantech Losers



Source: Intro-act, FactSet. YTD Data Through end of December 2023.

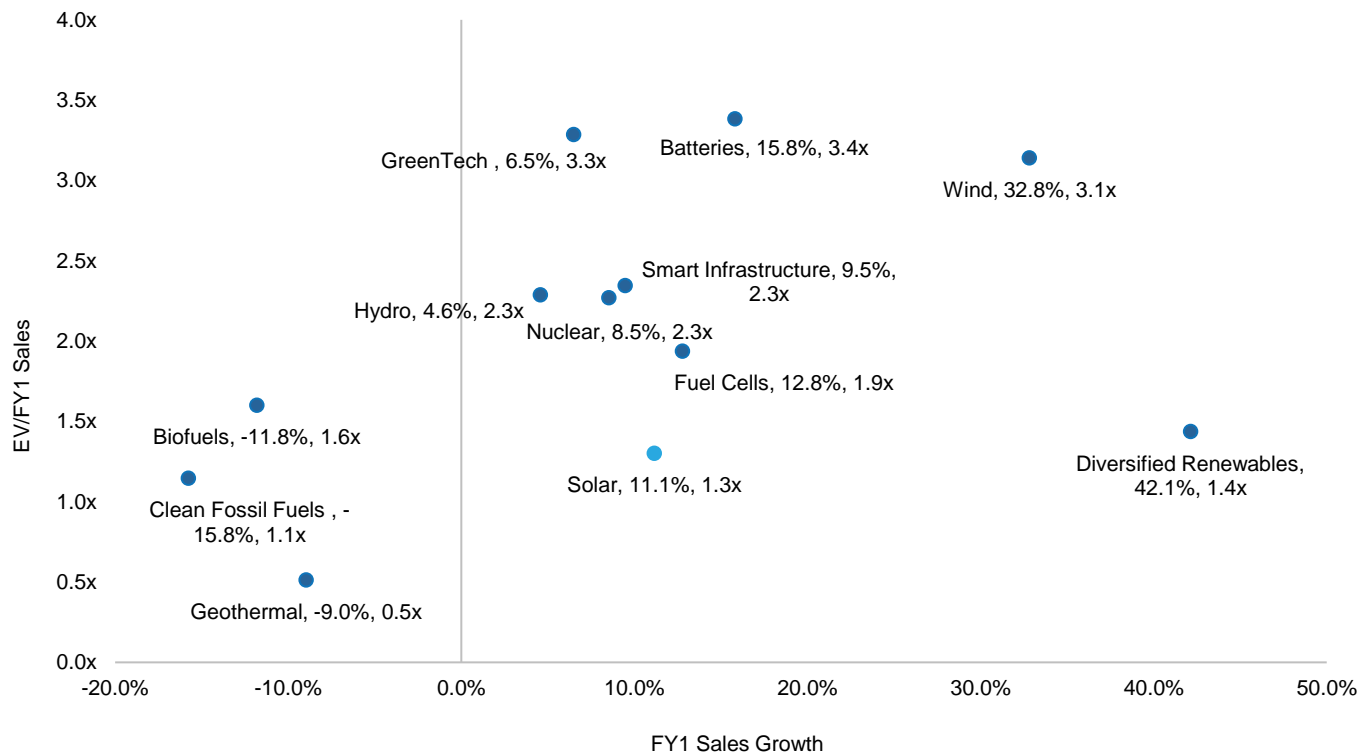
## SEGMENT RETURN AND VALUATION

Chart 41: YTD Stock Price Returns by Segment



Source: Intro-act, FactSet. YTD Data Through end of Dec 2023.

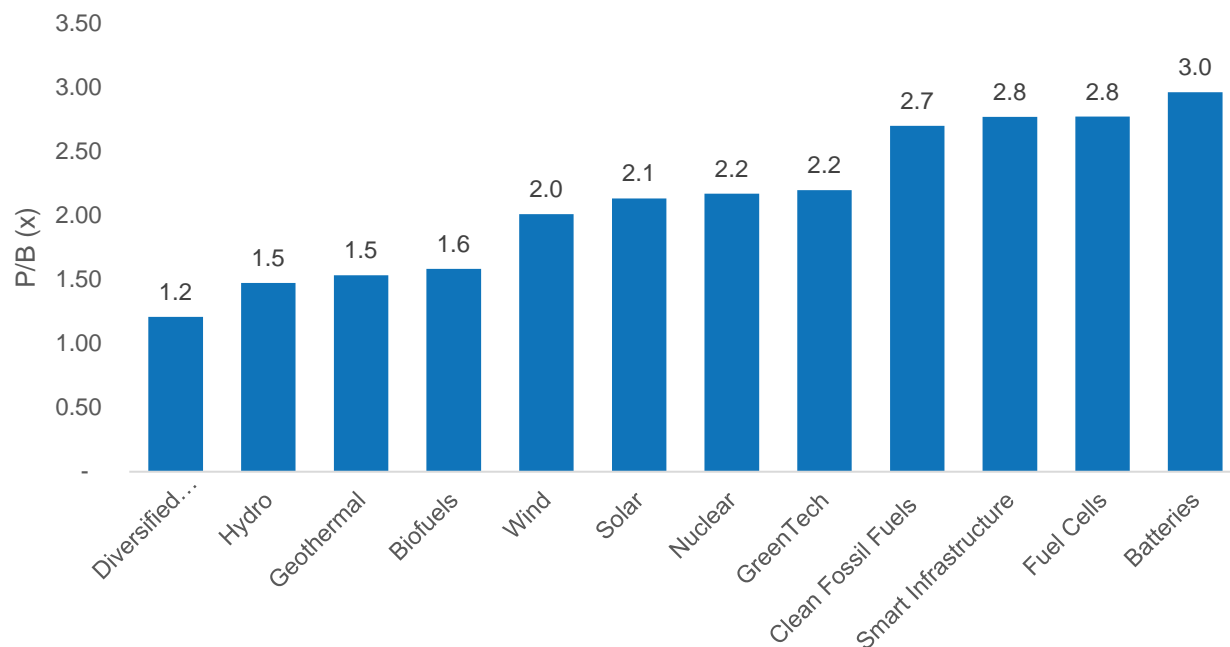
Chart 42: Cleantech Industry Growth and Valuation by Segment



Source: Intro-act, FactSet. Data Through end of Dec 2023. FY1 data is the first unreported financial year.

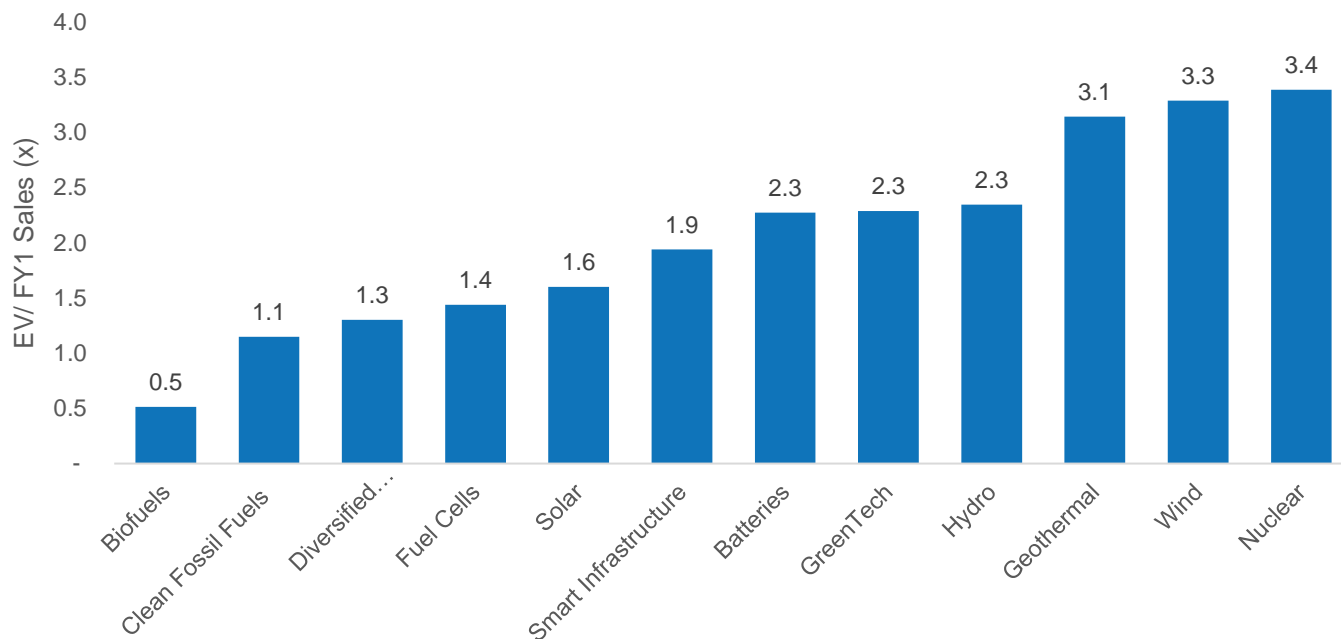


Chart 43: Price-to-Book Multiple by Segment



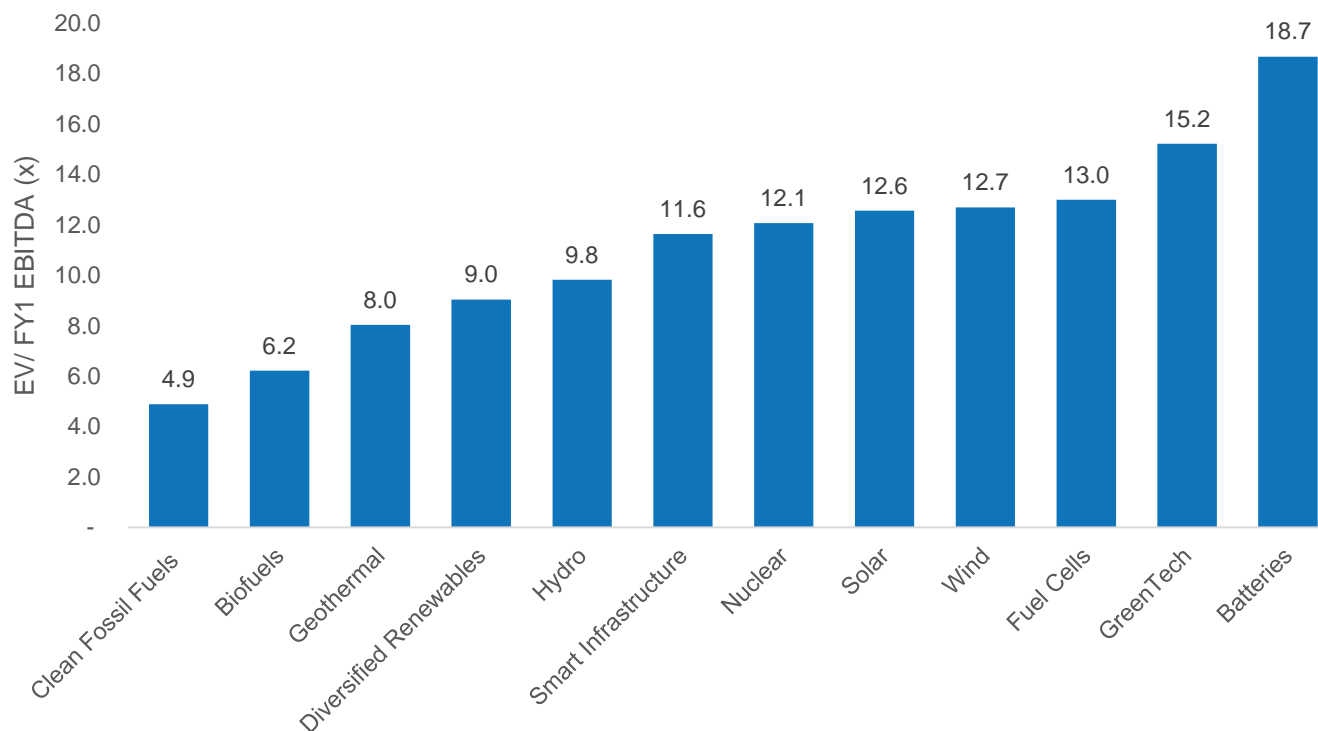
Source: Intro-act, FactSet. Data Through end of Dec 2023.

Chart 44: EV to FY1 Sales Multiple by Segment



Source: Intro-act, FactSet. Data Through end of Dec 2023. FY1 data is the first unreported financial year.

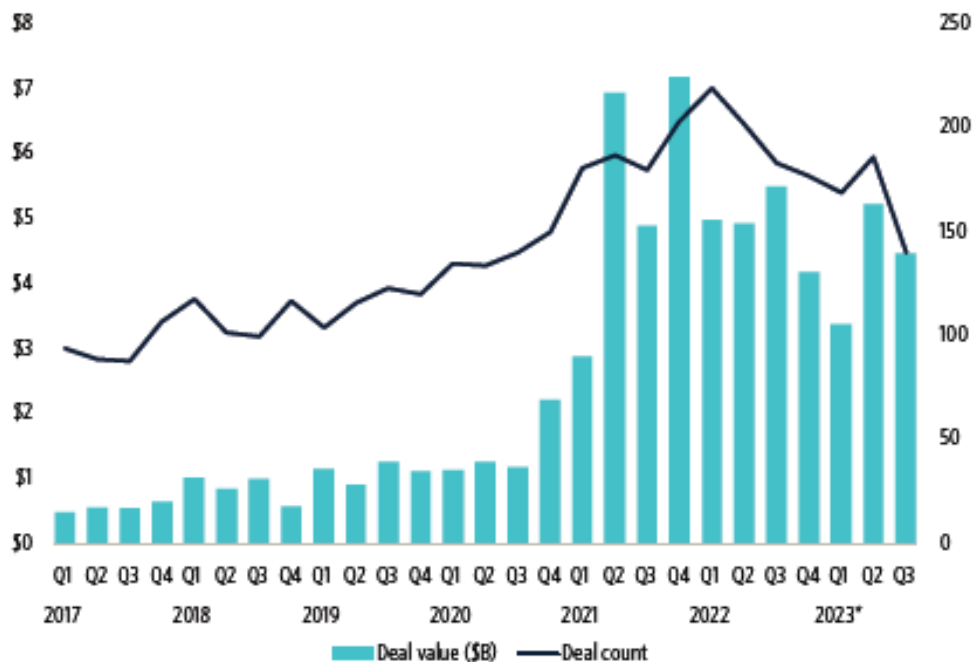
## Chart 45: EV to FY1 EBITDA Multiple by Segment



Source: Intro-act, FactSet. Data Through end of Dec 2023. FY1 data is the first unreported financial year.

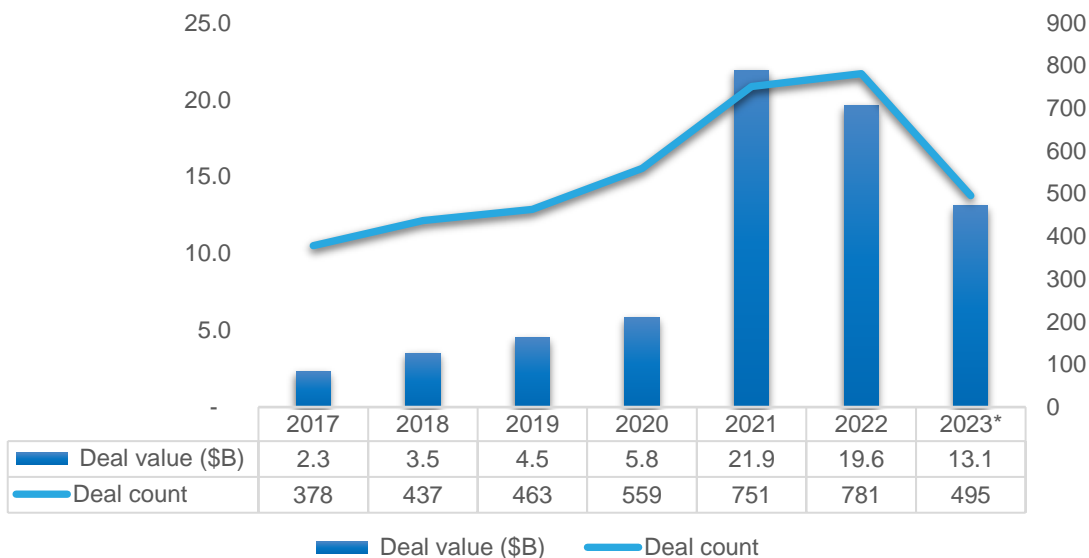
## CLEANTECH CAPITAL MARKET TRENDS

Chart 46: Clean Energy VC Deal Activity by Quarter



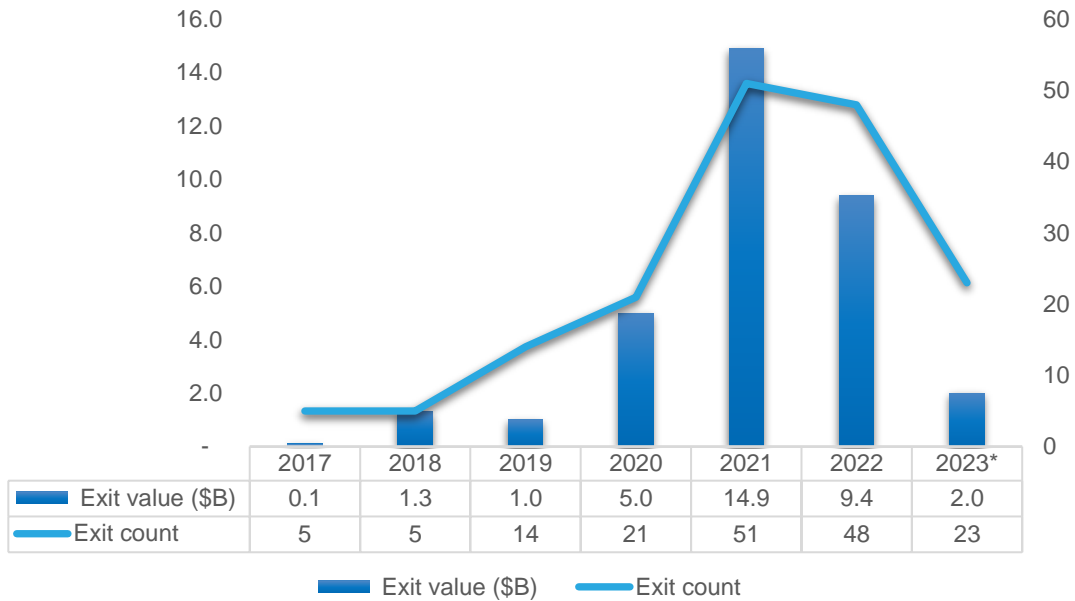
Source: Intro-act, Pitchbook, \*2023 data As of September 30, 2023.

Chart 47: Clean Energy VC Deal Activity



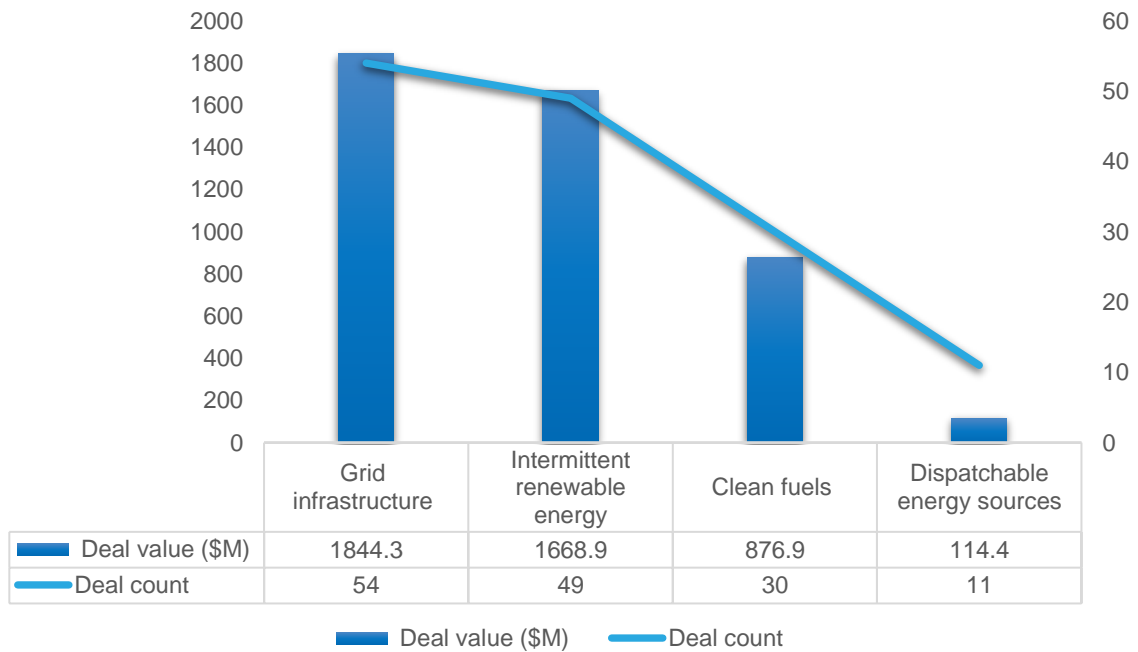
Source: Intro-act, Pitchbook, \*2023 data As of September 30, 2023.

Chart 48: Clean Energy VC Exit Activity



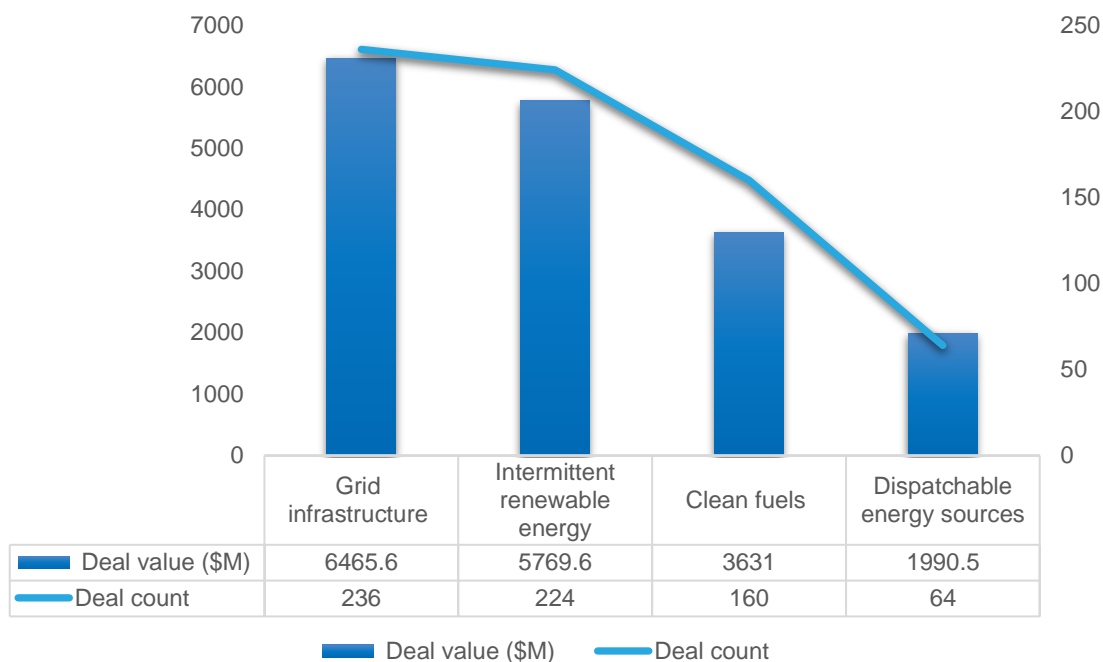
Source: Intro-act, Pitchbook, \*2023 data As of September 30, 2023.

Chart 49: Q3 2023 Clean Energy VC Deal Activity by Segment



Source: Intro-act, Pitchbook

Chart 50: Trailing 12-Month Clean Energy VC Deal Activity by Segment\*



Source: Intro-act, Pitchbook, \*2023 data As of September 30, 2023.

Chart 51: Top-10 Clean Energy VC Deals in Q3 2023

Company	Close date (2023)	Category	Deal Value(\$M)
Verkor	14 September	Battery storage	918.6
Electric Hydrogen	25 July	Hydrogen	380.0
Juniper Green Energy	13 September	Solar photovoltaic, wind	350.0
Astronergy	24 July	Solar photovoltaic	277.4
Ovo Energy	21 July	Analytics & grid management	256.4
Red Sun Photoelectric Technology	17 August	Solar photovoltaic	139.1
Guoqiang Singsun	31 July	Solar photovoltaic	137.0
d.light	13 August	Intermittent renewable energy	125.0
Accenta	18 September	Nonbattery storage	116.4
InterContinental Energy	27 September	Hydrogen	115.0

Source: Intro-act, Pitchbook

**Chart 52: Top VC Investors in Clean Energy Companies since 2017\***

Investor	Deal count	Investor type
Climate Capital	38	VC
Equinor Ventures	34	CVC
Shell Ventures	32	CVC
Lowercarbon Capital	27	VC
Prelude Ventures	25	VC
ENGIE New Ventures	23	CVC
Chevron Technology Ventures	23	CVC
EDP Ventures	22	CVC
Artesian Capital Management	20	VC
Clean Energy Ventures	19	VC

Source: Intro-act, \*2023 data As of September 30, 2023.

**Chart 53: Top VC-backed Clean Energy Companies by Total VC Raised to Date\***

Company	VC (\$M) raised to date	Category
SVOLT	3,231.3	Battery storage
Commonwealth Fusion Systems	1,999.0	Nuclear fusion
Verkor	1,955.5	Battery storage
REPT BATTERO	1,629.0	Battery storage
TAE	1,344.8	Nuclear fusion
Sila	933.5	Battery storage
Hithium	909.5	Battery storage
Enerkem	893.9	Waste to energy/fuel
TerraPower	865.0	Nuclear fission
Form Energy	816.0	Nonbattery storage

Source: Intro-act, \*2023 data As of September 30, 2023

## CLEANTECH SPAC ACTION

Chart 54: Cleantech SPACs (Searching)

S. No	SPAC Name	Ticker	Trust Value (\$ Mn)	IPO Date	Completion Date
1	AltEnergy Acquisition Corp	AEAE	230	10-29-21	05-02-24
2	dMY Squared Technology Group, Inc.	DMYY	63	09-29-22	06-29-24
3	Live Oak Crestview Climate Acquisition Corp.	LOCC	200	09-22-21	09-22-23
4	Nabors Energy Transition Corp. II	NETD	300	07-13-23	07-13-25
5	Enphys Acquisition Corp.	NFYS	345	10-05-21	10-05-23
6	Hennessy Capital Investment Corp. VI	HCVI	341	09-28-21	01-10-24
7	Onyx Acquisition Co. I	ONYX	265	11-02-21	02-07-24
8	SDCL EDGE Acquisition Corp	SEDA	200	10-29-21	10-29-23
9	Spree Acquisition Corp. 1 Ltd	SHAP	200	12-15-21	03-20-24
10	Welsbach Technology Metals Acquisition Corp.	WTMA	77	12-27-21	06-30-24

Source: Intro-act, Boardroom Alpha

**Chart 55: Cleantech SPACs (Business Combination Agreement Announced)**

S.No	SPAC Name	Ticker	Target Company	EV(\$ Mn)	Expected Closing
1	AltC Acquisition Corp.	ALCC	Oklo	850	3Q23
2	Aquaron Acquisition Corp.	AQU	Bestpath	1200	2Q24
3	Blue World Acquisition Corp	BWAQ	Vietnam Sunergy Cell Company	0	2Q24
4	Catcha Investment Corp	CHAA	CROWN LNG HOLDINGS LLC	685	2Q24
5	ESGEN Acquisition Corp	ESAC	Sunergy	475	2Q23
6	Flame Acquisition Corp.	FLME	Sable Offshore Corp.	883	1Q24
7	Finnovate Acquisition Corp.	FNVT	Scage International Limited	1,000	2Q24
8	Global Partner Acquisition Corp II	GPAC	Stardust Power, Inc.	490	1Q24
9	Keyarch Acquisition Corp	KYCH	ZOOZ Power Ltd.	100	1Q24
10	Liberty Resources Acquisition Corp.	LIBY	Caspi Oil Gas LLP	427.7	1Q24
11	Monterey Capital Acquisition Corp	MCAC	ConnectM Technology Solutions Inc.	145	4Q23
12	Nubia Brand International Corp.	NUBI	Honeycomb Battery Co.	700	4Q23
13	RMG Acquisition Corp. III	RMGC	H2B2 Electrolysis Technologies	0	3Q23
14	TMT Acquisition Corp.	TMTC	eLong Power Holding Limited	450	4Q24
15	TortoiseEcofin Acquisition Corp. III	TRTL	One Energy Enterprises LLC	300	3Q23
16	Power Digital Infrastructure Acquisition II Corp.	XPDB	Montana Technologies	500	2Q24

Source: Intro-act, Boardroom Alpha



Chart 56: Cleantech SPACs (Closed Deals Since January 2022)

S. No	SPAC Name	Ticker (Old)	DE-SPAC	Ticker	Closing Date
1	Decarbonization Plus Acquisition Corporation II.	DRCN	TRITIUM DCFC LTD	DCFC	13-Jan-22
2	Ivanhoe Capital Acquisition Corp	IVAN	SES Holdings	SES	3-Feb-22
3	CITIC Capital Acquisition Corp	CCAC	Quanergy Systems	QNGY	8-Feb-22
4	Novus Capital Corporation II	NXU	Energy Vault	NRGV	11-Feb-22
5	Spartan Energy Acquisition Corp.	SPAQ	Fisker Inc.	FSR	15-Mar-22
6	Poema Global Holdings Corp.	PPGH	GOGORO INC	GGR	4-Apr-22
7	Spring Valley Acquisition Corp	SV	Spring Valley Acquisition Corp	SMR	2-May-22
8	ArcLight Clean Transition Corp. II	ACTD	OPAL FuelsGroups	OPAL	21-Jul-22
9	Founder SPAC	FOUN	Rubicon Technologies	RBT	15-Aug-22
10	Kensington Capital Acquisition Corp. IV	KCAC	Amprius Technologies	AMPX	14-Sep-22
11	Chardan NexTech Acquisition 2 Corp..	CNTQ	Dragonfly Energy Corp.	DFLI	7-Oct-22
12	Executive Network Partnering Corp	ENPC	Granite Ridge Resources	GRNT	24-Oct-22
13	ACE Convergence Acquisition Corp	ACEV	Tempo Automation	TMPO	22-Nov-22

14	Decarbonization Plus Acquisition Corp IV	DCRD	Hammerhead Resources	HHRS	23-Feb-23
15	Roth CH Acquisition IV Co.	ROCG	Tigo Energy Inc	TYGO	23-May-23
16	Rice Acquisition Corp. II	RONI	NET Power	NPWR	8-Jun-23
17	ROC Energy Acquisition Corp.	ROC	Drilling Tools International	DTI	20-Jun-23
18	Freedom Acquisition I Corp	FACT	Complete Solar, Inc.	CSLR	17Jul-23
19	TLG Acquisition One Corp.	TLGA	Electriq Power	ELIQ	31-Jul-23
20	Genesis Unicorn Capital Corp.	GENQ	Environmental Solutions Group Holdings Limited	ESGL	2-Aug-23
21	Perception Capital Corp. II	PCCT	Spectaire Inc.	SPEC	19-Oct-23
22	HNR Acquisition Corp	HNRA	Pogo Resources, LLC	HNRA	15-Nov-23
23	Nabors Energy Transition Corp.	NETC0	Vast	VSTE	18-Dec-23
24	Dune Acquisition Corporation	DUNE	Global Hydrogen Energy	HGAS	21-Dec-23

Source: Intro-act, Boardroom Alph

## CLEANTECH EVENTS CALENDAR

S. No.	Event	Place	Dates
1	Net Zero Data Center Summit: Energy Efficiency and Decarbonization	Berlin, Germany	01-Feb to 02-Feb-2024
2	8th International Conference on Sustainable Energy Engineering (ICSEE 2024)	Brisbane, Australia	02-Feb to 04-Feb-2024
3	6th International Conference on Energy Management and Applications Technologies (ICEMAT 2024)	Brisbane, Australia	02-Feb to 04-Feb-2024
4	Clean Fuels Conference 2024	Texas, US	05-Feb to 08-Feb-2024
5	NAPE Summit 2024	Texas, US	07-Feb to 09-Feb-2024
6	Oil & Gas Automation and Technology Week 2024	Texas, US	13-Feb to 14-Feb-2024
7	Charge Expo	Texas, US	13-Feb to 15-Feb-2024
8	26th Annual Energy, Utility, and Environment Conference (EUEC 2024)	Texas, US	13-Feb to 15-Feb-2024
9	Argus Global Base Oils Conference	London, UK	19-Feb to 21-Feb-2024
10	IDEA 2024 - International District Energy Association	California, US	20-Feb to 23-Feb-2024
11	Energy Storage Summit	London, UK	21-Feb to 22-Feb-2024
12	14th International Conference on Renewable and Clean Energy (ICRCE 2024)	Tokyo, Japan	24-Feb to 26-Feb-2024
13	15th Annual Smart Energy Summit: Engaging the Consumer 2024	Texas, US	26-Feb to 27-Feb-2024
14	Low Carbon Fuels Summit	Singapore	27-Feb to 28-Feb-2024
15	World Smart Energy Week Tokyo	Tokyo, Japan	27-Feb to 01-Mar-2024
16	4th American Hydrogen Forum	Texas, US	28-Feb to 29-Feb-2024
17	The 8th International Conference on Power Energy Systems and Applications (ICoPESA 2024)	Hong Kong	01-Mar to 03-Mar-2024
18	Argus Biomass Asia Conference	Singapore	05-Mar to 07-Mar-2024
19	5th Edition Wind power Data and Digital Innovation Forum	Berlin, Germany	05-Mar to 06-Mar-2024
20	Global Smart Water Metering & Intelligent Data Utilization Congress 2024	London, UK	06-Mar to 07-Mar-2024
21	Energy From Waste 2024	London, UK	06-Mar to 07-Mar-2024
22	14th International Conference on Smart Grids, Green Communications and IT Energy-aware Technologies (ENERGY 2024)	Athens, Greece	10-Mar to 14-Mar-2024
23	6th World Summit on Renewable Energy and Resources	London, UK	14-Mar to 15-Mar-2024
24	8th International Conference on Green Energy and Applications (ICGEA 2024)	Singapore	14-Mar to 16-Mar-2024
25	5th Asia Conference on Renewable Energy and Environmental Engineering (AREEE 2024)	Singapore	22-Mar to 24-Mar-2024
26	International Conference on Renewable Energy and Sustainable Energy	Paris, France	25-Mar to 27-Mar-2024
27	18th World Congress on Biofuels and Bioenergy	Dubai, UAE	28-Mar to 29-Mar-2024

Source: Intro-act, Multiple web sources

## CLEANTECH COMP TABLE

			Price Performance						Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>Biofuels</b>			<b>670</b>	<b>1,70,668</b>	<b>2,58,322</b>			<b>-13%</b>	<b>5,59,890</b>	<b>5,04,161</b>	<b>0.5 x</b>	<b>45,624</b>	<b>41,534</b>	<b>6.2 x</b>	<b>423</b>	<b>1.6 x</b>
1	Valero Energy	VLO-US	130.00	44,259	51,800	17%	-20%	2%	1,76,383	1,45,422	0.4 x	18,073	14,599	3.5 x	76.30	1.7 x
2	Archer-Daniels-Midland Company	ADM-US	72.22	38,521	43,450	24%	-4%	-22%	1,01,848	95,695	0.5 x	6,714	6,325	6.9 x	47.16	1.5 x
3	Wilmar International	F34-SG	2.71	17,330	40,794	20%	-9%	-11%	73,399	68,864	0.6 x	4,203	3,524	11.6 x	3.19	0.8 x
4	Bunge Limited	BG-US	100.95	14,667	19,350	15%	-13%	1%	67,232	59,882	0.3 x	3,289	3,267	5.9 x	70.04	1.4 x
5	Darling Ingredients	DAR-US	49.84	7,951	12,537	44%	-22%	-20%	6,532	6,869	1.8 x	1,541	1,664	7.5 x	27.46	1.8 x
6	Energy Absolute	EA-TH	1.30	4,836	6,584	113%	-12%	-54%	746	1,013	6.5 x	296	388	16.9 x	0.34	3.8 x
7	Cosan S.A.	CSAN3-BR	4.00	7,496	21,984	10%	-36%	23%	31,186	31,650	0.7 x	3,100	3,993	5.5 x	2.04	2.0 x
8	Sime Darby	5285-MY	0.97	6,713	8,377	9%	-10%	-8%	4,715	3,971	2.1 x	1,079	724	11.6 x	0.57	1.7 x
9	Valmet Corporation	VALMT-FI	28.84	5,322	5,881	24%	-28%	8%	5,551	5,985	1.0 x	689	783	7.5 x	14.90	1.9 x
10	VERBIO Vereinigte	VBK-DE	33.01	2,097	2,157	101%	-25%	-49%	2,103	1,895	1.1 x	254	212	10.2 x	16.41	2.0 x
11	Sao Martinho	SMT03-BR	6.06	2,144	3,601	41%	-29%	23%	1,415	1,450	2.5 x	746	703	5.1 x	3.67	1.7 x
12	Green Plains	GPRE-US	25.22	1,501	2,017	49%	-15%	-23%	3,663	3,416	0.6 x	-4	56	36.3 x	13.92	1.8 x
13	First Resources	EB5-SG	1.08	1,717	1,776	14%	-8%	-1%	1,225	1,053	1.7 x	505	329	5.4 x	0.87	1.2 x

14	COFCO Biotechnology	000930-CN	0.94	1,746	2,161	43%	-9%	-21%	2,877	-	-	263	-	-	0.81	1.2 x
15	Andersons, Inc.	ANDE-US	57.54	1,942	2,379	2%	-40%	64%	17,325	15,800	0.2 x	407	365	6.5 x	36.71	1.6 x
16	Montauk Renewables,	MNTK-US	8.91	1,280	1,261	35%	-39%	-19%	206	190	6.6 x	71	54	23.3 x	1.71	5.2 x
17	Adecoagro S.A.	AGRO-US	11.10	1,195	2,297	13%	-34%	34%	1,342	1,365	1.7 x	418	474	4.8 x	11.83	0.9 x
18	Raizen SA	RAIZ4-BR	0.83	1,132	16,798	18%	-49%	19%	50,084	48,157	0.3 x	2,794	3,060	5.5 x	0.44	1.9 x
19	Greenvolt Energias	GVOLT-PT	9.04	1,258	2,098	1%	-43%	9%	273	385	5.5 x	101	123	17.1 x	3.65	2.5 x
20	CropEnergies AG	CE2-DE	12.70	1,108	889	11%	-42%	-9%	1,602	1,366	0.7 x	316	102	8.7 x	9.78	1.3 x
21	Longyan Zhuoyue	688196-CN	4.73	568	556	116%	-5%	-43%	632	498	1.1 x	69	-	-	3.23	1.5 x
22	Shandong Minhe	002234-CN	1.71	595	639	102%	-8%	-39%	234	301	2.1 x	-32	29	21.9 x	1.03	1.7 x
23	REX American	REX-US	47.30	828	621	8%	-42%	48%	855	838	0.7 x	54	97	6.4 x	28.17	1.7 x
24	Enviva Inc	EVA-US	1.00	74	1,642	5122%	-39%	-98%	1,094	1,226	1.3 x	155	99	16.6 x	4.16	0.2 x
25	Audax Renovables	ADX-ES	1.44	632	1,018	8%	-22%	80%	2,808	2,486	0.4 x	57	103	9.9 x	0.36	4.0 x
26	Jalles Machado	JALL3-BR	1.62	492	1,038	18%	-24%	12%	327	417	2.5 x	205	259	4.0 x	1.36	1.2 x
27	Henan BCCY	300614-CN	2.64	424	487	72%	-6%	-19%	65	-	-	18	-	-	1.34	2.0 x
28	Dalmia Bharat	500097-IN	4.95	401	373	19%	-24%	7%	-	366	1.0 x	-	63	5.9 x	4.36	1.1 x
29	Camlin Fine	532834-IN	1.63	273	344	37%	-8%	-16%	202	237	1.5 x	26	34	10.1 x	0.68	2.4 x
30	Gevo, Inc.	GEVO-US	1.16	279	-52	98%	-16%	-39%	1	17	-3.2 x	-78	-42	-	2.38	0.5 x
31	PT Tunas	TBLA-ID	0.05	266	1,047	29%	-10%	2%	1,106	1,064	1.0 x	178	163	6.4 x	0.08	0.6 x
32	Green Plains Partners LP	GPP-US	12.73	296	383	28%	-8%	-2%	-	-	-	51	-	-	-0.05	-272.5 x

33	Alto Ingredients,	ALTO-US	2.66	203	267	87%	-55%	-8%	1,336	1,242	0.2 x	-10	18	14.7 x	3.92	0.7 x
34	Dhampur Sugar	500119-IN	3.05	202	230	29%	-19%	1%	318	335	0.7 x	37	37	6.2 x	1.91	1.6 x
35	Aemetis, Inc.	AMTX-US	5.24	207	636	72%	-78%	32%	257	191	3.3 x	-22	-15	-	-5.08	-1.0 x
36	Dhampur Bio	543593-IN	1.84	122	147	28%	-24%	-25%	291	333	0.4 x	25	-	-	1.78	1.0 x
37	Codexis, Inc.	CDXS-US	3.05	213	157	129%	-52%	-35%	139	61	2.6 x	-18	-58	-	1.31	2.3 x
38	LGI LTD	LGI-AU	1.36	120	124	34%	-13%	12%	20	23	5.4 x	9	10	11.9 x	0.38	3.6 x
39	Agria Group	AGH-BG	11.41	78	256	40%	-6%	-19%	400	-	-	50	-	-	26.49	0.4 x
40	Biokraft International	BIOGAS-SE	2.02	88	145	28%	-31%	-14%	39	53	2.7 x	2	5	26.6 x	1.45	1.4 x
41	Comstock Inc.	LODE-US	0.55	65	53	80%	-50%	99%	0	2	27.3 x	-	-	-	0.56	1.0 x
42	Fermentalg SA	FALG-FR	0.33	14	16	452%	-34%	-79%	8	4	3.7 x	-6	-8	-	0.95	0.3 x
43	Greenlane Renewables	GRN-CA	0.10	15	3	326%	-8%	-73%	52	41	0.1 x	-2	-7	-	0.21	0.5 x

Peer Set	Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	Price Performance			Sales			EBITDA			Book Value			
				% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book		
Clean Fossil Fuels	374	1,49,053	1,75,112			5%	1,88,364	1,52,677	1.1 x	42,521	35,816	4.9 x	139	2.7 x		
44	Air Products	APD-US	273.80	60,846	71,268	17%	-8%	-11%	12,600	13,279	5.4 x	4,702	5,282	13.5 x	64.41	4.3 x
45	Eni SpA	ENI-IT	16.95	57,236	72,626	1%	-26%	28%	1,40,125	1,05,227	0.7 x	29,235	23,905	3.0 x	18.77	0.9 x
46	Shanxi Lu'An	601699-CN	3.09	9,241	6,607	11%	-33%	27%	7,843	5,990	1.1 x	3,794	2,208	3.0 x	2.30	1.3 x
47	Henan Shen	000933-CN	2.37	5,329	7,277	25%	-26%	11%	6,198	5,376	1.4 x	1,939	1,413	5.2 x	1.13	2.1 x
48	CNOOC Energy	600968-CN	0.40	4,085	3,591	38%	-4%	-3%	6,940	7,893	0.5 x	680	753	4.8 x	0.33	1.2 x
49	California Resources	CRC-US	54.68	3,752	3,928	7%	-38%	26%	2,707	2,480	1.6 x	845	902	4.4 x	29.87	1.8 x
50	Keda Industrial	600499-CN	1.49	2,898	3,513	62%	-10%	-26%	1,629	1,498	2.3 x	495	480	7.3 x	0.85	1.8 x
51	Aker Solutions	AKSO-NO	4.14	2,036	1,719	15%	-25%	10%	4,014	4,769	0.4 x	293	376	4.6 x	2.24	1.8 x
52	Guizhou Panjiang	600395-CN	0.87	1,867	2,952	34%	-6%	-10%	1,721	1,253	2.4 x	469	266	11.1 x	0.78	1.1 x
53	Tecnicas Reunidas,	TRE-ES	9.22	741	484	31%	-17%	6%	4,455	4,680	0.1 x	43	210	2.3 x	6.53	1.4 x
54	Aker Carbon	ACC-NO	1.34	808	684	25%	-38%	14%	76	147	4.7 x	-20	-19	-	0.12	10.9 x
55	Tidewater Renewables	LCFS-CA	6.12	213	464	45%	-23%	-28%	55	86	5.4 x	45	39	11.8 x	11.33	0.5 x
44	Air Products	APD-US	273.80	60,846	71,268	17%	-8%	-11%	12,600	13,279	5.4 x	4,702	5,282	13.5 x	64.41	4.3 x
45	Eni SpA	ENI-IT	16.95	57,236	72,626	1%	-26%	28%	1,40,125	1,05,227	0.7 x	29,235	23,905	3.0 x	18.77	0.9 x
46	Shanxi Lu'An	601699-CN	3.09	9,241	6,607	11%	-33%	27%	7,843	5,990	1.1 x	3,794	2,208	3.0 x	2.30	1.3 x
47	Henan Shen	000933-CN	2.37	5,329	7,277	25%	-26%	11%	6,198	5,376	1.4 x	1,939	1,413	5.2 x	1.13	2.1 x

48	<b>CNOOC Energy</b>	<b>600968-CN</b>	0.40	4,085	3,591	38%	-4%	-3%	6,940	7,893	0.5 x	680	753	4.8 x	0.33	1.2 x
49	<b>California Resources</b>	<b>CRC-US</b>	54.68	3,752	3,928	7%	-38%	26%	2,707	2,480	1.6 x	845	902	4.4 x	29.87	1.8 x
50	<b>Keda Industrial</b>	<b>600499-CN</b>	1.49	2,898	3,513	62%	-10%	-26%	1,629	1,498	2.3 x	495	480	7.3 x	0.85	1.8 x
51	<b>Aker Solutions</b>	<b>AKSO-NO</b>	4.14	2,036	1,719	15%	-25%	10%	4,014	4,769	0.4 x	293	376	4.6 x	2.24	1.8 x
52	<b>Guizhou Panjiang</b>	<b>600395-CN</b>	0.87	1,867	2,952	34%	-6%	-10%	1,721	1,253	2.4 x	469	266	11.1 x	0.78	1.1 x
53	<b>Tecnicas Reunidas,</b>	<b>TRE-ES</b>	9.22	741	484	31%	-17%	6%	4,455	4,680	0.1 x	43	210	2.3 x	6.53	1.4 x
54	<b>Aker Carbon</b>	<b>ACC-NO</b>	1.34	808	684	25%	-38%	14%	76	147	4.7 x	-20	-19	-	0.12	10.9 x
55	<b>Tidewater Renewables</b>	<b>LCFS-CA</b>	6.12	213	464	45%	-23%	-28%	55	86	5.4 x	45	39	11.8 x	11.33	0.5 x



Peer Set	Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	Price Performance			Sales			EBITDA			Book Value	
				% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
Diversified Renewables	617	3,37,533	6,24,024			6%	5,32,187	4,79,469	1.3 x	62,098	69,022	9.0 x	510	1.2 x
56 Enbridge Inc. ENB-CA	36.17	76,892	1,39,828	16%	-14%	-7%	39,969	33,151	4.2 x	11,630	12,248	11.4 x	20.79	1.7 x
57 Hitachi,Ltd. 6501-JP	72.14	66,884	79,456	6%	-32%	44%	79,912	64,155	1.2 x	8,797	8,210	9.7 x	41.45	1.7 x
58 ENGIE SA. ENGI-FR	17.58	42,822	77,058	4%	-24%	24%	1,00,281	1,06,724	0.7 x	14,636	16,542	4.7 x	11.73	1.5 x
59 Nidec Corporation 6594-JP	40.40	24,087	26,483	53%	-12%	-19%	16,683	16,047	1.7 x	1,648	2,437	10.9 x	19.85	2.0 x
60 RWE AG RWE-DE	45.49	33,837	39,357	4%	-27%	2%	41,322	49,627	0.8 x	6,796	8,497	4.6 x	50.48	0.9 x
61 Toshiba Corporation 6502-JP	32.56	0	15,030	10%	-8%	-100%	24,692	-	-	1,451	-	-	20.24	1.6 x
62 Chubu Electric 9502-JP	12.92	9,794	28,295	12%	-25%	25%	29,035	25,106	1.1 x	1,915	3,091	9.2 x	23.83	0.5 x
63 Zhejiang Zheneng 600023-CN	0.65	8,716	14,813	14%	-21%	29%	11,575	11,794	1.3 x	516	2,462	6.0 x	0.71	0.9 x
64 Tokyo Electric 9501-JP	5.24	8,418	48,613	17%	-38%	46%	56,798	48,986	1.0 x	-	-	-	11.55	0.5 x
65 Fuji Electric 6504-JP	43.05	6,427	6,746	12%	-15%	18%	7,413	7,390	0.9 x	972	1,045	6.5 x	26.87	1.6 x
66 Mercury NZ MCY-NZ	4.18	5,814	6,890	2%	-21%	19%	1,611	1,910	3.6 x	496	520	13.3 x	2.21	1.9 x
67 Bharat Heavy 500103-IN	2.32	8,095	8,521	6%	-66%	143%	2,820	3,135	2.7 x	87	58	146.7 x	0.90	2.6 x
68 Sojitz Corp. 2768-JP	22.59	5,083	10,058	6%	-17%	21%	18,171	16,187	0.6 x	1,154	893	11.3 x	28.48	0.8 x
69 Ultrapar Participacoes UGPA3-BR	5.48	6,108	7,638	5%	-57%	132%	28,033	26,307	0.3 x	838	1,047	7.3 x	2.39	2.3 x
70 Hubei Energy 000883-CN	0.60	3,889	9,357	15%	-6%	0%	-	-	-	-	-	-	0.71	0.8 x
71 IHI Corporation 7013-JP	19.58	3,029	6,689	56%	-11%	-31%	10,065	9,109	0.7 x	1,125	-49	-	13.99	1.4 x

72	Companhia Energetica	CMIG4-BR	2.37	3,476	6,888	18%	-17%	12%	6,246	7,245	1.0 x	1,049	1,518	4.5 x	2.11	1.1 x
73	Electric Power	9513-JP	16.23	2,971	13,849	9%	-11%	2%	13,702	9,487	1.5 x	2,202	1,522	9.1 x	44.96	0.4 x
74	Encavis AG	ECV-DE	17.22	2,773	4,715	20%	-30%	-13%	528	501	9.4 x	379	355	13.3 x	6.42	2.7 x
75	Centrais Eletricas	ELET6-BR	9.71	2,717	30,372	3%	-36%	18%	6,429	7,646	4.0 x	2,242	4,010	7.6 x	9.67	1.0 x
76	Terna Energy	TENERGY-GR	17.56	2,074	2,913	32%	-23%	-19%	327	363	8.0 x	181	196	14.8 x	4.34	4.0 x
77	TAURON Polska	TPE-PL	0.95	1,664	4,889	17%	-56%	97%	8,515	11,786	0.4 x	819	1,471	3.3 x	2.70	0.4 x
78	Romande Energie	REHN-CH	65.35	1,862	1,799	2%	-26%	51%	783	-	-	159	-	-	91.53	0.7 x
79	ReNew Energy	RNW-US	7.66	1,951	9,421	2%	-47%	39%	1,087	1,039	9.1 x	754	773	12.2 x	3.24	2.4 x
80	GEK Terna	GEKTERNA-GR	14.54	1,503	3,420	15%	-23%	37%	4,336	-	-	729	-	-	10.54	1.4 x
81	First Gen	FGEN-PH	0.31	1,130	1,736	25%	-11%	3%	2,497	2,585	0.7 x	812	875	2.0 x	0.91	0.3 x
82	KEPCO Plant	051600-KR	26.44	1,190	1,093	13%	-11%	1%	1,126	1,123	1.0 x	139	162	6.7 x	21.84	1.2 x
83	Opdenergy Holding	OPDE-ES	6.40	947	1,698	1%	-39%	56%	124	216	7.9 x	91	167	10.2 x	0.83	7.7 x
84	BCPG Public	BCPG-TH	0.26	750	1,500	26%	-11%	-12%	179	149	10.1 x	144	114	13.2 x	0.31	0.8 x
85	Shanghai Electric	2727-HK	0.21	610	10,703	33%	-5%	-7%	17,101	17,095	0.6 x	152	710	15.1 x	0.47	0.4 x
86	ABO Wind	AB9-DE	45.40	419	594	127%	-6%	-43%	249	275	2.2 x	61	59	10.1 x	20.84	2.2 x
87	PetroVietnam Power	NT2-VN	1.01	291	267	43%	-10%	-17%	370	275	1.0 x	69	46	5.9 x	0.59	1.7 x
88	Aker Horizons	AKH-NO	0.43	296	1,732	273%	-32%	-67%	-	-	-	0	-	-	0.56	0.8 x
89	Energia, Innovacion	EIDF-ES	6.90	399		398%	-51%	-77%	-	-	-	-	-	-	1.22	5.7 x
90	Renewable Japan	9522-JP	8.42	250	1,148	11%	-73%	130%	133	-	-	-	-	-	2.57	3.3 x

91	<b>Altius Renewable</b>	<b>ARR-CA</b>	5.98	184	146	24%	-20%	-9%	4	8	18.4 x	1	4	33.9 x	6.58	0.9 x
92	<b>clearwise AG</b>	<b>ABO-DE</b>	2.36	178	308	22%	-29%	-8%	70	47	6.5 x	52	40	7.8 x	1.54	1.5 x

			Price Performance						Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>Batteries</b>			<b>1,445</b>	<b>3,11,309</b>	<b>3,58,073</b>			<b>-23%</b>	<b>1,49,711</b>	<b>1,57,687</b>	<b>2.3 x</b>	<b>17,666</b>	<b>19,171</b>	<b>18.7 x</b>	<b>488</b>	<b>3.0 x</b>
93	Contemporary Amperex	300750-CN	23.02	1,01,264	99,619	75%	-12%	-27%	47,108	57,684	1.7 x	6,642	9,377	10.6 x	5.79	4.0 x
94	LG ENERGY	373220-KR	331.94	77,673	84,999	47%	-17%	-4%	19,636	25,898	3.3 x	2,343	3,506	24.2 x	68.07	4.9 x
95	Orsted A/S	ORSTED-DK	55.47	23,317	32,529	85%	-36%	-39%	19,417	14,349	2.3 x	4,706	2,908	11.2 x	20.21	2.7 x
96	Lucid Group,	LCID-US	4.21	9,638	7,620	323%	-29%	-38%	608	632	12.1 x	-1,969	-2,629	-	2.36	1.8 x
97	SolarEdge Technologies	SEDG-US	93.60	5,318	5,023	269%	-32%	-67%	3,110	3,000	1.7 x	487	341	14.7 x	43.84	2.1 x
98	Generac Holdings	GNRC	129.24	7,939	9,355	21%	-38%	28%	4,565	4,051	2.3 x	825	644	14.5 x	38.52	3.4 x
99	Littelfuse, Inc.	LFUS-US	267.56	6,663	7,147	16%	-20%	22%	2,514	2,366	3.0 x	665	526	13.6 x	96.56	2.8 x
100	Wuxi Lead	300450-CN	3.61	5,653	5,903	106%	-10%	-37%	2,012	2,693	2.2 x	398	555	10.6 x	1.13	3.2 x
101	China Shipbuilding	600482-CN	2.54	5,553	5,452	35%	-13%	15%	5,528	-	-	217	-	-	2.35	1.1 x
102	CNGR Advanced	300919-CN	6.93	4,640	7,566	72%	-13%	-26%	4,383	5,183	1.5 x	395	499	15.2 x	3.93	1.8 x
103	EnerSys	ENS-US	100.96	4,079	4,772	12%	-23%	37%	3,709	3,643	1.3 x	389	536	8.9 x	40.76	2.5 x
104	Shenzhen Kedali	002850-CN	11.91	3,212	3,418	92%	-16%	-30%	1,263	1,542	2.2 x	237	278	12.3 x	5.27	2.3 x
105	Gotion High-tech	002074-CN	3.03	3,924	8,786	65%	-10%	-27%	3,326	4,222	2.1 x	190	329	26.7 x	1.92	1.6 x
106	Voltronic Power	6409-TW	55.72	4,888	4,765	24%	-30%	11%	749	608	7.8 x	187	150	31.8 x	2.86	19.4 x
107	Wuxi Autowell	688516-CN	12.76	2,869	2,985	80%	-15%	-36%	511	852	3.5 x	126	204	14.7 x	2.06	6.2 x

108	Farasis Energy	688567-CN	2.30	2,802	2,750	76%	-12%	-41%	1,673	2,010	1.4 x	7	-88	-	1.22	1.9 x
109	Fluence Energy,	FLNC	23.85	2,845	2,588	31%	-38%	40%	2,218	2,977	0.9 x	-61	65	39.6 x	3.38	7.0 x
110	Zhuhai CosMX	688772-CN	3.10	3,482	4,014	12%	-26%	16%	1,597	1,691	2.4 x	237	232	17.3 x	0.89	3.5 x
111	Beijing Easpring	300073-CN	5.39	2,619	2,114	91%	-9%	-34%	3,093	2,650	0.8 x	365	388	5.4 x	3.52	1.5 x
112	Hunan Changyuan	688779-CN	1.03	1,986	2,501	141%	-10%	-51%	2,599	1,723	1.5 x	269	28	88.7 x	0.57	1.8 x
113	Zhejiang HangKe	688006-CN	3.31	1,999	1,687	89%	-10%	-26%	499	666	2.5 x	80	166	10.1 x	1.20	2.8 x
114	Guangzhou Great	300438-CN	3.99	2,008	2,235	214%	-13%	-64%	1,310	1,049	2.1 x	173	142	15.8 x	1.58	2.5 x
115	Shenzhen Senior	300568-CN	2.17	2,637	2,932	70%	-19%	-29%	416	531	5.5 x	175	233	12.6 x	1.00	2.2 x
116	Kehua Data	002335-CN	3.90	1,801	2,228	108%	-13%	-46%	815	1,144	1.9 x	146	188	11.9 x	1.33	2.9 x
117	Zhejiang Narada	300068-CN	1.82	1,514	2,560	126%	-10%	-40%	1,705	2,164	1.2 x	138	219	11.7 x	0.93	2.0 x
118	Anker Innovations	300866-CN	12.49	1,889	4,859	12%	-32%	47%	2,066	2,441	2.0 x	192	252	19.2 x	2.63	4.8 x
119	Sunnova Energy	NOVA-US	15.25	1,867	9,213	61%	-50%	-15%	558	757	12.2 x	119	230	40.1 x	12.73	1.2 x
120	W-Scope Chungju	393890-KR	34.55	1,164	1,213	99%	-16%	8%	196	220	5.5 x	79	78	15.6 x	22.86	1.5 x
121	V-Guard Industries	532953-IN	3.51	1,522	1,552	15%	-20%	11%	497	583	2.7 x	38	53	29.4 x	0.47	7.5 x
122	Sineng Electric	300827-CN	4.27	1,528	1,663	83%	-16%	-28%	338	727	2.3 x	19	60	27.6 x	0.64	6.7 x
123	Guizhou Zhenhua	688707-CN	2.89	1,280	1,634	167%	-14%	-55%	2,011	1,201	1.4 x	241	81	20.1 x	1.21	2.4 x
124	People &	137400-KR	39.13	890	935	73%	-19%	17%	316	403	2.3 x	61	61	15.3 x	14.97	2.6 x
125	Nikola Corporation	NKLA-US	0.87	1,013	783	324%	-40%	-59%	51	39	19.8 x	-434	-558	-	0.61	1.4 x

126	VARTA AKTIENGESELLSCHAFT	VAR1-DE	22.92	977	1,572	42%	-35%	-5%	891	895	1.8 x	77	44	35.4 x	4.54	5.0 x
127	FREYR Battery	FREY-US	1.87	261	-43	497%	-25%	-78%	0	0	-88.2 x	-125	-125	-	4.53	0.4 x
128	Shenzhen Click	002782-CN	1.98	976	954	69%	-23%	-19%	474	-	-	35	-	-	0.53	3.7 x
129	Enchem Co.	348370-KR	61.73	1,004	1,181	21%	-41%	48%	-	-	-	-	-	-	15.35	4.0 x
130	Li-Cycle Holdings	LICY-US	0.58	104	322	1025%	-14%	-88%	13	11	29.4 x	-101	-140	-	1.70	0.3 x
131	HNAC Technology	300490-CN	1.64	649	753	77%	-9%	-1%	253	-	-	-52	-	-	1.06	1.5 x
132	Gogoro Inc.	GGR-US	2.58	630	872	97%	-10%	-19%	383	285	3.1 x	-34	25	34.6 x	1.07	2.4 x
133	Microvast Holdings,	MVST-US	1.40	443	486	108%	-40%	-8%	204	297	1.6 x	-57	-25	-	1.80	0.8 x
134	Zhejiang Power	688184-CN	2.74	164	419	81%	-6%	-34%	-	-	-	-	-	-	2.71	1.0 x
135	CALB Group	3931-HK	2.25	599	9,326	46%	-15%	-3%	2,958	4,596	2.0 x	211	468	19.9 x	2.69	0.8 x
136	Fujian Nebula	300648-CN	3.76	555	688	83%	-14%	-29%	186	-	-	-	-	-	0.94	4.0 x
137	Energy Vault	NRGV-US	2.33	334	203	136%	-42%	-25%	146	373	0.5 x	-11	-57	-	1.66	1.4 x
138	W-SCOPE Corporation.	6619-JP	6.35	351	884	86%	-17%	-37%	340	346	2.6 x	119	92	9.6 x	6.96	0.9 x
139	Eos Energy	EOSE-US	1.09	210	321	420%	-28%	-26%	18	18	17.9 x	-202	-124	-	-0.82	-1.3 x
140	Allis Electric	1514-TW	2.45	604	679	21%	-59%	167%	252	283	2.4 x	-	27	25.0 x	0.55	4.4 x
141	VITZROCELL Co.,	082920-KR	12.64	286	219	50%	-14%	27%	107	-	-	30	-	-	8.03	1.6 x
142	Vulcan Energy	VUL-AU	1.94	335	174	175%	-33%	-55%	4	7	25.0 x	-	-40	-	1.87	1.0 x
143	NHOA S.A.	NHOA-FR	0.66	182	127	1029%	-2%	-91%	178	274	0.5 x	-27	-18	-	1.12	0.6 x

144	Leoch International	842-HK	0.16	215	460	98%	-14%	-12%	1,866	-	-	125	-	-	0.41	0.4 x
145	Forsee Power	FORSE-FR	2.88	206	217	39%	-5%	-19%	121	182	1.2 x	-18	-10	-	1.10	2.6 x
146	Largo Inc.	LGO-CA	2.31	148	183	206%	-19%	-57%	229	183	1.0 x	31	13	14.4 x	4.07	0.6 x
147	FDK Corporation	6955-JP	4.97	171	246	62%	-7%	-29%	468	-	-	-	-	-	2.89	1.7 x
148	mPlus Corp.	259630-KR	8.96	110	72	68%	-17%	20%	-	-	-	-	-	-	4.51	2.0 x
149	Nippon Den kai	5759-JP	7.39	67	137	147%	-12%	-42%	127	117	1.2 x	-	-	-	5.52	1.3 x
150	Flux Power	FLUX-US	4.11	68	81	82%	-28%	4%	66	74	1.1 x	-4	-0	-	0.47	8.8 x
151	Pioneer Power	PPSI-US	6.79	67	61	45%	-63%	153%	27	44	1.4 x	-4	2	28.2 x	1.86	3.6 x
152	Ideal Power	IPWR-US	7.77	46	36	79%	-10%	-27%	0	0	356.5 x	-	-	-	2.06	3.8 x
153	Gelion PLC	GELN-GB	0.31	42	25	103%	-10%	-37%	3	3	9.7 x	-7	-7	-	0.15	2.1 x
154	Kyoto Group	KYOTO-NO	1.65	27	21	27%	-38%	-9%	-	0	-	-	-8	-	0.84	2.0 x

			Price Performance						Sales			EBITDA			Book Value	
Peer Set			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
Fuel Cells			351	46,972	53,413			-18%	31,226	37,168	1.4 x	2,891	4,109	13.0 x	127	2.8 x
155	Cummins Inc.	CMI	239.57	33,958	39,873	11%	-15%	-1%	28,074	33,592	1.2 x	3,799	5,112	7.8 x	75.22	3.2 x
156	Plug Power	PLUG-US	4.50	2,725	3,130	320%	-28%	-64%	701	1,073	2.9 x	-446	-630	-	5.80	0.8 x
157	Bloom Energy	BE-US	14.80	3,316	4,175	79%	-36%	-23%	1,199	1,452	2.9 x	27	101	41.3 x	2.17	6.8 x
158	Nel ASA	NEL-NO	0.68	1,134	801	176%	-16%	-52%	93	161	5.0 x	-74	-49	-	0.37	1.8 x
159	Ballard Power	BLDP-CA	3.72	1,112	348	91%	-16%	-22%	84	91	3.8 x	-144	-152	-	3.56	1.0 x
160	Doosan Fuel	336260-KR	18.01	1,180	1,735	62%	-34%	-22%	248	247	7.0 x	16	24	73.2 x	4.97	3.6 x
161	Shinry Technologies	300745-CN	3.83	642	560	108%	-12%	-30%	219	-	-	9	-	-	2.20	1.7 x
162	Ceres Power	CWR-GB	2.33	450	256	170%	-27%	-45%	27	30	8.6 x	-53	-59	-	1.40	1.7 x
163	FuelCell Energy,	FCEL-US	1.60	723	517	173%	-39%	-42%	123	138	3.7 x	-103	-76	-	1.52	1.1 x
164	Nanofilm Technologies	MZH-SG	0.69	460	423	97%	-14%	-33%	177	131	3.2 x	57	31	13.5 x	0.44	1.6 x
165	SFC Energy	F3C-DE	21.56	374	330	39%	-21%	-20%	93	128	2.6 x	9	15	21.3 x	7.02	3.1 x
166	PowerCell Sweden	PCELL-SE	4.59	239	230	272%	-18%	-60%	23	-	-	-7	-	-	0.54	8.4 x
167	Hyzon Motors	HYZN	0.90	219	89	163%	-50%	-42%	4	0	-	-124	-140	-	0.73	1.2 x
168	Bumhan Fuel	382900-KR	15.72	138	101	58%	-18%	-22%	-	-	-	-	-	-	9.51	1.7 x
169	Beijing SinoHytec	2402-HK	4.30	110	658	44%	-11%	-	107	121	5.5 x	-15	-14	-	2.55	1.7 x
170	TECO 2030	TECO-NO	0.43	70	80	215%	-17%	-61%	1	-	-	-6	-	-	0.02	23.2 x



171	S-FuelCell Co.,	288620-KR	13.24	92	81	46%	-23%	-18%	35	-	-	2	-	-	7.92	1.7 x
172	Advent Technologies	ADN-US	0.22	16	20	838%	-25%	-88%	8	4	4.9 x	-47	-55	-	0.52	0.4 x
173	Cell Impact	CI-SE	0.02	13	6	1782%	-29%	-93%	9	-	-	-8	-	-	0.10	0.2 x

Peer Set	Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	Price Performance			Sales			EBITDA			Book Value		
				% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book	
<b>Geothermal</b>	<b>87</b>	<b>8,561</b>	<b>13,481</b>			<b>42%</b>	<b>3,293</b>	<b>4,293</b>	<b>3.1 x</b>	<b>1,262</b>	<b>1,676</b>	<b>8.0 x</b>	<b>57</b>	<b>1.5 x</b>	
174	Ormat Technologies, ORA-US	75.79	4,574	6,488	25%	-23%	-12%	734	827	7.8 x	435	483	13.4 x	37.76	2.0 x
175	PT Pertamina PGEO-ID	0.08	3,146	3,193	41%	-47%	-	-	409	7.8 x	-	336	9.5 x	0.05	1.6 x
176	First Philippine FPH-PH	1.13	523	3,352	7%	-7%	4%	2,491	2,976	1.1 x	782	799	4.2 x	5.77	0.2 x
177	Polaris Renewable PIF-CA	10.03	211	349	17%	-10%	-3%	63	81	4.3 x	45	60	5.8 x	13.20	0.8 x
178	FHT holdings 3777-JP	0.29	82	75	69%	-31%	42%	6	-	-	-	-	-	0.08	3.6 x
179	Bluestone Resources BSR-CA	0.16	25	22	198%	-21%	-49%	0	0	-	-	-	-	0.19	0.8 x

						Price Performance			Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>GreenTech</b>			<b>654</b>	<b>1,07,512</b>	<b>1,48,723</b>			<b>8%</b>	<b>62,801</b>	<b>65,031</b>	<b>2.3 x</b>	<b>9,342</b>	<b>9,769</b>	<b>15.2 x</b>	<b>297</b>	<b>2.2 x</b>
180	Waste Connections,	WCN	149.27	38,458	45,482	0%	-16%	13%	7,212	8,023	5.7 x	2,221	2,518	18.1 x	29.45	5.1 x
181	Xylem Inc.	XYL	114.36	27,570	29,215	4%	-23%	3%	5,522	7,299	4.0 x	940	1,379	21.2 x	41.24	2.8 x
182	GFL Environmental	GFL	34.51	12,361	19,662	13%	-22%	18%	4,993	5,528	3.6 x	1,271	1,477	13.3 x	14.57	2.4 x
183	Casella Waste	CWST	85.46	4,871	5,859	12%	-15%	8%	1,085	1,265	4.6 x	245	295	19.9 x	17.78	4.8 x
184	Stericycle, Inc.	SRCL	49.56	4,585	6,331	13%	-24%	-1%	2,705	2,665	2.4 x	432	414	15.3 x	26.76	1.9 x
185	Acea S.p.A.	ACE-IT	15.28	3,254	8,885	3%	-31%	11%	5,068	5,177	1.7 x	1,377	1,457	6.1 x	11.93	1.3 x
186	Keppel Infrastructure	A7RU-SG	0.38	2,132	4,540	16%	-16%	-5%	1,528	1,563	2.9 x	291	306	14.8 x	0.15	2.5 x
187	Sims Ltd.	SMSMY	10.62	2,051	2,353	6%	-28%	20%	5,234	5,028	0.5 x	308	250	9.4 x	9.22	1.2 x
188	China Tianying	000035-CN	0.70	1,758	2,841	27%	-16%	1%	968	1,002	2.8 x	-	218	13.1 x	0.62	1.1 x
189	Energy Recovery,	ERII	18.84	1,065	994	63%	-25%	-8%	126	135	7.4 x	31	31	31.8 x	3.43	5.5 x
190	Shanghai Environment	601200-CN	1.27	1,422	2,945	17%	-4%	-1%	916	-	-	252	-	-	1.34	0.9 x
191	PureCycle Technologies	PCT	4.05	664	961	194%	-41%	-40%	0	0	2,651.1 x	-76	-98	-	2.69	1.5 x
192	Montrose Environmental	MEG-US	32.13	970	1,321	71%	-32%	-28%	544	618	2.1 x	66	79	16.6 x	10.44	3.1 x
193	GS Engineering	006360-KR	11.66	998	3,300	68%	-20%	-30%	9,928	10,314	0.3 x	589	68	48.3 x	42.08	0.3 x
194	Enviri Corporation	NVRI	9.00	719	2,199	11%	-37%	43%	1,889	2,031	1.1 x	229	286	7.7 x	7.06	1.3 x

195	<b>NGL Energy</b>	<b>NGL-US</b>	5.57	735	4,475	2%	-75%	360%	8,695	7,843	0.6 x	633	667	6.7 x	3.82	1.5 x
196	<b>CECO Environmental</b>	<b>CECE</b>	20.28	706	818	6%	-47%	74%	423	536	1.5 x	42	55	14.8 x	6.48	3.1 x
197	<b>WELLE Environmental</b>	<b>300190-CN</b>	0.59	461	884	13%	-11%	0%	301	349	2.5 x	22	53	16.8 x	0.69	0.8 x
198	<b>Tsukishima Holdings</b>	<b>6332-JP</b>	9.53	435	367	3%	-23%	39%	718	898	0.4 x	-	-	-	13.98	0.7 x
199	<b>Vertex Energy,</b>	<b>VTNR</b>	3.39	317	726	230%	-40%	-45%	2,792	3,222	0.2 x	161	67	10.8 x	2.77	1.2 x
200	<b>VA Tech</b>	<b>533269-IN</b>	7.54	469	463	6%	-51%	90%	358	353	1.3 x	31	36	12.7 x	3.24	2.3 x
201	<b>GreenTech Environmental</b>	<b>688466-CN</b>	2.50	308	297	21%	-25%	40%	97	130	2.3 x	19	24	12.4 x	1.31	1.9 x
202	<b>Ekopak N.V.</b>	<b>EKOP-BE</b>	21.15	314	303	10%	-13%	15%	19	40	7.6 x	-0	4	70.0 x	4.21	5.0 x
203	<b>CSD Water</b>	<b>603903-CN</b>	1.39	282	557	26%	-15%	7%	208	-	-	45	-	-	0.94	1.5 x
204	<b>Danimer Scientific,</b>	<b>DNMR</b>	1.02	104	432	350%	-19%	-43%	53	52	8.4 x	-45	-39	-	2.98	0.3 x
205	<b>Dynagreen Environmental</b>	<b>1330-HK</b>	0.30	122	2,013	26%	-6%	-7%	664	564	3.6 x	220	232	8.7 x	0.74	0.4 x
206	<b>Green Impact</b>	<b>GIP-CA</b>	3.34	71	108	119%	-22%	-11%	159	129	0.8 x	1	1	140.2 x	3.83	0.9 x
207	<b>Ascent Industries</b>	<b>ACNT-US</b>	9.56	97	183	21%	-25%	10%	414	263	0.7 x	36	-13	-	9.52	1.0 x
208	<b>Tacmina Corporation</b>	<b>6322-JP</b>	12.32	95	67	8%	-28%	45%	72	-	-	-	-	-	9.19	1.3 x
209	<b>Nagaoka International</b>	<b>6239-JP</b>	7.30	52	46	6%	-31%	35%	56	-	-	-	-	-	5.72	1.3 x
210	<b>EverGen Infrastructure</b>	<b>EVGN-CA</b>	1.90	26	43	43%	-24%	24%	6	6	6.7 x	1	1	61.3 x	3.11	0.6 x
211	<b>Puequ Co.</b>	<b>9264-JP</b>	8.92	41	54	14%	-45%	30%	47	-	-	-	-	-	6.07	1.5 x

			Price Performance						Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>Hydro</b>			<b>601</b>	<b>2,43,400</b>	<b>4,19,093</b>			<b>25%</b>	<b>1,75,030</b>	<b>1,78,706</b>	<b>2.3 x</b>	<b>38,950</b>	<b>42,638</b>	<b>9.8 x</b>	<b>408</b>	<b>1.5 x</b>
212	VINCI SA	DG-FR	125.60	75,076	97,928	3%	-17%	34%	66,375	74,367	1.3 x	10,962	12,851	7.6 x	52.36	2.4 x
213	CEZ a.	CEZ-CZ	42.89	23,073	28,959	33%	-17%	26%	13,057	15,006	1.9 x	5,955	5,271	5.5 x	19.58	2.2 x
214	Endesa S.A.	ELE-ES	20.39	21,590	36,352	15%	-9%	8%	34,677	26,449	1.4 x	5,866	4,636	7.8 x	7.57	2.7 x
215	Huaneng Lancang	600025-CN	1.22	21,903	37,870	5%	-21%	28%	3,068	3,207	11.8 x	2,207	2,571	14.7 x	0.42	2.9 x
216	S.P.E.E.H. Hidroelectrica	H2O-RO	28.42	12,784	12,132	6%	-22%	-	-	2,615	4.6 x	-	1,737	7.0 x	11.08	2.6 x
217	Tata Power	500400-IN	3.99	12,750	18,469	9%	-44%	59%	6,759	7,429	2.5 x	1,015	1,273	14.5 x	1.13	3.5 x
218	Meridian Energy	MEL-NZ	3.51	9,073	9,692	2%	-21%	6%	1,912	2,524	3.8 x	472	537	18.0 x	1.47	2.4 x
219	Orkla ASA	ORK-NO	7.76	7,774	9,806	5%	-16%	8%	5,752	6,561	1.5 x	935	924	10.6 x	4.39	1.8 x
220	Brookfield Renewable	BEP.UT-CA	26.40	7,616	54,832	24%	-24%	4%	4,711	5,055	10.8 x	2,174	2,155	25.4 x	14.81	1.8 x
221	NHPC Limited	533098-IN	0.78	7,801	11,608	16%	-41%	62%	1,264	1,279	9.1 x	762	736	15.8 x	0.47	1.7 x
222	Brookfield Renewable Corp.	BEPC-US	28.79	5,172	34,950	26%	-24%	5%	3,778	5,033	6.9 x	1,991	2,703	12.9 x	18.08	1.6 x
223	IDACORP, Inc.	IDA-US	98.32	4,976	7,365	15%	-10%	-9%	1,571	1,665	4.4 x	505	527	14.0 x	57.71	1.7 x
224	Portland General	POR-US	43.34	4,383	8,433	19%	-12%	-12%	2,647	2,770	3.0 x	830	906	9.3 x	32.58	1.3 x
225	China Southern	600995-CN	1.39	4,443	6,446	68%	-15%	-33%	1,200	822	7.8 x	711	1,243	5.2 x	0.91	1.5 x
226	SJVN Limited	533206-IN	1.09	4,295	5,878	11%	-66%	164%	346	405	14.5 x	256	306	19.2 x	0.44	2.5 x

227	Colbun S.A.	COLBUN-CL	0.16	2,807	3,873	5%	-35%	56%	1,850	2,059	1.9 x	691	804	4.8 x	0.18	0.9 x
228	Borex Inc.	BLX-CA	25.54	2,625	5,190	26%	-28%	-14%	600	703	7.4 x	407	481	10.8 x	12.67	2.0 x
229	Webuild S.p.A.	WBD-IT	2.02	2,047	2,912	16%	-22%	40%	9,018	10,488	0.3 x	644	814	3.6 x	1.57	1.3 x
230	Innergex Renewable	INE-CA	6.97	1,424	5,982	79%	-12%	-42%	642	772	7.8 x	514	542	11.0 x	4.18	1.7 x
231	Aksa Enerji	AKSEN.E-TR	1.01	1,235	1,665	124%	-4%	-60%	2,416	956	1.7 x	-	238	7.0 x	0.65	1.6 x
232	Enel Generacion	ENGEPEC1-PE	0.62	1,939	2,314	83%	-23%	-27%	554	-	-	310	-	-	0.27	2.3 x
233	Tangshan Jidong	000401-CN	0.90	1,394	4,580	50%	-5%	-23%	5,015	3,950	1.2 x	834	416	11.0 x	1.61	0.6 x
234	Bestway Marine	300008-CN	0.56	970	1,004	40%	-7%	-1%	400	-	-	34	-	-	0.16	3.6 x
235	Scatec ASA	SCATC-NO	8.09	1,285	3,465	11%	-41%	1%	370	419	8.3 x	252	329	10.5 x	5.42	1.5 x
236	Manawa Energy	MNW-NZ	2.72	850	1,127	32%	-9%	-14%	271	259	4.4 x	85	84	13.5 x	2.65	1.0 x
237	CK Power	CKP-TH	0.10	776	1,716	51%	-13%	-27%	317	295	5.8 x	106	115	15.0 x	0.09	1.0 x
238	Meidensha Corporation	6508-JP	17.27	786	983	2%	-24%	22%	2,002	1,997	0.5 x	144	161	6.1 x	17.34	1.0 x
239	NAFCO Co.,	2790-JP	13.21	393	234	7%	-10%	17%	1,485	-	-	-	-	-	40.62	0.3 x
240	Torishima Pump	6363-JP	16.00	465	417	1%	-33%	61%	478	539	0.8 x	60	66	6.4 x	12.58	1.3 x
241	Northwest Pipe	NWPX-US	30.26	303	459	34%	-15%	-10%	458	443	1.0 x	64	50	9.2 x	33.47	0.9 x
242	Tokyo Energy	1945-JP	7.42	276	276	1%	-16%	14%	576	-	-	-	-	-	13.85	0.5 x
243	Lithium Ionic	LTH-CA	1.33	166	167	72%	-34%	11%	-	0	-	-	-46	-	0.11	12.2 x
244	Gia Lai	GEG-VN	0.53	181	658	35%	-9%	-17%	88	103	6.4 x	61	65	10.1 x	0.44	1.2 x

245	Indian Hume	504741-IN	2.91	153	219	26%	-52%	55%	187	188	1.2 x	16	17	12.6 x	1.76	1.7 x
246	Daido Metal	7245-JP	3.90	185	486	5%	-15%	9%	859	-	-	-	-	-	9.79	0.4 x
247	Dat Phuong	DPG-VN	1.63	103	182	21%	-32%	35%	140	125	1.5 x	36	24	7.4 x	1.13	1.4 x
248	Reach Subsea	REACH-NO	0.44	120	227	16%	-26%	4%	110	176	1.3 x	43	83	2.7 x	0.32	1.4 x
249	Iniziative Bresciane	IB-IT	16.35	85	198	22%	-10%	-13%	19	32	6.2 x	12	22	9.1 x	15.55	1.1 x
250	Imagineer Co.,	4644-JP	7.11	76	-0	16%	-10%	14%	49	-	-	-	-	-	8.84	0.8 x
251	Synertec Corp.	SOP-AU	0.10	44	38	108%	-8%	-40%	10	12	3.3 x	-3	-4	-	0.02	5.6 x

			Price Performance						Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>Nuclear</b>			<b>598</b>	<b>1,57,696</b>	<b>3,15,509</b>			<b>19%</b>	<b>92,842</b>	<b>93,230</b>	<b>3.4 x</b>	<b>22,555</b>	<b>26,121</b>	<b>12.1 x</b>	<b>276</b>	<b>2.2 x</b>
252	Constellation Energy	CEG-US	116.89	37,333	43,800	9%	-39%	36%	24,440	23,739	1.8 x	2,667	3,938	11.1 x	36.57	3.2 x
253	Public Service	PEG-US	61.15	30,472	50,280	7%	-12%	0%	9,800	10,824	4.6 x	3,331	3,780	13.3 x	30.45	2.0 x
254	Entergy Corporation	ETR-US	101.19	21,399	47,761	11%	-14%	-10%	13,412	13,550	3.5 x	4,123	4,618	10.3 x	64.74	1.6 x
255	China National	601985-CN	1.06	19,969	70,078	6%	-19%	23%	10,296	10,539	6.6 x	6,117	6,547	10.7 x	0.66	1.6 x
256	Cameco Corporation	CCJ-US	43.10	18,700	17,471	19%	-45%	90%	1,392	1,888	9.3 x	174	541	32.3 x	10.42	4.1 x
257	BWX Technologies,	BWXT-US	76.73	7,022	8,309	6%	-28%	32%	2,233	2,430	3.4 x	439	472	17.6 x	9.53	8.1 x
258	China Nuclear Engineering	601611-CN	0.98	2,950	14,495	44%	-7%	-10%	14,309	14,471	1.0 x	1,065	1,001	14.5 x	0.87	1.1 x
259	CGN Power	1816-HK	0.26	2,917	45,972	7%	-14%	10%	12,001	12,065	3.8 x	4,465	5,025	9.1 x	0.31	0.9 x
260	NexGen Energy	NXE-US	7.00	3,656	3,540	12%	-50%	58%	0	1	2,407.8 x	-43	-45	-	0.90	7.8 x
261	Uranium Energy	UEC-US	6.40	2,515	2,448	22%	-64%	65%	164	75	32.7 x	-	-13	-	1.75	3.7 x
262	Lanzhou LS	603169-CN	0.87	1,135	1,578	47%	-9%	-5%	730	779	2.0 x	67	76	20.8 x	0.35	2.5 x
263	Denison Mines	DNN-US	1.77	1,573	1,446	12%	-48%	54%	12	9	163.6 x	2	14	107.0 x	0.46	3.8 x
264	Energy Fuels	UUUU-US	7.19	1,159	1,034	26%	-33%	16%	13	44	23.6 x	-49	-16	-	2.36	3.0 x
265	Sinoseal Holding	300470-CN	5.33	1,110	962	27%	-8%	-3%	176	194	5.0 x	59	59	16.4 x	1.68	3.2 x
266	Beijer Alma	BEIA.B-SE	18.85	1,013	1,381	27%	-24%	20%	578	671	2.1 x	103	122	11.3 x	6.24	3.0 x



267	Jiangsu Shentong	002438-CN	1.68	855	941	26%	-23%	7%	284	301	3.1 x	58	68	13.9 x	0.87	1.9 x
268	Centrus Energy	LEU-US	54.41	806	832	13%	-54%	68%	294	288	2.9 x	80	42	19.9 x	-1.55	-35.2 x
269	Eagle Industry	6486-JP	11.35	565	635	14%	-28%	51%	1,171	-	-	-	-	-	16.89	0.7 x
270	Taihei Dengyo	1968-JP	31.71	645	437	2%	-23%	37%	930	926	0.5 x	-	-	-	33.78	0.9 x
271	NuScale Power	SMR-US	3.29	253	208	244%	-45%	-68%	12	34	6.2 x	-129	-142	-	1.39	2.4 x
272	Fission Uranium	FCUUF	0.82	617	568	14%	-51%	39%	0	0	-	-7	-9	-	0.43	1.9 x
273	Ur-Energy Inc.	URG	1.54	410	363	14%	-47%	34%	0	17	20.7 x	-	-	-	0.28	5.6 x
274	SUNG KWANG	014620-KR	9.44	270	183	41%	-10%	-8%	184	192	1.0 x	23	40	4.6 x	13.98	0.7 x
275	WOOJIN Inc.	105840-KR	7.22	147	147	27%	-20%	12%	-	112	1.3 x	-	-	-	6.43	1.1 x
276	Studsvik AB	SVIK-SE	12.84	106	105	25%	-37%	21%	78	81	1.3 x	7	7	15.1 x	5.41	2.4 x
277	China Nuclear	611-HK	0.04	66	528	96%	-7%	-45%	272	-	-	-	-	-	0.11	0.3 x
278	TVE Co.,	6466-JP	14.86	37	7	3%	-22%	11%	62	-	-	-	-	-	30.24	0.5 x

			Price Performance						Sales			EBITDA			Book Value	
			Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book
<b>Peer Set</b>																
<b>Smart Infrastructure</b>			<b>1,508</b>	<b>3,82,997</b>	<b>4,56,093</b>			<b>29%</b>	<b>2,23,668</b>	<b>2,35,394</b>	<b>1.9 x</b>	<b>34,761</b>	<b>39,202</b>	<b>11.6 x</b>	<b>544</b>	<b>2.8 x</b>
279	Siemens Aktiengesellschaft	SIE-DE	187.70	1,50,162	1,91,398	0%	-33%	37%	84,593	89,080	2.1 x	14,919	16,495	11.6 x	66.83	2.8 x
280	ABB Ltd.	ABB	44.32	83,407	86,330	0%	-29%	48%	29,446	32,059	2.7 x	4,639	5,853	14.7 x	6.88	6.4 x
281	STMicroelectronics NV	STMPA-FR	49.98	45,510	43,155	11%	-26%	43%	16,128	17,324	2.5 x	5,678	6,203	7.0 x	17.67	2.8 x
282	Siemens Limited	500550-IN	48.32	17,208	16,309	6%	-27%	41%	2,346	2,673	6.1 x	291	346	47.2 x	4.08	11.9 x
283	EVE Energy	300014-CN	5.95	10,999	14,907	129%	-12%	-53%	5,280	7,409	2.0 x	553	863	17.3 x	2.32	2.6 x
284	WESCO International,	WCC-US	173.88	8,881	14,212	7%	-30%	39%	21,420	22,500	0.6 x	1,726	1,761	8.1 x	95.71	1.8 x
285	Sensata Technologies	ST-US	37.57	5,686	8,602	45%	-19%	-7%	4,029	4,039	2.1 x	913	909	9.5 x	21.28	1.8 x
286	Acuity Brands,	AYI	204.83	6,324	6,519	12%	-27%	24%	3,952	3,867	1.7 x	631	649	10.1 x	66.83	3.1 x
287	AGL Energy	AGL-AU	6.47	4,352	5,969	29%	-31%	18%	9,283	10,311	0.6 x	892	1,364	4.4 x	5.19	1.2 x
288	Advanced Energy	AEIS	108.92	4,061	4,102	16%	-25%	27%	1,845	1,657	2.5 x	338	264	15.5 x	29.53	3.7 x
289	Sharp Corporation	6753-JP	7.13	4,639	7,444	19%	-25%	0%	18,832	17,127	0.4 x	458	591	12.6 x	2.98	2.4 x
290	Hyundai Autoever	307950-KR	164.22	4,504	4,059	21%	-51%	117%	2,236	2,312	1.8 x	219	235	17.3 x	44.12	3.7 x
291	Itron, Inc.	ITRI-US	75.51	3,435	3,686	6%	-33%	49%	1,796	2,166	1.7 x	95	213	17.3 x	27.22	2.8 x
292	Verra Mobility	VRRM	23.03	3,830	4,789	1%	-39%	67%	742	809	5.9 x	339	370	12.9 x	2.43	9.5 x
293	Beijing E-Hualu	300212-CN	4.43	3,207	3,764	59%	-24%	52%	233	-	-	58	-	-	0.72	6.2 x

294	Iren S.p.A.	IRE-IT	2.18	2,835	7,773	7%	-25%	41%	8,778	8,950	0.9 x	1,149	1,275	6.1 x	2.41	0.9 x
295	Hannon Armstrong	HASI	27.58	3,070	6,578	44%	-52%	-5%	124	157	41.8 x	167	231	28.4 x	18.47	1.5 x
296	Fibocom Wireless,	300638-CN	2.68	2,055	2,118	34%	-15%	25%	818	1,208	1.8 x	82	100	21.2 x	0.56	4.7 x
297	KEC International	532714-IN	7.08	1,820	2,381	26%	-24%	18%	2,112	2,415	1.0 x	102	168	14.1 x	1.80	3.9 x
298	TKH Group	TWEKA-NL	43.63	1,841	2,367	26%	-18%	14%	1,923	2,033	1.2 x	298	309	7.7 x	21.60	2.0 x
299	Hexing Electrical	603556-CN	4.09	2,000	1,366	9%	-35%	62%	480	567	2.4 x	101	127	10.7 x	1.83	2.2 x
300	NV5 Global	NVEE-US	111.12	1,766	1,963	28%	-20%	-16%	787	866	2.3 x	135	136	14.4 x	47.81	2.3 x
301	Taiwan Secom	9917-TW	3.81	1,720	1,755	8%	-16%	19%	502	-	-	154	-	-	0.87	4.4 x
302	Topcon Corp.	7732-JP	10.78	1,168	1,512	41%	-22%	-4%	1,584	1,469	1.0 x	223	159	9.5 x	6.95	1.6 x
303	Alfen NV	ALFEN-NL	66.59	1,448	1,532	50%	-56%	-26%	470	547	2.8 x	84	59	26.0 x	8.07	8.2 x
304	COSCO SHIPPING	002401-CN	2.55	950	748	77%	-28%	64%	255	-	-	29	-	-	0.61	4.2 x
305	Kazakhstan Electricity	KEGC-KZ	3.25	845	1,142	16%	-7%	-7%	493	540	2.1 x	233	264	4.3 x	5.47	0.6 x
306	Pentamaster Corporation	7160-MY	1.00	713	644	22%	-9%	3%	135	150	4.3 x	30	34	18.8 x	0.21	4.7 x
307	Shanghai Fudan	1385-HK	1.81	513	1,651	153%	-18%	-52%	514	525	3.1 x	194	157	10.5 x	0.87	2.1 x
308	Jiayuan Science	301117-CN	7.69	709	620	78%	-21%	-33%	39	48	12.9 x	10	13	47.2 x	2.05	3.7 x
309	Hangzhou EZVIZ	688475-CN	6.33	530	3,031	33%	-33%	59%	625	689	4.4 x	76	85	35.7 x	1.28	5.0 x
310	Shenzhen Longtech	300916-CN	3.45	498	399	64%	-10%	-16%	187	-	-	-	-	-	1.14	3.0 x
311	Shijiazhuang Kelin	603050-CN	2.53	575	738	5%	-29%	57%	383	485	1.5 x	31	51	14.5 x	0.91	2.8 x
312	FARO Technologies,	FARO	22.53	427	436	63%	-54%	-23%	346	357	1.2 x	13	6	70.8 x	13.67	1.6 x

313	American Superconductor	AMSC	11.14	338	317	56%	-67%	203%	106	133	2.4 x	-26	-7	-	2.54	4.4 x
314	Jiangsu Tongxingbao	301339-CN	2.85	160	717	65%	-11%	12%	87	112	6.4 x	30	-	-	0.88	3.2 x
315	Billion Electric	3027-TW	1.39	161	143	35%	-21%	29%	40	-	-	-	-	-	0.63	2.2 x
316	Energy S.p.A.	ENY-IT	2.10	113	134	113%	-45%	-18%	-	72	1.9 x	-	12	11.0 x	1.17	1.8 x
317	Dragonfly Energy	DFLI-US	0.54	32	41	1657%	-12%	-95%	86	66	0.6 x	-7	-19	-	0.41	1.3 x
318	Invinity Energy	IES-GB	0.45	85	71	68%	-26%	-13%	4	28	2.5 x	-22	-26	-	0.29	1.5 x
319	PowerFleet, Inc.	PWFL	3.42	127	195	2%	-52%	27%	135	133	1.5 x	6	6	30.5 x	2.16	1.6 x
320	Cepton, Inc.	CPTN-US	3.14	50	98	359%	-24%	-75%	7	11	9.3 x	-53	-45	-	-2.00	-1.6 x
321	Inseego Corp.	INSG	0.22	26	174	491%	-23%	-74%	245	193	0.9 x	-10	14	12.0 x	-0.78	-0.3 x
322	Advanced Emissions	ADES	2.98	99	78	27%	-61%	23%	103	98	0.8 x	1	-11	-	5.25	0.6 x
323	Orion Energy	OESX	0.87	28	37	147%	-6%	-52%	77	100	0.4 x	-8	-7	-	0.70	1.2 x
324	Merus Power	MERUS-FI	4.46	34	35	68%	-14%	1%	-	32	1.1 x	-	0	78.7 x	1.77	2.5 x
325	Ferroamp AB	FERRO-SE	0.87	27	18	478%	-31%	-74%	20	33	0.6 x	-4	-7	-	0.94	0.9 x
326	Tantalus Systems	GRID-CA	0.61	27	36	49%	-19%	-18%	40	44	0.8 x	-2	-0	-	0.01	50.4 x

Peer Set	Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	Price Performance			Sales			EBITDA			Book Value			
				% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book		
<b>Solar</b>	<b>752</b>	<b>1,11,193</b>	<b>1,41,250</b>			<b>-33%</b>	<b>84,362</b>	<b>88,293</b>	<b>1.6 x</b>	<b>12,750</b>	<b>11,243</b>	<b>12.6 x</b>	<b>353</b>	<b>2.1 x</b>		
327	First Solar,	FSLR-US	172.28	18,407	17,120	35%	-25%	15%	2,619	3,476	4.9 x	249	1,143	15.0 x	58.99	2.9 x
328	Enphase Energy,	ENPH-US	132.14	18,044	17,572	98%	-44%	-50%	2,331	2,331	7.5 x	730	770	22.8 x	7.43	17.8 x
329	JA Solar	002459-CN	2.92	9,688	12,669	145%	-15%	-52%	10,691	11,784	1.1 x	1,321	1,907	6.6 x	1.50	2.0 x
330	Xinjiang Daqo	688303-CN	4.17	8,943	6,113	82%	-8%	-39%	4,483	2,372	2.6 x	3,126	1,112	5.5 x	2.85	1.5 x
331	Trina Solar	688599-CN	4.02	8,744	12,990	168%	-14%	-56%	12,344	15,879	0.8 x	907	1,481	8.8 x	2.04	2.0 x
332	Suzhou Maxwell	300751-CN	18.26	3,475	4,883	131%	-25%	-51%	600	1,025	4.8 x	106	154	31.6 x	3.51	5.2 x
333	Array Technologies,	ARRY-US	16.80	2,540	3,400	59%	-21%	-13%	1,638	1,552	2.2 x	129	284	12.0 x	1.84	9.1 x
334	Hengdian Group	002056-CN	1.91	3,063	2,594	78%	-9%	-29%	2,791	3,076	0.8 x	302	431	6.0 x	0.77	2.5 x
335	Sunrun Inc.	RUN-US	19.63	4,277	15,427	51%	-57%	-18%	2,321	2,269	6.8 x	-210	-1,376	-	25.77	0.8 x
336	Shoals Technologies	SHLS-US	15.54	2,641	2,824	94%	-22%	-37%	327	490	5.8 x	93	169	16.8 x	3.09	5.0 x
337	Risen Energy	300118-CN	2.49	2,837	4,267	112%	-15%	-30%	4,265	5,191	0.8 x	311	414	10.3 x	1.89	1.3 x
338	Daqo New	DQ-US	26.60	1,994	325	109%	-19%	-31%	4,608	2,346	0.1 x	3,165	964	0.3 x	63.13	0.4 x
339	CECEP Solar	000591-CN	0.79	2,366	5,297	48%	-7%	-25%	1,344	-	-	567	-	-	0.82	1.0 x
340	Nextracker Inc.	NXT-US	46.85	6,396	5,998	6%	-40%	-	1,902	2,350	2.6 x	209	425	14.1 x	-42.53	-1.1 x
341	Wuhan DR	300776-CN	8.50	2,320	2,386	63%	-22%	-25%	191	255	9.3 x	63	84	28.4 x	1.52	5.6 x
342	Canadian Solar	CSIQ	26.23	1,695	4,356	73%	-32%	-15%	7,469	7,598	0.6 x	592	764	5.7 x	38.23	0.7 x

343	JinkoSolar Holding	JKS-US	36.94	1,932	8,054	64%	-32%	-8%	12,111	16,230	0.5 x	423	1,931	4.2 x	53.17	0.7 x
344	Jolywood (Suzhou)	300393-CN	1.46	1,589	2,581	100%	-13%	-32%	1,384	1,946	1.3 x	-	144	18.0 x	0.57	2.5 x
345	Jiangsu Shuangxing	002585-CN	1.14	1,318	1,489	96%	-9%	-37%	876	792	1.9 x	179	131	11.4 x	1.18	1.0 x
346	Bravida Holding	BRAV-SE	8.04	1,642	2,041	53%	-27%	-25%	2,536	2,872	0.7 x	208	224	9.1 x	3.93	2.0 x
347	SunPower Corporation	SPWR-US	4.83	847	1,105	300%	-33%	-73%	1,741	1,704	0.6 x	95	-19	-	2.41	2.0 x
348	Daejoo Electronic	078600-KR	67.09	1,039	1,135	56%	-26%	25%	132	150	7.6 x	14	13	88.9 x	6.17	10.9 x
349	WONIK IPS	240810-KR	26.36	1,294	1,192	14%	-20%	38%	773	529	2.3 x	103	22	53.6 x	13.80	1.9 x
350	United Renewable	3576-TW	0.48	780	1,012	58%	-14%	-29%	615	-	-	-	-	-	0.30	1.6 x
351	Maxon Solar	MAXN-US	7.17	378	542	443%	-45%	-55%	1,060	1,130	0.5 x	-109	10	52.7 x	3.22	2.2 x
352	Hubei Huitian	300041-CN	1.41	790	963	55%	-10%	-21%	540	633	1.5 x	58	64	15.0 x	0.73	1.9 x
353	Abalance Corp.	3856-JP	23.30	407	753	328%	-18%	26%	1,486	-	-	-	-	-	6.18	3.8 x
354	Jiangsu Yuxing	300305-CN	1.39	402	501	62%	-9%	-33%	272	-	-	38	-	-	1.00	1.4 x
355	TES Co.,	095610-KR	15.61	309	182	21%	-17%	42%	270	-	-	46	-	-	13.62	1.1 x
356	Thai Solar	TSE-TH	0.05	105	482	60%	-8%	-26%	38	-	-	34	-	-	0.09	0.6 x
357	Otovo ASA	OTOVO-NO	0.33	93	68	517%	-15%	-84%	66	110	0.6 x	-25	-29	-	0.35	0.9 x
358	Chugai Ro	1964-JP	16.58	129	128	7%	-25%	42%	207	-	-	-	-	-	23.46	0.7 x
359	Suzhou Delphi	688170-CN	5.51	369	485	77%	-25%	-18%	83	65	7.4 x	16	-	-	1.74	3.2 x
360	NPC Incorporated	6255-JP	5.31	117	84	12%	-36%	56%	62	73	1.2 x	8	13	6.7 x	2.57	2.1 x
361	Intevac, Inc.	IVAC-US	4.32	114	55	75%	-29%	-33%	36	50	1.1 x	-	-	-	4.41	1.0 x

362	<b>Gantan Beauty</b>	<b>5935-JP</b>	10.98	42	43	349%	-28%	38%	100	-	-	-	-	-	9.54	1.2 x
363	<b>Advanced Soltech</b>	<b>ASAB-SE</b>	0.61	33	114	179%	-8%	-66%	-	17	6.7 x	-	16	7.3 x	1.12	0.5 x
364	<b>Super Tool</b>	<b>5990-JP</b>	13.61	32	22	20%	-5%	-10%	51	-	-	-	-	-	32.10	0.4 x

Peer Set	Share Price	Mkt Cap (\$ Mns)	Ent Val (\$ Mns)	Price Performance			Sales			EBITDA			Book Value		
				% to High	% to Low	% YTD	FY0	FY1	EV/Sales	FY0	FY1	EV/EBITDA	Book/Share	P/Book	
Wind	699	4,62,818	7,32,074			-3%	2,19,794	2,22,762	3.3 x	54,166	57,685	12.7 x	348	2.0 x	
365	NextEra Energy, NEE-US	60.74	1,24,621	2,05,854	42%	-22%	-27%	20,956	26,171	7.9 x	11,846	14,020	14.7 x	22.95	2.6 x
366	General Electric GE-US	127.63	1,38,911	1,42,686	2%	-41%	52%	72,094	63,175	2.3 x	8,672	7,855	18.2 x	26.34	4.8 x
367	Iberdrola SA IBDRY-US	52.45	83,266	1,49,663	1%	-21%	17%	57,337	61,276	2.4 x	14,357	15,704	9.5 x	28.77	1.8 x
368	Dominion Energy D-US	47.00	39,329	82,803	35%	-17%	-23%	17,174	16,210	5.1 x	7,913	8,112	10.2 x	31.36	1.5 x
369	Eversource Energy ES-US	61.72	21,560	47,733	40%	-16%	-26%	12,289	12,770	3.7 x	3,852	3,832	12.5 x	44.91	1.4 x
370	Avangrid, Inc. AGR-US	32.41	12,535	24,540	38%	-15%	-25%	7,611	8,251	3.0 x	2,099	2,281	10.8 x	50.26	0.6 x
371	Northland Power NPI-CA	18.25	4,633	10,151	61%	-24%	-33%	1,795	1,649	6.2 x	1,025	900	11.3 x	12.87	1.4 x
372	Ming Yang 601615-CN	1.77	4,017	6,176	135%	-10%	-51%	4,438	5,949	1.0 x	621	774	8.0 x	1.78	1.0 x
373	Neoen S.A. NEOEN-FR	33.45	5,088	7,755	10%	-27%	-10%	534	630	12.3 x	439	519	15.0 x	19.43	1.7 x
374	Suzlon Energy 532667-IN	0.46	6,229	6,238	19%	-82%	258%	720	916	6.8 x	100	133	46.8 x	0.03	15.2 x
375	Titan Wind 002531-CN	1.64	2,939	4,414	53%	-13%	-25%	973	1,390	3.2 x	202	351	12.6 x	0.69	2.4 x
376	CECEP Wind-Power 601016-CN	0.42	2,739	5,410	41%	-4%	-23%	763	723	7.5 x	663	600	9.0 x	0.36	1.2 x
377	Nordex SE NDX1-DE	11.49	2,716	2,548	44%	-14%	-18%	6,186	6,747	0.4 x	-265	4	692.6 x	4.38	2.6 x
378	Clearway Energy, CWEN-US	27.43	2,260	12,329	28%	-32%	-14%	1,190	1,323	9.3 x	1,160	1,089	11.3 x	18.03	1.5 x
379	CS Wind 112610-KR	54.51	2,299	2,615	28%	-39%	2%	1,091	1,243	2.1 x	86	171	15.3 x	17.70	3.1 x
380	Qingdao Tianneng 300569-CN	1.01	1,031	1,611	39%	-17%	-13%	604	-	-	94	-	-	0.78	1.3 x



381	Inox Wind	539083-IN	6.01	1,958	2,314	8%	-82%	359%	75	365	6.3 x	-38	56	41.7 x	0.61	9.9 x
382	Zhejiang Windey	300772-CN	1.50	1,032	2,001	70%	-10%	-30%	2,520	2,620	0.8 x	103	23	86.3 x	1.03	1.5 x
383	Alimak Group	ALIG-SE	8.15	876	1,183	6%	-33%	53%	428	684	1.7 x	63	131	9.1 x	6.77	1.2 x
384	VRL Logistics	539118-IN	9.26	810	918	4%	-37%	41%	320	360	2.5 x	49	55	16.8 x	1.25	7.4 x
385	Jiangsu Haili	301155-CN	8.34	741	1,829	82%	-18%	-34%	236	332	5.5 x	28	47	39.0 x	3.64	2.3 x
386	Ficont Industry	605305-CN	4.56	692	487	65%	-16%	-11%	116	146	3.3 x	25	24	20.6 x	2.06	2.2 x
387	EuroGroup Laminations	EGLA-IT	4.29	403	933	70%	-26%	-	908	926	1.0 x	113	124	7.5 x	2.74	1.6 x
388	Gurit Holding	GURN-CH	96.95	454	535	26%	-25%	0%	531	548	1.0 x	40	42	12.6 x	28.88	3.4 x
389	Eneti Inc.	NETI-US	11.33	821	414	20%	-32%	111%	199	131	3.2 x	79	17	23.7 x	17.37	0.7 x
390	Goldwind Science	2208-HK	0.45	348	7,848	139%	-13%	-50%	6,731	6,434	1.2 x	780	870	9.0 x	1.16	0.4 x
391	CS Bearing	297090-KR	8.55	233	249	33%	-24%	33%	38	71	3.5 x	-3	5	48.4 x	2.53	3.4 x
392	TPI Composites,	TPIC-US	4.14	176	694	257%	-61%	-59%	1,758	1,508	0.5 x	62	-74	-	-3.47	-1.2 x
393	Broadwind, Inc.	BWEN-US	2.77	59	107	120%	-27%	55%	177	207	0.5 x	2	20	5.3 x	2.51	1.1 x
394	Windar Photonics	WPHO-GB	0.61	42	36	7%	-61%	140%	2	5	6.6 x	-1	1	46.8 x	0.00	509.9 x

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