



# TRINITY SMF

STUDENT MANAGED FUND

## Energy & Utilities Sector Report 2023-2024

**Sector Manager**  
Keave Daly

**Senior Analyst**  
Rory McElligott



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# Sector Overview

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## Energy

The energy sector encompasses a wide array of companies involved in harnessing, storing, creating, moving, and dispersing energy. These companies are categorised according to their methods of delivering energy to the market. Within the energy market, distinct segments emerge, including pure-play ventures, those dealing with non-renewables, and those pioneering renewable solutions. Further classification divides companies into upstream, midstream, and downstream players.

Historically dominated by traditional oil corporations, often referred to as "supermajors" or "big oil," these industry giants have undergone a transformative shift. While maintaining their involvement across the entire value chain, supermajors have diversified their portfolios by venturing into renewable energy sources like solar, wind, geothermal, hydrogen, and biofuels. As a result, their reliance on oil has dwindled to around 80%, rendering their stock prices less susceptible to oil price fluctuations.

Oil prices hinge on the intricate interplay between global supply and demand, which in turn mirrors the prevailing macro environment. Given the substantial capital investments and ownership of tangible assets like oil reserves, extraction and processing equipment, transportation networks, and infrastructure, energy companies are subject to cyclical patterns and the sway of macroeconomic elements.

Given its cyclicity, the energy sector stands as a barometer of economic vitality, fuelling numerous other industries within the broader economy.

See below the average sector fundamentals for the sector (MSCI, 2023):

MSCI World Energy Index vs. MSCI World Index Average Fundamentals – Index Returns

In short the MSCI tracks the performance of companies in the global energy sector and the MSCI World Index Average Fundamentals gives us an insight into the overall state of the global stock market.

	Energy	World
P/E TTM	7.68	20.75
Forward P/E	9.99	17.51
P/BV	1.83	3.07
Dividend Yield (%)	3.65	1.96
Performance YTD (%)	2.9	19.34
Performance 1 Year (%)	13.99	14.07

From the table above, we can see P/E TTM in the Energy index is less than the World Index. P/E TTM is the Price-To-Earnings Trailing Twelve Months, it indicates how much investors are willing to pay for each dollar a company earned over the past twelve months.

A lower P/E TTM in the Energy Index in comparison to the World Index suggests on average energy companies are currently trading at a lower valuation relative to their recent earnings compared to the average company in the global stock market.

# Sector Overview

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## Utilities

The Utilities sector encompasses companies that provide essential amenities, including electricity, natural gas, water, and sewage services. These utility companies typically operate under stringent regulations due to their provision of fundamental necessities for daily life. Within the utilities sector, dividends remain stable and dependable, exhibiting less price volatility compared to the usual fluctuations seen in equity markets. This sector usually demonstrates resilience during economic downturns and recessions, yet its performance tends to lag behind other sectors during periods of economic expansion.

The remarkable stability of utilities can be attributed to the predominant use of long-term power purchase agreements that span up to a century. This approach allows for highly predictable earnings forecasting. Notably, these agreements frequently involve governmental entities, thereby enhancing the reliability of earnings. This reliability contributes to the accurate valuation of utility companies and subsequently lowers overall market volatility.

Given the nature of the products provided by utility companies, many of them are owned by the state. This ownership ensures consistent supplies, often aligning with national security considerations. Similarly, private utility projects are seldom subject to cancellation by governments due to the same concerns, further bolstering the sector's stability and minimizing volatility.

Below demonstrates that the utilities sector has typically underperformed relative to the MSCI world since 2008. This underperformance is due to the fact that utilities are a non-cyclical sector that underperforms during periods of economic expansion.

See below the average sector fundamentals for the sector (MSCI, 2023):

MSCI World Utility Index vs. MSCI World Index Average Fundamentals – Price Returns

	Utility	World
P/E TTM	20.23	20.75
Forward P/E	15.23	17.51
P/BV	1.81	3.07
Dividend Yield (%)	3.84	1.96
Performance YTD (%)	-0.11	17.74
Performance 1 Year (%)	-4.34	11.58

The dividend yield is high relative to that of the wider equity market. The utilities sector is synonymous with high dividends, so much so that it is seen as an alternative to investing in bonds by many.

Looking at the table above, forward P/E of the Utility Index is less than the World Index. This metric is used to assess a company's expected future earnings relative to its stock price, it's an indication whether a stock may be overvalued or undervalued. In this case, the lower forward P/E indicates that utility companies are expected to have lower future earnings relative to their stock prices compared to the average company in the global stock market.

## Market Sentiment

Both the energy and utilities sectors find themselves at a crossroads of transformation, between the growing commitment to decarbonisation and the decentralisation of energy generation. Current market sentiment is consumed with uncertainty, as we are coming out the back of an energy crisis there are more obstacles to face. In April OPEC+ announced production cuts of 1.6 million barrels per day (mb/d) in an attempt to support market stability, which soon led to additional reductions by Saudi Arabia as well as an extension of OPEC+ targets through the end of 2024.

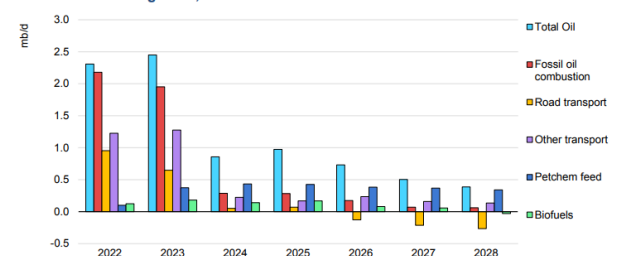
Oil demand is projected to reach record highs of 102.2 mb/d in 2023, an average rise of 2.2 mb/d. This surge in demand is facilitated by the increased use of oil in power generation, heightened air travel and the rise of petrochemical activity in China. China is forecasted to account for over 70% of the growth in global oil demand, however, with an anticipated rebound in the aftermath of the pandemic, their economy is facing prolonged setbacks. The recovery has been repeatedly postponed, now indicating a loss of momentum in the economy, raising concerns of a recession taking hold.

The impact of Saudi's cuts has been counteracted by the weak economic performance in economies worldwide, and the expected recovery will be seen in 2024. To maintain stable oil prices OPEC+ will need to extend their existing reductions into the beginning of next year. Worries are looming as the preservation of these targets will lead to a decline in oil inventories of 2.2 mb/d in Q3 and 1.2 million barrels in Q4, while also potentially raising prices even higher.

The IEA has forecasted a slowdown in oil demand growth amounting to 1 mb/d in 2024, and to just 0.4 mb/d in 2028. This deceleration is attributed to multiple factors. As the global economies become more interconnected, there's a notable reduction in dependence on oil imports. Additionally, the use of oil for transport fuel is set to decline after 2026 due to the increasing affordability of electric vehicles combined with improvements in fuel efficiency technology. The post-pandemic recovery, which has been the driving force behind oil demand, is expected to run out of steam as we move into 2024. This trend further contributes to a reduction in oil demand.

Oil inventories have experienced a decline in 2023, demonstrating strong demand and tight supply. This shortage has put upward pressure on oil prices, which have been trading around \$90 per barrel. Currently, stockpiles are 115.4mb below the 5-year average and are likely to continue this way as OPEC+ cuts are enforced, and demand remains high. The driving forces behind this scarcity include the Ukrainian War, post-pandemic recovery, OPEC+ cuts as well as refinery outages. These factors are likely to remain, therefore we can expect elevated oil prices in the near term. Overall, the future of the energy sector remains unclear and has the potential to undergo significant shifts.

Annual oil demand growth, 2022-2028



IEA, CC BY 4.0.

Note: Fossil oil combustion is total demand minus feedstock use, other non-energy uses and biofuels consumed.

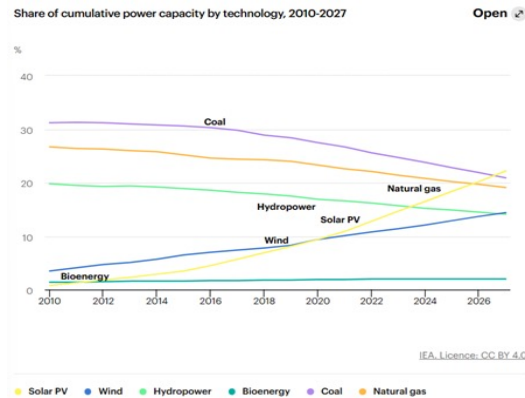


## Themes: Traditional and Renewable

Both solar and wind energies have been the forerunners of renewable sources contributing to a greener environment. The IEA expects both wind and solar PV electricity to more than double in the next five years, providing ~20% of global power generation in 2027. They are continuing to reshape the energy realm with a combined capacity of 1,000 gigawatts (GW) in 2022, up from just 100 GW in 2010.

In terms of cumulative power capacity by technology, they represented 23.6% in 2022 in comparison to 13.1% five years previous. Cost reductions have propelled growth, ensuring the cost of solar energy is competitive with the costs of fossil fuel-generated electricity and wind energy is expected to follow in the near future.

In March 2023 there was a revision of the EU Renewable Energy Directive which now sets a binding target for 2030 of at least 42.5% share of renewable energy in the EU's gross energy consumption, a significant increase from the previous target of 32%. This amendment is a positive step forward for solar and wind initiatives, as it will accelerate the deployment of these technologies. IEA reports show if countries address regulatory, permitting and policy challenges, global renewable capacity can expand by an additional 25%. The simplification of the permitting process will accelerate project approval, resulting in reduced costs and mitigated risks. This streamlined method is positioned to attract potential investment and narrow the gap for renewable electricity growth needed to meet zero emissions by 2050.



### Solar

The IEA reported solar energy to be the largest expanding power source worldwide, surpassing all alternative sources of electricity. This growth trend can be attributed to the rise in awareness of solar energy benefits as well as the diminishing costs of solar panels. 2023 is reflecting this trend as the US is to add 29.1GW of solar photovoltaic (PV) capacity. This surge in capacity demonstrates the uprise in solar energy's momentum, affirming it's a booming industry. It's estimated solar panel costs have decreased by 82% over the past decade thus fuelling its expansion and ensuring greater accessibility and affordability. Solar cell efficiency has now reached 26%, and with the continued exploration to push these boundaries, solar panels are harnessing more sunlight than before. There has been a great breakthrough with solar energy storage solutions, with an 80% cost reduction in the past decade also signifying the immense effort to set aside energy for rainy days. These efforts contribute to the enhanced reliability and continuous availability of solar power. Looking forward, solar PV is expected to be the cheapest source of electricity with average costs expected to fall by at least 40% by 2050.

# Themes: Traditional and Renewable

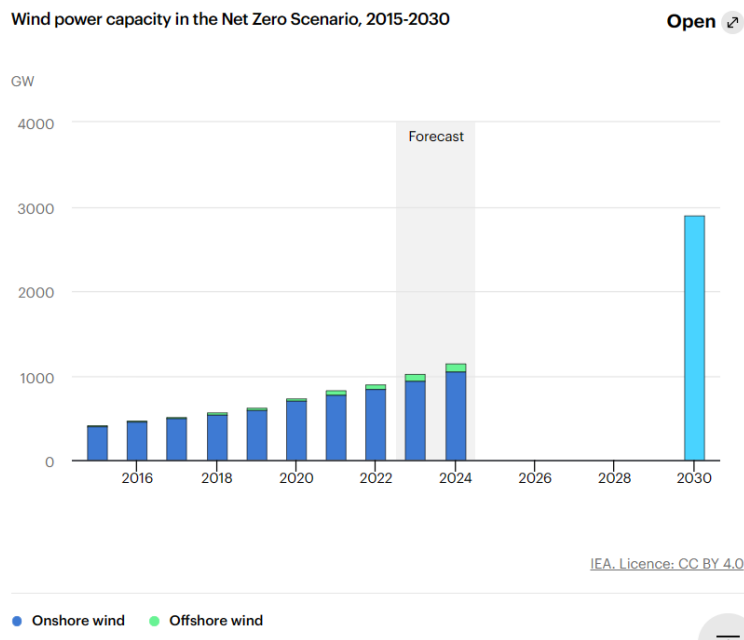
## Wind

Wind energy is a predominant source of power generation in the Net Zero Emissions by 2050 Scenario, however, annual wind capacity needs to grow at a considerable rate until 2030 to be on track with this target. In 2022 wind electricity generation was up 14%, the second-highest growth among all renewable power technologies following behind solar PV. However, to achieve the Net Zero Emissions by 2050 Scenario, we need the average annual generation growth rate to increase by ~17%, meaning the 75 GW in 2022 will need to be 350 GW in 2030. Enormous efforts need to be put in to facilitate permitting for onshore wind and cost reductions for offshore wind to make these targets attainable.

2023 looks bright for wind power as onshore wind capacity additions are set to expand by 70% to 107 GW reaching an all-time record amount. Aiding this expansion is the commencement of projects in China that were previously delayed due to Covid-19 regulations. Moreover, both Europe and the US are set to experience accelerated growth due to supply chain problems which have caused project timelines to shift from 2022 to 2023.

Conversely, offshore wind growth is expected to fall short of the record expansion it experienced two years prior. This deceleration is primarily due to the limited number of projects being commissioned outside of China.

In 2022, onshore systems accounted for 93% of total wind capacity installed while the remaining 7% was offshore systems. These systems are at different lifecycle stages, Onshore systems are well-integrated in today's world with a presence in over 115 countries, whereas offshore systems are present in 20 countries because it's at an early stage of expansion. Nevertheless, the utilisation of offshore technologies is anticipated to surge as countries explore new avenues for renewable resources.



# Themes: Traditional and Renewable

## Wind

Supporting the bright years ahead, Windpower Monthly’s August 2023 Windicator index rose to 107.5 points, a leap from 106.5 in July, marking the index’s highest level since January 2023. The global wind energy market’s healthy state can be attributed to the strong demand for wind turbines, with an expected 12% growth in 2023, as well as the favourable government policies implemented to support the development of wind energy. Policies such as China’s 14th Five-Year Plan for Renewable Energy, the Inflationary Reduction Act in the US as well as the RePowerEU Plan within the EU are transforming the pathway to net zero emissions.

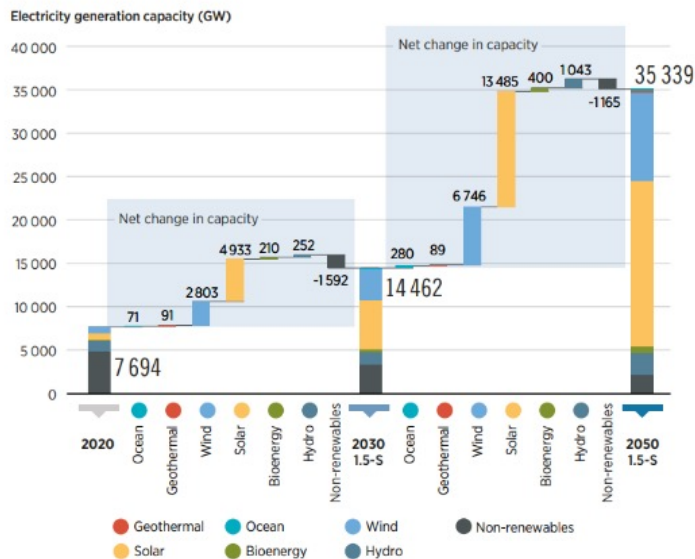
Wind power investments increased by 20% in 2022 which has further substantiated the enthusiasm for capacity deployment in 2023. We can see a rise in Turbine Purchase Agreements (TPAs) signed between June and July 2023, with an increase in value from 9.4 GW to 10.8 GW.

Looking forward to 2050, wind capacity is projected to experience a 9-fold increase, offshore wind 56-fold, and onshore wind 7-fold. Wind energy is anticipated to contribute 50% of on-grid electricity in Europe, and 40% in both North America and Latin America. Notably, the cost of onshore wind decreased by 15% YoY in 2021, while offshore wind costs saw a 13% decrease during the same period.

In conclusion, solar and wind energy have solidified their positions as the world’s fastest-growing sources of electricity, and looking ahead, we expect global renewable capacity to increase by almost 75% between 2022 and 2027.

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**FIGURE 2.4** Total global electricity generation capacity expansion needed by 2030 and 2050 to realise the 1.5°C Scenario



Notes: GW = gigawatt; 1.5-S = 1.5°C Scenario.



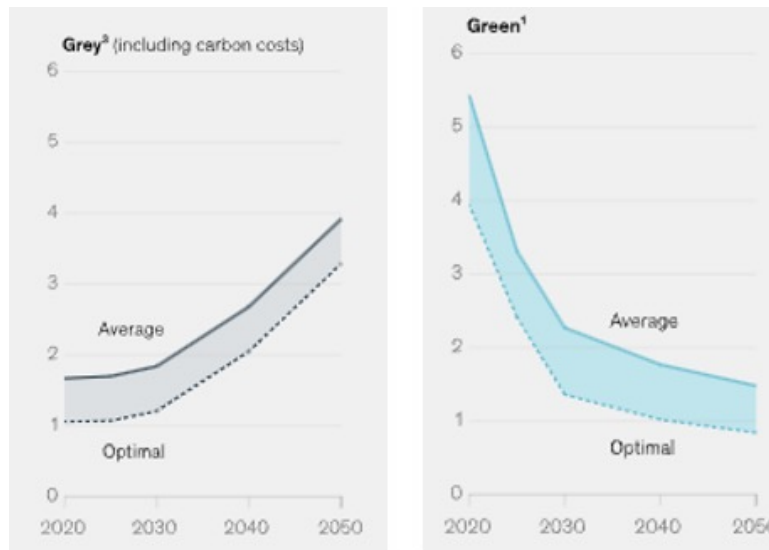
# Themes: Hydrogen

Hydrogen is the lightest element in the universe, and it has taken centre stage in our relentless pursuit of cleaner energy solutions. Global renewable capacity dedicated to producing hydrogen is expected to increase 100-fold within the next five years. Firstly, we will focus on hydrogen derived from fossil fuels, referred to as grey hydrogen.

Hydrogen has great potential to reshape the energy landscape due to its low environmental footprint and versatility. Its flexibility facilitates the generation of electricity, heating homes, powering vehicles, and producing materials and chemicals. There are clear signs hydrogen will be a key player in the clean energy transition, mainly within heavy industry and long-distance transport. In 2021 global hydrogen production reached a staggering 94 million tons, a 3 million tonne rise from pre-pandemic levels in 2019. However, this output comes at a cost, emitting an estimated 830 million tonnes of CO<sub>2</sub> per year, the equivalent to CO<sub>2</sub> emissions of the UK and Indonesia combined.

This is when our attention shifts to green hydrogen, a relatively new invention where hydrogen is produced using renewable electricity, sourced from wind or solar power. This process involves splitting water into oxygen and hydrogen. This method is considered a clean energy source as it emits no greenhouse gas emissions, as opposed to conventional hydrogen production methods. While the global production of green hydrogen stood at ~0.5 million tons in 2022, the global investment to advance green hydrogen technologies stands at ~\$240 billion, with over 680 large-scale projects announced globally in mid-2022. An estimated 38 million tons per annum (mtpa) of clean hydrogen supply has been announced globally by 2030, with just less than 1 mtpa deployed today. As it is a relatively new energy source, it is burdened by a higher cost of production compared to its conventional counterpart, however, it's expected to level out in years to come.

Clean hydrogen costs are expected to decline over the next decade  
Production cost of hydrogen, \$ per kilogram



## *Themes: Hydrogen*

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Although it's still early days for green hydrogen within the transport sector, there is great potential for it to decarbonise the sector. Technologies such as fuel cells, which convert hydrogen and oxygen into electricity to power vehicles, are progressively gaining momentum. 2022 witnessed about 80,000 hydrogen fuel cell vehicles on the roads worldwide, a 30% rise from the year previous. A pivotal driving force motivating hydrogen cell development is the EU's target of achieving 1 million hydrogen-powered vehicles on the road by 2030.

Nonetheless, green hydrogen still faces many challenges that need to be addressed, stemming from the high costs of production to safety regulations and improvement of infrastructure. However, the evolution of green hydrogen within the transport industry creates a promising future. Grey hydrogen is dominant in today's world in terms of volume; however, green hydrogen production is quickly gaining ground and is poised to play a pivotal role in the energy transition in the future.

The success of the hydrogen economy relies not only on the reduction in the cost of production but on the duration and expenses required for constructing electrolyzers, establishing distribution networks, creating storage capacities, and the time needed for the global transition of both engines and machinery to adopt hydrogen utilisation. It is said if all hydrogen projects are realised, the production of low-emission hydrogen could reach up to 24 mtpa by 2030.

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BP Plc is one of the largest oil and gas companies worldwide, operating in over 70 countries. BP has established a strong reputation as a reliable energy provider and is one of the world's seven 'supermajors'. They operate a diversified business model with a foothold in exploration, production, refining, and marketing. They are committed to reducing their environmental impact by focusing on renewable and low-carbon energy sources. They operate a global portfolio of renewable energy projects accumulating over 2.5 GW, with a target of 50 GW of renewable energy capacity by 2050. In terms of new technologies, enormous investment is going towards carbon capture, utilisation, and storage operations, as well as hydrogen and electric vehicle charging R&D.

BP's share price is up 8.4% year-to-date. 2022 was a prosperous year for oil majors including BP due to the full-scale invasion of Ukraine, oil and gas prices soared seven-fold, allowing BP to reap record profits of \$27.7 billion for the year. However, 2023 hasn't been all that favourable as oil's prospects are looking fragile. BP had reported a near 70% YoY drop in Q2 profits due to weak fossil fuel prices. Lower refining margins, weak oil trading results and a higher level of turnaround and maintenance activity were reflected in Q2 earnings. Although they are experiencing a challenging environment, they have committed to a share buyback programme of \$1.5bn as well as a 10% growth in their dividend.

BP's growth strategy is executed through its five transition growth engines, those being the convenience segment, EV charging, bioenergy, hydrogen, and renewables. The first half of 2023 witnessed great momentum within their convenience business displaying record gross margins of ~7% YoY growth, on top of 9% per annum over the past three years. This figure excluded their acquisition of TravelCenters of America, which now adds a network of 288 sites, which is expected to double convenience gross margin.

The EV charging area is rapidly gaining pace with a 70% increase in EV charging points, leading to a rise in energy sold by over 2 times YoY in the first half of 2023. In bioenergy, biofuel production has increased 10% YoY, and Archaea Energy is being integrated into BP to enhance its biogas capabilities. The pipeline for hydrogen projects has increased by 60% since the end of 2022, reaching 2.8 mtpa and the renewables pipeline currently stands at 43.6 GW. These five growth engines are expected to grow EBITDA from \$700 m to \$3-4bn in 2025. BP has committed to invest 40% of its capital in energy transition projects by 2025, and 50% by 2030, reaching about \$60 billion.

Looking ahead at potential growth avenues, India is key for BP's agenda. In 1H23, BP has collaborated with partners to establish 3,000 EV charging points, increasing from 750 in January. Furthermore, the company has directed investments into India's gas sector and multiple renewable energy initiatives. The CEO of BP has committed to further investment in India in the years to come, expressing confidence that this market is key for the future of energy.

## Current Performance



Cheniere Energy is a liquified natural gas (LNG) provider, offering a wide variety of services including gas procurement, liquefaction, transportation, vessel chartering and LNG delivery. Cheniere has one of the world's largest and most advanced liquefaction platforms. They are currently operating a capacity of about 45 mtpa of LNG, with an additional 10 mtpa under construction.

LNG is a cleaner-burner fuel than fossil fuels as natural gas produces half as much CO<sub>2</sub> when burned as coal. In basic terms, LNG is natural gas that has been cooled down to a liquid state to make it easier for storage and transportation. LNG's non-explosive nature is a great advantage as leaks or spills aren't catastrophic. Once transported, the liquified gas can be transformed back into its original state by reheating it, a process called regasification.

Cheniere is well-positioned to benefit from the growing demand for LNG in the global market. The war in Ukraine has been a great driver for LNG, with construction starting on over 20 LNG terminals across the world since the invasion. Natural gas demand has soared as European economies attempt to wean themselves off Russian energy. McKinsey and Co. have estimated LNG global demand to rise 3.4% p.a. till 2035.

However, 2023 hasn't been a strong year for natural gas, with it trading lower year-to-date and briefly going below the \$2 threshold in April for the first time since 2020. As a whole, the natural gas market was down 43% so far in 2023. There has been a recent decline in natural gas returns due to maintenance outages which have curtailed LNG inflows to export plants. This combined with a projected slowdown in upstream activity leaves the natural gas market to be quite unpredictable. Despite these circumstances, the demand for LNG remains underpinned by Europe's pursuit of independence from Russian natural gas and the heightened US LNG exports due to climate change initiatives.

Cheniere's Q2 results displayed a combination of both favourable and challenging factors. They reported a 48.8% drop in top-line revenue from the previous year's quarter, as well as a decrease in Adjusted EBITDA down \$225 million compared to the same period in 2022. This decline in EBITDA was mainly attributed to reduced margins per million British thermal units (MMBtu) of LNG delivered as a result of higher proportions of volume sold under long-term contracts, lower total volumes sold in short-term markets, as well as lower international gas prices. In Q2 534 trillion British thermal units (TBtu) were sold in comparison to volumes of 563 TBtu in Q2 2022. Despite all of these headwinds, Cheniere's net income trended upward, and the distributable cash flow amounted to \$1.35b. Looking forward, the company has revised its full-year guidance upwards, expecting a rise in adjusted EBITDA and distributable cash flow. This positive revision is supported by the release of reserved cargoes and optimisation efforts.

Despite the uncertainty and volatile gas benchmarks, Cheniere is positioned to reap the benefits. With over 150 million tons of upcoming global LNG supply, their secure cash flow contracts offer both stability and flexibility to adapt to shifting markets. Despite these challenges, Cheniere's advantage is amplified by the scarcity of new supply, demonstrated by the 9% YoY growth in LNG flows to Europe.

Regional Demand for Term U.S. LNG Volumes Since 2022<sup>(2)</sup>  
Elevated demand from European counterparties to replace Russian volume





Canadian Solar operates within the renewable energy equipment and services segment. They are a global leader in the design, development, and deployment of solar energy solutions catering to customers in 25 countries worldwide, focusing on premium markets.

Its structure can be broken into two areas, Global Energy and CSI Solar. Global Energy accounts for 55% of the business and involves global project development activities for both battery storage and solar project development. Canadian Solar expects to grow sales volume by a CAGR of 20% to 2026, while also maximising the value of its project assets through local investment vehicles. Topline growth is down to both backlog projects as well as a growth in the overall project pipeline totalling 24,743MWp (megawatt-peak) as of Jan 31, 2023. The CSI Solar segment refers to solar module manufacturing as well as their battery storage system integration business which caters to commercial, industrial, and residential clientele.

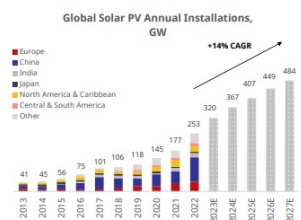
Alongside their generous market cap of \$2.14 billion and favourable Operating CF/EV of 15.23%, we can see an upward trend in revenue growth of 42% YoY 2022. They demonstrated resilience throughout the pandemic with 9% topline growth in 2020, and since we've seen a bounce back in growth of ~47%.

A favourable element of this company is their direct control over costs obtained through vertical integration. They manufacture silicon ingot, wafers, solar cells, and solar panels, while also participating in project development and engineering, procurement, and construction. An expansion strategy executed by CSI Solar is expected to resolve supply chain issues that affect competitors within the solar market. It'll also encourage the facilitation of growing demand for existing solar products while also enabling the R&D of future products. The vertical integration of the manufacturing process will provide the competitive edge needed to enable the cutting of costs and mitigating risk. In recent years we have seen rapid cost reductions in both battery storage solutions and solar module prices, further benefitting the business.

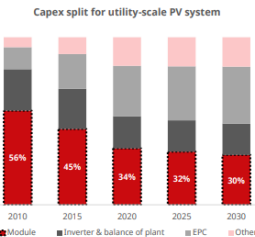
Looking down the line, Canadian Solar is likely to stand the test of time, bolstered by its sound financial foundation and prudent management team. The surge in renewable energy awareness is likely to maintain its momentum for the foreseeable future. Initiatives aimed at addressing climate concerns, illustrated by measures like the US Inflation Reduction Act allocating \$369 billion for energy security and climate mitigation, further solidifying a smooth path for the growth of Canadian Solar.

Solar PV proves to be the perfect blend of environmental friendliness and economic viability as opposed to alternative electricity sources. Despite its potential, global solar energy utilisation stands at a mere 3%, making it extremely underpenetrated. As of 2022, global solar PV installations reached 1 terawatt (TW). Yet, to align with the Paris Agreement's 1.5-degree Celsius target, this capacity must reach 5.5 TW by 2030, and a staggering 20 TW by 2050. On an annual basis, this translates to an expected 14% CAGR in installations. Thus, the future promises unparalleled growth opportunities for Canadian Solar.

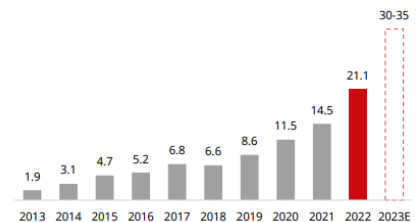
Strong growth outlook on a much larger market base: annual PV installations up 7x over the past decade



Declining marginal benefit from further module price cuts



Solar Module Shipments, GW



# *Priced in Sector Drivers*

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## EU and US Industrial Policy

The EU and US are shifting towards a more economically interventionist stance, marked by the adoption of robust industrial policies centred around critical infrastructure such as energy. This shift is set to have a significant influence on the sector in the upcoming year. In February 2023, the European Commission introduced the EU Green Deal Industrial Plan. This ambitious initiative aims to bolster European manufacturing capabilities for pivotal technologies essential to achieving binding net-zero targets. The plan relaxes state aid limitations, enabling European countries to actively support domestic clean energy enterprises through measures like reduced taxes, eased regulatory constraints, and access to low-interest loans. This strategic move is poised to particularly benefit clean energy companies in France and Germany. Simultaneously, the US is embracing a nativist "buy American" strategy within the energy sector. Embodied by the IRA (Inflation Reduction Act), this approach allocates almost \$400 billion in federal funding to propel clean energy initiatives, aiming to slash carbon emissions by 40% before 2030 (Whitehouse.gov, 2023). Interestingly, this dynamic has generated tension between the US and the EU following the escalation of the war in Ukraine. As both entities vie to become the most appealing destinations for clean energy investment, the winning firms will likely be those with the financial ability to make large investments quickly -- large clean energy corporations with low debt and high liquidity.

## Windfall Taxes

For many energy companies, the sharp surge in energy prices resulting from the escalation of the conflict in Ukraine has presented a unique opportunity. Many of these firms have witnessed a notable uptick in both their profits and stock prices, capitalising on the increased energy prices. This upward trajectory in prices has translated to substantial windfall gains within the energy sector, particularly benefiting companies involved in fossil fuel extraction and oil refining. In response to this situation, the United Kingdom and 20 EU member states, among them Ireland, France, and Germany, have acted by introducing windfall taxes targeting the profits of energy corporations. These taxes are especially stringent for electricity producers, with potential levies of up to 90% on profits exceeding prescribed rates per megawatt-hour (MWh). However, these windfall taxes could potentially have unfavourable repercussions on the future investment endeavours of energy companies operating in the sector. Unlike the United Kingdom and the EU, the United States has refrained from implementing windfall taxes. Consequently, it is possible that American energy firms might experience advantages due to higher cash flows and increased investment throughout 2023 and 2024.

## Growth of Solar

In 2022, solar photovoltaic (PV) power production saw an unprecedented uptick, increasing by a remarkable 270 terawatt-hours (TWh). This rise was a 26% increase compared to the figures for 2021. Solar PV's contribution to the overall global electricity output reached 4.5%, solidifying its position as the third most prominent renewable electricity technology, behind wind and hydropower. The surge in solar PV output in 2022 was predominantly driven by China, responsible for around 38% of the growth. This can be attributed to substantial capacity increases in both 2021 and 2022. Following closely was the European Union, accounting for the second largest growth (17% of the total), trailed by the United States (15%).

# *Anticipated Sector Drivers*

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## Potential in Hydrogen

In 2021, the demand for hydrogen reached a significant milestone of 94 million tonnes (Mt). This rebound not only brought the demand back to levels seen before the pandemic but also exceeded the 91 Mt recorded in 2019. The energy stored within this volume of hydrogen roughly equals about 2.5% of the overall global final energy consumption.

The bulk of this rise originated from traditional applications in areas such as refining and industry. Nonetheless, there was a remarkable surge in demand for innovative uses, accounting for approximately 40 thousand tonnes. This surge signifies a substantial 60% increase compared to the figures observed in 2020. It's important to note that this growth starts from a relatively low baseline.

Several intriguing and inventive applications for hydrogen are advancing significantly. Notably, there's a swift emergence of new steel projects, closely following the initial trials that focused on utilising pure hydrogen for direct iron reduction. Additionally, Germany has commenced the operation of its inaugural fleet of hydrogen fuel cell trains. In the sphere of power generation, there is growing interest in hydrogen and ammonia. This trend is evident from the accumulation of projected ventures, which collectively could amass a potential capacity of nearly 3.5 GW by the year 2030. A company poised to benefit from this is Plug Power (PLUG).

## Grid Decentralisation

By 2025, the portion of the decentralised energy sector in the overall gross electricity production is projected to rise, shifting from around 15% as of 2010 to a range of 26-35%. Presently, less than 15% of companies in the decentralised energy sector generate revenues beyond this threshold. However, a substantial surge in the significance of the decentralised energy industry is anticipated before 2025. Many companies are expected to witness a decline in electricity sales due to the emergence of decentralised energy structures, while the impact on natural gas sales is predicted to be comparatively less pronounced. The increasing prominence of renewable power generation, when contrasted with conventional power generation's contribution to total electricity production, will underscore the growing importance of decentralised generation solutions for powering residences and workplaces. A company poised to benefit from grid decentralisation is Canadian Solar (CSIQ).

## Grid Modernisation

More than 115 million "smart" electricity meters have been installed at various customer sites across the United States since 2000, and now many of them are starting to show signs of ageing. This has prompted utility companies to think about their eventual replacement. These meters have a lifespan of around 15 to 20 years, and as they reach the end of this period, their batteries are wearing out, necessitating replacements. The first generation of these digital electricity meters replaced the traditional mechanical meters and introduced the capability for utility companies to remotely monitor their entire meters network, whether on a daily, hourly, or even 15-minute basis. This advancement allowed utilities to access data about power quality, manage power supply, and quickly detect power outages. Initially designed to last about two decades, these first-generation smart meters seem to be holding up well, according to insights from utilities using the AMI 1.0 technology. However, as these systems approach the end of their expected lifespan, some utilities are beginning to plan for their replacement, with projects of this magnitude typically taking three to five years to plan and execute due to potential supply chain challenges. Duke Energy (DUK) has first mover advantage in this regard, having installed 6.2m smart meters in 2019.

# *Priced In Sector Risks*

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## Effect of climate change on electricity infrastructure

The impact of climate change reverberates through various aspects of the electricity infrastructure. It influences the effectiveness of power generation, the resilience of transmission and distribution networks, and even the dynamics of demand. In many countries, the increased frequency and intensity of extreme weather events such as heatwaves, cold spells, wildfires, cyclones, and floods are primarily responsible for widespread power outages. Recent occurrences, like the disruption of electricity during a heatwave in California, a cold spell in Texas, and wildfires in Australia, highlight the current vulnerability and significant consequences of climate-related hazards on electricity grids.

Rising global temperatures could potentially result in decreased efficiency, changes in the capacity for power generation, and adjustments in heating and cooling requirements. Shifts in precipitation patterns may trigger alterations in generation output, capacity, peaks, and variability, all while introducing concrete threats to the integrity of transmission and distribution networks. The upward surge in sea levels has the potential to hinder the expansion of new infrastructure and cause damage to electricity systems located along coastlines. Furthermore, electricity networks remain open to heightened and frequent instances of extreme weather, which can cause physical harm to energy facilities and hamper overall efficiency.

## Cyber Threats

Energy is a highly targeted industry for cyberattacks. For example, in 2018, the Russian state-sponsored cyber-attacking group Dragonfly gained access to the networks of U.S. electric utilities, which could have allowed them to cause blackouts. Cyberattacks disrupt operations, resulting in power outages and safety hazards. These attacks accrue significant financial losses due to downtime, system restoration, and legal matters. Supply chains also suffer, negatively affecting firms. Collaborative cybersecurity measures involving governments, regulators, associations, and experts are vital to mitigate these extensive repercussions within the energy industry.

## Supply Chains

Instability in supply chains represents a significant threat to energy companies, impacting their operations and resilience. Energy production, including solar panels, relies on intricate networks of suppliers providing essential equipment, materials, and services. Disruptions in any part of this chain can trigger a cascade of effects, causing delays, diminished capacity, or even operational shutdowns. China's pivotal role in solar panel production adds a unique layer of complexity to these supply chain concerns. Many energy companies rely on China as a major source of solar panel components due to its cost-effectiveness. Geopolitical tensions, trade disputes, or disruptions in China's manufacturing sector can thus directly affect global solar panel supply.

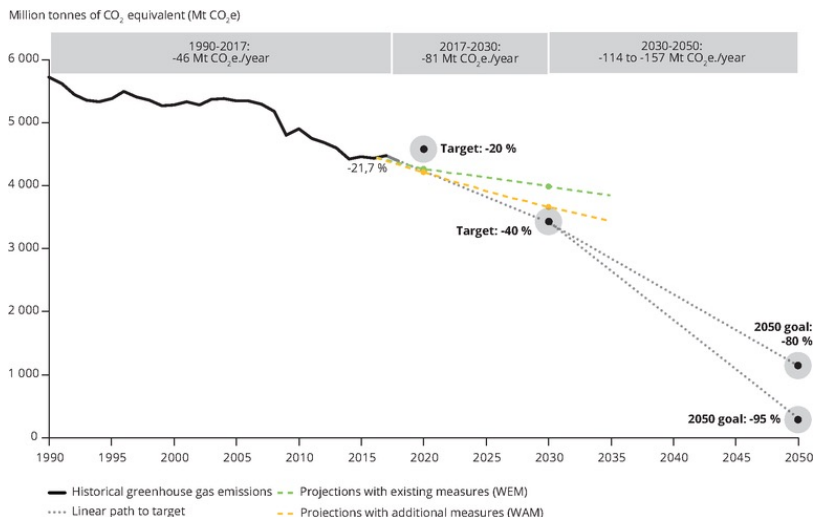
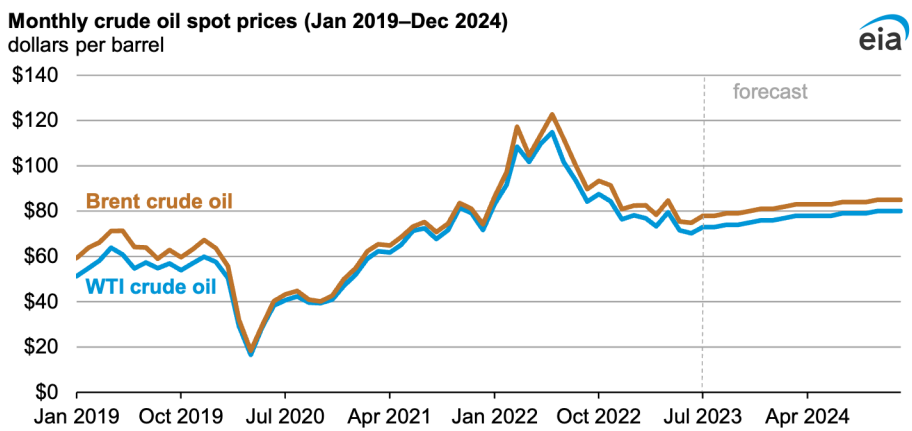
# Anticipated Sector Risks

## Emissions Targets

Ambitious emission reduction targets pose a risk for companies primarily involved in the extraction of fossil fuels. The shifting global focus towards cleaner and more sustainable energy sources threatens the long-term viability of these businesses. However, we believe this risk can be overcome by investing in companies that produce renewable energy such as solar and wind. This transition not only aligns with environmental goals but also allows us to harness the growth potential in the rapidly expanding renewable energy sector.

## Rising Oil Prices

OPEC+ has cut production by a further 1.4 million barrels a day. In July 2023, Goldman Sachs updated its global oil demand forecast for the year, while maintaining its 12-month Brent price estimate of \$93 per barrel, an increase of over 10% based on a starting point of \$83.5 in August 2023. To strategically mitigate the impact of this anticipated oil price surge, considering an investment in oil companies becomes a prudent move. Such a choice would position us to capitalize on the potential gains stemming from the projected escalation in the market value of their core product.





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