

Bird & Bird



# Energy Outlook 2023



# Contents

*Excellent industry knowledge - genuinely exceptional - very pragmatic - not scared to get off the fence and give opinions on the tough elements - very good negotiators.*

Legal 500 UK, 2022

# 1 Introduction

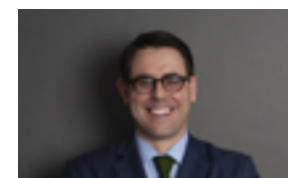
The Energy & Utilities sector is changing rapidly as the world is in the midst of a global energy crisis of unprecedented breadth and complexity. Companies across the sector are racing to reach net-zero and improve sustainability, whilst trialling new and exciting technologies including the use of green hydrogen. The energy crisis has prompted many countries to bolster investment and policy into renewable energy, and many organisations must look to diversify as the clean energy transition accelerates.

The energy transition is multi-faceted, covering renewables, electrification, energy management, energy storage, hydrogen and more, and the policy and regulatory landscape needs to reflect this. It also impacts every sector; with the energy crisis accelerating organisational energy transition activities such as a shift away from traditional to green energy sources (including on-site, near site and off-site (including virtual) power purchase arrangements) and energy management solutions (including energy efficiency as a service, heat as a service and energy storage solutions in each case as a cost saving and revenue stacking opportunity).

As a result, there is corresponding growth in innovative products, services, financing and insurance solutions.

The public sector must also go beyond policy and regulation, and continue being an energy transition exemplar as energy, smart cities and ESG often converge.

In the first edition of our Energy Outlook report, our global Energy & Utilities team anticipate the important developments across key areas of the sector, and give an invaluable oversight of the market in 2023.



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The increase in energy costs has accelerated global investment into the clean energy transition.





## 2 Mining & Minerals

Technology will play a critical role in assisting miners reach net zero and productivity goals

Mining companies are increasingly investing in and developing their own technologies to support decarbonisation plans and increase productivity. We predict that the following two technologies will increasingly be adopted in 2023:

- Drones: the use of drones for supporting exploration, surveying, mapping, monitoring site safety, stockpile management, blast analysis and reviewing tailing dams is continuing to increase. Typically, these drones will operate at a low level and are exempt from most regular aeronautical regulatory requirements (such as registration, licencing and certification). Whilst the operation of drones and the benefits are now well understood, the next priority for the

industry is ensuring secure data processing, management and analysis to enable real-time communication.

- Blockchain: the adoption of blockchain technologies will continue to support the traceability and accountability of supply chains. The diamond sector is already successfully demonstrating the implementation of blockchain to trace conflict-free diamonds from 'site to finger'. We predict that more miners will adopt blockchain to track GHG emissions of critical minerals to support the credibility of the sector's decarbonisation plans. Careful design and review of the smart contracts being utilised in this area will be required.

### Green hydrogen

In 2022 we saw a number of joint venture and collaboration agreements between mining companies and researchers in relation to developing and trialling green hydrogen technologies. We also saw the potential of using green hydrogen in hydrogen fuel cell trucks to support decarbonising mining fleets currently using diesel. Green hydrogen technologies are

Technology will play a critical role in assisting miners reach net zero and productivity goals.



notably costly and technically challenging to develop, therefore we also expect collaboration to continue.

### Large scale renewable projects on site

In 2022 we also saw a number of mining companies announcing investments and joint ventures into large scale renewable projects. Typically, the projects involved the installation of renewable energy assets such as solar and wind, upgrading transmission networks and installing large-scale battery storage to support decarbonisation of sites. The Bird & Bird team have advised on one of the largest solar projects for a mining project in Africa. We expect this trend to continue as sites are well positioned with land, access to technical expertise, wind and solar resources. Advice on financing arrangements, energy infrastructure and power purchase agreements will be key.

### Resource security

The war in Ukraine has highlighted international reliance on scarce energy supplies. As a result, the increase in energy costs has accelerated global investment into the clean energy transition, whereby renewable energy assets are localised. Notably, however, green technologies require critical minerals (such as lithium, cobalt, and rare earth elements) which are often challenged by geographical constraints. The outlook of growing global demand for green technologies and an increase in resource nationalism - the balance between attracting foreign investment and ensuring the benefits of mineral extraction are passed on nationally - should encourage Governments to adopt more flexible policies to support commercial opportunities for critical mineral exploration and development domestically, to shorten supply chains.



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# 3 Energy Management

## Technology and green buildings

New technology tools are helping the market to soar in the last years and are driving the business towards a more evolved one with systems integrated due to increased consumers and builders demand energy savings and reduced grid reliance. With a view from the stakeholders to prioritize reduction of energy sources and to minimize greenhouse gas emissions, we see the soaring of installation of energy management systems emerging as an invaluable practice to enhance performance and sustainable energy efficiency.

Buildings are one of the most significant contributors to energy consumptions in cities, with heating ventilation and air conditioning (HVAC) systems making up about 60% of a building's total energy consumption. Green building management tools can help monitor performance, optimise energy use, make predictive adjustments and allow the building user to monitor live data on energy consumption, which overall helps to promote energy savings.

Standalone energy conservation measures are now being replaced by integrated digital services

where technologies are interlinked to enable not just automation but clever customization to occupants' needs and preferences. Modern day green building management systems incorporate smart technology solutions that make use of AI, data analytics and IoT. The new generation of green buildings are smart, safe and sustainable and benefit occupants, operators and the environment.

The legal documentation we see in this area revolves around fairly long-term energy savings and energy performance contracts with customised variations, and with the increase in buildings implementing intelligent green building management systems, we anticipate the same trend will continue through 2023.

## Energy as a Service (EaaS)

Energy Management is the efficient and effective use of energy to minimize costs and reduce future energy demand. As energy management solutions may be capital-intensive and a burden to businesses already grappling with an energy crisis and inflationary pressures, EaaS has become an increasingly attractive option.

The new generation of green buildings are smart, safe and sustainable and benefit occupants, operators and the environment



Under an EaaS agreement, the energy service provider (ESP) secures third-party funding to pay for all project costs, so the customer has no upfront expenses or internal capital and the customer typically treats the transaction as an off-balance-sheet financing solution. As the EaaS model generally operates on a pay-for-performance model, the ESP bears the performance risks and is constantly seeking operational efficiencies. This usually means more frequent upgrades to new technology to secure more savings for the customer. The ESP can usually also offer a suite of energy-related services on top of supplying electricity. For instance, ESPs can bundle energy consultancy, financing, asset installation and energy management solutions all-in-one for customers.

### Increased government spending

With stakeholders prioritising a reduction in energy demand and minimising greenhouse gas emissions, energy management systems are key to enhancing building performance and ensuring energy efficiency. Governments are boosting their investments in building systems but also monitoring the output of digital devices and IoT technologies to collect reliable data regarding

electricity supply and consumption.

Since 2020, US\$1 trillion of government spending around the world has gone towards energy efficiency measures . Global investment into energy efficiency reached US\$560 billion in 2022, an 16% increase from 2021 . The investments have gone into energy management solutions, for homes, commercial buildings, public transport and infrastructure.

This is in part triggered by the 2022 energy crisis sparked by the Russian invasion of Ukraine, as well as rising demand for energy. Lowering consumer bills and energy spending through energy management is considered as a critical must-have, not an option.

Governments are boosting their investments in building a strong commercial infrastructure consuming high voltage of electricity and requiring consistently energy-efficient systems that will not only conserve energy (storage) but will also monitor its output (such as digital devices and IoT technologies facilitating the collection of large volumes of data regarding electricity supply and consumption).

### Tightening regulation

Laws play a key role in the push towards adopting energy efficiency practices both for consumers and manufacturers, with many countries already enacting laws to encourage energy efficiency in various sectors of the economy.

Singapore introduced the Energy Conservation Act 2012 in 2013, which aims to promote energy conservation in industries by requiring certain high-energy consuming facilities to adopt prescribed energy management practices. For household appliances, inefficient household appliances are removed from the market by making it an offence to supply them; and persons who supply certain consumer goods are required to affix energy labels, which contain information on, amongst others, the relative energy efficiency of an appliance through a tick rating system. Since its inception, the ECA has undergone several rounds of enhancements to raise energy efficiency standards. Further amendments to the ECA are targeted to take effect between 2024 to 2025; under which, certain household appliances have to meet a higher minimum efficiency requirement and the tick rating system will be



Energy management systems are key to enhancing building performance and ensuring energy efficiency

expanded to include other household appliances that were not previously regulated (such as portable air-conditioners). More appliances are now being monitored and scrutinised, which puts pressure on manufacturers to introduce more high efficiency models into the market.

Singapore is an example of how regulatory authorities are continuously scrutinising best-in-class standards, and reviewing and tightening energy efficiency standards through legislation. As greater emphasis is being placed on energy efficiency in countries' push to decarbonise, regulations in this space are likewise becoming increasingly stringent. Companies must therefore remain proactive to, not merely meet the minimum standards, but constantly improve their energy management and keep a close watch on how energy is being used in the production of their goods and services and in the latest innovations in energy management practices.

In 2022 the European Commission, as part of the REPowerEU plan, proposed an increase to the EU energy efficiency target up to 13% by 2030, up from the 9% target from 2021. The negotiation of the proposal is currently ongoing in the Council and the European Parliament through the legislative procedure. Negotiations are understood to be progressing but there is still plenty of work to do, with many of the most sensitive issues, including the overall energy savings target, yet to be agreed – The European Parliament would like a the much more ambitious target of 14.5%. As such, the Council may need to amend its position on targets in order to finalise the proposal. Once the proposal is adopted by both co-legislators, the new 2030 energy efficiency targets will apply.



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# 4 Hydrogen

Produced by using renewably generated electricity that splits water molecules into hydrogen and oxygen, green hydrogen holds significant promise to help meet global energy demand while contributing to climate action goals.

Hydrogen production market was valued at \$130 billion and is estimated to grow up to 9.2% per year through 2030. Although over 95% of current hydrogen production is fossil-fuel based, green hydrogen is the corner stone of the energy transition and it's use cases are expanding across multiple sectors.

The following trends might shape the hydrogen economy development path in the coming year:

## Offshore hydrogen production

The European Commission's expects renewable energy projects to become increasingly important in most sea basins in Europe, including innovative projects such as on site offshore hydrogen production. Hydrogen may be produced offshore by achieving an association between wind turbines and electrolyzers by various approaches. These could include retrofitting an electrolyser to an

existing oil & gas platform, building a renewable hydrogen production hub on a man-made island (see energy islands below), building a new platform close to an offshore wind farm, or integrating the electrolyser and wind turbine into one offshore assembly. Moreover, offshore produced hydrogen may be exported via existing repurposed or new pipelines or by dedicated ships; and a platform may be used for grid balancing and for refuelling ships offshore. The ambition is set, and offshore hydrogen is expected to support mainstream production at scale.

## Energy islands and integrated local solutions

The Energy Islands and hydrogen valleys projects signal a new, integrated approach to generating renewable energy and hydrogen. Such projects can be high scale and local scale.

The artificial North Sea and Baltic Sea Islands have the potential to supply electricity to several countries alongside Denmark, including the Netherlands, the UK, and Belgium. Smaller locally focussed Hydrogen valleys will provide a local integrated approach to not for export but for a local consumption approach.

## Hydrogen in Transport

The next transport trend will evolve around hydrogen cars and trains whereas Hydrogen fuelled airplanes might see their deployment on a longer horizon.

There are still significant challenges such as high cost, low range, difficulty in meeting commercial use cases or slow rollouts of charging infrastructure.

There is now a growing interest in hydrogen vehicles, with manufacturers starting to invest. Manufacturers will benefit in the longer term, as they will have more diverse vehicle portfolios, but users will benefit too from having a greater choice of vehicle type. Finally, commercial fleets will be able to be decarbonised more easily.



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Green hydrogen holds significant promise to help meet global energy demands while contributing to climate action goals



# 5 Renewables

The energy crisis triggered by the Russian invasion of Ukraine has prompted an increase in momentum for renewable energy. Disruptions to the supply of oil and gas has driven up energy prices and highlighted the benefits of domestic renewable energy for energy security. This has led many countries to bolster investment and policy in renewables while higher energy prices, particularly in Europe, have improved the commercial appeal of solar, wind and other renewable generation.

## Scaling-up wind power

Wind power is set to continue to grow with some estimates that capacity will almost double by 2027. The viability of floating offshore wind is increasingly being looked at to harness the stronger and more consistent winds found around deeper water. This is the point where fastening to the seabed would become prohibitively costly. Some forecasts have shown global floating offshore wind production hitting 29.8GW by 2040. Scaling the production of these projects is the key factor in reducing the cost per MW with an aim to achieve half the current cost at scale.

## Continued growth of solar power

Floating solar farms are a development which is seeing some promise with large projects in China, Singapore and Thailand reaching completion in recent years. This avoids some of the objections to solar where the land use competes with other industries, especially food production. These projects have shown the viability of floating solar albeit with a much smaller potential than floating offshore wind.

Solar is expected to continue growth into 2023 and beyond. Although high material and commodity prices have increased investment costs in solar, it remains one of the most affordable and convenient options for new electricity generation in many countries worldwide. The use of distributed solar, such as those mounted on rooftops, is also set to increase in light of high energy prices and rising support through policy (e.g. grants) helping consumers to afford installation and save on their energy bills. Development in solar technology is also continuing to improve with companies looking to reduce land usage through integrated photovoltaics and improvements in materials and design to maximise efficiency.

Solar photovoltaic manufacturing is also set to become more diversified on the back of policy in the US and India lowering the costs of manufacturing photovoltaics through subsidy allowing manufacturers to compete with Chinese manufacturers. This is diversifying the photovoltaic supply chain and reducing China's share of the market, although China is still set to remain the substantially dominant manufacturer in the foreseeable future.

## Investment in grids and storage to overcome intermittency

Grid congestion is increasingly becoming a barrier to strong renewables uptake and substantial improvements to grid infrastructure takes considerable time and investment. In many regions, the limitations of the grid are the limiting factor in the future growth in renewables. Investment into technologies for smart grids may improve the pace of improvements in reliability, resilience flexibility and stability.

Storage of the energy produced by renewables is also key in accounting for the fluctuations experienced in renewable energy production often resulting in output exceeding demand at





times. The use of battery storage is most likely to improve the capacity in short term but other energy storage methods in development such as compressed air storage, mechanical gravity storage, and hydrogen technologies may also soon be utilised commercially. Storage is a current obstacle to net zero so development and investment into these energy storage technologies will be key to achieving net-zero whilst maintaining grid resilience.

### Significant uptake of heat pumps

Heating is the world's largest end use of energy, accounting for almost half of global final energy consumption. With heat consumption set to continue to increase decarbonisation will require discontinuing oil and gas fired boilers and replacing with heat pumps. Heat pumps have recently benefitted from policy in the US

(Inflation Reduction Act) and the EU (REPowerEU) which points to huge potential growth in heat pump markets. Further, the major increase in gas prices through 2022 have made the cost-competitiveness of running heat pumps highly attractive when compared to gas-fired boilers, although the upfront cost remains a barrier for many consumers. Therefore, continued support through subsidy, tax reductions or loan schemes is required to promote widespread uptake of these heat technologies.



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# 6 Energy Digitalisation

## EU action plan to digitalise the energy system to play a major role

- The EU's Action plan to digitalise the energy system ("Action Plan"), published in October 2022, will play a major role in 2023, affecting almost all companies in the energy market.
- The Action Plan highlights the key activities required to digitalise the energy system and shows how new technologies can improve the efficiency of energy resources, facilitate the integration of renewable energy into the grid and save costs for EU consumers and energy companies. It sets out measures to reduce the energy consumption of the tech sector, boost data sharing, promote investments in digital electricity infrastructure, ensure benefits for consumers and strengthen cybersecurity.

## Efforts to reduce energy consumption in the tech sector

The tech sector is responsible for around 7% of global electricity consumption and this is set to rise to 13% by 2030.

To stop the sectors growing energy needs from becoming an obstacle to the EU's objectives

on demand reduction, the Commission have announced steps to improve digital energy services while ensuring the sector is energy-efficient, including:

- Developing an energy-labelling scheme for computers
- Evaluating a possible revision of the eco-design regulation on servers and data storage products
- Explore the potential to develop common indicators for measuring the environmental footprint of electronic communications services

## Building the European framework for sharing energy related data

The Commission believes that the key enabler for a digitalised energy system is the availability of, access to, and sharing of energy-related data based on seamless and secure data transfers among trusted parties. The Commission announced that by 2024 they will develop a common European energy data space. In this data space the generally applicable principles will need to be strictly upheld, including those on

EU data sovereignty, cybersecurity, data privacy, consumer acceptance and interoperability.

As a first step, by March 2023, the Commission will set up the 'Data for Energy' (D4E) working group as part of the Smart Energy Expert Group. This group will bring together the Commission, the Member States and the relevant public and private stakeholders to collaborate on building the European framework for sharing energy related data.

## Strengthening the cybersecurity of energy networks

Ensuring the cybersecurity of a digitalised energy system is a key component of the abovementioned EU Action Plan.

On 27 December 2022, the Directive concerning measures for a high common level of security of network and information systems across the Union (NIS 2 Directive) was adopted and entered into force on 16 January 2023. It defines the energy sector as one of the EU's critical infrastructures and provides for cyber-security obligations related to supply chain security and risk-management measures.



To increase resilience to cybersecurity-risks in the electricity system, the Commission will propose a delegated act in the form of a network code for the cybersecurity aspects of cross-border electricity flows, including rules on common minimum requirements, planning, monitoring and reporting crisis management. It's hoped these will be adopted in early 2023.

### Promoting investment in digital energy infrastructure

The EU aims to accelerate the digitalisation of the grids across its member states significantly. To achieve the targets of both the "Fit for 55" legislative package and the REPowerEU plan, the EU assumes that EUR 584 billion of investment in the electricity grid will be required between 2020 and 2030. Therefore, the Commission announced in its Action Plan that it will support TSOs and DSOs to create a digital twin of the European electricity grid.

Furthermore, to foster investments in smart energy grids the Commission will aim to ensure

that by 2023 a regulatory framework that is fit for purpose to attract and guide such investment is in place. In particular, the Commission will support ACER and the national regulatory authorities in their work to define common smart grid indicators, as well as objectives for these indicators, so NRAs can monitor smart and digital investments in the electricity grid annually as of 2023 and measure progress towards the creation of the digital twin. To date, we have not seen a draft of this initiative.



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# 7 Energy Storage

## Improving sustainability and increasing manufacturing of battery systems

The relevant legal and regulatory framework applicable to Battery Energy Storage Systems (generally categorised as a form of generation) is now relatively settled in many jurisdictions and routes to market are becoming more standardised (e.g. as seen through optimisation services contracting in the UK). In the EU, as part of the European Green Deal, new legislation concerning the competitiveness, safety and sustainability of batteries reached provisional political agreement in December 2022, providing rules on sustainability in production, recycling and repurposing of batteries. This revised Battery Directive is planned to be phased in from 2024 but the sector will need to start reacting in 2023 to avoid being left behind.

The US government has announced \$2.8 billion in grants for electric vehicle batteries resulting in a race between the EU and the USA in attracting battery manufacturers. For example, Swedish company Northvolt was planning to build a Gigafactory in Northern Germany but is now considering making investments in USA instead. The industry has criticised the EU process for being too slow and there are calls for EU grants

to allow competition with the USA. Further, there have even been calls to act under WTO law and sue the USA for protectionism and discrimination of EU companies under the Biden administration's "Inflation Reduction Act".

## Cheap Aluminium-Sulphur and other new technologies for batteries

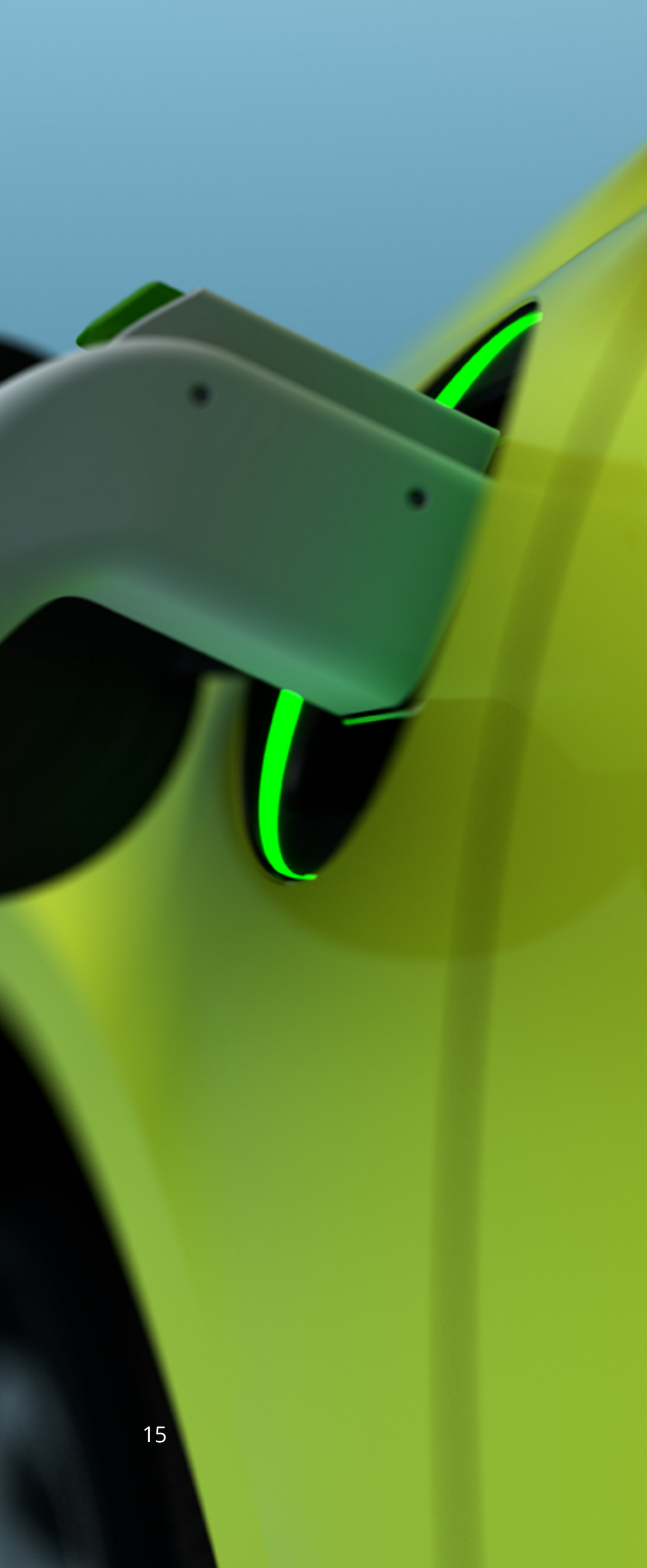
Conventional lithium-ion batteries are toxic, contain a flammable electrolyte and are produced with valuable metals which are often harvested under environmentally harmful conditions. Unlike lithium-ion batteries, aluminium-sulphur batteries are not flammable, and the raw materials are cheaper and more readily available. According to researchers, aluminium-sulphur batteries could have one sixth of the cost of lithium-ion batteries and do not require special insulation and anticorrosion measures. Therefore, they may be ideal for use in single homes, small to medium businesses or electric vehicle charging stations. Other new types of batteries under development include Lithium-Tungsten, Zinc-Manganese, and Organosilicon batteries which similarly offer various potential benefits in terms of energy density, safety, and recharging speed.

Aluminium-sulphur batteries will likely be subject to the same obligations as other, well-established battery types in EU law and will most likely also be subject to the new European Battery Directive. The situation is similar in other jurisdictions including the UK.

## Hydrogen energy storage

Hydrogen is predicted to play a pivotal role in the future as one of the most promising energy storage mediums. However, handling and storing requires high-pressure tanks or cryogenic temperatures making it expensive and complicated. Development of the novel processes and tanks necessary to economically store hydrogen is an area where innovative start-ups are coming up with solutions. The energy in hydrogen is not necessarily needed at the location of production, requiring sufficient transport capabilities and local distribution. The use of offshore wind in hydrogen production is a highly attractive method of circumventing the issues in the production of power when demand is low and grid storage capacity is insufficient. These synergies between emerging technologies demonstrates the importance of diverse investment and development across different technologies aiming to achieve net zero.





Some new developments include a new electrolysis module which uses air humidity to produce hydrogen by splitting the humidity into hydrogen and oxygen has been successfully tested. This could allow the production of green hydrogen even where water is scarce. Further, researchers are developing methods to store hydrogen in a battery using formic acid and its salts as a storage medium which could allow renewable energies to be stored locally at the place of production.

The infrastructure for hydrogen requires massive investment and time to be built. Nevertheless, we are seeing this investment coming in, for example the US is deploying \$10 billion in funding for hydrogen technologies with an additional \$1.5 billion for R&D in clean hydrogen manufacturing and recycling. In Europe, examples include Denmark which has introduced a new target of producing 6GW of hydrogen annually by 2030. In contrast, it has been suggested that some EU states are being hindered by lacking EU-legislation and causing uncertainties in the industry which leads to hesitation with investments which are necessary for the ramp-up. Therefore, the EU legislative package on renewable and natural gases and

in hydrogen is eagerly awaited and currently being worked on by the Committee on Industry, Research and Energy.

### Electrification push

The European Parliament and the Council have recently agreed on reducing CO2 emissions for cars and vans by 100% by 2035, de-facto banning new internal combustion engines (ICEs) cars from that date.

In addition, the proposal on the deployment of alternative fuels infrastructure is expected to be completed in 2023. It sets a minimum coverage of vehicles' charging points across all EU roads.

Moreover, in early 2023, the European Commission is expected to present a revision of CO2 emissions standards for trucks, eyeing stricter standards and promoting zero-emission heavy-duty vehicles.

Therefore, the auto industry is expected to endorse further the trend towards EVs, as adaptation to these proposals will kick in in view of future compliance and shift in EV production will consolidate. The success of the electrification shift will also depend on the availability of batteries and the deployment of charging stations.

Hydrogen is predicted to play a pivotal role in the future as one of the most promising energy storage mediums



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# 8 Oil & Gas

The oil and gas sector has seen record profits over 2022 owing to disruption of energy trade between Europe and Russia driving gas prices to new highs. Nevertheless, the industry faces several challenges in energy security, diversification and the transition to low-carbon and renewable energy. The industry is familiar with supply disruptions and price volatility, but long-term uncertainties are prompting oil and gas companies to think carefully about how to allocate their huge cash flow accumulated over the last year.

## Big Data and digital solutions to improve and streamline activities

Improved data-recording sensors in exploration and drilling can reduce drilling time, improve safety, and optimise production by allowing for predictive maintenance and timely equipment replacement. Technology using seismic data in combination with a company's historic data and research can vastly improve the identification of reservoirs and reduce the cost and time required for exploration. Further, the use can improve supply chain management and improve logistics by detection of faults in pipelines and

tankers allowing predictive maintenance in this equipment as well.

The integration of collection, transfer and analysis of raw data in real time is where IoT technology can synergise with big data. In the oil and gas industry this allows real time visibility of faults, environmental conditions and fleet operations while allowing efficient implementation of predictive maintenance and hazard management where required.

Some difficulties in implementing these technologies come from underinvestment, managing data transfer from field to processing facilities and risks in storage of data. Investment in cybersecurity must come alongside implementation if companies are to remain resilient against the increase threats that the technology can bring.

## High energy prices will keep the momentum for M&A activity

The historic highs of energy prices and the all-time best average price of oil at \$100/bbl over 2022 bode well for oil and gas M&A through 2023. Nevertheless, an uncertain economic

environment of inflation and geopolitical tensions may significantly taper this momentum as companies remain mindful of the required capital discipline necessary to navigate these challenges. Acquisition of natural gas assets is likely as majors look to take advantage of the momentum in energy security for natural gas. Further, investment in clean energy and technology such as carbon capture and storage also seem likely as companies seek to diversify, spurred by an accelerating clean energy transition.

## Continued interest in investment into low-carbon and renewable energy

The oil and gas majors are seeking to diversify and increase investment in low-carbon and renewable energy during the energy transition. Increased government support, notably the Inflation Reduction Act and REPowerEU, and demand for low carbon clean energy, are creating urgency for many companies to move



towards investing in these solutions. This will contribute to accelerating the energy transition which in turn could further bolster demand for low-carbon and renewable energy. As technologies mature and demand increases, investment will continue to look more and more attractive for oil and gas majors seeking to mitigate against long term risks.

### Further diversification of activities in the downstream and services sector

In response to demand for green fuel, electric vehicles and possibly hydrogen-powered vehicles the downstream activities of the oil and gas industry are also looking to diversify. The sector has already invested in a wide selection of businesses. These include biofuel manufacturing, renewable generation assets (solar PV and wind) in addition to customer facing business such as energy and fuel sales and EV charging points. There is also indication of diversifying into services such as energy trading in power markets, PPA offerings and behind the meter energy management. Green and blue hydrogen production is a huge area which majors have

been venturing into and is an industry which oil and gas companies are well placed to take advantage of due to experience in producing and distributing natural gas. Sustained high natural gas prices through 2023 and beyond may make green hydrogen and biomethane more attractive investments than blue hydrogen.



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Disruptions to the supply of oil and gas has driven up energy prices and highlighted the benefits of domestic renewable energy for energy security



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