Quadrise

# SUSTAINABILITY REPORT

*For the year ended 30 June 2023*

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# OUR COMPANY

AIM-quoted Quadrise plc (QED) is an energy technology provider whose solutions enable production of cheaper, cleaner, simpler and safer alternatives to fuel oil and biofuels, proven in real world applications.

Our MSAR® (Multiphase Superfine Atomic Residue) and bioMSAR™ transition fuels allow clients in marine, heavy industry and utilities to reduce carbon emissions by up to 30% whilst also saving costs. Founded in 2006, Quadrise has worked alongside global technology partner Nouryon to develop our patented oil-in-water emulsion fuels and prove their effectiveness across a range of applications.

Our team of specialists have over 70 years' combined experience in the emulsion fuel sector, managing our projects at major refineries, power plants and on marine vessels worldwide. Our low cost technology is available for immediate deployment, can be installed in under 12 months and runs on existing fuel oil / biofuel infrastructure, with minimal capital expenditure required.

We are committed to a net-zero future and is aiming to deliver a commercially-competitive net-zero emulsion fuel by 2030, whilst also reducing our company footprint to net-zero by 2030.

After several successful product trials in close collaboration with world-leading companies, Quadrise has now reached the critical milestone of signing a Site License and Supply Agreement with Valkor Technologies LLC which will generate first revenues for Quadrise, evidence that our solutions are credible and solve a real need.

### *Our Purpose*

Delivering innovative energy solutions for a cleaner planet.

### *Our Values*

Drive. Expertise. Integrity.

### *Our Mission*

To be the leading emulsion-based energy solutions provider to benefit the environment and create value for our stakeholders.

# CHAIRMAN'S MESSAGE

Since our previous sustainability report, alongside the advancement of our key projects, Quadrise has continued to take important steps towards our twin goals of a net-zero fuel and carbon footprint by 2030. Progress towards these goals future-proofs our business as the regulatory environment continues to tighten around greenhouse gas and other emissions, in shipping in particular.

Our own carbon footprint remains small and is largely a function of activity at our research facility. However, as we approach commercial revenues and then look to scale-up our business, we will ensure we maximise our efforts to keep this at a minimum in order to achieve a net zero carbon footprint by 2030.

The development of our net-zero fuel 'bioMSAR™ Zero' has also progressed during the year and, with alternative zero-carbon feedstocks being investigated, early indications are promising.

As well as our environmental focus, Quadrise continues to demonstrate best-in-practice corporate governance and strong societal credentials as outlined in this report, with ESG sitting at the core of our business.

**Andy Morrison**
Non-executive Chairman

# CEO'S MESSAGE

The decarbonisation of the energy sector continues to advance during a period of escalating energy costs, increasing legislation and pressure to reduce emissions and control global warming. Against this backdrop, Quadrise is positioning itself to be one of the key solution providers in this rapidly changing global energy market.

We are preparing for larger scale production of bioMSAR™ to supply a commercial MSC container vessel in North Europe, using waste-based ISCC-certified refined glycerine. Since our last report we have also expanded the bioMSAR™ technology platform to investigate the potential use of other biofuels, including methyl esters from waste sources and sugars derived from biomass.

We've also investigated alternative zero-carbon feedstocks for our bioMSAR™ Zero initiative, evaluating their key properties as emulsion biofuels as well as their economic and social impact. We will continue to invest and collaborate with others in research and development to enhance our IP portfolio and future opportunities in the renewable fuels sector to help shape a cleaner future for the next generation.

**Jason Miles**
Chief Executive Officer

# OUR SOLUTION TO A GLOBAL PROBLEM

Our technology draws on over 70 years of combined experience in the production of oil-in-water emulsion-based fuels. MSAR® and bioMSAR™ are direct substitutes for fuel oil (also called Heavy Fuel Oil or “HFO”) and biofuel respectively.

Our technology has established a strong reputation with market leading companies, and is a potential game changer for oil refiners and heavy oil producers. It frees up valuable distillates normally used for fuel viscosity control, increasing profitability. This is achieved rapidly and without incurring significant expenditure or costs – which differentiates our technology from alternative upgrading solutions.

## *HFO vs MSAR® and bioMSAR™*

Crude oil production and refining often result in heavy residual oils that require expensive refined distillates to reduce viscosity and meet pipeline and HFO specifications. HFO is sold at a discount to crude oil, resulting in a loss for the producer.

Cost-effective MSAR® technology enables additives and water to replace these high value distillates, which can then be sold at a premium. MSAR® technology can also be used to produce bioMSAR™, that incorporates renewable fuel-grade glycerine to provide an economic biofuel solution offering up to 30% lower $CO_2$ emissions today. We are further developing our bioMSAR™ technology to incorporate other potential low- or negative[1]- carbon feedstocks, to produce bioMSAR™ Zero, a Net Zero fuel.

## *Our positive impact*

Our MSAR® and bioMSAR™ products are proven in a wide range of applications and sectors, within a global fuel oil market of 386 million tonnes or $236 billion a year. The sectors that we serve contribute 59% of global (GHG) gas emissions, and regulatory and customer pressures to decarbonise energy are increasing. We are proud to be partnering with world-leading companies to deploy our proven technology in commercial applications.

[1] Feedstocks from products that have a net effect of removing carbon dioxide from the atmosphere rather than adding it, over their lifecycle.

## *Marine*

Maritime transport volume has increased by 250% over the past 40 years, resulting in continued increases in GHG emissions from the shipping sector. The estimated total emissions from maritime transport is approximately 940 million tonnes of carbon dioxide each year, or 2.5% of global carbon dioxide.

Shipping is also a source of emissions such as nitrogen oxides (NOx), sulphur oxides (SOx), carbon monoxide (CO) and black soot. They not only affect the climate, but also the environment, air quality, and human health.

The International Maritime Organisation has set a target to reduce 2030 Greenhouse Gas (GHG) emissions by 40% compared to 2008. The EU's Fit for 55 target is more aggressive, aiming for a 55% reduction by 2030. This gives the industry a very short timeline to find solutions.

Quadrise has a framework agreement with MSC to test our technology with the goal of helping MSC meet their ambitions to be net-zero by 2050. Commercial-scale trials with bioMSAR™ on board the vessel MSC Leandra are scheduled for Q1 2024, with commercial discussions commencing shortly thereafter.

## *Heavy Industry*

Our technology enables both refiners and upstream producers to economically and rapidly free-up valuable distillates traditionally used to upgrade residues into heavy fuel oil. Instead, the distillates can be sold at market value, increasing refinery margins; and in place of heavy fuel oil, lower emission MSAR® and bioMSAR™ can be produced and sold.

Quadrise has a commercial agreement with Valkor Technologies LLC to produce MSAR® and bioMSAR™ in Asphalt Ridge, Utah, serving as sources of supply for the marine sector or heavy industry.

There is an opportunity to use this arrangement as a blueprint to roll-out across North America where the Inflation Reduction Act provides a favourable legislation environment for decarbonisation technologies.

## *Utilities*

Direct emissions from generation of the electricity and heat contribute 23% of global greenhouse gas emissions. Switching from fuel oil to MSAR® and bioMSAR™ to generate heat and power allows industrial clients to reduce emissions whilst saving fuel costs.

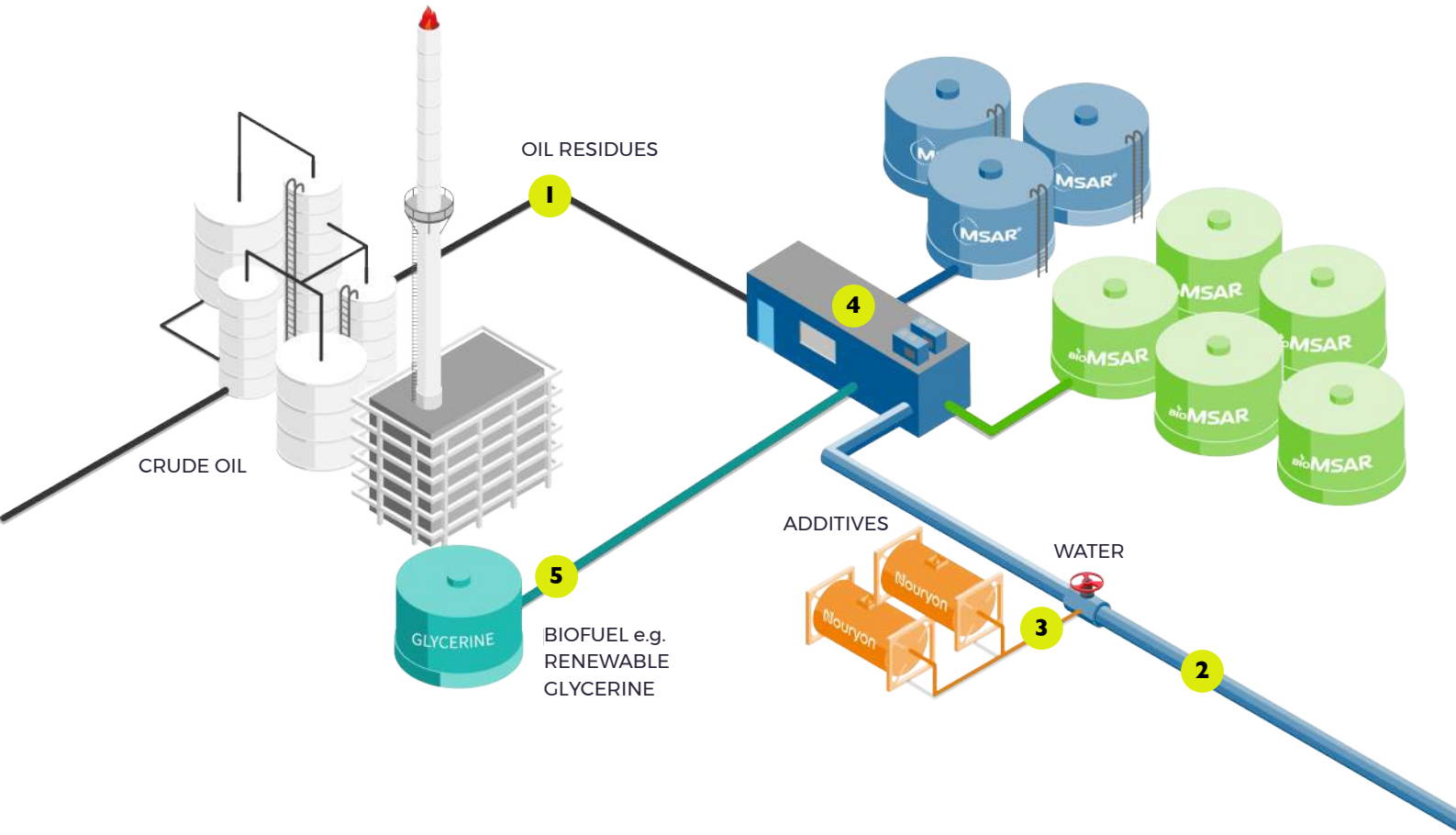
***"Further to initial exploratory discussions in 2020, MSC entered into a partnership with fuel supplier Quadrise in 2022 whereby MSC vessels will be used for proof of concept tests and operational trials using oil-in-water emulsion fuels bioMSAR™ and MSAR® – producing 25% less NOx and lower $CO_2$ emissions – for potential adoption."***

Extract from MSC Group's 2022 Sustainability Report

## *THE SIMPLICITY OF OUR SOLUTION*

### *Flexible production, rapidly deployed*

Our modular technology can be installed in under 12 months and is compatible with existing fuel oil and biofuel infrastructure, resulting in a low cost solution. The simple production process is as follows:




**1** Oil residues are taken from the refinery or heavy oil production and cooled to under 200°C to achieve the required viscosity.

**2** Water, which can be derived from several utility or waste-water sources is added to the residue.

**3** Special additives provided by our long term chemical technology partner Nouryon are included in the water phase to stabilise the emulsion for long-term storage and transport, and to promote complete combustion.

**4** The mixture is processed in a proprietary emulsion module to produce a highly-stable oil-in-water emulsion with enhanced fuel properties.

**5** A biofuel component such as renewable glycerine can be added to produce bioMSAR™ as an alternative to MSAR® for further carbon dioxide savings. bioMSAR™ and MSAR® can be made interchangeably and are compatible with each other.

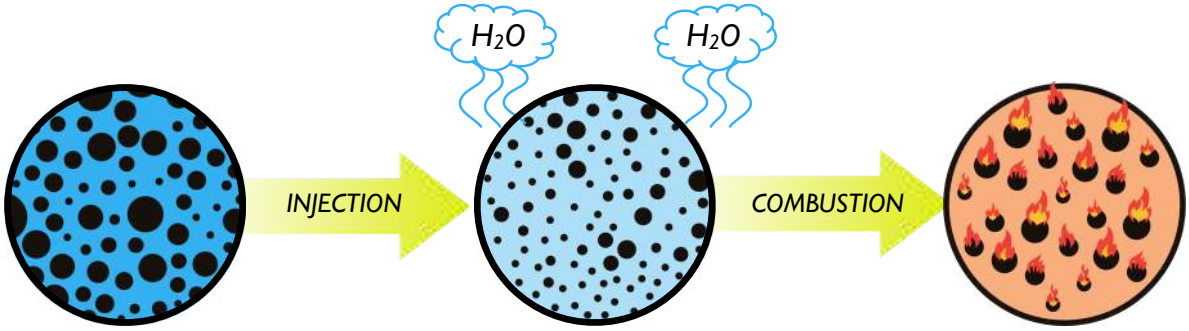
## *ENVIRONMENTAL, FINANCIAL AND OPERATIONAL BENEFITS*

### *How it's cleaner*

MSAR® and bioMSAR™ are both water-based fuels. With bioMSAR™, some of the fossil content is replaced with renewable glycerine. The superfine dispersion of fuel in the water phase leads to complete combustion. All of the fuel is converted to energy at lower temperature, reducing losses.

NOx emissions are reduced by up to 45%, with no visible black soot. MSAR® delivers up to 9% reduction in carbon dioxide, and bioMSAR™ up to 30%.

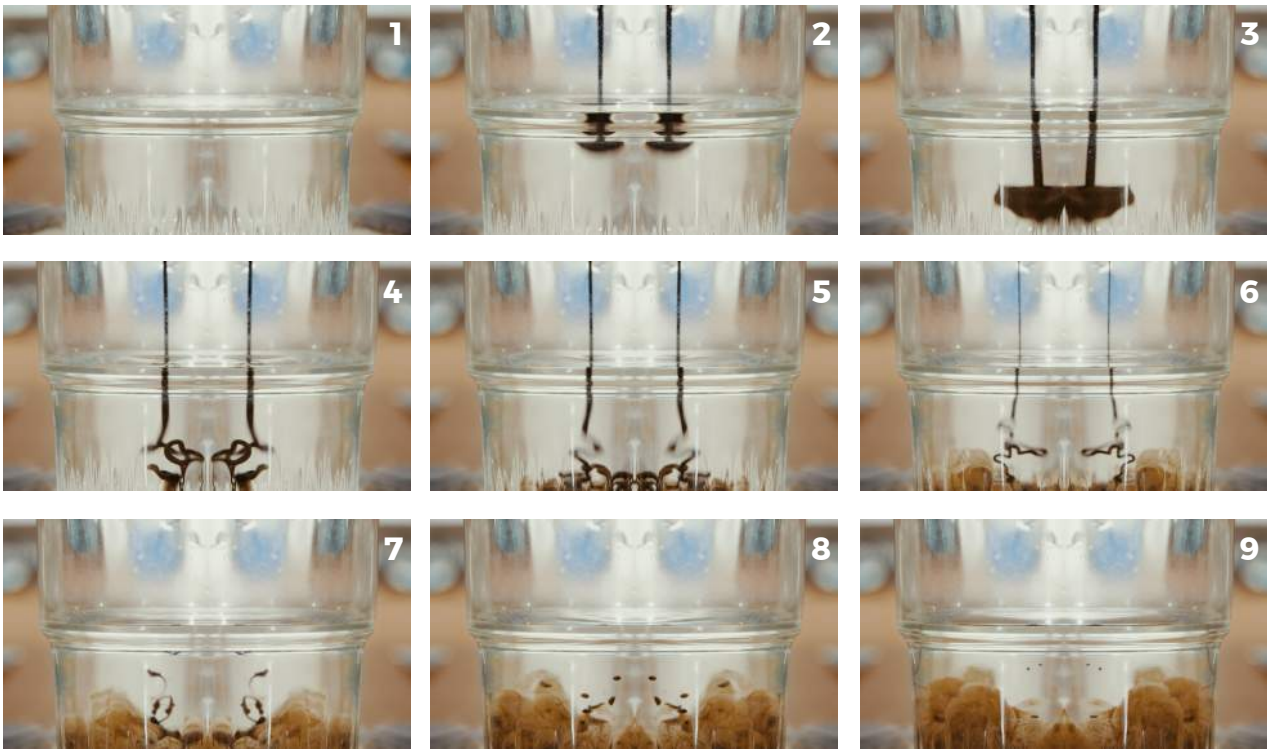
The series of 9 images below capture the dispersion of fuel oil when poured into a glass of water containing our proprietary additives. The entire sequence lasts only 2 seconds and results in a fully dispersed oil-in-water emulsion.




The water phase carries tiny atomised oil droplets, 5-10 microns which are invisible to the human eye.

The water evaporates, dispersing the oil droplets to sub-micron sizes.

Nano droplets combust completely, providing near-perfect energy conversion.



## *How it's cheaper*

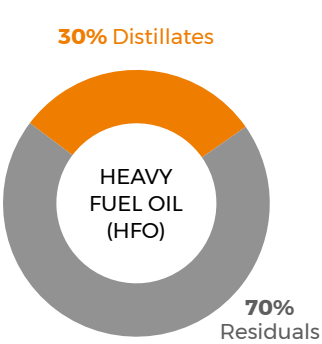
MSAR® technology replaces high-value distillates with lower-cost water (even waste water) and <1% of additives, thereby improving a refinery's conversion of a barrel of oil into premium-value products by 10-20%. Compared to fuel oil, MSAR® delivers cost savings of over 10%.

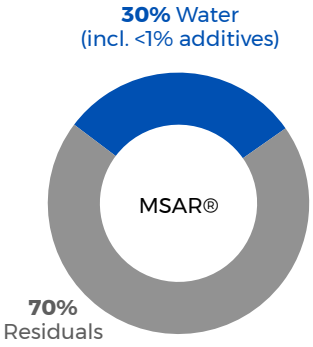
bioMSAR™ takes this one step further, displacing some of the fossil fuel with renewable glycerine or other renewable components such as Crude Sugar Oils (CSO), and bio-oils derived from waste agricultural or forestry products. Compared with biofuel, bioMSAR™ delivers cost savings over 10%.

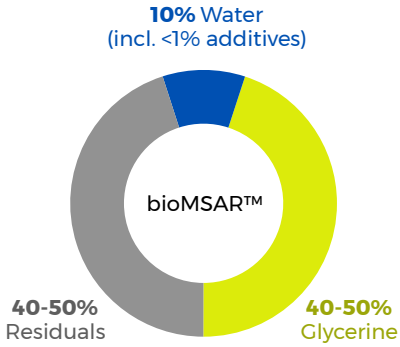
## *How it's safer*

MSAR® and bioMSAR™ are extremely stable, with storage and handling possible at much lower temperatures than HFO. These characteristics make our products safer for crew to handle and reduce the cost and complexity of heated storage tanks which are required for conventional HFO and some biofuels.

As emulsion fuels, MSAR® and bioMSAR™ both readily disperse in water in the unlikely event of a spill; a characteristic which is beneficial compared with conventional HFO or biofuels.




## *BIOFUELS GAINING RECOGNITION*

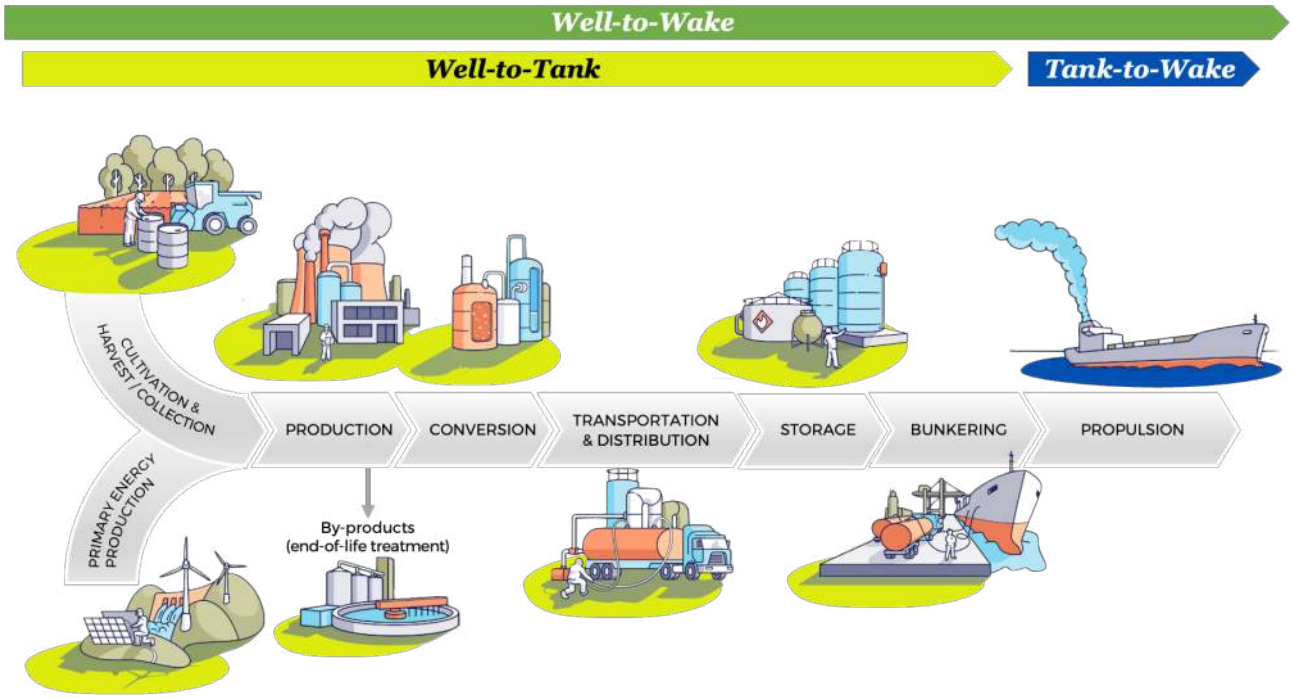
In acknowledgement of the growth in biofuels as a way for shipping companies to reduce GHG emissions, the International Maritime Organisation (IMO) recently approved interim guidelines that clarify how certified sustainable biofuels can be used.

The Marine Environment Protection Committee (MEPC) which addresses environmental issues under the IMO's remit has adopted guidelines on life cycle GHG intensity of marine fuels, which now allow for GHG to be assessed on a Well-to-Wake basis.

The full lifecycle from Well-to-Wake (WTW) combines both Well-to-Tank (WTT) and Tank-to-Wake (TTW), as depicted in the illustration on the following page.

We support and welcome this development. Biofuels are derived from organic material that was recently living and absorbing carbon dioxide. When combusted, the emissions released are more than compensated for by the carbon dioxide already absorbed. This results in zero TTW emission, and recognises the important role that biofuels has in the energy mix.

We have analysed the lifecycle emissions for bioMSAR™ and compared this to HFO and other biofuels. The renewable component in bioMSAR™ is glycerine, which can be produced from different types of feedstock, ranging from oil crops like rapeseed

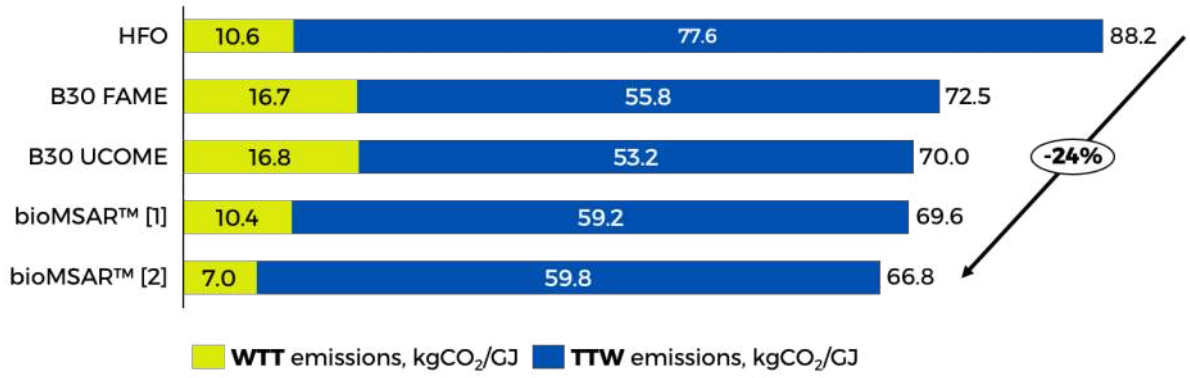



Infographic adapted from Sustainable Shipping Initiative.

and soybean, to animal fats, or preferably waste-based used cooking oil (UCO). Each of these results in different Well-to-Tank emissions due to the differences in cultivating, harvesting, collection, transportation, and processing into glycerine.

Sourcing of glycerine is undertaken by our customers from a variety of sources. Emissions based on an average of these feedstocks results in Well-to-Wake emissions of 69.6 $kgCO_2/GJ$, which is significantly lower than HFO and comparable to a B30 blend of UCO Methyl Ester (UCOME). [1]

Our product trials will use waste-based glycerine for incorporation into bioMSAR™. The result of this is Well-to-Wake emissions of 66.8 $kgCO_2/GJ$, which is 24% lower than HFO. [2]




bioMSAR™ [1] uses the lifecycle carbon emissions of glycerine based on an average value across all different types of feedstock, based on the European Commission's 2015 Progress Report on "Environmental Sustainability Assessment of Bioeconomy Products and Processes".

bioMSAR™ [2] uses the lifecycle carbon emissions of glycerine from waste-based sources (EU Annex 9A), which matches the feedstock that we will use for our upcoming bioMSAR™ trials.

# ENVIRONMENTAL

At Quadrise, environmental responsibility is ingrained in our core mission. Our revolutionary emulsion fuels offer a practical and impactful solution to address the pressing issue of climate change. Our commitment to environmental responsibility is exemplified through the following initiatives and accomplishments:

**Emulsion fuel technology**
We continuously invest in research and development to advance our emulsion fuel technology. Our proprietary MSAR® and bioMSAR™ technologies enhance combustion efficiency, resulting in reduced GHG emissions and lower levels of harmful pollutants, such as oxides of nitrogen and particulate matter.

We are pushing the boundaries to develop a net-zero emulsion fuel by 2030, that will be commercially viable for our clients. We have made significant progress in identifying and testing various feedstocks that deliver a material reduction in carbon intensity.

**Carbon Reduction Targets**
We have set ourselves a goal to achieving net-zero emissions across our value chain by 2030, working diligently to innovate and optimise our processes. Our actions support this commitment, and we have already achieved a 15% reduction in our Scope 1 and Scope 2 emissions over the past year, using the market-based approach. Under the location-based approach, our emissions are 37% higher, as the use of renewable power at QRF is excluded.

**Collaborations for Sustainability**
Quadrise actively seeks partnerships with governments, industry peers, and environmental organisations to accelerate the adoption of low-carbon fuels and support the global transition to a sustainable energy future. Our collaborations extend to research and policy development to drive positive change. Quadrise is an active member of the UK Chamber of Shipping (UK CoS) and the International Bunker Industry Association (IBIA), working together to drive innovation, share knowledge, and create solutions that address decarbonisation of shipping.

**Lifecycle Assessments**
In line with the IMO's recently approved interim guidelines on certified sustainable biofuels that recognise the full Well-to-Wake lifecycle assessment, Quadrise is conducting


comprehensive assessments of bioMSAR™ from production to consumption, to provide our clients with the assurance of the real impact of choosing our solutions.

**Eco-friendly Supply Chain**
Quadrise works closely with our suppliers to ensure ethical and environmentally responsible sourcing of raw materials, promoting fair labour practices and responsible resource management throughout our supply chain.

**Continuous Improvement**
Quadrise is committed to a culture of continuous improvement in environmental practices. We engage in regular environmental audits and assessments to identify opportunities for reducing our environmental impact further.

## *OUR PROGRESS TOWARDS A NET-ZERO FUEL*

MSAR®

MSAR®, our oil-in-water emulsion technology has been tested with leading players across multiple sectors, and proven to deliver up to 9% CO2 reduction compared with conventional HFO.

bioMSAR

In 2021, we developed bioMSAR™, building on our original MSAR® technology to incorporate biofuels. Our formulation with 40% renewable glycerine in bioMSAR™ delivers up to 30% reduction in GHG emissions compared to HFO. Successful formulations also exist for 70% glycerine blending resulting in 50% less GHGs.

bioMSAR™ has previously been tested on a 4-stroke engine in low-compression mode at an independent test facility, VTT, as a proof of concept. We are now testing bioMSAR™ on the same independent test engine in in high compression mode to better represent operating conditions in ship engines. We expect bioMSAR™ to excel under these conditions.

bioMSAR ZERO

In 2022, in response to rising demand for low and near-zero GHG emission fuels, we started to develop options to further reduce the GHG emissions profile of bioMSAR™. Our goal is to deliver a commercially viable 'bioMSAR Zero' by 2030. We researched feedstocks with potential for blending into our base bioMSAR™ product to produce a net-zero GHG emission fuel on a Well-to-Wake basis. Several feedstocks have been shortlisted and partnerships developed with companies owning unique or advantaged technologies, or access to the feedstocks.

**Lignocellulosic Biomass** is the most abundantly available raw material on Earth for the production of biofuels. It is composed of two kinds of carbohydrate polymers: cellulose and hemicellulose, and an aromatic-rich polymer called lignin. Lignocellulosic biomass can be broadly classified as virgin biomass, waste biomass, and energy crops. Virgin biomass includes plants, and energy crops are those that provide high yields of lignocellulosic biomass. Waste biomass is produced as a low value by-product of various industrial sectors such as agriculture, forestry and paper/pulp sectors. The Well-to-Wake GHG profile is low or near-zero for waste biomass.

Whilst the lignin is hydrophobic (repels water), the cellulosic sugars (Crude Sugar Oils, or CSO) are water soluble and therefore suitable for our oil-in-water emulsion fuel formulations. The CSO products have few, if any, competing commercial fuel outlets today.

Today the producing sites for lignocellulosic biomass and by-products are currently small-scale when compared

with the potential demand from the marine sector. Quadrise has a joint development agreement with Vertoro BV, who are partnered with Maersk to supply methanol-soluble lignin products, with the residual CSO available for other applications.

Testing to-date with a Vertoro CSO proxy has shown a high level of stability in bioMSAR™. It has similar physical and calorific properties as glycerine when concentrated, and we are optimistic about incorporating lignin sugars into formulations for future bioMSAR™ Zero products.

bioMSAR™ formulations with CSO have been tested in our Cummins engine. The results show encouraging emissions profiles compared to diesel, with corresponding GHG emissions reductions. The next step is to test the CSO bioMSAR™ on a 4-stroke high compression engine at VTT's independent test facility in Finland in Q1 2024.

In parallel to Vertoro, Quadrise is working with suppliers of similar CSO products from other sources in Europe and the USA.

**Wood Pyrolysis Oil (WPO)**, similar to lignin, is derived from wood or woody biomass. Through the application of heat, the organic materials are chemically broken down into gases, liquid bio-oils and solid char. WPO is one of the products produced through this process.

Previous research has shown WPO successfully combusting in engines, however the product is sensitive to polymerisation issues where relatively small molecules combine into large chains or networks of molecules, especially when blending.

Further processing of pyrolysis oils is possible, to produce lignin products and pyrolytic sugars - the latter are similar in principle to crude sugars derived from biomass. There is currently no competing demand for pyrolysis sugars in other transportation sectors.

Quadrise is currently working with BTG Bioliquids BV to investigate the blending of pyrolysis oils and pyrolytic sugars into bioMSAR™ at sufficient concentration to yield the same energy output as our current glycerine-based bioMSAR™.

**Tyre Pyrolysis Oil (TPO)** is produced from waste tyres, and is a dark brown liquid that is already used as a fuel in industrial furnaces and compression-ignition engines. TPO has a lower availability today than WPO but it can be upgraded into clean fuels in the future. Today, there is little competition from the road transportation sector.

bioMSAR™ has been produced in the laboratory incorporating TPO. The bioMSAR™ emulsion was stable for over 21 days, and further optimisation is possible in the future.


**Methyl Esters** are produced from a diverse range of feedstocks, all of which are relatively abundant. Methyl Esters have been used in fuel blends for several decades.

Some varieties such as Used Cooking Oil Methyl Esters (UCOME) have significant Well-to-Wake GHG emission savings as they are waste-based (listed on EU Annex 9B). Fatty Acid Methyl Esters (FAME) are also promising components for bioMSAR™ Zero, and blending tests to-date have been successful. The drawback is that there is competition for FAME coming from the road transport sector (bio-diesel).

Quadrise is very aware of the 'food vs fuel' debate involving Methyl Esters. To the extent that feedstocks and

production are diverted to industrial uses, less is available for food or to feed livestock. The demand for FAME could contribute to higher prices for maize, grains and plant oils. The 'food vs fuel' debate has resurfaced due to the rising prices of grain caused by the war in Ukraine.

There is also a risk that demand for FAME may indirectly incentivise monoculture farming, increase water use, induce changes in land use and encroach onto indigenous territories leading to conflicts over land rights and traditional practices. To mitigate against these risks, there are well-established international bodies and certification schemes such as the RSPO (Roundtable on Sustainable Palm Oil) and the ISCC (International Sustainability and Carbon Certification) that verify and certify the environmental and social sustainability of biomass sources.

The impacts related to FAME can vary widely depending on the feedstock used. We are focusing on Methyl Esters derived from waste products such as UCOME in order to avoid these negative environmental and social impacts.

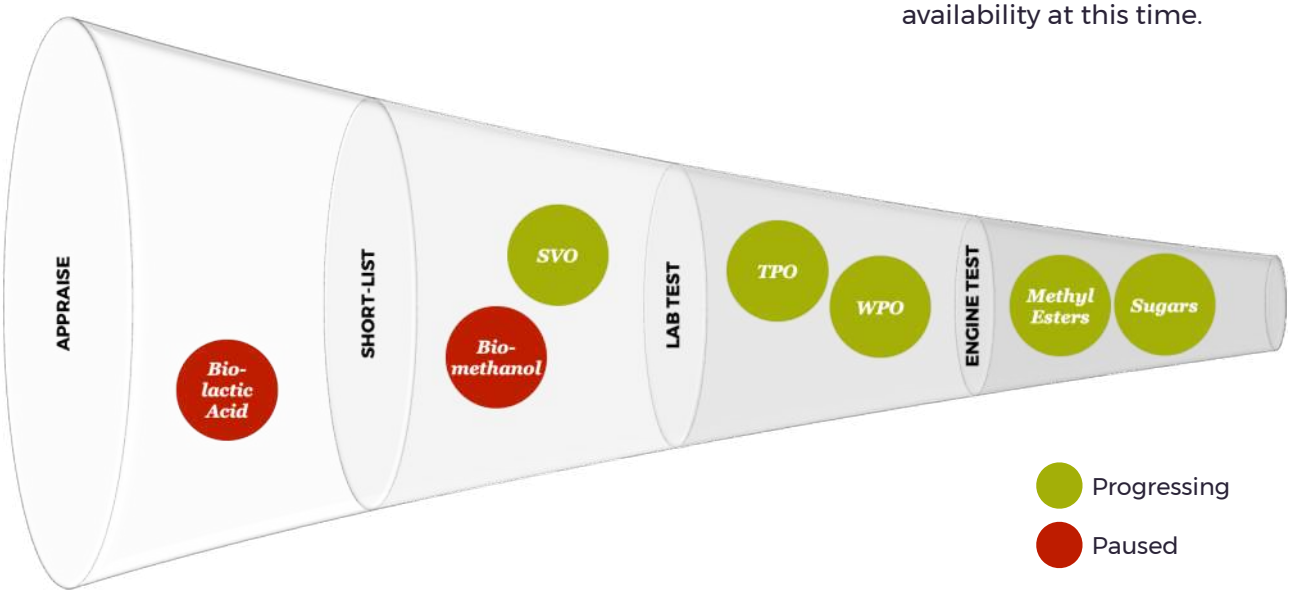
**Straight Vegetable Oil (SVO)** is a pure plant oil, commonly derived from vegetable sources and plant crops such as soybean, sunflower and canola. These are cheaper than FAME or UCOME as there is less processing involved, and they are produced on a relatively large scale compared to other bio components.

There is low demand for SVO as a fuel component today due to its natural physical properties such as high viscosity and low atomisation. However, we expect that these will be improved when SVO is blended using MSAR® technology. Testing is planned for 2024.

**Bio-methanol** (also known as Renewable methanol or Green methanol), is methanol produced from biomass like agricultural residues or municipal solid waste. Therefore, it provides considerable Well-to-Wake GHG emission savings and has beneficial fuel properties. Bio-methanol is gaining interest as a sustainable feedstock for various chemical processes, and production is projected to increase.

We shortlisted and tested bio-methanol as a component for bioMSAR™ Zero, reaching up to a level of 2% in the formulation but stopped as the dispersed particles started to rise to the surface, a phenomenon known as 'creaming'.

**Bio-lactic Acid** is lactic acid produced using green pathways, often involving micro-organisms or fermentation processes. It was shortlisted as a potential component but has been halted due to limited availability at this time.



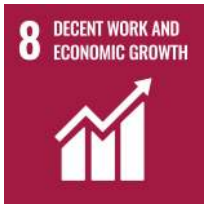
## *ALIGNMENT TO UN SUSTAINABLE DEVELOPMENT GOALS*

At Quadrise, sustainability is at the heart of our business strategy and operations. We are committed to making a positive impact on the world by aligning our efforts with the United Nations Sustainable Development Goals (UN SDGs). Our dedication to these goals underscores our responsibility to drive change in energy, innovation, infrastructure, and more. Our work directly relates to advancing the following UN SDG targets.



### *Affordable & Clean Energy*

Quadrise is actively contributing to SDG 7 by developing clean and sustainable energy solutions. Our MSAR® and bioMSAR™ technology converts heavy hydrocarbon feedstocks into low-emission fuels, reducing greenhouse gas emissions and enhancing energy efficiency. Through our innovation, we are increasing the share of renewable and clean energy sources in the global energy mix. We aim to substantially increase the share of renewable energy in the global energy mix.




### *Decent Work and Economic Growth*

Our commitment to SDG 8 is evident in our approach to employment and economic growth. We provide opportunities for skills development, training, and meaningful work for our employees. By fostering a diverse and inclusive work environment, we contribute to creating decent jobs and promoting sustainable economic growth within the communities where we operate. We endeavour to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.


### *Industry, Innovation and infrastructure*

Quadrise embraces innovation as a cornerstone of our business model. By continuously investing in research and development, we aim to enhance the technological capabilities of the energy industry. Our MSAR® and bioMSAR™ technology is a testament to our commitment, offering an innovative solution that bridges traditional fossil fuels with environmental sustainability. We aim to enhance scientific research, upgrade the technological capabilities of industrial sectors, and encourage innovation.


### *Sustainable Cities & Communities*

Our efforts align with SDG 11 through our focus on sustainable infrastructure. By providing a cleaner alternative to traditional fuels, our technology contributes to air quality improvement in urban areas. Quadrise plc is dedicated to making cities more resilient and sustainable for present and future generations.

## *Responsible Production & Consumption*


We are committed to responsible consumption and production through our MSAR® and bioMSAR™ technology. By transforming heavy residues into cleaner fuels, we reduce waste and promote efficient use of natural resources. This aligns with our dedication to minimizing the environmental impact of energy production and consumption. Quadrise aims to contribute to the efficient use of natural resources by developing a net-zero fuel by 2030.

## *Climate Action*


Addressing climate change is central to our purpose and mission. Our low-emission fuel solutions contribute to mitigating climate-related risks. By lowering greenhouse gas emissions, Quadrise plc plays a role in building resilience against climate-related challenges and driving the transition to a more sustainable energy landscape. Our technologies directly contribute to reducing GHG emissions across multiple sectors.

## *Life Below Water and Life on Land*



Our commitment extends to preserving biodiversity and ecosystems on both land and in water. Our MSAR® and bioMSAR™ fuels readily disperse in water, a characteristic which is different to conventional HFO or biofuels.
In the unlikely event of a spill, this characteristic of our fuel contributes to mitigating negative impacts on oceans and forests.

## *Peace, Justice and Strong Institutions*


Our commitment to ethical conduct and responsible business practices supports SDG 16. We voluntarily adopt the UK Corporate Governance code, placing us in the top tier of AIM companies. We adhere to principles of transparency, integrity, and accountability in our operations, ensuring that our business contributes to peaceful and inclusive societies while upholding the rule of law.

## *Partnership for the Goals*


We understand that climate change is a global challenge, one that can only be tackled through concerted effort across governments, corporations and society. Therefore, collaboration is a cornerstone of our approach to sustainability. Quadrise is an active member of the UK Chamber of Shipping (UK CoS) and International Bunker Industry Association (IBIA), working together to drive innovation, share knowledge, and create solutions that address decarbonisation of shipping. Through meaningful partnerships, Quadrise amplifies the impact of our efforts in alignment with all UN SDGs.

## *STREAMLINED ENERGY & CARBON REPORTING (SECR)*

This is the second year that Quadrise is voluntarily reporting its energy use and carbon emissions in line with the Companies (Directors' Report) and Limited Liabilities Partnerships (Energy and Carbon Report) Regulations 2018 (the 2019 regulations).

We calculated our Scope 1 & 2 carbon footprint for the past financial year 2022/23 through an international advisory consultancy. We also completed a materiality assessment of our Scope 3 emissions. The biggest contributors to Scope 3 emissions - 'Use of Sold Products' and 'End-of-use Treatment of Sold Products' - were not present in our operations for the past financial year, therefore we elected to focus on Scope 1 & 2 only, consistent with the previous reporting year.

We are reporting our annual emissions in tonnes of carbon dioxide equivalent (tCO2e), accounting for all activities that we are responsible for, including the combustion of gas, consumption of fuel for the purposes of transport and any purchase of electricity, heat, steam or cooling by the Company for our own use. The emissions cover the 'Kyoto' gases, carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydro-fluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride ($NF_3$) and sulphur hexafluoride ($SF_6$).

Consistent with our last assessment, the emission data has been calculated using the operational control reporting boundary and in accordance with the requirements of:

1. 'Greenhouse Gas (GHG) Protocol Corporate Accounting and Reporting Standard' (revised version) (WRI & WBCSD, 2001); and

2. 'Environmental reporting guidelines: Including Streamlined Energy and Carbon Reporting and Greenhouse Gas Reporting' (DEFRA & BEIS, 2019)

Quadrise operates two sites in the United Kingdom; one office (since January 2023) located at 10 Arthur Street, London, EC4R 9AY, and one laboratory at 8 Faraday Close, Clacton-on-Sea, Essex, CO15 4TR. Prior to January 2023, Our office was located at TOG Scott House, Suite 1 The Concourse, Waterloo Station, London SE1 7LY.

Quadrise has applied the appropriate emission factors (BEIS 2021/22) provided by the UK Government for company greenhouse gas reporting. Actual data was obtained and estimations based on industry benchmarks have been applied to fill data gaps, where necessary. We have, to the best of our knowledge and with the help of an our consultant, accounted for 100% of the Scope 1 and 2 GHG emissions from operations that we control.

We have not carried out any refrigerant top ups to air conditioning units during the reporting year, and no UK company vehicles or UK grey fleets are used.

All Scope 3 emissions have been excluded from this footprint. All upstream emissions (Well-to-Tank (WTT)) from Scope 1 and Scope 2 activities, including emissions associated with transmission and distribution (T&D) losses in grid electricity distribution, have also been excluded.

In order to express the business's annual emissions in relation to a quantifiable factor, Quadrise has chosen to report tCO2e/FTE, consistent with last year.

Our footprint has increased by 30% from the previous reporting year due mostly to higher gas consumption at Quadrise Research Facility ("QRF"), as activity in the laboratory has increased in connection with bioMSAR™ development work.

Due to our small size and our pre-revenue status, we do not have full control over the choices of energy used at our London office, however we are using 100% renewable power[2] backed by REGOs (Renewable Guarantees of Origin) at QRF. The impact of using renewable electricity is not considered under the *location-based method* of the SECR, which takes an average emissions intensity of the grid in the UK. However, under the *market-based method* which reflects emissions from electricity that Quadrise has purposefully chosen, there is a 15% reduction in emissions, reflecting the full year of using renewable electricity.

Our business activities in the current reporting year have intensified compared to the previous year, as we continue to develop our commercial projects through product trials and to ramp-up efforts to develop a net-zero biofuel which the market needs.

We acknowledge that our footprint and intensity may rise further in the short term as we focus on doing more activities with the same number of staff. Nevertheless, we remain committed to being a net-zero company by 2030, and to have a commercially viable net-zero fuel by 2030.

| ***Disclosure for the period July 2022 - June 2023*** | | **Current reporting year 2022/23** UK & Offshore | **Previous reporting year 2021/22** UK & Offshore | **% Change** |
|---|---|---|---|---|
| Total energy consumption used to calculate emissions | kWh | 49,586 | 38,092[3] | 30% ▲ |
| Emissions from activities for which the company own or control including combustion of fuel & operation of facilities (Scope 1) | $tCO_2e$ | 3.06 | 1.52 | 100% ▲ |
| Emissions from purchased electricity (Scope 2, location-based) | $tCO_2e$ | 6.91 | 5.77 | 20% ▲ |
| Emissions from purchased electricity (Scope 2, market-based) | $tCO_2e$ | 2.48 | 4.99 | 50% ▼ |
| **Total gross $tCO_2e$ based on above (location-based)** | $tCO_2e$ | **9.97** | **7.29** | **37%** ▲ |
| **Total gross $tCO_2e$ based on above (market-based)** | $tCO_2e$ | **5.53** | **6.51** | **15%** ▼ |
| Intensity ratio: gross tCO2e / FTE (location-based) | $tCO_2e$/ FTE | 1.11 | 0.81 | 32% ▲ |

[2] The fuel mix used to produce electricity between July 2022 - June 2023 was reported by our electricity supplier EON Next as 100% renewable. https://www.eonnext.com/about/fuel-mix
[3] The total energy consumption for the previous reporting year 2021/22 has been restated upwards from 37,896 kWh to 38,092 kWh to correct errors.

# SOCIAL

At Quadrise, our commitment to sustainability goes beyond environmental considerations; it extends to our dedication to employees, local communities, and the broader social fabric. We recognise that our success is deeply intertwined with the well-being of our employees and the communities where we operate.

As part of our Environmental, Social, and Governance (ESG) initiatives, we emphasise the 'S'— social responsibility — by fostering a supportive work environment, respecting our suppliers, and upholding ethical standards.

In this report, we showcase our commitment to employees highlighting our efforts to create a positive impact.

**Personal and professional development**

Our employees are the driving force behind all our operations. We prioritise their well-being through various initiatives that promote professional growth, health, and work-life balance.

We invest in development programs including Health & Safety training at our research facility QRF, and to enhance skills and career opportunities, ensuring that our team remains empowered and adaptable in a rapidly evolving industry.

**Physical and mental wellbeing**

The health and safety of our employees, contractors, and stakeholders are of paramount importance. We adhere to rigorous safety standards by following stringent CSR and HSEQ procedures.

Our clients' projects are usually located in industrial environments and the goal is to prevent accidents and incidents, promoting the physical and mental well-being of everyone associated with our operations.

Our employees have the benefit of full health insurance which includes support for mental health.

**Inclusive culture**

We strive to foster an environment where every employee feels valued and respected, contributing to a culture of innovation and collaboration.

Our culture enables flexi-working, enabling our staff to balance their personal and professional lives. We strive to build a workforce that reflects the societies in which we operate.

We recognise there is a gender skew in our sector, and are in the process of reviewing our employment policies and job descriptions to encourage the widest possible consideration from talented individuals regardless of gender.

The recruitment of young talent underscores the value we place on fresh perspectives, our commitment to innovation and the development of future leaders within the organisation.

We are committed to retaining talent from a wide range of age groups, fostering intergenerational collaboration.

We provide equal opportunities for candidates regardless of age, gender or ethnicity.

***"Working as part of the enthusiastic team at Quadrise allows me to expand my skillset developing exciting new fuels that promise a greener tomorrow."***

**David Sayer**
Chemist at QRF

***"Working at Quadrise has enabled me to expand my knowledge into other areas of chemistry and has given me on-site experience, seeing firsthand what a difference our fuels can make."***

**Callum Smith**
Chemist at QRF

# GOVERNANCE

Strong governance practices are the foundation of our sustainability journey. Our commitment to governance responsibility is reflected in our corporate structure, ethical conduct, and risk management:

**Code of Conduct and Ethics**
We maintain a robust code of conduct and ethics that governs the behaviour of all employees, from the leadership team to every staff member, to ensure the highest ethical standards are upheld.

Since admission to trading on AIM in 2006, Quadrise has voluntarily adopted the UK Corporate Governance Code (the 'Code'), that establishes standards for good corporate governance in accordance with five clear principles of board leadership, effectiveness, accountability, appropriate remuneration and good relations with shareholders. Companies which adhere to the Code must set out how they comply, or explain instances of non-compliance.

Our disclosures under the Code are on our website: https://www.quadrise.com/investor-relations/corporate-governance/

**Business model and strategy**
Everything we do at Quadrise is to deliver our purpose. We only grow when our cleaner technologies are adopted in the market. In that sense, our incentives are perfectly aligned with ESG goals.

As we mature, our intent is to also incorporate ESG into our selection criteria for projects, suppliers and partners. Our commitment to reducing the CO2 footprint of our products and activities will be embedded into our corporate targets which form the basis of our remuneration today and in the future.

Ultimate accountability for ESG matters rests with the Board of Quadrise plc; with each committee considering ESG as part of its deliberations. The Board fully embraces the importance of ESG in delivering value to our stakeholders.

**Risk Management**
Our rigorous risk management practices include identifying, assessing, and mitigating risks that could impact our business and stakeholders. This proactive approach safeguards our long-term sustainability.

**Policies and practices**
Quadrise maintains a comprehensive suite of policies and practices appropriate for our size and stage of development, including policies on Health, Safety and Environment (HSE) and a Sustainable Travel policy. Each of these is reviewed and signed off by at least one nominated Executive or Non-executive Director with appropriate subject matter expertise.

**Shareholder Engagement**
Quadrise actively engages with our shareholders, seeking their input and feedback to improve our governance practices and align our strategies with shareholder interests.

As an AIM quoted Company we are always required to announce any material information via RNS. However, our goal is to ensure that all our shareholders, whether retail, institutional or our longstanding high net worth shareholders are as informed as possible through our regular use of online presentation and Q&A sessions, our social media channels and TV interviews.

In July 2023 the Company announced that it had raised gross proceeds of £1.94 million via a placing of new ordinary shares in the Company and subsequent Open Offer to qualifying shareholders at an issue price of 1.25 pence per share.

Our ability to raise funds in a difficult market demonstrates that current and new investors have confidence in the commercial potential of our technologies.

**Transparency and Accountability**
We maintain transparency in our financial reporting and operations, holding ourselves accountable to our shareholders, regulatory authorities, and the public.

**Compliance and Regulatory Adherence**
We comply with all relevant laws and regulations in the jurisdictions where we operate, ensuring that our actions are not only ethical but also legally sound.

**Board Independence and Expertise**
Our board of directors consists of highly qualified individuals from diverse backgrounds, ensuring independent oversight of our operations and informed decision-making.

**Joint Brokers**
Shore Capital Stockbrokers Ltd

VSA Capital Ltd

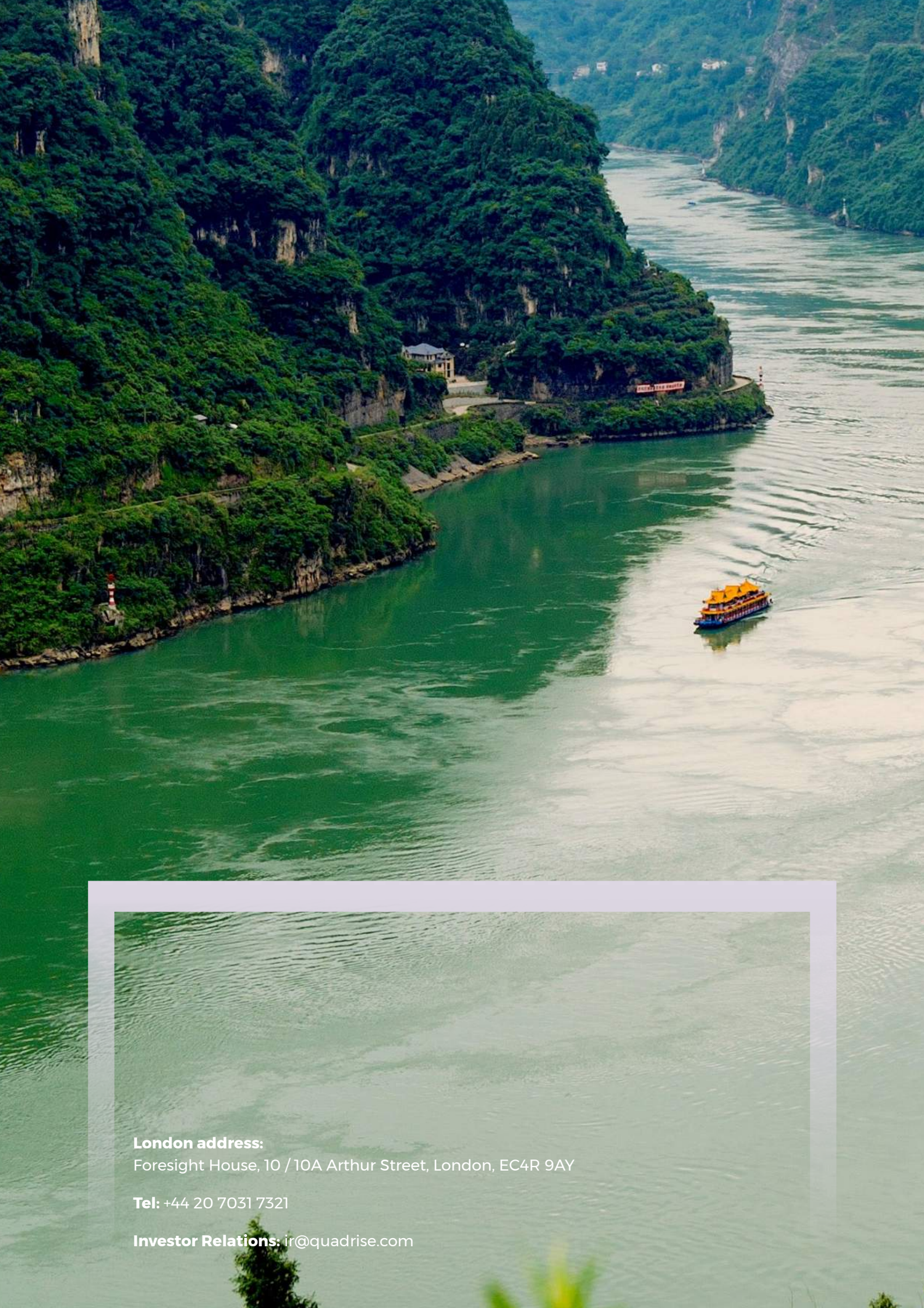
**Nominated Advisor**
Cavendish Securities plc

**Auditors**
PKF Littlejohn LLP

**Solicitors**
Shoosmiths LLP

**Public Relations**
Vigo Consulting

**Principal Bankers**
Coutts & Co.



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