CLIFFORD
CHANCE

ENERGY TRANSITION PERSPECTIVES – SAF AND GREEN FUELS

– THOUGHT LEADERSHIP

JULY 2025

ENERGY TRANSITION PERSPECTIVES – SAF AND GREEN FUELS

With many countries around the world introducing new requirements to encourage the use of e-fuels and biofuels, demand is growing. In this extract from a recent webinar, we consider how the market is developing in different regions and discuss the issues that developers and investors need to consider when structuring alternative fuel projects.

"There's no standardised terminology in the sector, so you hear a lot of different terms for the same thing. Green fuels are sometimes referred to as renewable fuels, sustainable fuels or low-emission fuels. Broadly they can be split into two categories – molecules which are produced and created from biological sources, that is, biofuels, and those which are made synthetically using green hydrogen, such as e-fuels or power-to-x," says Philip Walsh, a counsel in Clifford Chance's Amsterdam office.

Biofuels include biodiesel, biomethanol, renewable diesel and biokerosene, which is also a term used for Sustainable Aviation Fuel (SAF), and gaseous molecules such as biomethane, biopropane and biobutanol. Synthetic fuels, e-fuels or power-to-X fuels include e-methane, e-methanol, green ammonia and e-SAF. Those fuels are typically produced using green hydrogen from renewable energy produced via electrolysis and carbon dioxide. The CO_2 is captured from biogenic sources or from direct air capture to keep the molecules green, which is a requirement under EU regulations for certain green fuels.

"The issues for these projects are quite similar to traditional energy projects," says Walsh. "The molecules are ultimately the same as those derived from fossil sources – when we talk about biomethane, it's the same molecule as natural gas. The difference is how the products are produced and what the feedstock is, and so it's regulatory and market factors that drive the price differential."

European regulatory drivers – SAF

In Europe, the Renewable Energy Directives (RED II and RED III) and associated Delegated Acts including ReFuel EU Aviation and FuelEU Maritime, are designed to push renewable fuel demand forward and ramp up the supply of green fuels.

ReFuel EU Aviation sets binding targets which apply to fuel suppliers and aircraft operators, provided that they meet specific thresholds (operating at least 500 commercial passenger flights or 52 commercial or cargo flights departing EU airports). Starting from 2025, SAF must comprise 2% of all kerosene used by those operators and fuel suppliers, increasing to 6% in 2030, and further every five years (20%, 34% and 42%) up to 70% in 2050.

"There are a couple of things worth noting," says Walsh. "It's not an exponential rise, it's a jump at each milestone. In addition to that, there is a sub-target for e-SAF, which starts in 2030 and increases over time up to 35% in 2050. If the targets are not met there will be penalties, but these still need to be put in place by Member States. The ReFuel EU Aviation regulation sets a minimum amount for the penalty, but States can increase it – so at the moment we're seeing uncertainty as no Member State has yet specified exactly what these amounts will be."

The minimum penalties set under ReFuel EU Aviation differ between fuel suppliers and airlines:

- for airlines, the fine is twice the yearly price of traditional kerosene per tonne multiplied by the non-yearly uplifted quantity of SAF (i.e. the difference between the yearly aviation fuel required and the actual fuel uplifted by an operator); and
- for fuel suppliers, the fine is two times the amount equal to the difference between the market SAF price and the Jet A1 price multiplied by the non-delivered quantity.

For fuel suppliers specifically, if a supplier fails to meet the target in a reporting period, the shortfall is carried over and in addition to the penalty, the target for the following year will be raised by the amount of the shortfall. This creates a material incentive for fuel suppliers to produce or purchase SAF and make it available to airlines.

The current challenge is that there's no agreed reference price; however, in February 2025, the European Union Aviation Safety Agency published the "2024 Aviation Fuels Reference Prices for ReFuel EU Aviation" briefing, which provides the average reference prices for EU member states to use for determining penalties under ReFuel EU Aviation.

"We're seeing substantial SAF projects now being developed in Europe," says Walsh "and hopefully will see some of them reaching FID and financial close soon. These are mostly bio-SAF projects using HEFA technology, a technology which is already well-developed."

European regulatory drivers – maritime

The EU regulations applicable to the maritime sector under FuelEU Maritime differs from ReFuel EU Aviation, particularly as there is no specific fuel used in the maritime sector.

The focus under FuelEU Maritime is instead on greenhouse gas reduction targets, which can be achieved in different ways. These targets apply to all vessels of over 5,000 gross tonnes calling at European ports, regardless of their flag. The targets are intended to result in the greenhouse gas intensity of fuels used in the sector gradually decreasing over time, starting with a 2% emission reduction by the end of this year, reaching an 80% reduction by 2050. The targets cover not only CO_2 but also methane and nitrous oxide emissions.

Potential low-carbon fuels include renewable diesel, biodiesel, liquefied biomethane, ethanol, methanol, ammonia and hydrogen. There does not seem to be a particular front-runner among the fuels to be used in the future by the maritime sector, which is likely a key reason as to why the momentum of these projects is somewhat slower than SAF projects.

The development of fuel-agnostic vessels which can switch between different fuels, for example, those of Wärtsilä, may, however, start to drive things forward.

Biomethane

"Biomethane can be fed directly into the existing natural gas grid in most jurisdictions," says Liesbeth Buiter, a Partner in Clifford Chance's Amsterdam office. "As it is produced from agricultural waste, it is well-suited to being used near farmland, and it's already available on a small scale in many European countries. The EU has boosted the production of biomethane, targeting 950 new projects by 2030. As well as being renewable, it has the additional benefit of providing a solution for waste in the agricultural sector."

There are some very big projects in the Nordics, and these countries have the advantage of a well-connected grid and a huge agricultural sector which is already producing energy from waste.

"We are also seeing a lot of smaller scale projects that are being bundled together in portfolio deals with debt financing or further investment," says Buiter.

Regulatory drivers in APAC

"The rising volume of final investment decisions and commercial operations of clean fuel facilities highlights robust interest in this sector in Asia-Pacific", says Suguru Kimura, a counsel in Clifford Chance's Tokyo office.

Examples of investment in APAC	
Australia	• HIF's synthetic e-fuel facility in Tasmania is under development for export to Japan and the EU. The facility is expected to produce 100 million litres of e-fuels annually by 2028. • Rio Tinto is developing Pongamia seed farms as part of a new biofuels pilot exploring the potential of Pongamia seed oil as a feedstock for renewable diesel.
Thailand	• BSRC delivered the country's first consignment of B24 marine biofuel in February 2025, attracting strong interest from Japanese shipping companies. • In January 2025, PTT Global Chemical began the country's first output of SAF with an expected production of 6,000,000 litres this year.
Singapore	• Neste, which has been producing SAF since 2011, expanded the capacity of its refinery in 2023, producing an additional 1,000,000 tons of SAF annually. This expansion, together with the expansion in Rotterdam, highlights Nasta's commitment to increasing its SAF production to support the global green fuels market.
Japan	• Cosmo Energy Holdings launched Japan's first domestic production of SAF in April 2025.

"Growing SAF production activity from both oil and gas majors and smaller local project developers in the APAC region could accelerate global commercialisation. This should lead to cost reductions and technology exports, but could also impact feedstock availability and trade flows between countries," says Kimura.

In the APAC region, just like other regions, regulatory drivers play an important role in the adoption of SAF. Various countries have set mandates to increase SAF usage, others have yet to do so.

Airlines are also separately committing to using SAF. "The increasing number of SAF trials and commitments from airlines active in the APAC region could boost demand and competition for SAF globally," says Kimura. "There should also be more opportunities for green fuel producers and suppliers to secure offtake agreements."

In addition to SAF mandates, various measures including incentives and supply obligations are being discussed and implemented to promote the use of SAF and other green fuels. For instance, the Australian government is considering providing production incentives through the tax system, while in Japan four domestic SAF production projects have received subsidies.

As regards maritime fuel, Hong Kong announced its intention to reduce carbon emissions from Hong Kong-registered ships by at least 11% compared with 2019, and to reduce emissions from container terminals by 30% by 2030 compared with 2021.

"While some of these measures have yet to be implemented, it is anticipated that there will be a more widespread introduction of green fuel policies, mandates and incentives. This could enhance the financial attractiveness of producing SAF and other green fuels in the region," Says Kimura.

The US – a growing market

"SAF, renewable fuels, renewable natural gas and e-fuels are all experiencing significant growth and investment in the US," says David Stringer, a Partner in Clifford Chance's Houston office. "This is being driven by the incentives and mandates that are available at both the federal and state level."

SAF production is increasing exponentially, particularly because of the commitments made by airlines.

Renewable diesel had a period of significant growth from 2021 to 2023, but production is now slowing as a consequence of oversupply in the market, and the Renewable Investment Numbers (RINS) that are issued by the Environmental Protection Agency for renewable diesel are currently trading down.

There has been significant investment in renewable natural gas (RNG) throughout the United States. However, while there has also been a great deal of investment in e-fuels, development is still at an early stage. The infrastructure isn't yet there, and the hydrogen feedstock facilities are still being built out. Consequently, these projects have a deal of project-on-project risk. "We're seeing a lot of joint development agreements being negotiated, but have yet to see projects reaching final investment decisions and reaching commercial operation," says Stringer.

Latin America

A number of countries in Latin America have existing infrastructure for green fuel production and are looking to exploit these capabilities and grow their export markets. It is projected that Latin America will be responsible for the production of 15% of global SAF capacity by 2030.

Some countries have their own mandates; for example, Brazil, which has had a SAF regulation and a SAF mandate since October 2024, requiring air operators to reduce CO_2 emissions on domestic flights from 2027, and with reduction targets spread over ten years from 1% up to 10%. Brazil is already the second largest export market for (bio) ethanol, produced from sugar cane.

"The region has good access to bio feedstock due to the strength of the agricultural sector which, combined with existing export infrastructure gives it a competitive edge, so Brazil, Uruguay, Paraguay and Argentina are all looking to develop green fuels projects for export," says Walsh.

The US, EU and APAC are all potential export markets, subject to the challenges of regulatory uncertainty in the US and meeting strict EU regulatory ReFuel EU Aviation requirements.

Equity and financing investment structures

There are three structures in particular that we frequently see: strategic joint ventures, tax equity financings and structured equity financings.

The strategic joint venture usually consists of two investors, often offtakers, bringing in capital to develop production and secure future supplies. Stringer says, "the Martinez Project is a good example – it was a joint venture to retrofit a refining unit into a renewable diesel manufacturing facility. Neste brought the feedstock, which can be difficult to find, and Marathon brought the refinery. By creating a joint venture they were able to move forward with producing the renewable diesel."

In the US, tax equity partnerships allow developers who do not yet have a revenue stream to use tax credits to fund the equity portion of the project and obtain the debt financing that they need. There needs to be certainty with respect to the tax credits, both for the tax equity investor and for the banks that will be lending. Where there is uncertainty as to whether tax credits are available, it becomes more difficult to form these partnerships and secure the financing.

Structured equity financings are often used by private equity investors. These transactions create a special type of equity with debt-like features, enabling the investor to finance projects while protecting themselves in the event that the project doesn't go as planned and still preserving upside value; for example, guaranteeing that the investor will achieve a specified rate of return following FID. This enables non-strategic investors to come into a project early and be protected from risk during the development phase.

Offtake and feedstock supply

"Offtake is critically important because it determines the flow of revenue," says Walsh. "The feedstock, however, is equally important, because typically these projects are refineries – taking feedstock in and converting it to something else, and if you have no feedstock, then the facility can't produce and sell product and has no revenue stream. Both offtake and feedstock are important and there needs to be some form of risk allocation between the two."

For some projects feedstock is more challenging. It is important to ensure long-term supply, but this is not always possible. For example, re biomethane, trying to enter into long-term feedstock supply arrangements for waste agricultural products from local farmers which are suitable for project finance is quite challenging, and instead the developer has to develop a feedstock strategy with a breadth of suppliers which works equally well. There are similar challenges for HEFA, which relies on tallow or used cooking oil, where there's currently over-demand and undersupply in the market.

Developers also need to consider (i) whether feedstock will be delivered onsite, or will the developer take the risk of transportation, and (ii) the specifications of the feedstock, ensuring that it is of a particular quality, which can also impact the facility's output.

As the sector is driven by regulation, there's typically a "proof of sustainability" certification process to ensure that the feedstock, and therefore the end product, is green.

"For offtake, it will be important for financiers and investors to see hard commitments from the offtaker through a take-or-pay obligation. But equally, there needs to be enough offtake to derisk the project. For larger projects this might be through multiple offtakers, which can result in some complexities in terms of nominations and scheduling to ensure there's good interface between the various parties," says Walsh. "This can be particularly challenging when that part of the structure is perhaps outside of the project ring-fence; for example, in third-party port infrastructure."

From a pure project finance perspective, lenders will typically prefer to have a delivery point at the factory gates or a jetty within the control of the project where the risk passes from the project to the offtaker, meaning that transportation is at the risk of the offtaker. However, some types of sponsors, for example those who do not require limited recourse project financing, might take a different view and accept the risk of delivery, which then brings additional challenges such as the interface with the shipper, and perhaps greater exposure to costs such as tariffs. However, this is a commercial position to be agreed between the producer, offtaker and shipper.

Being driven by regulation, there's a significant sector focus on certification and change in law. "The price differential for these products stems from the fact that they are green and that they meet the regulatory requirements. If there are changes to those regulations, it is likely to affect the risk profile for the producer and/or the offtaker. So there is typically a deal of discussion about how to allocate the risk of changes in law. As there is no established market position on this, it is generally driven by commercial factors, including whether there's project financing in place," says Walsh.

Construction

"In some ways there is little to distinguish green fuel projects from more traditional refinery or petrochemical projects," says Buiter. "What really differentiates them is the speed at which the sector is developing. The technologies are relatively new and different licensed technology providers focus on different types of projects, so it is important to lock in suppliers well in advance."

Lenders, investors and technical advisers are focused on the technical set-up of these projects and, for example, how performance guarantees will be met. There is a delicate balance to be struck when presenting a project to investors and financiers, where they are relying on the reputation of the technology provider

or the contractor to ensure that there's enough comfort that is not a wholly new project, but just has some new elements related to the relevant feedstock. Licensed technology providers have quite a lot of bargaining power, but they also want to build their track record and are keen to have their name associated with a project so that, once proven, their technology can be rolled out elsewhere.

"It's important to structure the licence documentation right from the outset to protect the sponsors and lenders, to determine what the main contractor is responsible for, and what remains with the licence technology provider," says Buiter. "We have seen some creative solutions, where the licence technology is assigned to the contractor for the construction phase, ensuring performance guarantees are met, but when the project is handed over the licence flows back to the sponsors. In other projects the sponsors hold the licence to the technology, meaning that they will bear the risk instead of the contractor, but that can be challenging for risk allocation when there are project finance lenders or co-investors involved."

It's important that all the documentation is aligned and that consideration is given to liability caps, the scope of the performance guarantees, and ensuring that the IP licence is broad enough to include the sale of the products and relevant by-products.

"As we have previously seen in the wind industry, in the beginning, with first-of-a-kind projects, parties are more reluctant to have several different construction packages. With a big project, it's much easier to have one main EPC contract and one technology supplier, who are, ideally, already involved in the FEED study, with lump sum pricing. That said, we are starting to see more disaggregated procurement structures, and expect even more in a few years' time when the industry has matured," says Buiter.

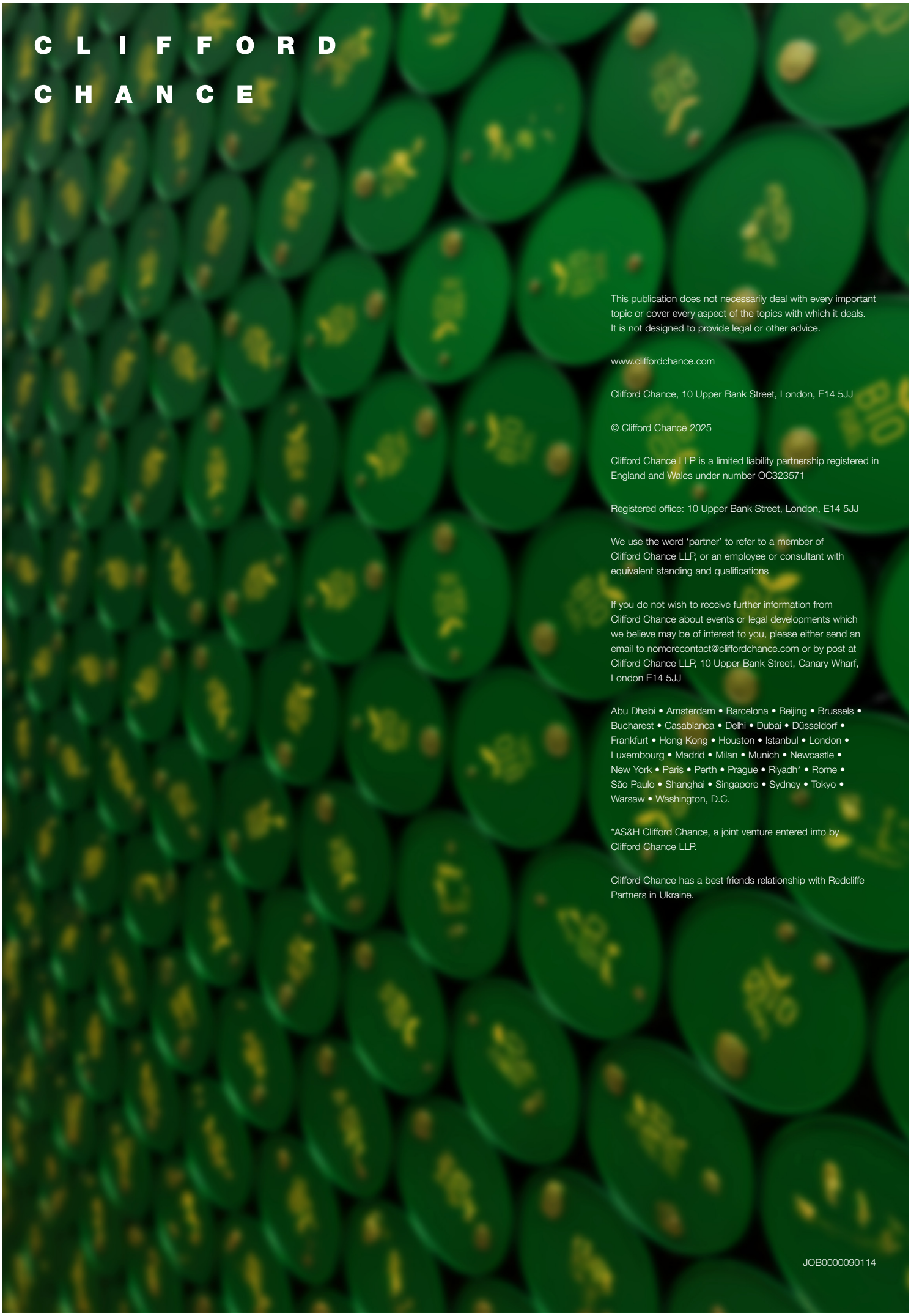
CONTACTS

Liesbeth Buiter
Partner
Amsterdam
T: +31 20 711 9326
E: liesbeth.buiter@cliffordchance.com

Suguru Kimura
Counsel
Tokyo
T: +81 3 6632 6412
E: suguru.kimura@cliffordchance.com

David Stringer
Partner
Houston
T: +1 713 821 2824
E: david.stringer@cliffordchance.com

Philip Walsh
Counsel
Amsterdam
T: +31 20 711 9547
E: philip.walsh@cliffordchance.com



CLIFFORD
CHANCE

www.cliffordchance.com

Clifford Chance, 10 Upper Bank Street, London, E14 5JJ

JOB0000090114