Green Hydrogen Contracting Guidance

Financing green hydrogen projects

Key considerations

- A major consideration for green hydrogen projects will be to structure an acceptable risk profile for financing by allocating risks to those best able to take them, whether this be sponsors, insurers, financiers or governments.

- In this early stage in the development of the green hydrogen sector, public sector grants and other forms of concessionary funding will be a critical source of project financing, with blended financing solutions being key to making green hydrogen projects bankable and commercially viable. As direct financial support and investment from developing host nations is expected to be limited due to national budget constraints, development finance institutions are expected to play a key role in derisking financing in emerging economies.

- Host governments, project developers and sponsors will need to ascertain which combination of financing sources they wish to consider when determining how to structure a green hydrogen project. Each institution will have their own specific considerations as to required elements of the structure of a project, and will need to conduct in-depth due diligence to ensure that the project complies with their applicable credit and policy requirements.

- In developing countries, it will also be important to ensure that there is a robust cost-benefit analysis, socio-economic analysis, consensus building, and balancing of interests to ensure that commitments undertaken by the host state to provide a favourable environment for investment are weighed appropriately with the state's interests and rights to effect changes in policy. This will be critical to ensure the long-term success of the project and avoid disputes between stakeholders.

This brief forms part of a set of guidance from the initiative on Green Hydrogen Contracting – for People and Planet. The project supports governments, communities and companies in developing contracting practices for green hydrogen projects that ensure rapid expansion to everyone's benefit. The guidance has been developed by a working group consisting of governments, law firms, companies and civil society groups to draw lessons learned from emerging practices in the green hydrogen industry. For further information, visit gh2.org/green-hydrogen-contracting.

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1. Introduction

Green hydrogen, as a clean source of energy, is expected to make a significant contribution to addressing the impacts of climate change as well as achieve the United Nations Sustainable Development Goals.[1] Globally, governments have committed more than USD 37 billion in public funding to hydrogen development, while the private sector has announced an investment of a further USD 300 billion.[2]

As a carbon-free means of storing energy, it is easy to see why green hydrogen provides a particularly attractive opportunity for funding initiatives, investments, and financial flows. The benefits that arise from the development of the green hydrogen economy will however not be for the short term. At this juncture, governments and project developers may be compelled to strike a pragmatic balance between the nature of the short-term risks and challenges associated with the production of green hydrogen, and the medium to long term benefits.

This guidance provides a summary of certain key issues relating to the financing of green hydrogen projects (using electrolysis powered by electricity obtained from renewable energy) that stakeholders will need to address as business models across the emerging hydrogen sector develop. To this end, it provides a roadmap to:

i) Develop instruments and financing structures with features responding to certain challenges and risks associated with the hydrogen value chain; and

ii) Replicate, wherever possible, financing structures already deployed at scale in other sectors of activity (e.g., renewables, and liquefied natural gas - LNG). In this regard, the paper also applies lessons from transactions in such sectors to develop the most cost-effective financing mechanisms for green hydrogen, taking advantage of both nascent business models and public support mechanisms.

This paper looks ahead to the financing of green hydrogen projects on a long-term 'limited recourse' basis (i.e., with the lenders' recourse being limited to the cash-flows of the project during the operational phase). However, in the short-term it is expected that many projects in this sector will either require some form of completion support and

[1] The contribution which the Green Hydrogen Economy can make to the achievement of the UN Sustainable Development Goal is considered in the *Green Hydrogen Contracting Guidance on Sustainable development*.
[2] IEA (2021), Global Hydrogen Review, https://www.iea.org/news/decisive-action-by-governments-is-critical-to-unlock-growth-for-low-carbon-hydrogen

long-term offtake support or will be funded on the balance sheet of sponsors and/or by direct government support.[3]

Hydrogen is at the intersection of major industrial sectors, mobility, and energy. The financing of the green hydrogen value chain is expected to include the manufacturing of upstream and downstream equipment, hydrogen production, storage, transportation, and infrastructure to deliver hydrogen and its derivatives to market and end-users. The financing structure and bankability analysis for green hydrogen projects will vary depending on, among other things, the offtake arrangements, where the plant is located, whether the undertaking is a "greenfield" or "brownfield" development, and access to renewable energy, water and existing infrastructure in the host country.

Project financing lenders have demonstrated a willingness to develop structures that involve the application of new or existing technology on a larger scale and in integrated projects. **The challenge for green hydrogen projects is to structure an acceptable risk profile for financing by allocating risks to those best able to take them, whether this be sponsors, insurers, financiers or ultimately in some cases, governments**. The project finance lending community are experts at assessing and pricing risk and, whilst they can be expected to accept some risk on early projects, their approach to risk is traditionally conservative, with a low tolerance for default.

The existing global hydrogen generation market size was estimated at approx. USD 124 billion in 2021.[4] While there is currently no spot market for hydrogen, this demonstrates a clear demand that can support the funding of new green hydrogen projects by private finance. Initial project financing transactions are likely to focus on opportunities where there is proven demand, by replacing "grey", "brown", and "black" hydrogen with "green hydrogen" in industrial processes as a way of decarbonizing production of goods that already use hydrogen as a feedstock (e.g., ammonia, refining, and glass production), and include activities currently relying on fossil fuels (e.g., steel production, with the substitution of hydrogen for coal in the direct reduction process).

At this juncture the long-distance supply of hydrogen presents certain technical and economic challenges.[5] To transport hydrogen, it must either be liquefied or be converted into chemical carrier compounds (such as ammonia). At the point of import, most hydrogen must undergo either a re-gasification or re-conversion process, in a similar way to most imported LNG. The economics of the long-distance trade of

[3] Potential models and mechanisms which the host state governments and sponsors could consider is discussed in more detail in the *Green Hydrogen Contracting Guidance on Fiscal Terms and Incentives.*
[4]Grand View Research (2022), Hydrogen Generation Market Size, Share & Trends Analysis Report, https://www.grandviewresearch.com/industry-analysis/hydrogen-generation-market
[5] US Hydrogen and Fuel Cell Technologies Office, Hydrogen Storage Challenges, https://www.energy.gov/eere/fuelcells/hydrogen-storage-challenges

liquefied hydrogen currently is subject to a high degree of uncertainty. As the development of a global hydrogen market gathers pace, commercially viable transport models are however expected to emerge. Although not directly equivalent from a technical and economic perspective, parallels can be drawn with the LNG market where integrated liquefaction and regasification projects have been successfully project financed around the world, most notably with natural gas from Qatar.

Until these challenges relating to long-distance transportation have been addressed, project financings of green hydrogen projects are more likely to focus on the transport of hydrogen over shorter distances to a captive demand (e.g., local green steel production) or where there is an existing pipeline network, such as around parts of continental Europe, where pipeline transmission of gaseous hydrogen will be more cost effective. While pipeline transmission using existing gas networks is possible, and hydrogen may be blended with natural gas for such purposes, significant and costly upgrades to pipeline infrastructure could be required in some cases for the transportation of pure hydrogen, owing to hydrogen's chemical and physical properties.

While some commentators[6] suggest that existing LNG import infrastructure could be modified for the importation of liquefied hydrogen, others believe that dedicated infrastructure will be required, possibly at or adjacent to existing LNG infrastructure. Other potentially cost-competitive methods of hydrogen transportation have been proposed, including the conversion of hydrogen to chemical carrier compounds, which can be shipped to the destination port for reconversion to hydrogen at destination. The transportation and storage of such chemical compounds would require enhanced safety analysis by the project sponsors, and verification by the project lenders' independent consultants.

[6] NGI (2020), Infrastructure Easily Modified to Liquefy Hydrogen, Says Chart CEO, https://www.naturalgasintel.com/lng-infrastructure-easily-modified-to-liquefy-hydrogen-says-chart-ceo/

2. Relevant practices and international trends

It is premature to discuss international trends in the financing of green hydrogen projects. This paper therefore assesses a number of important considerations that are expected to influence the future development of financing activity in the sector. These are:

Finance sources	• Governments and other international organisations • Multilateral and development financial institutions • Export Credit Agencies (ECAs) • Commercial bank term debt providers • Others
Risk allocation: due diligence	• Offtake / market risk • Renewable power and water supply risk • Technology Risk • Construction Risk • Access to market, transport and infrastructure risks • Regulatory risks • Environmental and social issues
Risk allocation: sponsor support	• Sponsor completion guarantee • Debt Service Undertaking (“DSU”) / Sponsor Financial Guarantee • Contingent Stand-by Equity
Government / public sector finance and regulatory landscape	• Regulatory developments • Public - Private Partnerships • Cap & Trade Systems / Carbon Tax

Finance Sources

Green hydrogen project financing may be expected to involve one or more of the following lender groups:

a. Governments and other international organisations:

In this early stage in the development of the green hydrogen sector, public sector grants and other forms of concessionary funding will be a critical source of project financing, at least until sufficient private sector sources of funding are available. At a recent Global Infrastructure Facility (GIF) Advisory Council Meeting, commentators agreed that blending public and private capital is key to making green hydrogen projects bankable and commercially viable.

The announcement by the European Commission in September 2022 to establish a €3 billion Hydrogen Bank is just one example of the support available to green hydrogen projects, as host governments and international public institutions recognise the importance of public funding to "*bridge the investment gap and connect future supply and demand*"[7]. Other salient examples of this type of funding include the €40 million in grant funding which the German Federal Ministry of Economic Cooperation and Development (BMZ) committed for the promotion of South Africa's green hydrogen economy or the separate commitment of €200 million in concessional loan finance by the German development bank KfW for public and private sector green hydrogen projects in the country.

Chile has created an attractive investment environment that includes financing structures (as well as tax and regulatory support) and the Chilean Government is providing or enabling support on multiple fronts, including financial support for pre-feasibility phases. Australia is similarly creating a supportive environment and also investing directly into projects e.g., via the Government-owned Green Bank with an AU$300 million hydrogen fund.[8]

Direct financial support and investment from developing host nations is expected to be limited due to national budget constraints. However, such host governments have a number of other tools to mobilize private capital from industry actors and financial institutions as described below, including regulatory, policy and other incentives. Drawing analogies from the early development of capital-intensive extractive industries, such as natural gas, the capital funding requirements for the project (including in respect of the state's equity interest) have been funded by private companies and

[7] European Commission President Ursula von der Leyen during her State of the Union address, September 2022.
[8] Further information is available in the *Green Hydrogen Contracting Guidance on Fiscal Terms and Incentives.*

international financial institutions. As a general matter, while lenders have sought comfort from the host state with respect to the regulatory, legal and fiscal environment, they have not imposed minimum funding participation requirements from developing host states.

b. Multilateral and development financial institutions

As has been demonstrated in other sectors, multilateral and development finance institutions are frequently a source of substantial funding for projects in emerging sectors, although they typically will undergo significant risk analysis as part of a credit approval process. In Europe for example, the European Investment Bank has played a key role in the development of the offshore wind sector by committing large amounts of debt to the sector to support development projects, and currently is playing an important role in the funding of battery giga-factories in Europe. Whilst many of these institutions have geographical limitations in terms of the scope of the projects and markets that they can support, many have demonstrated enthusiasm to support green hydrogen projects. The International Finance Corporation (IFC) is committed to growing its climate-related investments to an annual average of 35 percent of its own-account long-term commitment volume between 2021 and 2025, and is actively working with clients in emerging markets on green hydrogen initiatives[9].

The African Development Bank's Sustainable Energy Fund for Africa (SEFA) may be an example of a further source of funding for projects based in Africa. This multi-donor special fund was established to provide catalytic finance to unlock private sector investments in renewable energy and energy efficiency.

In its own words, SEFA offers technical assistance and concessional finance instruments to remove market barriers, build a more robust pipeline of projects and improve the risk-return profile of individual investments. The Fund's overarching goal is to contribute to universal access to affordable, reliable, sustainable, and modern energy services for all in Africa, in line with the New Deal on Energy for Africa and Sustainable Development Goal 7. Although SEFA funding may not be available for a project developed in Africa for the export of green hydrogen to Europe, SEFA could nevertheless be an important source of funding for those green hydrogen projects that can demonstrate domestic benefits (e.g., from the development of ancillary renewable energy supply or grid infrastructure for the domestic market), or the export of green ammonia to other African jurisdictions with the necessary market demand.[10]

[9] The International Finance Corporation, Hydrogen's New Horizon – Scaling Up Clean Hydrogen for the Power Sector, May 2021.
[10] African Development Bank, Sustainable Energy Fund for Africa, https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/sustainable-energy-fund-for-africa

c. Export Credit Agencies (ECAs)

ECAs can be providers of political and / or commercial risk insurance, and of direct lending to support the export of equipment and services from the country in which the ECA is based (i.e., on a "tied basis"). ECA support can also be accessed via equity investment or offtake. As such, in structuring the project, strategic partnerships, procurement sources and offtake markets each need careful consideration when assessing financing needs.

ECAs are a key source of liquidity for project financing transactions, particularly in the energy space, and have demonstrated the capacity and willingness to accept risks (including technological and geographical / political risks) that commercial lenders are not able to accept (or are not able to accept at a price that supports the economics of the project). For example, many ECAs from North America, Europe, Asia and Africa have provided critical catalytic support for the development of LNG projects and continue to provide billions of dollars of funding support to such projects around the world.

In relation to green hydrogen, ECAs from countries that have made more ambitious climate pledges may be considered more likely to invest in such projects, depending on policy determinations by their home governments.[11] As well as having the potential to offer significant liquidity and reduce-all-in-costs as compared to commercial bank lending, ECAs may also be willing to lend on longer tenors. ECAs are therefore expected to be a key enabler for the development of project financing transactions and have a role in "crowding in" other funding sources in the medium term. The participation of ECAs signals to the private sector that that a business is commercially viable. The ECA guarantee and insurance products have a catalytic impact on private investment, providing comfort to stakeholders in emerging markets and in new industry sectors. They can mobilise commercial bank lenders who participate with the benefit of cover from an ECA protecting against the risk of non-payment and/or alongside an ECA.

d. Commercial bank term debt providers

These entities, which may include domestic and/or international banks would typically provide medium to long-term amortizing loans, secured on the assets being financed. The lending policies of international commercial banks who are active in the energy sector are increasingly focused on the carbon intensity of projects / borrowers, with a marked shift away from fossil fuel projects. Compliance with green loan principles, as

[11] Ten European countries (Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden and the United Kingdom, all signatories to the COP26 Commitment) and their ECAs formed the "Export Finance for the Future" ("E3F") coalition with the goal of leading efforts to align export finance with climate objectives, including an assessment of their export finance support to the fossil fuel sector and how best to phase out that support.

described below, should further enable access to increased market liquidity for green loan projects.

The participation of domestic banks in developing countries is likely to be limited in the early stages of the financing of green hydrogen projects.

e. Others

Alongside the public sector funding that will underpin early-stage development of the green hydrogen industry (e.g., strategy, feasibility, and pilot stages), private philanthropic funders such as the Microsoft Climate Innovation Fund, the Rockefeller Foundation's environmental program, and The African Climate Foundation are already starting to play a key role, alongside other private climate funds and organisations focused on research and development.

As the green hydrogen sector matures, other financial market actors are expected to provide significant investment to green hydrogen projects, including institutional investors (e.g., infrastructure funds and insurers) as well as other sources of private capital. In addition to traditional institutional investors who may be attracted to capital markets debt investments in the project finance / infrastructure space, liquidity in the green bond market and other sustainability capital market instruments has grown significantly in recent years, providing potential access to a deeper pool of debt capital markets investors.

Risk allocation – due diligence[12]

Before committing to lend to a green hydrogen project on a limited-recourse basis, lenders will need to conduct in-depth due diligence to ensure that the project complies with their applicable credit and policy requirements.

The level of due diligence will vary depending on the institution, but the scope can be expected to include an assessment of legal risks, construction and technology risks, operating risk, offtake / market risks, environmental and social risks, insurance cover, and if applicable, shipping risks. Certain or all of these risks may require the engagement of independent expert consultants, who would be engaged on behalf of the lenders to prepare detailed due diligence reports in order to allow lenders to consider whether the risks have been adequately managed, and to address lender questions or concerns on the same.

[12]It is worth noting that several matters which ought to be considered during the due diligence process are also considered under the Green Hydrogen Organisation's *Green Hydrogen Standard*.

The following areas are expected to be a key focus of the lenders' due diligence for the financing of green hydrogen projects (in addition to those risks that are common to other project financing transactions):

a. Offtake / market risk

The revenue contracts that support the bankability of the project will be key project agreements for the financing.

Project finance requires a predictable revenue stream and lenders can be expected to require long-term 'take or pay' offtake arrangements with creditworthy customers (typically covering the tenor of the debt plus a "tail"), until such time as the market for hydrogen is sufficiently liquid or hydrogen is traded as a commodity to support the bankability assessment of the project on a merchant basis.

Offtake structures may take several different forms and project financing transactions have been successfully financed based on different models.

For example, a company that owns the hydrogen production facilities (the "Project Developer") may enter into tolling arrangements with its customers, whereby the customer is responsible for the supply of the inputs (i.e., the electricity and the water, if applicable) required to produce green hydrogen, and will pay a "tolling fee" to the Project Developer to produce the hydrogen. This insulates the Project Developer from variable supply costs and provides for a predictable revenue stream that would support the financing.

Alternately, the Project Developer may be responsible for purchasing the electricity and water that is needed for production, and then may sell the hydrogen produced to the purchasers / offtakers.

In an integrated project model, the Project Developer also may be responsible for production of the chemical carrier compounds (such as ammonia), in which case the lenders would be focused on the compound-specific offtake contracts that would generate the revenue to repay the loans and pay interest on the same.

Beyond the terms of the initial offtake contracts themselves, the lenders will want to understand the potential market for the project's hydrogen, in order to assess the projected medium / long-term demand for the product. For green hydrogen projects in developing countries, it may be challenging to secure sufficient domestic offtake demand from creditworthy offtakers to make a green hydrogen project economically viable, and therefore much of the focus may be channeled towards overseas / export customers.

b. Renewable power and water supply risks

The largest single cost component for on-site production of green hydrogen is the cost of the renewable power needed to run the electrolyser unit, followed by the plant capex, which is primarily the cost of the electrolysers themselves. A low cost of electricity is therefore a necessary condition for producing competitive green hydrogen. This creates an incentive to produce green hydrogen at locations around the world that have optimal renewable resources, in order to optimise competitiveness. Although it is challenging to generalise project costs across the sector (due to the number of variables), and to compare across different hydrogen production methods, it should be noted that the levelised cost of producing green hydrogen in certain markets is already reported to have fallen below the equivalent production cost for blue hydrogen, which is directly impacted by the cost of natural gas used for production and the significant cost of carbon capture, transportation and storage.[13]

Lenders will assess electricity supply capacity, connectivity, stability and price – including any project-on-project risk where the power generation is being developed at the same time as the green hydrogen project (in such circumstances, the lenders may require that the project enter into quiet enjoyment and non-disturbance arrangements with any lenders to the renewables company). The market advisor, together with the financial advisor, will need to ensure that the financial model assumptions are appropriately reflected. Where electricity supply is expected to be supplied under a combination of long-term power purchase agreements (PPAs) and futures/options, consideration will also be given to the project's hedging strategy.

The supply of water from suitable sources to produce hydrogen also will need to be considered, and the lenders will expect the project to enter into firm commitments with water suppliers. Depending on the location of the project, this could be a material risk that will need to be covered off as part of the due diligence process.

Lenders will assess the risk of a change in utility tariffs, in particular if the plant is reliant on a single water and / or renewable power supply where one entity is a monopoly provider.

c. Technology risk

Lenders will need to be comfortable with the technology being applied for the green hydrogen project (such as the electrolysers), and the interfaces between all relevant technologies. Although the production of hydrogen and its derivatives and renewable power generation are well-established, lenders will require independent verification

[13] Institute for Energy Economics and Financial Analysis, *Russia Sanctions and Gas Price Crisis Reveal Danger of Investing in "Blue" Hydrogen*, May 2022.

regarding the technical feasibility of the application of renewable power to produce green hydrogen at commercial scale, and will need to assess any technology risks throughout the value chain on which the project relies to monetise the hydrogen produced.

d. Construction risk

The lenders' technical advisor will need to validate the project's construction and installation strategy. Project finance lenders have a strong preference for a turn-key "wrapped" engineering, procurement, and construction agreement (EPC contract) allocating risk to a single creditworthy EPC contractor or consortium that is responsible for delivery of the project.

The green hydrogen value chain however comprises different segments presenting risks that are specific and interdependent (for example the renewable energy plant and the hydrogen production plant). Therefore, it may not be possible or economically viable to develop a green hydrogen project under an all-inclusive EPC contract. Furthermore, to the extent a project being developed is reliant on transportation facilities (i.e., pipelines or ship), and/or a customer who in turn needs to construct receiving terminals for the hydrogen, the lenders also will need to understand and assess the construction / development risks associated with those other facilities, as noted below.

Tax implications in the host jurisdiction may also be a factor in driving the allocation of engineering, procurement, construction and installation works between separate offshore and onshore scopes of work. Where the equipment constituting the project is being supplied and installed by more than one supplier or under multiple contracts, the lenders will need to be comfortable with the integration and interface risks that this contracting structure presents.[14]

e. Access to market, transport and infrastructure risks

A distinction needs to be drawn between (A) 'captive' green hydrogen projects, where the hydrogen to be produced is dedicated primarily (or solely) to one or more local industrial facilities (such as green steel production), and (B) green hydrogen projects that are reliant on a downstream hydrogen market that is not proximate to the hydrogen production facilities. For the latter projects, lenders will need to understand how the gas is to be transported (by pipeline or ship) to the offtaker / end user.

Unlike renewable power generative assets where the product can be sold into an existing network or grid, the infrastructure network and consumer end-user products

[14] Potential models and mechanisms which the host state governments and sponsors could consider to alleviate the costs arising from the import of machinery is discussed in more detail in the *Green Hydrogen Contracting Guidance on Fiscal Terms and Incentives*.

are not sufficiently mature to provide a "plug and play" delivery system for hydrogen in most geographies. As noted above, gas pipelines, where applicable, would need to either be adapted or replaced to allow hydrogen supply at scale, or ships build to transport the liquid hydrogen or green ammonia.[15] Therefore, the lenders will require assurance that all necessary infrastructure is in place to ensure both the delivery of the inputs required to produce hydrogen and the storage and transport of hydrogen to the project's customers. This will take the form of a logistics study and, if relevant, a shipping report.

Given green hydrogen's potential in playing a key role in the energy transition, a number of governments worldwide have initiated measures targeted at increasing investment in hydrogen.

Changes in tax legislation,[16] rules and regulations may transform the regulatory environment for the project and the lenders, as compared to those reflected in the financial model assumptions. Therefore, the lenders' legal and market advisers will opine on the regulatory risks faced by the project. The project may seek to mitigate these risks by procuring assurances in the form of comfort letters from the relevant governmental authority, stabilisation clauses included in concession / host government agreements,[17] and/or political risk insurance, in addition to any protections provided under applicable investment treaties.

In a conservative lending environment, lenders may seek to "stress" the financial model to run scenarios where public support mechanisms are turned off, requiring the project to demonstrate commercial viability in circumstance assuming that a material change in the applicable regulatory regime occurs.

As in the early stages of the development of the renewables market, long-term purchase agreements with utilities or other government related offtakers that provide lenders with attractive returns may be required to "kick-start" the market.

Sustainably produced green hydrogen is made with additional renewable electricity to ensure that electrolyser consumption does not increase fossil fuel consumption

[15] See for example Hydrogen Infrastructure (Science Direct) Phull, B. (2003). "Evaluating hydrogen embrittlement," in *Corrosion: Fundamentals, Testing, and Protection*, eds S. D. Cramer and B. S. Jr. Covino (Novelty, OH: ASM International). 617–623; Prospects and Challenges of Green Hydrogen Economy via Multi-Sector Global Symbiosis in Qatar.

[16] For a more comprehensive analysis of the fiscal regulatory regime which applies to the production of green hydrogen see the *Green Hydrogen Contracting Guidance on Fiscal Terms and Incentives*.

[17] For a discussion of potential fiscal terms to be included in concession agreements see the *Green Hydrogen Contracting Guidance on Fiscal Terms and Incentives*.

elsewhere or displace more efficient uses of renewable electricity.[18] For example, grid-connected electrolysers could draw upon new renewable capacity at the expense of other electricity uses and using grid electricity could lead to higher use of fossil fuel capacity, effectively locking in fossil fuel generators for more years if additional renewable energy capacity is not deployed in time. This is summarised by the principle of "additionality": if there are other productive uses for the electricity being generated from renewable sources, that electricity should not be diverted from those uses to produce green hydrogen. Instead, green hydrogen should be produced only from additional renewable energy capacity that would not otherwise be commissioned and electricity that would not be otherwise consumed.

This is especially important for developing countries, which may be at risk of developing renewables projects dedicated to green hydrogen for export, without delivering improvements in local access to electricity and decarbonisation of their own electricity mix.

Regulators, policy makers and lenders are expected to focus on incentives and market rules that promote additionality, for example to encourage project developers to use renewable electricity that would otherwise be curtailed or to increase the installed renewable energy generation capacity for the benefit of the project and other users.

In developing countries in particular it will also be important to ensure that there is a robust cost-benefit analysis, socio-economic analysis, consensus building, and balancing of interests to ensure that the commitments undertaken by the host state that are intended to provide a favourable environment for investment and to mitigate foreign investment risks are weighed appropriately with the state's interests and rights to effect changes in policy. This will be critical to ensure the long-term success of the project and avoid disputes between stakeholders.

f. Environmental and social issues[19]

With the increasing global emphasis on Environmental, Social and Governance (ESG) issues, lenders will seek to ensure that green hydrogen projects operate in a framework premised on sound environmental and social management principles. To ensure that projects follow international best practice, lenders will require that projects comply with the requirements imposed under international standards such as the Equator Principles, the IFC's Performance Standards on Environmental and Social Sustainability, of the World Bank's

[18] IRENA (2021), Green hydrogen supply: A guide to policy making, International Renewable Energy Agency, Abu Dhabi.
[19] The environmental and social concerns associated with green hydrogen projects are considered in greater detail in the *Green Hydrogen Guidance on Community Engagement and Transparency* and *Sustainable Development*.

Environmental and Social Framework (ESF). The exact requirements may depend on the identity of the lender or the project's own specifications (which among other things will depend on the location of the project).

Based on examples from other extractive industries in developing countries, companies and governments will not only need to deliver tangible benefits to the local community, but will also have to demonstrate the long-term contributions of their projects to the economic well-being of the host country (for example, through additional renewable electricity capacity, water supply and improvements in infrastructure).

Risk allocation – sponsor support

The sponsors (traditionally an entity or entities with more substantial corporate worth and skill than the Project Developer, which may include private or public sector industrial companies or financial institutions) are often required to provide support to the Project Developer to ensure that the project is successful. The green hydrogen space has attracted investment from traditional energy companies and industrial players with strong balance sheets, as well as new market entrants and start-ups. This support typically would take one of the forms described below.

a. Sponsor completion guarantee

Sponsors guarantee to the lenders that the "Lenders Completion Date"[20] will occur by a specified drop-dead date. The guarantee is released in full if and when the Lenders Completion Date occurs. Although the sponsors commit to complete the project by the drop-dead date, the likely remedy available to the lenders against the sponsors is damages for breach of contract and not specific performance (specific performance would require the sponsors to spend whatever amount is necessary to achieve the Lenders Completion Date). The maximum amount of damages is likely to be the total outstanding amount due and payable by the borrower to the lenders, but it is theoretically possible that lenders could claim loss of future profit. For this reason, the guarantee will typically expressly exclude loss of future profit. Each sponsor will be required to pay its pro rata share of the amount of damages determined by the courts / arbitration tribunal.

Sponsors typically prefer to give financial guarantees / debt service undertakings and not completion performance guarantees because, under a completion performance guarantee, the project's failure to achieve the Lenders Completion Date by the drop-

[20] This note assumes that the "Lenders Completion Date" is defined conventionally as being the point at which all project construction has been completed, the project is fully operational (as demonstrated by a testing regime) and other conventional completion test requirements have been satisfied (such as financial covenant testing).

dead date will automatically trigger a breach by the sponsors of their guarantee obligations (as opposed to triggering an obligation to pay a sum of money under a financial guarantee).

b. Debt Service Undertaking ("DSU") / Sponsor Financial Guarantee

Sponsors severally (in proportion to their ownership interest in the project) undertake to the lenders to pay all amounts due and payable by the borrower under the finance documents after demand is made on them by the lenders, which demand can be made (a) at any time prior to the Lenders Completion Date, and (b) only if and when the borrower fails to pay any amount due and payable by it under the finance documents (this includes all amounts due and payable under the finance documents post-acceleration of the loans). The DSU is released in full if and when the Lenders Completion Date occurs. The sponsors are liable on a several basis (in proportion to their ownership interest in the project) for the full amount outstanding under the finance documents. This liability is in debt and not damages and therefore the principles of contract law which govern the assessment of damages do not apply.

As an alternative to a DSU, the sponsors may guarantee to the lenders the payment by the borrower of all amounts due and payable by the borrower under the finance documents and undertake to pay to the lenders such amounts after demand is made on them by the lenders, which demand can only be made if and when the lenders accelerate the loan. The guarantee is released in full if and when the Lenders Completion Date is achieved.

The sponsors are liable on a several bases (in proportion to their ownership interest in the project) for the full amount outstanding under the finance documents. This liability is in debt and not damages and therefore the principles of contract law which govern the assessment of damages do not apply.

A DSU and a 'pure' financial guarantee are substantially the same except that (a) lenders will generally prefer a DSU because it gives them greater assurance that debt service will be paid when due (and without needing to accelerate the loans), and (b) sponsors typically prefer to give DSUs and not 'pure' financial guarantees because under a DSU sponsors are required to cure payment defaults as and when they occur and not only when lenders accelerate the loans (this means that each sponsor will have a greater level of comfort that the project will be kept alive during the construction phase).

Although a debt-buy down guarantee could also be considered as an alternate structure, this type of guarantee is not common particularly where there is a material risk of the project's minimum target output not being achieved. It is therefore not expected to be applicable for the financing of green hydrogen projects, pending further development of the electrolyser technology at scale.

c. Contingent Stand-by Equity

Sponsors are required to make equity contributions to the project company (based on an agreed gearing or leverage ratio), which may take the form of subscription for share capital, shareholder's contribution, and/or unsecured subordinated shareholder loans. This support typically will be required until the project has reached the commercial operations date and satisfied the lenders' reliability tests. Lenders also may be willing to agree that the Sponsor's equity support requirement for the project is capped – limited recourse to the Sponsor being a hallmark of project financing structures.

Where a sponsor is not able or willing to provide a guarantee or debt service undertaking in the form described above, the sponsor (or, where that entity does not have sufficient substance, the investors in that sponsor) may undertake to provide contingent equity in order to provide comfort to the lenders that funds are available to meet project costs so that the project is able to reach completion, in particular, to mitigate a funding shortfall in the event that a cost overrun or delay occurs. This support may be pre-funded and held in an escrow account or backed by a letter of credit from a bank or other financial instrument.

The equity support agreement will impose binding obligations on the sponsor or its investors to make funds available to the project company at certain times and based on certain conditions. This may take the form of a standby contingent equity facility. Project finance lenders typically will want to have direct and enforceable rights against the equity support providers and/or the right to request utilizations under the standby contingent equity facility on the sponsors' behalf where there is a funding shortfall.

In developing countries the ability of any state-owned sponsor participating in the project financing (or any other state entity) to provide a financial guarantee or other similar commitment is expected to be limited due to underlying credit quality of the sovereign guaranteeing the debt, debt sustainability considerations and the strong political support required. In practice, the lenders may take the view that a financial guarantee from such a state-owned entity would is symbolic only and fails provide any credit enhancement while potentially risking wider development goals. In such circumstances, lenders may require that the international sponsors / private companies assume the state's proportionate share of the liability.

Government / public sector finance and regulatory landscape

As noted above, given green hydrogen's potential in playing a key role in the energy transition, a number of governments worldwide have initiated measures targeted at increasing investment in green hydrogen, which will likely have a bearing on the financing of these projects.

a. Regulatory developments

For example, the **European Union and United Kingdom** both have Hydrogen Strategies which have been released over the course of the past two years, establishing goals and targets in relation to the use of hydrogen. Such incentives usually fall into one of three categories:

- Lowering the cost of production of green hydrogen;
- Encouraging wider adoption of green hydrogen end uses; and
- Improving the equipment performance of systems that create green hydrogen (e.g. electrolysis equipment) to speed up cost competitiveness.

The measures can include tax breaks or subsidies (which may be direct or conditional such as Contracts for Difference), as has been seen in Europe, including with the Netherlands introducing tax credits for investment in the industrial sector to substitute hydrogen as an input for fossil fuels. The nature of these benefits will vary jurisdiction by jurisdiction, but they are becoming increasingly prevalent, particularly in Europe.

The more recent developments in the **United States** are also expected to have a major impact on investment flows to green hydrogen projects. The US Inflation Reduction Act 2022 is expected to unlock approx. USD 370 billion in funding and tax credits to drive investment in renewable energy sources such as wind and solar, "qualified clean hydrogen", clean technologies such as electric vehicles, heat pumps and battery storage well as penalties on highly polluting methane emissions.

The law includes a breakthrough tax credit for "qualified clean hydrogen" which would pay producers up to $3 per kilogram of hydrogen from 2023 depending on the levels of lifecycle emissions and staff wages. As an alternative, a producer could choose an investment tax credit of up to 30% of the cost of the hydrogen production facility. The law also allows the pairing of green hydrogen production facilities with wind and solar farms where a further tax credit may be claimed. This follows November 2021 Bipartisan Infrastructure Law's USD 8 billion program to develop regional clean hydrogen hubs (H2Hubs) across the United States.

A number of **African countries** are pursuing green hydrogen strategies, including the six front-running governments that have founded the Africa Green Hydrogen Alliance: Egypt, Kenya, Mauritania, Morocco, Namibia and South Africa.[21]

South Africa's vision is guided by its Hydrogen Society Roadmap (HSRM) which sets clear targets that the country intends to achieve by 2050.[22] Among other things, South Africa aims to deploy 10 gigawatts (GW) of electrolysis capacity in the Northern Cape by 2030 and produce about 500 kilotons of hydrogen annually by 2030. If it succeeds in doing so, the new sector may generate up to 20,000 jobs annually by 2030 and 30,000 by 2040. According to a report by the National Business Initiative, it is anticipated that South Africa could produce green hydrogen for USD1.60 per kg by 2030. If so, this would be one of the lowest costs worldwide. This could help the country reach its goal of doubling its current share of global hydrogen production by 2050—from 2 to 4 percent.

There are various funding programs available which could support the establishment of green hydrogen plants. Important examples include the Department of Environment, Forestry and Fisheries's ZAR 800 million green fund which seeks to support green initiatives and the collaboration between South Africa and the German Ministry of Economic Cooperation and Development (referred to above) the KfW Development Bank (as referred to above).

Namibia is currently testing the green hydrogen market.[23] At the end of 2021, it selected a preferred bidder to pioneer a USD9.4bn green hydrogen project. If the project is successfully implemented, the country may proceed to grow the industry by concluding a number of small yet strategic Public Private Partnerships.

Examples of other African countries which announced green hydrogen initiatives or projects in 2022 include Egypt, Kenya, Mauritania, Morocco and Tunisia.

b. Public - Private Partnerships

Project co-financing (public - private partnerships) are also used as a way of allocating some risk / responsibility away from private investors and lenders in the context of green hydrogen projects.

[21] Africa Green Hydrogen Alliance, https://climatechampions.unfccc.int/africa-green-hydrogen-alliance/
[22] For a more comprehensive discussion on South Africa see the CSIS's commentary on South Africa's Hydrogen Strategy.
[23] For more information on Namibia's green hydrogen opportunities see Namibia's Green Hydrogen Opportunity - key questions + initial answers (Jan 2022)

c. Cap & Trade Systems / Carbon Tax

As the cost of carbon is projected to continue to rise throughout much of the world (e.g. through EU Emissions Trading System and other similar cap and trade style systems), green hydrogen projects will likely become more attractive economically, particularly in harder to abate industries such as steel or cement production where there may be limited alternate technologies for reducing carbon intensity.

Cap and trade systems function by a central authority (often a government or regulator) setting a "cap" on the total amount of in-scope emissions permitted over the course of a set time period (usually a year). The total amount of this cap is then split into "allowances", "permits" or some other equivalent tool, which are allocated to emitters via some combination of free allocation by the central authority and an auction process. Such allowances/permits then can be traded between emitters, with the market price of allowances functioning as the cost of emitting in-scope emissions. Emitters are then required to surrender an amount of allowances at the end of each year equal to their in scope emissions. As the carbon emission cap reduces annually in line with net zero objectives, allowances (and therefore the cost of carbon) will increase in price, leading to greater competitiveness for low carbon projects, such as green hydrogen.

3. Guidance on best practice

This section will focus on certain industry standards that should underpin best practice in the financing of green hydrogen projects.

Green Loan Principles ("GLP")

The GLP is a set of voluntary principles published by the Loan Market Association (LMA), Loan Syndications and Trading Association (LSTA), and Asia Pacific Loan Market Association (APLMA) that provides a framework to clarify in which circumstances a loan can be considered "green".[24] An official guidance document has also been published to assist with the GLP's implementation. The GLP has no formal legal recognition, but it is increasingly seen as the most authoritative framework in this area.

Crucially, compliance with the GLP enables the financial advisors to market the financing of a project as a "Green Loan", providing access to sustainability-linked liquidity.

[24] Loan Syndications and Trading Association (LSTA), https://www.lsta.org/content/green-loan-principles/

There are four "core elements" of the GLP, which are required for a loan (e.g., in the context of financing a green hydrogen project) to be GLP-aligned. In summary, these are:

1. **Use of Proceeds** – the proceeds of the loan must be directly channeled into an eligible green project.
2. **Process for Project Evaluation and Selection** – borrowers / sponsors should communicate their environmental sustainability objectives etc. with lenders and process for selection of projects (possibly in the form of a green loan framework). This is likely to be a more straightforward process in a project financing where all proceeds are channeled towards one project.
3. **Management of Proceeds** – borrowers / sponsors should ensure that there is clear tracking of the allocation of funds to eligible green projects.
4. **Reporting** – borrowers should keep readily available information on the use of proceeds, to be renewed annually until fully drawn and as necessary thereafter (for material developments), which may be available on the request of the lenders. Qualitative and quantitative (where possible) KPIs on the impacts of projects should be recorded and tracked.

The GLP contain a list of "indicative categories of eligibility" for green projects, which includes renewable energy projects, and green hydrogen projects should qualify on this basis. Furthermore, the GLP guidance document references international taxonomies (such as the EU Taxonomy) which will be an important way of assessing the eligibility of green projects for purposes of raising green loan financing.

Whilst not a "core element", and therefore not mandatory for GLP-alignment, external review of the loan, green loan framework and impact reporting is recommended under the GLP. There are a number of different forms that such verification can take in practice, a second party opinion being amongst the most common.

The GLP guidance indicates that information undertakings / covenants relevant to the eligible green project should be clearly identifiable in the loan documentation, although the exact content of these covenants will naturally vary between transactions. **In the context of green hydrogen, it would be expected that such covenants would include the requirement to produce certificates of origin for the renewable electricity purchased under PPAs.**

It may also be necessary to ensure that the hydrogen project satisfies certain international standards and is certified as green hydrogen by an international

organization. A wide array of national and regional schemes have been proposed. In the first global effort of its kind, GH2's Green Hydrogen Standard was published in May 2022.25 Green hydrogen projects that meet the standard will be licensed to use the label "GH2 Green Hydrogen" and will be eligible to obtain and trade GH2 certificates of origin for green hydrogen and derivatives such as green ammonia. The Standard draws on global best practices, including the IFC Performance Standards (see below) and ISO standards. For example, ISO 14000 standards addresses the plant's environmental management practices, including ISO 14067:2018 which specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product (CFP), in a manner consistent with International Standards on life cycle assessment (LCA) (ISO 14040 and ISO 14044).

According to the guidance, the borrower under the green hydrogen project should be under an obligation to represent the accuracy of any reporting. The Green Hydrogen Standard adopts a similar approach. It includes provisions addressing transparency and accountability and relies on project operators to make a complete and compelling case of how they are meeting the Standard. These disclosures are subject to independent review and an appeals mechanism.

Equator Principles[25]

The Equator Principles are a risk management framework for financial institutions aimed more specifically at environmental and social risks in the financing of projects. These principles provide a due diligence framework for banks to manage the social and environmental risk of financing large projects. Over 100 financial institutions in over 35 countries have adopted the Equator Principles, including nearly all project financing lenders. It will therefore be important for green hydrogen projects that are raising project financing to comply with these principles.

The Equator Principles consist of 10 principles, which include environmental and social assessments and review but also processes regarding stakeholder engagement and grievance mechanisms.

Notably, Principle 8 which concerns covenants (Principle 8) provides that **borrowers must comply with all relevant host country environmental and social laws, regulations and permits.** Moreover, according to this principle certain larger projects must (i) comply with relevant environmental and social management plans, (ii) provide periodic reports and representations of compliance, and (iii) decommission the facility

[25]https://equator-principles.com/app/uploads/The-Equator-Principles_EP4_July2020.pdf

where appropriate in line with an approved decommissioning plan. Decommissioning operations must comply with predetermined national and international environmental and social standards.

Relevant Performance Standards

Certain institutions also may have their own specific requirements in relation to environmental and social characteristics that must be met by a project before they invest. This is particularly the case in relation to multilateral finance institutions.

For example, the IFC Performance Standards on Environmental and Social Sustainability (IFCPSs) is a set of eight standards that project operators must abide by throughout the life of an investment by IFC.

The eight standards of the IFCPS relate to a variety of areas, including labour and working conditions (Performance Standard 2), resource efficiency and pollution prevention (Performance Standard 3), and indigenous peoples (Performance Standard 7).

A green hydrogen project will need to abide by each of the IFCPSs. An example of such requirements is Performance Standard 1, which requires the project operator to implement an environmental and social management system (ESMS), applicable throughout the life of the project, relating to how environmental and social risks should be managed.[26] The ESMS should also be responsive to the needs of affected local communities, and ensure that their grievances are addressed and managed appropriately.[27] This will be particularly relevant for green hydrogen projects in more densely populated areas.

The project operator must also establish and maintain a process for identifying environmental and social risks, which may include an Environmental and Social Impact Assessment ("ESIA"). The nature of these risks will largely depend on the nature and scale of the green hydrogen project, and the scope of the facilities that are being developed in connection with the project.

The IFCPS's are indicative of the sort of requirements that may also form part of policies for a number additional lender institutions, such as ECAs and multilateral or development finance institutions. ECA policies include the OECD Arrangement on Officially Supported Export Credits.

[26] For more information on local community engagement processes see Green Hydrogen Contracting Guidance on Community Engagement and Transparency.
[27] For more information on local community engagement processes and grievance management processes see Green Hydrogen Contracting Guidance on Community Engagement and Transparency.

A number of the contractual provisions required by these institutions may mirror provisions of the GLP (or even incorporate the GLP), for example regular reporting and the use of KPIs to measure and report on impact.

Whilst each project may have different characteristics, sponsors of green hydrogen projects should be aware of these general requirements when engaging with prospective lenders.

4. Guiding principles for decision makers

Consideration of finance sources

As noted above, there are a wide variety of possible sources of financial support for green hydrogen projects, including ECAs, development finance institutions, commercial banks, and governments. Whilst each of these sources may provide differing levels and forms of support, it is key for sponsors to ascertain which combination of financing sources they wish to approach when determining how to structure a green hydrogen project.

This is because each of these institutions will likely have their own specific considerations as to required elements of the structure of a project, whether that be entities from a specific jurisdiction being involved in the project's value chain (in the context of ECAs), specific terms in the transaction documents or otherwise.

These requirements may also include the environmental and social best practice standards that the project must abide by, which may in some cases be bespoke to the finance source, or in some cases lean on the frameworks that we have identified above.

Consideration of available government support schemes

Given the widespread recognition of the transformational potential of green hydrogen, a number of governments have started to (or are planning to) implement schemes to support green hydrogen projects.

Consideration of which of these schemes may be available to support projects should be front of mind from the perspectives of both lenders and sponsors, as they may provide an attractive risk mitigation opportunity.

The nature of these schemes is also important from the perspective of the governments themselves. Given the projected growth of the green hydrogen industry, support schemes may be an essential way of ensuring the development of the industry realizes the positive climate and economic impacts that it has the potential to. It is therefore a key objective, both from the perspective of governments and project finance parties, that an ongoing and effective dialogue between the needs of public and private parties continues so that green hydrogen projects can be developed in sufficient quantity to make this potential impact materialize.

A number of these schemes may be tied to the environmental credentials of the green hydrogen project, such as ensuring compliance with the EU Taxonomy for Sustainable Finance. As a result, these types of considerations will be crucial to analyse for project parties at an early stage of the project, in order to accurately forecast available revenue streams.

Risk allocation in finance documents

Like all project financing transactions, especially in emerging industries such as green hydrogen, the allocation of risk in finance documents will be a key consideration for all parties involved**. Lenders' will wish to see coherent projections of future demand from the project's offtakers.** This is especially the case if the production of green hydrogen is not envisioned to provide a discrete and specific secondary project that will utilize the hydrogen in e.g. an industrial process.

Sponsor support in the finance documents, using any number of the mechanisms identified above, is likely to form a key aspect of this, particularly at the early stages of green hydrogen projects. Thorough due diligence on market and legal risks arising from the projects will also form a key component of this analysis and will be an area of vital importance for the advisers of the sponsors and lender.

Part two: Guidance on Structuring Project Financings

1. Project Structure

The project finance structure typically revolves around the creation of a special purpose entity, the '*Project' Company* that holds all of the project's assets, including all of its contractual rights and obligations.

The Project Company is usually a limited liability company, although in some cases it may be a limited partnership.

The equity interest in the Project Company will be held by the sponsors or by at least one intermediate holding company, usually a limited liability company (the Holding Company), and the shares in the Project Company's equity will be pledged to the lenders in the eventual project financing, subject to local law requirements.

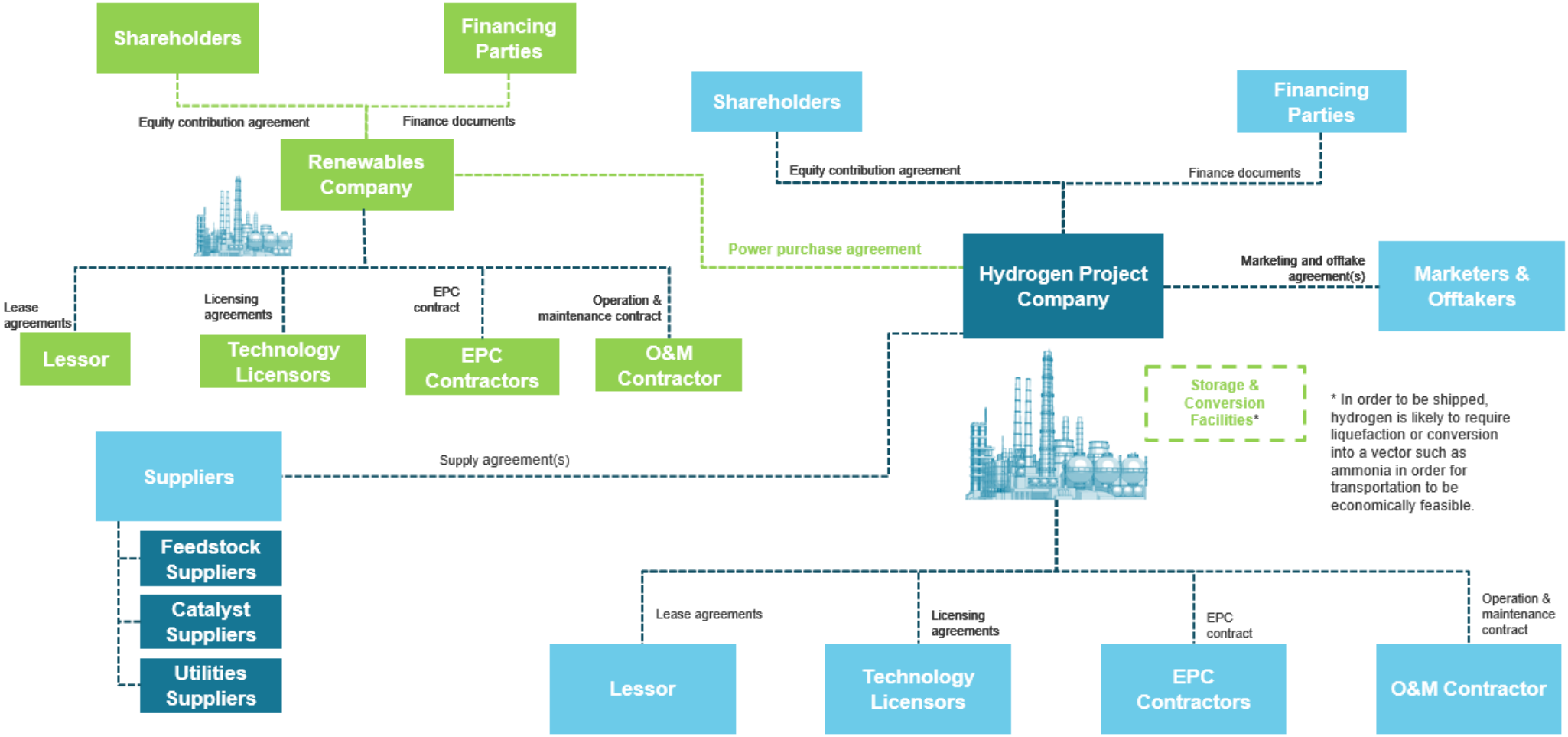
While the Holding Company will have a separate legal identity, typically it will not have any business apart from holding the equity of the Project Company. This structure allows for most liability to be contained at the bankruptcy-remote Project Company level, and thus insulates the sponsor (including equity investors in the sponsor).

To ensure that the Project Company is treated as a separate legal entity, it will be necessary to have governance mechanisms at the Project Company level that are independent, including designated officers, at least one independent director, and internal controls and procedures designed to preserve a legal entity distinct from the sponsors and any Holding Company.

The project funding and ownership structure is expected to vary from project-to-project and will be driven, at least in part, by the proximity of the project to competitively priced electricity generated from renewable energy sources, which constitutes a key component of the capital and operational cost model and a project's competitiveness. In regions with a mature renewable energy market and existing electricity grid infrastructure, including many parts of Europe, Australia and the United States, the green hydrogen plant may be structured and financed independently of the renewable energy generating plant (as shown in the diagram below), on a consolidated basis together with dedicated renewable energy generation facilities, or a hybrid combination of on-site production and grid supplied electricity.

In developing countries, which typically do not have surplus electricity market capacity for renewable energy, dedicated generating facilities are expected to be built as part of an integrated green hydrogen project (i.e., captive renewable energy generation). Whether renewable electricity is procured from existing installed capacity or on-site production will shape the lenders' analysis and diligence of the project financing and project structure. For example, for grid-connected projects, the sustainability of the electricity consumed must be ensured (as grid electricity (generally composed of both renewable and fossil fuel power plants) cannot ensure low emissions at all times, certificates of origin are expected to be required). Lenders also are expected to raise questions during their diligence process regarding "additionality", as referred to above.

Illustrative Green Hydrogen Project Structure



2. Transaction Documents / Key Project Agreements

The Project Company will enter into numerous agreements during the course of developing, constructing and operating a project. Such agreements may include PPAs; land lease or usage agreements; construction and installation contracts; a site lease agreement (if the project's land is not owned by the Project Company itself); an interconnection agreement (for projects tied to the electricity grid); agreements for the provision of utility services; agreements for the provision of any feedstock commodities or other inputs; and the necessary price and supply hedging.

The lenders are expected to require those project documents that are material (including by virtue of their value, importance to ensuring certainty of cost, revenue and completion, or ability to replace such agreement etc.) be designated as "Material Project Documents" for the purpose of the finance documents. Such finance documents will include provisions relating to the execution, performance, maintenance, termination, and amendment of the Material Project Documents. Documents will be identified by the lenders and their advisors as Material Project Documents during the diligence process, and the finance documents will set out the key deliverables and milestones for the delivery of the Material Project Documents, to ensure that all project documentation required to support the financing is available as required for the lenders (and when needed by the project).

As further described below, the lenders will require the assignment of the rights of the Project Company in respect of its Material Project Documents and direct agreements with, and legal opinion in respect of, the counterparties to such agreements.

Hedging

As noted above, project financing transactions involve a number of risks. For example, the creditworthiness of the counterparty or the possibility that host state's laws are reformed in a way that affects the project's ability to operate or increases costs for the project. Some of these risks, such as risks relating to interest rate, commodity, power or currency fluctuations, can be addressed through hedging products.

It is customary for lenders to require that the Project Company enter into certain hedging arrangements, including interest rate swaps and currency risk. In addition, lenders may require commodity hedging where the project is exposed to raw material fluctuations that would impact its feedstock or the price of its products (such that the project can secure a constant revenue stream). For a green hydrogen project, taking

into account the significance of electricity costs for the production of hydrogen, we would expect lenders to require that the electricity price is hedged for at least part of the project's electricity supply requirement, if the Project Company has not entered into a PPA to achieve a fixed or capped price that mitigates such price risk.

Financial Covenants

The commercial terms for a green hydrogen project will depend on factors including the geography (country risk), project structure, fiscal regime, creditworthiness of sponsors, and offtakers. A green hydrogen project is initially likely to have less debt capacity than the renewables project(s) providing electricity to the electrolyser and the purchaser of the green hydrogen (e.g., a refinery or steel plant), where there is a long track record of successful financing and clear precedent for the financing. However, where the hydrogen project is for the "captive" supply to a related business or industry, this will influence (and may improve) the lender's assessment of the credit risk and bankability assessment of the project.

It is likely that the first commercial financings will be based on relatively conservative assumptions compared to the typical financing of the renewable energy industry or other gas industries, such as LNG. However, based on experience from other industries / technologies and project financing principles, it is expected that the following key debt structuring criteria and financial covenants to apply (at levels to be agreed):[28]

- **Debt Sizing Criteria:** Maximum gearing / leverage ratio (debt to equity) in the range of 60% debt to 40% equity to 70% debt to 30% equity.
- **Debt Service Cover Ratio ("DSCR"):** Calculated as Cash Flow Available for Debt Service (for example, revenue, minus expenses, adjusted for net working capital movements, minus capex, minus tax) ("CFADS") divided by debt service, where debt service is the principal and interest payments due to project lenders (depending on the nature of the offtake arrangements, this could range from 1.3:1 (fully contracted with no merchant offtake risk) to 1.8:1 (partially contracted or market based). For the purposes of debt sizing, the lenders will apply a "hair cut" to the projected CFADS to determine the implied debt size. The DSCR test may be calculated on a look back (historic) as well as look forward (projected) basis, and may cover different periods (for example 12 month historic versus 6 month historic).

[28] The ratio levels shown in this section are indicative only and applicable levels will vary based on a number of factors including, among other things, country-risk and credit strength of the sponsor(s) and offtakers.

- **Financial Covenants:** The borrower will undertake or covenant to adhere to certain financial performance standards. These tests will apply for certain specified purposes, such as making a distribution to the equity investors or incurring additional debt, and would typically be set at different levels depending on the purpose.

Accounts Waterfall and Account Structure

In project finance transactions, it is the cash flow from the project's operations and assets (rather than the balance sheet of the borrower or its affiliates) that will be the source of debt repayment. Lenders will therefore require certain restrictions on the borrower's access to the project's cash flow and its allocation. All amounts received by the Project Company will generally be applied in accordance with a "cash waterfall" that governs how and when funds are deposited and withdrawn during the construction period and during the operating period. To facilitate this process, amounts are required to be deposited in a master project revenue account, which serves as the top of the metaphorical waterfall, and which is required to be secured in favour of the lenders.

As the money flows down the waterfall it is transferred into segregated secured accounts at each different level and applied or reserved for specified purposes, as described in an accounts or depositary agreement, with any funds remaining at the bottom of the waterfall being paid, assuming that all applicable conditions have been satisfied (which typically would include demonstrating that certain financial covenants are met), to the equity owners of the Project Company as a distribution.

Typically, the project waterfall is structured (roughly) in a manner as described below, with most withdrawals from the waterfall occurring on a monthly or quarterly basis as appropriate to meet the payment obligations of the Project Company (including debt service):

- The first level of payment would be in an amount necessary to pay costs incurred by the Project Company (i.e., construction and/or operation and maintenance expenses depending on the project's stage of development);

- The second level of payment would be to the senior lenders to pay (i) loan fees and expenses, (ii) interest payments, and (iii) principal payments (in this order);

- The third level of payment will be used to fill an account segregated for the purposes of paying future debt service in times of lower project revenues, although once this account has been filled to the level of the required amount no amounts will be taken out at this level (a "Debt Service Reserve Account");

- The fourth level of the waterfall may operate to fill one or more reserve accounts, often designated for future major maintenance or other purposes, but

once the reserve account is filled with the required amount no amounts will be taken out at this level, other than to pay for maintenance capex, when required. The sizing of the maintenance reserve account will be informed by the technical advisers' report and the financial model. A maintenance reserve account is expected to be required for a green hydrogen project taking into account the degradation of the electrolyser(s);

- The fifth level of the waterfall may be used to repay the holders of subordinated debt, if applicable; and
- The sixth level of the waterfall allows for cash remaining after amounts have been removed at the higher levels to be paid to the equity holders of the Project Company in the form of an equity distribution, assuming there are no defaults and that financial tests are met.

While every project waterfall will operate somewhat differently and many will have features unique to specific project and financing arrangements, the waterfall operation outlined above is generally standard in project financing arrangements.

Subject to the requirements imposed under the host state's laws, all project accounts will be maintained with a reputable bank in a jurisdiction that is familiar to the lenders. The secured parties will benefit from security over such accounts.

Security Arrangements

In the majority of large international project financings, lenders will benefit from a comprehensive security package consisting of substantially all of the Project Company's assets. However, in most jurisdictions (including U.S. jurisdictions and England), the description of the security package in the Security Agreement or Debenture will not simply state "all assets of the Project Company," but rather will list all of the Project Company's assets by category.

A typical English law security package includes a combination of:

- assignments of key project agreements and project insurances and reinsurances;
- mortgage over the project site, buildings, plant and equipment;
- security interest (under English law, fixed and floating charges) over project;
- asset security interest (under English law, charges) over project bank accounts; and
- share pledges over the sponsors' equity interests in the Project Company.

Similar security will also be granted over the shares of all holding companies of the borrower and all of their respective assets. As noted above, often each sponsor will utilize a separate holding company to hold

its ownership interests in the borrower. This means that the list of security documents can become quite extensive.

The type of security required is generally market and jurisdiction-specific. Local security packages outside of U.S. or English law can feature further variations and could include a duty to provide certain guarantees, such as parent company guarantees. The characteristics of the host state's legal system (including the strength of its judiciary) will also influence the type(s) of security that may be required. Not all jurisdictions recognize foreign judgments for the purpose of enforcing onshore security and/or guarantees. In addition, legal systems in certain jurisdictions are considered by lenders to be unpredictable, resulting in onshore enforcement proceedings that are often time-consuming, costly and of questionable effectiveness.

The lenders' offshore security package is essential to reducing these legal and political risks, as the lenders may exercise security enforcement remedies over the offshore holding company, together with any offshore accounts and other offshore assets in the event that remedies are unavailable in the host state (for example, owing to political instability). This permits lenders to take control of the onshore borrower / Project Company by controlling (and potentially selling) the shares in its parent holding company(ies) without needing to enforce directly against onshore assets. It is therefore advantageous to the lenders for the borrower to set up offshore holding companies and to maintain and fund offshore accounts governed by the law governing the finance documents, particularly in cases where the project is located in a jurisdiction subject to high political risk.