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Structuring a bankable project: energy storage

by Caroline Saul, a partner at Osborne Clarke LLP and Sam Forrest, consultant at Ikigai Capital

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This note explains the principal technologies used for energy storage solutions, with a particular focus on battery storage, and the role that energy storage plays in the renewable energy sector. It also describes a typical project finance structure used to finance energy storage projects and highlights the key issues investors and financiers should consider when financing an energy storage project.

Scope of this note

This note explains what energy storage is and why it is coming into sharper focus for developers, investors, financiers and consumers. It looks at common types of energy storage projects, the typical financing structures and the principal requirements for obtaining financing. It also highlights the key points that parties should consider when financing an energy storage project.

The note considers how a battery storage project compares with a typical renewable energy project from the point of view of commercial bank lending. Additionally, the note considers some alternative technologies and funding structures and looks at the next steps for energy storage solutions.

The note focuses on in front of the meter storage projects because these projects are built to receive an income from interaction with the National Grid (for example, supplying energy to the grid in times of high demand, or taking energy off the grid in times of low demand or surplus supply). Behind the meter projects, on the other hand, typically do not transact with the grid, but rather, generate an income by means of pricing arbitrage for an end customer.

For more information on energy storage more generally, see Practice note, Energy storage: overview.

What is energy storage?

Energy storage involves creating a mechanism for storing energy produced at a time when it is in excess of the current demand (or prices are otherwise low) for use at a later time (when needed or when a higher price can be obtained for that energy). It also plays an important role when the grid needs to recruit energy storage to maintain the balance of electrical frequency. Energy storage takes a variety of forms. Some more traditional, such as pumped-storage hydroelectric, and some more recently developed and evolving, such as battery storage.

The main technologies include:

- **Batteries.** Chemical batteries include technologies such as lithium ion, nickel-cadmium and lead-acid batteries, each with their own unique properties. Flow batteries can store electricity by altering the electrical charge of an electrolyte solution (typically vanadium, zinc bromine or iron chromium based) by passing the solution over an ion selective membrane.
- **Heat storage.** A number of methods are used to store heat, including storing heat in materials such as (but not limited to) concrete for slow release later. "Phase change" batteries use cheap electricity to change the state of an internal liquid (for example, water) which will then release heat when it changes back to its previous state at a prescribed time. The phase change process is able to store more energy than a unit that contains material which remains in the same state (such as, concrete).
- **Stored hydro power.** With stored-hydro power, water is pumped into an elevated reservoir during periods when electricity is at its lowest cost, then released through turbines to generate electricity when demand (and therefore cost of electricity) is higher. Geographical restrictions and opportunities will govern where this technology is used. It is best suited for hilly or mountainous areas. Several examples exist in North Wales and Scotland.
- **Hydrogen.** Presenting long term and high capacity storage potential, hydrogen is currently under the spotlight as an energy storage solution. However, in order to create hydrogen, it needs to be separated from other elements with which it forms a molecule

(most commonly for this purpose, water). Although this process demands a lot of energy, since hydrogen emits no harmful emissions and is (and will remain) in abundance, it continues to be a focus as part of the future of energy storage.

Some of these technologies have a longer and more consistent track record for performance which will impact the overall financeability of an energy storage project (see Stability of asset for a battery storage project). Recent growth in the size of viable battery technologies and a drop in the cost of battery storage has spurred the growth of this sector and the remainder of this note focuses on chemical battery storage solutions (see What types of energy storage are most common?).

For more information on energy storage technologies, see Practice note, Energy storage: overview: Energy storage technologies.

Why energy storage?

Two principal drivers have conspired to push energy storage to the forefront of energy development during recent years:

- Efficient use of intermittent energy generation to reduce costs and increase revenues.
- Efficient use of intermittent energy generation to reduce impact on the environment.

Energy efficiency is now a common consideration in the construction of new buildings or renovation of existing buildings, with energy storage in one form or another commonly being part of developments of every size, from homes to multi-unit industrial sites. Additionally, industrial sites often now include their own generating assets on site for efficient use of not only energy but also space (for example, the use of rooftop solar). These assets can be enhanced by co-locating them with energy storage.

Efficient use of intermittent energy generation to reduce costs and increase revenues

Energy storage can play a key role in reducing costs and increasing revenues both when there is too little electricity available at the right place and the right time, and too much.

Dealing with low demand

Over the past decade, the UK government has created a number of incentive schemes and subsidies for the construction and operation of renewable energy projects. Based on these incentives and subsidies, investors developed numerous solar and wind farms in the UK. Typically, the incentive regime encourages maximum use of the renewable capacity, irrespective of demand.

Since the output of these projects depends on weather conditions, rather than market prices, there are times (for example, on a particularly windy and sunny day) when more energy is generated than can be safely transported and used. As a result, this has led to payments being made by:

- National Grid to the owners of these projects to stop generating.
- Energy suppliers to customers, incentivising them to use the excess energy.

Storing this energy would avoid the need to constrain clean sources of energy and keep the focus on energy efficiency for end users.

Dealing with high demand

The unexpected power outage in August 2019 in parts of Great Britain demonstrated the valuable use of stored energy, when batteries (amongst other facilities) were called upon to provide immediate input into the grid system. To ensure security of supply, National Grid enters into contracts under which payments are made to generators who can quickly respond by delivering electricity to the network. While most battery systems cannot sustain levels of output for a long time, their contribution fills a gap while other, slower to respond forms of generation can come online. Payments made under these contracts can provide an attractive revenue stream for developers (see Stability of cashflows for a battery storage project).

Efficient use of intermittent energy generation to reduce impact on the environment

In recent years, the public's attention has been drawn to the environmental impact of the inefficient use of energy. For many, minimising energy use and ensuring that any energy use has as little detrimental effect on our surroundings as possible has become imperative. This, in turn, has driven changes in behaviour including from more conscious use of appliances in the home, to the carbon footprint of the food we eat and to choices in the modes of transport we use.

While some people can choose to lessen their negative impact on the environment through considerate use of energy, for others it is mandatory that they do so if they want to be able to access certain funding (see for example, Practice note, Green, social and sustainability bonds) or want the results of their energy and carbon reporting to favourably demonstrate their commitment to fighting climate change (see Practice note, Energy and carbon reporting (including under SECR) for quoted companies, large unquoted companies and LLPs).

What types of energy storage are most common?

The type of storage that has received the most attention so far in the market is chemical battery storage. While lithium-ion is the most common form of battery used for energy storage solutions, zinc-hybrid and redox flow batteries are also making gains in the market.

Chemical batteries have the benefit of being readily scalable to provide larger storage capacity. In addition, they have life past their optimum efficiency. For example, new lithium-ion batteries might be used in a car where they can reliably charge up to 100% of their capacity. However, once they can no longer do this, they might be aggregated into a module and used for larger scale storage of electricity for private use or to provide grid balancing services. When no longer useful in this way, they could go on to be recycled.

Financing energy storage solutions

The structure used to finance energy storage projects can take a variety of forms. However, one of the more common is a typical project finance structure, similar to the structure used regularly to finance renewable energy projects where a project sponsor establishes a special purpose vehicle (SPV) (also referred to as a project company) to raise limited or non-recourse financing.

Typical project finance structure

A typical project finance structure uses a complex web of project agreements as a foundation to shape a secured financing package which is repaid by the revenues generated from the project. For more information, see Practice note, Project finance: UK law overview: Outline of a typical project finance structure which also details the lenders' primary concerns when providing debt in respect of a specific project.

Project agreement framework

Given the prevalence of new renewable energy projects, in front of the meter energy storage projects have naturally evolved to use many of the same agreements expected for a renewable project finance transaction, including:

- **Lease.** A lease, together with appropriate consents and planning permissions, usually for a length comparable to that of a solar project (around 20 to 30 years, although if the battery is not a "flow" one then it will need re-energisations during this period where cells or stacks of cells are replaced).
- **Grid connection.** An accepted grid connection offer and, once commissioned, a grid connection agreement.
- **Construction and operation and maintenance contracts.** These are very similar to those used in a traditional solar project, however, particular attention will be paid to compliance with and maintenance of the warranties issued by the manufacturer of the batteries.
- **Route to market.** It is likely that an energy storage financing will have more than one contract comprising its route to market (see Stability of cashflows for a battery storage project). Many lenders will expect to see a floor on the aggregate revenues received by a project. If certainty of minimum revenues is required, this may be catered for under the power purchase agreement or the optimisation agreement, by way of a price-floor on revenues and may be complimented by a price-cap on imported electricity costs. For more information on the route to market (including offtake arrangements) in a project finance transaction, see Practice note, Bankable offtake agreements: key issues in project finance transactions.

As with a renewable project, the main concerns of any potential debt provider assessing the project agreement framework will be confirmation that the:

- Project will generate the anticipated income stream, in accordance with the anticipated timetable.
- Price floors and key contracts are supported by credible counterparties with strong balance sheets.
- Underlying project agreements provide sufficient obligations on the part of the counterparties for maintaining the smooth operation of the project (and adequately apportion liability should issues arise).
- Borrower is not exposed to any large unmitigated liabilities and cannot take any intentional action to disrupt the operation of the project.
- Borrower has sufficient insurances in place.

The lenders will perform detailed legal due diligence on the project agreements in order to achieve these confirmations. For more information on due diligence in a project finance transaction, see Practice notes, Due diligence for a project finance transaction: purpose and process and Due diligence for a project finance transaction: report contents checklist.

Finance documents

On the basis of this structure, and provided that their initial concerns have been appropriately addressed, lenders are likely to be willing to progress with negotiating the advance of financing to a project company to develop the project. A typical financing package will resemble one used with renewable projects and will include the following finance documentation:

- A loan agreement, containing:
  - detailed conditions precedent to the advance of funding;
  - prescriptive representations and undertakings, as well as financial covenants tailored to the specific project; and
  - a comprehensive list of events of default which can trigger the lenders' right to take remedial action.

  For an example of the usual conditions precedent and events of default used in a typical project finance transaction, see Standard clauses, Project finance facility provisions: conditions precedent and Project finance facility provisions: events of default.
- A suite of security documents granting effective security over the security package used to support the financing (see Security package).
- Direct agreements creating a contractual relationship between the lenders and the various key project agreement counterparties (for more information on direct agreements, see Practice note, Direct agreements in a project finance transaction and for a template direct agreement, see Standard document, Direct agreement).
- Hedging agreements for currency exchange and interest rates, as applicable.

Security package

As with a renewable energy project, a battery storage project financed on a project finance basis will require a comprehensive security package. A typical security package will include:

- Full security at the project company level (for a detailed description of the project level security, see Practice note, Taking security in project finance transactions: Security taken at the project level). For battery storage, an assignment over the battery warranty will usually be required, as well as acknowledgement of such assignment from the battery manufacturer.
- A limited recourse share charge and assignment of intercompany debt granted by the parent of the project company (for a detailed description of the shareholder level security, see Practice note, Taking security in project finance transactions: Security taken at the shareholder level). Additional support from the project sponsors would usually only be required:
  - during the constuction phase of the project when the project sponsors will be expected to pick up cost overruns; or
  - potentially where payments from the battery storage project flow into a group account at the project sponsor level (where an account charge in favour of the lender would be granted).

Key features and principal risks of financing energy storage solutions

While renewable energy projects and battery storage projects share many similar features, they differ as to the nature of the cashflows and the stability of the asset. For a typical renewable project, two of the primary elements underpinning any project financing are:

- **Regular payments.** Payments made:
  - in respect of the government subsidies for which the project is accredited; and
  - by a single reputable and creditworthy offtaker for the energy generated by the relevant project.
- **Predictability and stability of the underlying generating asset.** The lenders will perform detailed technical due diligence to, amongst other things, identify the probability of the project assets working as expected once commissioned. For most renewable technologies, there is sufficient data and expertise to confidently assess this risk.

These elements translate directly into two of the most significant risks facing both renewable projects and energy storage projects. The greater the certainty of the cashflows and the reliability of the technology, the lower the risk profile, which means a lower cost of lending to the borrower project company because the lenders are more comfortable with the sources available to repay the debt.

For more information on the typical risks associated with a project finance transaction, see Practice note, Identifying and managing project finance risks: overview (UK).

Stability of cashflows for a battery storage project

Taking the first element, significant differences exist between a renewables project and a battery storage project. Of particular note, in a battery storage project:

- There are no underlying long-term subsidies to guarantee payment of a proportion of the debt. Subsidies, coupled with a long-term offtake agreement, historically provided the backbone of the cashflows expected by lenders in a renewables project, but are not part of the structure in an energy storage financing.
- Energy storage projects typically provide a number of services from which to derive value. If a third party has been engaged via a trading and optimisation agreement, these services will be managed through a suite of contracts in which experienced trading parties or aggregators, acting as agent to the project, are engaged to trade or manage the assets. The aggregators will directly contract and engage with the National Grid Electricity System Operator (NGESO),

the distribution network operators (DNOs) and the energy markets to bid and deliver the operational requirements for various services. A project will seek to provide a number of services, creating a revenue "stack", although it should be noted that some sources of income preclude a project from pursuing other revenue streams. Services from which revenues may be derived include (but are not limited to) the following:

- balancing services to the balancing mechanism (BM) which help NGESO balance demand and supply in each half-hour trading period of every day. When NGESO predicts there will be a mismatch between electricity supply and demand during a time period, participants in the BM may submit 'bids' and 'offers' to increase or decrease their generation (or consumption), up to one hour before delivery, which may then be accepted by NGESO to help balance the system and ensure the security of electricity supply across Britain's transmission system;
- ancillary services to NGESO, such as frequency response payments, where the operator responds to fluctuations in the frequency of the grid by increasing or reducing its energy consumption, such bids being made to National Grid on a monthly basis under contracts up to two years in term (depending on the type of frequency response procured). Previously, the main product had been Firm Frequency Response (FFR), although this is being phased out from 31 March 2022 as a new suite of faster-acting frequency response services went live. These include Dynamic Containment, which was already active following its launch in October 2020, and Dynamic Moderation and Dynamic Regulation, both of which were rolled out in Spring 2022 (see NGESO: Frequency Response Services and NGESO: Dynamic Containment);
- available capacity under a capacity agreement (usually for fifteen years) under which monthly payments are made to the battery operator, and under which extra payments may be available for over-delivery (see Practice note, Capacity Market: guide to capacity agreements);
- services related to the Embedded Export Tariff (EET), which is a tariff paid to embedded generators based upon their half hourly metered generation export volumes during triad periods, being the three half-hours between November and February with the highest net system demand (separated by at least 10 clear days). The EET was introduced under CMP264/265 to replace triad benefits, which previously allowed transmission network use of system charges (TNUoS charges) to be avoided in return for generation during a triad period (see Practice note, Electricity network charges: charging reviews and embedded benefits);
- flexibility services in which the asset helps the DNO to solve congestion in local electricity grids and is paid a fee for the availability, arming or utilisation of supply and/or offtake of electricity, depending on the type of service provided (these services are available in specific regions in which DNOs have identified sensitive networks); and
- other revenue generating services, including price arbitrage in the day-ahead and intra-day wholesale markets, which will be dependent on the technology of the battery itself and the other live services it is providing.

Trading and optimisation agreements are the key vehicle for revenue stacking. An optimisation agreement will set out the arrangements for a single counterparty (which may be an energy aggregator or large energy offtaker (EDF and Centrica are particularly active in this market)) to manage the revenue stack described above to maximise the potential revenues of the project. Management fees of the counterparty will be deducted from these revenues before a net amount is periodically transferred to the project company. Such arrangements are increasingly including a "floor price" (a level below which the net revenues received from the counterparty will not fall) payable to the project company to enable it and its lenders to determine a minimum cashflow on which any debt can be sized.

Although the diversification of these revenue streams offers comfort through the wide market scope and redundancy of services provided, the lack of a government subsidy scheme and committed creditworthy offtakers guaranteeing fixed (and often index linked) prices makes the revenue stream of an energy storage project less certain than for a renewable energy project. A further uncertainty facing the revenue stream for energy storage projects results from the fact that any predicted revenue streams could be affected by a change in regulation and changes to the industry codes. For example, in recent years, the financial viability of storage projects has been impacted by the:

- Lowering of the Capacity Market de-rating factors applied in respect of certain batteries (for more information, see Practice note, Energy storage: overview: Electricity storage in the Capacity Market and for more information generally on the Capacity Market, see Practice note, Capacity Market: overview).
- Targeted Charging Review (for more information, see Practice note, Electricity network charges: charging reviews and embedded benefits).

The impact of the uncertainties associated with the revenue stream of a battery storage project (as compared with a typical renewable project) has caused a number of lenders to require the following enhancements to strengthen the financing structure of battery storage projects:

- Shorter tenors than seen in a typical renewables project.
- More front-loaded repayment profiles.
- Additional cash sweep mechanisms.
- A high percentage of the development costs to be funded by equity.

Stability of asset for a battery storage project

In respect of the second element, the predictability and stability of the underlying battery asset needs to be analysed very carefully. Lenders will need to be confident in the performance parameters of the relevant technology. A usage pattern that maximises short-term revenues may not be the optimum use of the technology and may accelerate degradation of the battery or invalidate the warranties.

If the technology then fails to perform adequately under its longer-term offtake arrangements and has been operated in a manner to invalidate its warranties, the lenders may lose:

- The value in their asset security.
- Their reliance on the underlying warranties.
- The cashflows servicing their debt.

To illustrate, typically, a warranty issued in respect of a battery permits only a certain number of cycles of charging and discharging (limited per annum and/or within a pre-determined period, for example, "x" number of years). It will also recommend a "depth of discharge" (the maximum percentage by which a battery should be discharged before being charged again). Borrowers therefore need to carefully assess whether they can meet their obligations under the various offtake agreements to which they are a party while remaining squarely within the warranty parameters. This also applies when commissioning the battery and testing its performance.

Conversely, a situation may arise where the short-term gains generated by the revenues from various offtake agreements outweigh the longer-term benefit of being able to rely on the warranty if the technology fails. In these cases, the lenders may allow the borrower to operate the assets in such a way as to maximise its revenues notwithstanding a violation of the warranty terms. However, if the lenders become comfortable with this approach, they will most likely require the inclusion of appropriate prepayment provisions within the facility agreement or structure the financing to permit the borrower to replace the batteries (if feasible).

Value of warranties

When considering whether a warranty can be used as security for a lender in respect of an energy storage financing, consider the following points:

- **Reputation and reliability of the manufacturer.** Are they likely to still be in existence for the length of the warranty? Are they likely to be able to stand behind the warranty if called on?
- **Recourse to the manufacturer by the lender.** Can the lender have a direct claim under the warranty to expedite resolution? A failure of an asset sufficiently serious to call on a warranty will most likely have removed the equity upside from a project and therefore potentially a borrower's interest or incentive to pursue claims promptly. Consider whether obtaining a collateral warranty may be required.
  For more information, see Practice note, Collateral warranties and third party rights on construction projects: a quick guide.
- **Warranty flexibility.** Despite the battery not being used within the strict parameters of the standard warranty, can confirmation be received from the manufacturer that the warranty still in fact applies in whole or in part with the intended use?

Types of lending facilities used

Although energy storage solutions are often financed on a limited recourse project finance basis, the lending facilities used to finance energy storage solutions can take a variety of forms. Some of the more common facility types include:

- Borrowing base facilities.
- Asset finance facilities.
- Expansion facilities.

For more information on the different types of lending facilities used in the corporate lending context, see Practice notes, Types of lending and facilities and Types of lending: alternative finance.

Borrowing base facilities

Due to the differing periods of contracted revenue under the various offtake agreements entered into by the borrower and therefore the fluctuating nature over time of the cashflows in an energy storage project, some lenders may only be willing to provide borrowing base facilities in respect of energy storage projects. Under a borrowing base facility, the available facility amount fluctuates based on the value of the revenue under the various qualifying offtake agreements. For example, when the cumulative value of all the borrower's qualifying offtake agreements is high, the available commitments under the facility agreement will also be high (usually, a discounted factor of the value of the contracts). However, as the offtake agreements expire, the cumulative value of the offtake agreements will reduce, as will the available commitments under the facility. If the borrower secures further suitable offtake agreements, then the available facility amount may increase again.

This expansion and contraction of the available facility amount protects the lenders against borrowings being in excess of a percentage of the revenues (even if all parties had been aware of the expiry date of all contracts). Although this fluctuation in availability amount may mean an early prepayment for the relevant borrower when the value of its offtake agreements drops, it will in many cases enable lenders to provide facilities and the borrower to access debt that would not otherwise have been forthcoming. For more information on borrowing base facilities in the trade finance context, see Practice note, Borrowing base facilities.

Asset finance facilities

In addition to looking at the projected revenue stream of the project, as is the case in a traditional project finance structure, lenders may look to the value of the underlying assets in an energy storage project in order to maximise the amounts available to the borrower. In these structures, the lenders will include the value of the assets (as well as cashflows) as a source of repayment in the case of an enforcement of security.

To ascertain whether any value can be attributed to the assets, the lenders will evaluate:

- Whether that asset can in fact be packed up and moved effectively which is more likely in the case of battery storage than for other forms of storage, such as a pumped hydro plant.
- The extent and quality of the warranties applicable to such assets and whether the warranties can be transferred with ownership of the assets (see Value of warranties).
- The market for purchasing such assets for their current application or a different application. To maximise value, lenders will need to assess the potential markets (both current and anticipated future) and market value for the batteries from the project they are financing.

Expansion facilities for existing projects to include storage

When incentivising the construction of renewables projects, the subsidies offered were solely in respect of the generating capacity of the relevant assets, rather than the efficient use of the energy generated and therefore little consideration was given during the time of development as to whether energy storage should form an integral part of the project. However, given the increased revenues now available to generators who can control their output to match anticipated demand or respond to unexpected or ad hoc peaks in demand, attention has turned to the storage of energy generated by these projects, and "co-locating" battery storage alongside generation. This co-location effectively offers a forward hedge against renewables price cannibalisation, with the effects of this set to increase as the energy transition progresses and more renewables are deployed across the UK.

When contemplating co-locating storage with an existing financed project (or "retrofitting"), a number of factors must be considered:

- Whether the existing lease and planning permissions permit the addition of storage onto the site?
- Whether the existing grid connection is sufficient for the purposes of exporting both currently generated and stored electricity from the site and whether the DNO is prepared to permit the same? An increased import capacity is also typically required.
- The preservation and compliance with ongoing obligations in respect of Renewables Obligation (RO), feed-in tariffs (FIT) or the Smart Export Guarantee and the regulatory requirements facilitating co-located storage to enter into electricity market agreements such as the capacity agreements. For more information, see Practice note, Renewable power projects M&A: due diligence issues for consideration.
- Whether there will be any interruption to the operation of, or revenues generated by, the existing project during the installation and operation of the storage facilities.
- The ability (or willingness) to amend the existing financing to take into account the new financing and related grant of security.
- How these considerations will be affected if a new SPV is used to own and develop the storage facility. For example, will the new assets and any cashflows generated by them fall outside of the original lenders' security net? How will the relationship between the borrower and new SPV be governed?

Enhancing returns through technology

As with any new technology, energy storage solutions continually evolve and adapt to become more efficient or to address perceived weaknesses. Two recent innovations that have had beneficial impacts on energy storage solutions include:

- Aggregators.
- Artificial intelligence.

Aggregators

In order to obtain a capacity agreement and participate in the Capacity Market, the current minimum capacity threshold for a generator is 1MW (reduced from 2MW by the Electricity Capacity (Amendment etc.) (Coronavirus) Regulations 2020 (SI 2020/697)). Although the capacity of most battery projects will be far in excess of this threshold, if a storage facility has a capacity below the current minimum threshold, it cannot bid for a capacity agreement and participate in the Capacity Market. This means that it cannot obtain this source of revenue for that particular project and benefit from the predictable cashflow it brings.

However, a new breed of facilitator, referred to as an aggregator, has sprung up to address this issue. Aggregators contract to receive the electricity generated by a number of small projects, then on the back of these contracts bid for a capacity agreement on the basis of the aggregated capacity of the small projects. With their focus being on the revenues generated by the precise consumption and dispatch of electricity, these aggregators will often offer generation management and prompt data visibility to customers to maximise their access to the contracted assets and returns (for both their energy storage customers and them).

Although the role of aggregator started out in this sense (for example, truly aggregating), they are now increasingly synonymous with (and often owned by) the trading companies which manage the revenue stacking and who interface between the assets and the service users such as NGESO, the DNOs and the electricity markets.

Artificial intelligence and internet of things (IoT)

The use of IoT is exponential and it can be used to automate actions. For energy storage, it can be used to respond appropriately to electricity demand and prices, without the need for human intervention. Similar to the data collection done by aggregators to maximise their returns, use of IoT can enhance the data collection and analysis that is crucial for those wishing to use arbitrage to make money from electricity markets. In order to maximise returns in the energy markets, prompt reactions to fluctuations in demand and prices are imperative.

The data is deemed to be an asset class of its own, not least because analysis of this can lead to accurate predictions of future market behaviour which prepares a generator for the prime times to purchase and sell electricity. Such predictions could be enhanced with the use of artificial intelligence. However, with any use of data and artificial intelligence comes an additional plethora of legal issues. For more information see, Practice notes, Processor obligations under GDPR (GDPR and DPA 2018) (UK), Legal aspects of artificial intelligence and Demystifying artificial intelligence (AI).

Environmental, social and governance considerations

Various entities, including lenders, have implemented environmental, social and governance (ESG) policies to ensure consideration of each of these factors in their decision-making. While batteries can make the use of renewable energy more efficient, for purposes of their ESG evaluation, lenders will need to also bear in mind:

- The location of mining for the metals to make the components of batteries (for example, has the relevant country enacted appropriate laws protecting employees and abolishing slavery and child labour?).
- Whether the company from which such metals are purchased has its own ESG policy or otherwise adheres to principles aligned with the borrower's or the lender's ESG policy?
- The final destination for the batteries once they have exhausted their warranty or anticipated capacity in the project being financed? Are they to be used elsewhere in the same form, or can they be recycled?
- Whether the batteries have been used previously (for example, a new asset class of second-life electric vehicle (EV) batteries is emerging which may have significant environmental benefits)?
- Who is responsible for bearing the costs of the safe disposal of the batteries?

It is no longer sufficient to merely consider the financial returns of a project (see Efficient use of intermittent energy generation to reduce impact on the environment). Any lender will need to consider the wider effects of the project on its geographical and human environment before committing to provide any funding to comply with its own policy regarding these additional factors but also the expectations of its stakeholders and any relevant legislation (see Practice notes, Task

Force on Climate-related Financial Disclosures (TCFD): recommendations for disclosing climate-related financial information: overview and Sustainable finance: EU SFDR: overview). A lender will look to the borrower to provide confirmations and comfort (to be proven during the due diligence exercise and catered for in the finance documentation) that the relevant policies and legislation will be adhered to by the borrower throughout the life of the loan and may require separate periodic reports from the borrower to verify compliance.

What's next for energy storage solutions?

Following quickly on the heels of a period of intense development of renewable energy projects, energy storage solutions have shown a potential to enhance the efficiency of these projects by giving the generators greater flexibility as to when they can dispatch energy from their plants, effectively freeing them from the confines of specific weather conditions and hedging future revenues against increased renewables price cannibalisation. As with any new technology, energy storage is a constantly evolving field with new innovations creating more opportunities to improve efficiency and reduce costs associated with the energy sector.

Lenders are eager to lend to these projects. However, given some of the hurdles facing these projects (such as unproven technology risk and the lack of long-term committed offtake arrangements), a number of factors need to align in a borrower's favour for it to secure limited or non-recourse project financing to develop an energy storage project.

Going forward, it is anticipated that there will be:

- A continuation of the appetite of lenders to work with borrowers to:
  - understand the relevant assets on offer; and
  - work out a solution to enable projects to be financed without the need for a corporate guarantee from the project sponsor(s).
- An increase in co-located projects, where energy storage is assumed to be a part of any energy generation project going forward, to enable the generator to benefit from arbitrage.
- An overall increase in understanding the:
  - revenue stack for energy storage projects;
  - lifecycle risk of battery projects; and
  - quality of the warranties underpinning them.