Offshore Wind: A Changing Sea Of Risk

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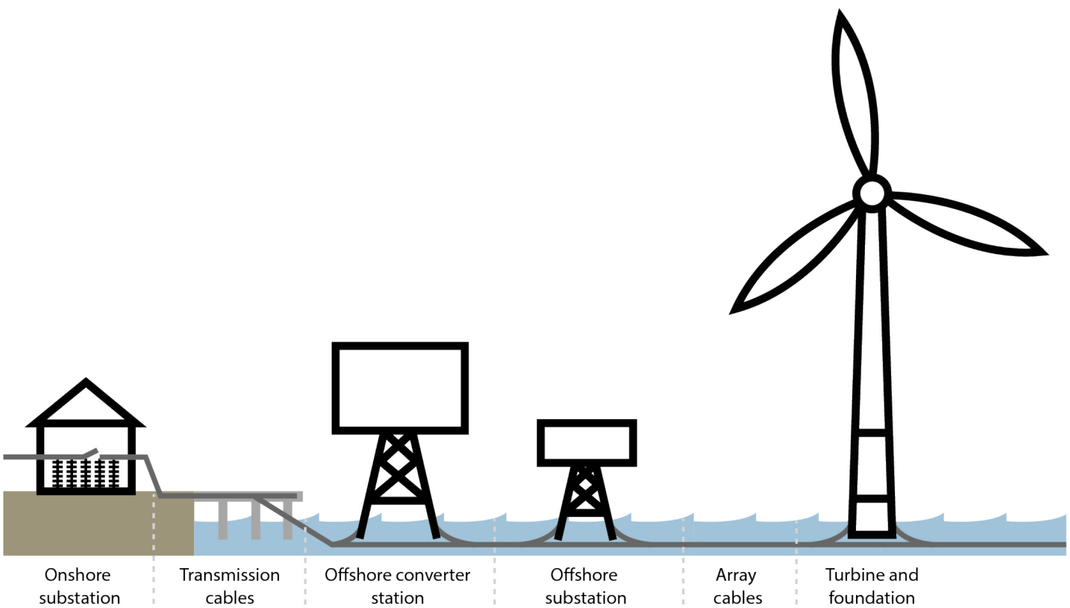
Costs for offshore wind development continue to fall, fueling projects to expand capacity globally. Indeed, the three winning bids of the Sept. 11, 2017, U.K. contracts for difference auction of offshore wind projects saw a drop in offered tariff prices of 50% on average since the last competitive auction in 2015[1]. The maturation of the industry, particularly in Europe, has enabled greater transparency and a better understanding of the key risks, especially during the construction phase, which in turn has supported further cost reductions. We believe investment-grade ratings are possible for projects under construction with strong contractors and suitable construction schedules, together with appropriate warranties for technologies without a sufficient track record. A robust pipeline of new projects is growing to leverage the vast untapped potential of offshore wind around the globe (see "Offshore Wind Projects Take off as Technology Improves and Costs Fall," published on June 2, 2017). Here, S&P Global Ratings explores some of the key risks that offshore wind projects face and how we factor them into our ratings analysis. First, we briefly discuss trends in the types of risk involved in project finance. Then, we delve in depth into how we assess each kind of risk.

A robust pipeline of new projects is growing to leverage the vast untapped potential of offshore wind around the globe.

Chart 1

Structure Of An Offshore Wind Farm



Source: S&P Global Ratings.

In 2016, operators connected 1.6 gigawatts (GW) of new offshore wind power capacity to the grid in Europe, representing 70% of global installed capacity. Investment in the offshore wind industry in the region has grown at an annual average 30% over the past five years. By 2020, WindEurope estimates that European offshore wind capacity will reach 24.6 GW, based on the high number of offshore wind projects under construction.

With the trend toward bigger turbines and foundations to increase manufacturing and production efficiency, combined with greater distances to shore and harsher sea conditions, technology risk will remain an important factor. This risk is accentuated when a difference exists between the

[1] DONG Energy and the EDP Renovaveis/ENGIE consortium bid a strike price of 57.5£/MWh, for delivery in 2022/2023; and £74.75 per MWh for the joint venture between Innogy and Statkraft offshore wind project, for delivery in 2021/2022. This compares to £114/MWh in previous auctions in the U.K. only 30 months ago.

technologies proposed at the bidding stage and the ones that are actually feasible at the time of construction.

Offshore wind assets are often financed via project finance on a non-recourse basis, which is critical given the heavy investment requirement and the large quantities of debt needed to finance such transactions--while offering a decent equity return to the sponsors in a very competitive environment. (Nonrecourse means that the lender is entitled only to repayment from the cash flow available for debt service of the specific project the loan is financing. Even if the borrower defaults, the issuer cannot seek out the borrower for any further compensation, even if the collateral does not cover the full value of the defaulted amount). Such projects face significant construction risk, absent risk transfer and mitigation. Cost and schedule overruns are just two examples of such risks. For example, in 2011-2013, cracks in the monopiles built by Shanghai Zhenhua Heavy Industries Ltd. for the Greater Gabbard project (504 megawatts (MW)) in the U.K. led to delays and a contractual dispute between the project parties. However, as the industry has matured and participants have a better understanding of the risks, along with a more robust supply chain, S&P Global Ratings believes construction risk is abating. For example, the 2015 Westermost Rough (210 MW) in the U.K. was built at a cost 15%-20% below the initially announced final investment decision budget and in January 2017 Sandbank in the U.K. (288 MW) was commissioned three months ahead of schedule.

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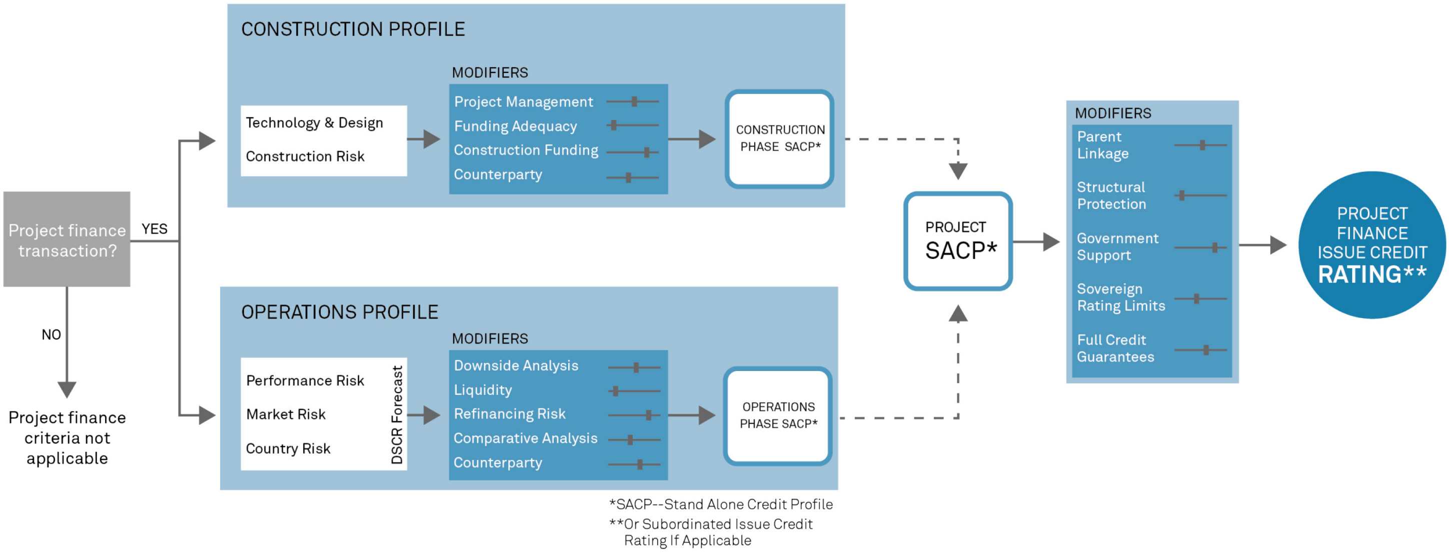
Recent auction bids have ushered in a new era for the sector, after DONG Energy and EnBW bid at zero, meaning no subsidies, just market prices. Now that the market is moving to pool prices from contract pricing, merchant risk is increasing. WindMW GmbH, whose debt we rate investment-grade, has merchant exposure (that is, electricity sold on the spot market, which we deem very volatile and which can be close to zero in very windy days) during its refinancing phase. However, we believe this factor is important and could mean the difference between an investment-grade or speculative-grade rating. Under our operations methodology, we combine exposure to market risk (which we assess on a scale from '1' to '5') with performance risk ('1' to '12') to determine the preliminary operations phase business assessment.

We assess all of these types of risks to develop our opinion of a project's credit risk, and symbolize that in terms of ratings. Ratings express our opinion about the ability and willingness of an issuer to meet its financial obligations in full and on time. Credit ratings on project finance transactions speak to the credit quality of an individual debt issue, and the relative likelihood that the issue may default.

To assess these risks in a transparent and comparable way, we rate offshore wind project finance transactions through a specific methodology ("Project Finance Framework Methodology," published on Sept. 16, 2014), also taking into consideration "Key Credit Factors For Power Project Financings," published on Sept. 16 2014. The first spells out the framework for rating projects, while the second helps us score specific features within the broad and diverse universe of power projects. For our construction and operations phase methodologies, see "Project Finance Construction Methodology," Nov. 15, 2013, and "Project Finance Operations Methodology," Sept. 16, 2014. We also draw on these methodologies: "Project Finance Construction And Operations Counterparty Methodology," published Dec. 21, 2011; and "Project Finance Transaction Structure Methodology," published Sept. 16, 2014. First, we establish a project's stand-alone credit profile (SACP), an assessment of its intrinsic creditworthiness (see chart 2). The project SACP is the lower of our assessments of the project's construction phase SACP and operations phase SACP. To arrive at the final rating, we adjust the project SACP for factors related to the transaction structure, extraordinary government support, the sovereign ratings, and any full credit guarantee.

Chart 2

Project Finance Ratings Framework



Source: S&P Global Ratings.

Construction Phase Risks

How we assess technology risk

Our approach to assessing technology risk is described in our construction methodology criteria and in the Key Credit Factors articles mentioned above, see paragraphs 13-17. The criteria consider four categories of this type of risk: commercially proven; proven; proven but not in this application or arrangement; and new or unproven technology.

Such technology typically includes turbines, structures, offshore substations, and possibly cabling and onshore connections. Our approach is to evaluate the technologies' key features, including any innovations. Our analysis is informed by the findings and opinions in independent engineer reports.

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Given the limited operational history of some newer turbines, our assessment of them might range from "proven" to "proven but not in this application." Certain turbine and foundation technologies could be scored "proven" depending on their operational track record and support for reliable long-term forecast. When scored “proven,” we view the technology as having a satisfactory operating record relative to the project and technology life, hence we feel comfortable with the long-term generation forecast that is expected to be reached by these turbines.

To achieve lower installed costs, manufacturers of turbines have been building larger ones by leveraging existing technologies and adding new features. Under our criteria, we view enhancements as more credit supportive than new technologies, depending on the extent of the changes. In addition, we consider strong testing, verification, and certification vital for new turbines.

Importantly, our technology assessment reflects residual risk to the project after mitigants and after allowing for any conditions attaching to mitigants. Mitigants therefore can offset technology risk. These include warranties and operation and maintenance contracts that guarantee performance such as availability; these can also carry attendant benefits during the operations phase. We assess the robustness of the risk transfer by evaluating the conditionality of the contracts as well as the balance sheet strength of the party supporting this risk transfer. Assuming robust transfer due to mitigation, we could assess technology risk as proven. In contrast, a weaker assessment can limit construction phase SACP and consequently the rating.

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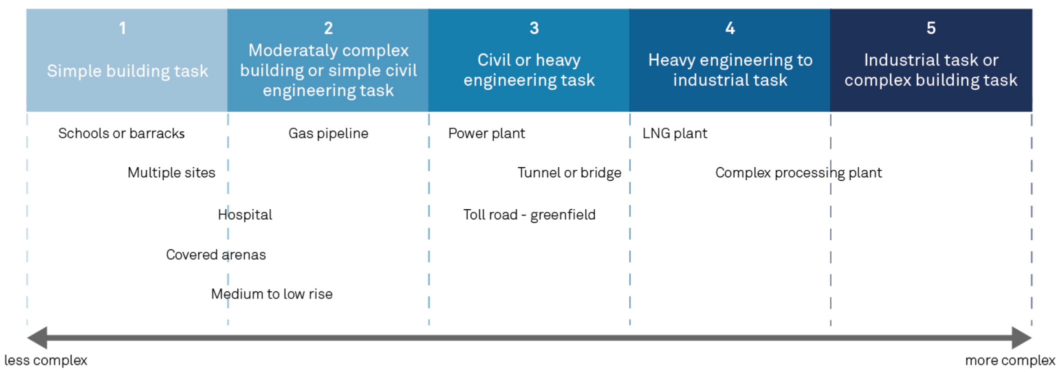
How we assess construction difficulty

We have observed that more difficult construction tasks are more likely to lead to delays and cost overruns than simpler ones (see chart 3 below and paragraphs 31-33 of the construction phrase methodology).

Chart 3

Diagram Of Construction Difficulty



Source: S&P Global Ratings.

We typically assess as "civil or heavy engineering task" offshore wind and subsea transmission in benign sea conditions, while offshore wind plants in harsh sea environments are typically assessed as "heavy engineering-to-industrial task." For this assessment, S&P Global Ratings takes into consideration not only the wind project size and turbine capacity, but also the distance to shore, neighboring projects, nearby ports, water depth, and tidal range and soil composition, which might require focus during the design stage to ensure that foundation design (including boat landings), installation (piling activity), and operational strategy (including corrosion protection) are suitable.

Monopile substructures remained by far the most popular substructure type in 2016, representing 88% of all installed foundations. The average water depth of offshore wind projects where work was carried out in 2016 was 29.2 meters, slightly more than in 2015 (27.2 meters). The average distance to shore for those projects was 43.5 km, a small increase on the previous year (43.3 km). As sizes, water depths, and distances to shore continue increasing as the industry develops further, absent mitigants this could introduce additional risk. This might lead to "heavy engineering-to-industrial task" assessments of new projects. However, we expect these challenges to be met with more robust design, standardization, and increasing vessel and crane capacity.

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Current technology requires larger vessels during the construction phase, which only a limited number of players are equipped to handle. Availability of offshore wind purpose-built vessels could increasingly become a constraint if not contracted well in advance and considering potential delays during the construction phase. If there is significant risk that a task can become challenging because of the way the project plans or schedules construction activities, we would assign a "construction difficulty" assessment representative of a more complex construction task, notwithstanding a simple design or construction task.

The value given to a contractor's experience

The ability and experience of contractors, together with major subcontractors, to deliver the project on time (including sufficient time buffers) is a key part of the construction analysis. We base this on their relevant expertise with the project's type, scale, and location, experience of each contractor's project director and team, risk management and quality control systems, labor relations record, subcontractor selection and management. We expect the industry to leverage from the expertise and supply chain of oil and gas majors, which could act as a substitute or even complement the European companies, which to date have built most offshore wind projects in the world. For example, during construction of the first offshore wind project located in the U.S., Block Island (30 MW), offshore oil and gas companies such as Montco Offshore, Gulf Island Fabrication, Keystone Engineering, and Blue Water Shipping played a role.

The contractor's technical capacity and experience can be a significant factor in ensuring the project is completed as expected (on time and within budget, among other factors). The assessment also incorporates the contractor's experience and ability in resolving issues between various prime or subcontractors (interface risk), which can result in mismatches and disputed responsibilities. Liquidity can also be a factor in mitigating interface risk, along with a clear delineation of responsibilities. The assessment ranges from "very experienced" to "inexperienced."

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This factor is significant in the offshore wind sector, where we believe only a few players are capable of delivering a project on time and budget, given the logistics and supply chain (industrialization and economies of scale) required to conduct the works. Therefore, in most cases we expect to define contractor experience as either "very experienced" (as defined in the project finance construction methodology) or "experienced." The second category might involve, for example, a second-tier construction contractor or multiple contractors with an experienced project director and well-defined contractor interface issues. Under the "very experienced" assessment, we expect experience not just with the technology but in local conditions, including weather, seabed, and distance to shore; this can be increasingly difficult to attain as the industry transforms.

Installation planning is often strongly influenced by the requirements of permits and licenses. Having experienced parties involved at an early stage in the consenting process enables insights from past projects and feedback from later stages of the process to be incorporated. These approaches to continuous improvement will help to ensure that future consents are more flexible and open to the various cable installation techniques that are available.

Studies by the construction industry tie construction performance issues to the quality of project management expertise in managing construction activities. We evaluate project management expertise directly in our methodology both for the contractor (see paragraph 37) and the project's management, which has oversight responsibility of the contractor and sometimes other construction work not covered by the main contractor (see paragraph 44).

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The information we use is gathered from meetings with both the contractor and the management of the project, site visits, input from the independent engineer, resumes, the experience of sponsors and the contractor, the transparency and thoroughness of project reporting mechanisms in place, and other secondary sources. For example, we would likely view more positively project management that has demonstrated success in the business of building, operating, and decommissioning of multiple projects than a sponsor that has limited or no track record.

The project team, separate from the contractor, should have an experienced project director with a track record of delivering similar projects within budget and on schedule under the type of contract used. However, we would be more confident in management expertise for a project with complex construction if the contractor's team has experienced leads in the engineering, procurement, construction, and commissioning phases, even if the management team has less direct experience in developing offshore wind assets. We have a positive view of project sponsors that have input into the selection and a say in how much time the key leads spend on the project.

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When counterparty risk is a limiting factor during construction

Counterparty risk will be a limiting factor during construction. At what level will depend on our view of replace ability. Examples of irreplaceable construction counterparties are:

- A head construction contractor that has only a small field of replacement contractors available, reflecting the nature of the task, and
- Contractors performing under a "turn-key construction contract," where the builder takes design and performance risk, or contracts providing specialist design or construction skills (because we don't believe that a successor counterparty could replace the initial engineering, procurement, and construction (EPC) contractor on similar terms).

If the counterparty is replaceable, subject to the amount of available liquidity, a project can have a higher rating than the creditworthiness of the construction and equipment suppliers (see our counterparty criteria for further details). Contractor credit enhancement is measured against the estimate of all costs to replace and complete the project, as if the contractor did not fail. Determining a cost estimate involves interviews with contractors and the independent expert (IE), any IE analysis on requirements to replace a builder or operator, and analysis of comparable projects in the jurisdiction; additionally, we must make an assessment of project progress at the time the EPC contractor fails to fulfill its contractual obligations. We also consider whether liquidity in the project is sufficient to replace key subcontractors.

Complicating the analysis is the relatively low number of EPC contractors in the offshore wind sector. Consequently, we consider both replacement time and a potential increase in EPC costs, both of which could be more burdensome than for conventional projects.

How the assessment takes into account multiple contractors

In our view, a project's construction typically becomes more complex as the number of interfaces increases. These include subcontractors and equipment suppliers interfacing with the main contractors, as well as any tasks the project is directly managing outside of the scope of the main contractor. For example, if poor performance of a key subcontractor or a separate contractor outside the scope of the EPC could allow performance obligations to decline, we will likely consider this a weakness. Some projects maintain a portion of the construction risk by directly subcontracting works without the benefit of a main contractor. In these cases, the project is exposed to the interface risk associated with managing multiple contractors; the inability to contractually resolve disputes between contractors can be a limiting factor for construction risk.

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For multiple contracts covering construction tasks (such as installation of foundations, cables, and turbines), the construction counterparty dependency assessment (CDA) would reflect the CDA of the weaker contract. For separate contracts covering supply of equipment and installation and construction of the building, the CDA reflects the weaker of the supplier CDA and constructor CDA (see tables 5 and 3 in the "Project Finance Construction And Operations Counterparty Methodology"). Therefore, we view the credit quality of the equipment supplier, such as the turbines, to be key under the CDA analysis.

For example, we assess the CDA of the contract to build and install equipment as a construction activity, but the counterparty CDA of the contract to supply equipment as an equipment supplier activity. Specifically for offshore wind, the turbine manufacturer is a supplier and the building and associated balance of the plant is civil, mechanical, and electrical engineering. We expect the EPC contractor, if available, to be responsible for transporting the technology to the site.

The offshore wind industry is trending toward a reduction in the number of construction contracts, which is beneficial for the overall coordination of tasks and mitigation of execution risk.

Interface management between the main activities, such as foundation installation and cable installation, has improved in recent years. In earlier offshore wind project developments, cable installation would typically wait until the substation foundations or topsides were installed. This occasionally led to delays in the cable installation program, as a consequence of delays in the construction of the offshore substation. In more recent projects, high level construction programs allow for decoupling of these two activities, which means that the installation of cables can be scheduled during the most suitable period of the year.

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When a project uses multiple contractors, the definition of responsibilities should be clear and allow for an integrated delivery to be assessed as "experienced" or, if appropriate, "very experienced." In this context, the assessment depends on the arrangements among counterparties, and it generally reflects:

- The strength of the strongest party within "joint and several arrangements" (see "Project Finance Construction And Operations Counterparty Methodology," published on Dec. 21, 2011);
- The weakest link among "several" arrangements with a focus on the materiality of the task that each party carries out; and
- An inexperienced assessment if responsibilities are vaguely defined.

How we assess the effectiveness of contract risk transfer

We measure the effectiveness of construction contracts by assessing how well the risks of cost and time overruns and project performance are transferred to the builder and how much risk the project retains. This is not only a function of the type of contract, but also pricing, contractor incentives, and alignment with the project's goals. The prime difference among contracts, and therefore the assessment, is which party takes the risk of cost overruns, project delays, and who keeps any savings (see table 7 of the construction methodology).

We examine the contract price--if possible in consultation with the independent expert--to ascertain whether it was fairly priced and whether it includes adequate contingency to cover any potential cost overruns and variations. Deliberately low-priced, incentive-weak, or poorly priced contracts indicate an aggressive pricing strategy or inexperience for the type of contract and associated task. As such, they may be a precursor to variations in the design that will add to the project's cost and weaken the incentive to perform under the contract or could indicate significant scope exclusions from the EPC, which may weaken the project's resilience in a downside case. Additionally, limitations in liquidated damages packages can give the contractor the wrong incentives, that is, they can potentially push the contractor to walk away from a construction works that are underperforming. This is identified by an analysis of the contracting culture in the country, the form of the contract, and comparison with any other known comparable costs.

We expect contingency timeline plans to cover critical paths in the installation process to be incorporated into the overall execution plan. Contingency measures should also include plans for approvals of necessary changes to the installation methodology as in the past, projects have needed to make late changes in response to unforeseen seabed conditions or weather changes while the vessel is onsite. Standard administrative procedures for cable installation contracts should be adopted. Document submission and approval sequences should be agreed in advance and implemented to cover the deliverables needed under the installation contract.

Additionally, in other types of financings, we've seen the use of credit substitution to completely transfer the risk of construction (and often operations) to counterparties. Most notably, this approach has been used for the Cameron LNG transaction. Of course, the standard for ensuring that no construction risks reside with the project are high. However, if this can be achieved contractually, and we consider the risk fully mitigated, then the project rating will be tied to the rating of the counterparties. In the case of a wrapped transaction with construction guaranteed by the parent, the rating on the parent would likely drive the rating. In contrast, in the case of Cameron LNG, the construction is effectively guaranteed by the offtakers, the lowest rated of which (in a several arrangement) is Engie SA. Here, Engie's rating thus drives Cameron's rating. For projects that, on their own merits, we might consider investment grade, the reliance on a higher-rated entity's credit quality can be a boon for the transaction and alleviate the need for excess liquidity at the project level. However, this could, in turn, weigh on the credit quality of the parent or counterparty.

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Operations Phase Risks

The assessment of "asset class operation stability"

We generally assess offshore wind projects as having a score of '5' for asset class operation stability--the risk that a project's cash flow will differ from expectations due to operational issues. These are ranked from '1' (the most stable) to '10' (the least stable). By comparison, onshore wind projects are generally assessed at '4'. Generally speaking, the more complex the project's operations and technology, the higher (that is, the weaker) the assessment. The difference between the two results from remoteness: Because of the greater difficulty in maintaining projects offshore, we consider such projects to have a greater likelihood of operations and maintenance cost overruns than their onshore cousins.

Can offshore wind projects benefit from performance redundancy?

For power projects generally, we apply a positive adjustor for redundancy if we see a diverse portfolio of generating assets in different regions, different technologies or fuel types, and multiple assets. All U.S. wind portfolio financings have a positive score for redundancy given regional spread. But we may also give redundancy uplift for other, project-specific traits. In the case of WindMW, we assign a positive adjustor not for locational or technological diversity, but because the project has certain operational redundancies—namely, a backup transformer and a looped cable array--that limits the likelihood of catastrophic failure and therefore offset some of the risks inherent to offshore projects. Based on the IE's opinion, we concluded that the WindMW had comparatively more redundancy than other offshore wind assets.

How we incorporate resource risk

As with onshore projects, we consider the extent of variability in wind resources when rating offshore projects to determine if the resource or raw material will be available in the quantity and quality needed to meet production and performance expectations. But perhaps as important as the wind data itself is our understanding of the manner of collection, including the proximity, height, and duration of the data. For example, in the WindMW transaction, we were able to use data collected over a four-year period, at hub height and approximately 1 km away from the edge of the project site; these data were backed up by several other data sets that were tabulated at more distant locations, but over a longer period of time (as much as 20 years). Our resource and raw material risk assessments range from minimal to high. We assess resource availability for all project financings, and for most of the projects we've rated to date, we classify wind projects as having either modest or moderate resource exposure, depending on the level of confidence in the project's resource estimates.

Table 1

Resource Availability Assessment

Resource Risk Score	Modest (+1 notch)	Moderate (+2 notches)	Moderate (+3 notches)
Criteria	We expect resource and raw materials availability and quality to be high. We typically assess a wind resource as modest when we have a high level of confidence in the resource estimation, based on reliable analysis from multiyear data at the site that supports a long-term view of resource availability. High confidence in resource estimation over the debt tenor.	Our assessment of moderate typically applies when there is some uncertainty that resource and raw material will be available at all times in the quantity and quality expected. This assessment typically applies to natural resources that exhibit significant variability or that are not well characterized, in our opinion. Generally, if the resource is likely to vary from a baseline amount by 10%-20% over the long term or 20%-30% in the short term, in our view, we typically assess the resource as moderate and apply a '+2' adjustment to asset class operations stability assessment.	Same as moderate (+2), except if the long-term variation is higher, generally between 20%-30% from a baseline amount, in our view, or if the short-term variation is greater, generally 30%-40%, we typically assess the resource as moderate and apply a '+3' adjustment to the asset class operations stability assessment.
Relevant example	Not typically used for single-site wind projects; we have assessed some regionally diverse wind portfolio ratings that have about 10 years of operations as modest. For example, FPL Energy American Wind and FPL Energy National Wind.	Single-site wind project where resource availability is based on strong wind data; data is likely for a long period of time, shows less seasonal variability, is captured in close proximity to the project site and mast height, and is corroborated by multiple sources. For example, Alta Wind Holdings.	Single-site wind project where resource availability is based on limited wind data; data may be for a short period of time, show higher-than-average seasonal variability, or have been collected at some distance from project site.

Source: S&P Global Ratings.

We make estimates about the future variability of wind resources when scoring for resource risk, for which we typically rely on historical data. The quality of that data is key, and a number of factors influence their credibility. We consider the proximity of the data to the proposed site, the altitude of the wind in the recorded data compared with the height of the turbines in question, and the duration of data, as well as any seasonal variability. Of course, no set of data is perfect, and we use corroborating sources of data to supplement the primary data source when available. We would generally come to understand the methodology used to estimate wind resources through discussions with a resource consultant.

How we incorporate market risk

For projects with massive upfront capital costs, a power purchase agreement or feed-in tariff that fixes revenues for a period of time is a typical feature for investment-grade projects, and these contracts have often included rates that well exceed market power rates. But while these contracts may be lucrative in the project's early years, they may not cover the entire life of the asset or even the debt tenor.

While there is inherently little to no market risk during the contracted phase, there could be during the subsequent merchant phase. Our assessment first determines how significantly cash flow would decline in a once-in-20-year market stress to power prices. Generally, we classify the project as having moderate or high market exposure during this period, depending on the historical and forward-looking stability of the market where it would sell power. For example, in Meerwind the initial feed-in tariff provides for the robust contract rate only through 2027 at which point more than €100 million is outstanding. We assessed market risk as moderate, based on discussions with market consultants and our understanding of publicly available reports on expected power prices. We also attempted to ascertain the effects of persistently low prices for gas and weak demand growth to assess a downside case, as prescribed under our Key Credit Factors article. Because pricing dynamics change, we update such assessments.

Table 2

Market Risk Assessment

Market risk descriptor	Low	Moderate	High
Criteria description	15%-30% reduction in cash flow based on once-in-20-year market stresses.	30%-50% reduction in cash flow based on once-in-20-year market stresses	More than 50% reduction in cash flow based on once-in-20-year market stresses.
Typical features	Portfolio is partially hedged or contracted	Portfolio may not be contracted, but enjoys protection of a stable capacity market	Portfolio is not contracted, may not participate in capacity auctions or have a weak capacity market, and faces highly volatile energy revenues
Examples	Heat rate call options, PPAs with some basis mismatch	PJM, ISO-NE (regional markets with capacity payments)	ERCOT, AESO (regional markets without capacity payments)

Source: S&P Global Ratings.

We also assess the asset's competitive position if it has market exposure. In this respect, renewable projects can typically fare well, and in the case of Meerwind the competitive position falls into the satisfactory category. There is usually a strong regulatory preference for renewable assets, which typically compete for dispatch (the provision of electricity) with a lower variable cost structure, and we generally assess fuel supply risk as positive. (We assess the risk of resources adequacy separately).

Because of the difference in cash flow volatility during different periods, we may consider such projects to be two-phase projects. Thus, we calculate a preliminary operations phase SACP for both the contracted and merchant phases by using the debt service coverage ratios calculated below. The issue credit rating on the project would therefore reflect the lowest of either phase.

Our base-case and downside-case financial forecasts

As with all projects, we develop a base case to assess minimum and average debt service coverage ratios, based on a comprehensive financial model. However, there are certain assumptions in the model that bear particular significance for offshore wind projects.

First, we assess the adequacy of operating costs and maturity of the operations and maintenance (O&M) environment. One of our important observations from rating renewable projects is that, when markets open up, initial O&M expenses are usually estimated with limited comparable benchmarks. As the industry grows, which can be rapid, demand for specialist labor and crane hire can significantly push O&M expenses upward. This was the case in the U.S. wind industry, where O&M expenses increased by about 30% to 40%, resulting in downgrades of the two FPL Energy wind projects we rate. However, as a region starts to mature in terms of the number of operating assets and sufficient capacity to service the projects, costs start to stabilize. As a result, we will likely adjust the underlying issuer forecast, especially if we have limited familiarity with the O&M contractor and management team. In the case of WindMW, we formed the view that the O&M environment was sufficiently mature in the North Sea such that the adjustment was rather modest. Furthermore, as we mentioned earlier, a high degree of performance redundancy is desirable for offshore projects, and operating budgets are usually larger in such cases.

Additionally, it is important to reasonably gauge what levels of availability are attainable in offshore projects. That's because of the difficulty and time associated with remediation, if needed. Although a high-availability percentage is not unattainable in our forecast, we aim to understand the operating track record of the specific technology. Furthermore, services providers may guarantee a high level of availability, which we may consider credit positive for the project. Nonetheless, we analyze the nature of this guarantee: Will the contractor merely make the project whole financially or guarantee remediation of the underlying problems?

Downside resilience

In general, contracted plants, including renewable assets, fare well in a combined downside scenario where operational, market, and financial stresses occur simultaneously. Often, we assess these in the 'bbb' or 'a' stress resilience categories, providing a notch or two of uplift depending on the preliminary operations score. But there are several stresses that we might apply differently for offshore wind projects than for other renewable assets.

While the typical stress for availability of an onshore wind asset is around 6%, it might be higher for an offshore wind asset. Our thinking is that outages might be more protracted for offshore projects because of relative inaccessibility. Of course, guarantees from service providers could mitigate this stress to some extent.

Additionally, we may stress an offshore project's operating costs, both fixed and variable, to a greater degree. Given that these are contracted assets, availability is paramount. For that reason, we expect management to spend significantly more than budgeted under stressed conditions to ensure availability. And given the more limited track record of these assets, it's hard to estimate how significant cost overruns could be. The typical stress for power projects is usually 12%; for an offshore project, we may assume as much as 20%.

Finally, we stress wind resources. For projects with a limited operating history, we use a one-year P99 scenario (that is, we assume an electricity production amount with a 99% probability of being exceeded in a given year). While this is ostensibly more severe than the standard once-in-20-year stress, our recent experience with onshore projects has been that this is in fact more realistic.

We may also consider the effects of performance degradation over time such as observed for solar projects, or we may consider the impacts of weaker operational efficiency if our discussions with technical experts lead us to conclude this is likely.

How counterparty risk can be a limiting factor during operations

We assess the materiality and replaceability of key counterparties to the project. If the counterparties are replaceable, subject to the amount of available liquidity, a project can have a higher rating than the creditworthiness of the construction and equipment suppliers implies.

First, under the purchase price agreement we have observed for this type of project, we generally consider the revenue counterparty or "offtaker" to be irreplaceable. These contracts often feature prices well above market rates, which are frequently the rationale for developing the project. The absence of the revenue counterparty generally means selling power at market rates, which could materially weaken the project's credit quality.

Further, the O&M counterparty may also be important for offshore wind projects. While we generally consider the O&M counterparty for a conventional gas-fired or onshore renewable power plant as replaceable because it provides a relatively standard service at a competitive rate, the services rendered to an offshore wind project may be more bespoke and therefore more difficult to replicate.

Importantly, depending on contractual arrangements, we may need to understand the credit quality of the entity that is party to the contract in question, not solely that of a parent company.

Related Criteria And Research

Related Criteria

- Key Credit Factors for Power Project Financings, Sept. 16, 2014
- Project Finance Framework Methodology, Sept. 16, 2014
- Project Finance Operations Methodology, Sept. 16, 2014
- Project Finance Transaction Structure Methodology, Sept. 16, 2014
- Project Finance Construction Methodology, Nov. 15, 2013
- Project Finance Construction And Operations Counterparty Methodology, Dec. 21, 2011

Related Research

- Transaction Update: WindMW GmbH, March 27, 2017
- Offshore Wind Projects Take Off As Technology Improves And Costs Fall, June 2, 2017
- With Offshore Wind Projects Set To Take Flight, What Factors Will Move Ratings? Feb 12, 2016
- Presale Report: WindMW GmbH, Nov. 11, 2015
- Standard & Poor's Approach To Rating Renewable Energy Project Finance Transactions, April 20, 2015

Only a rating committee may determine a rating action and this report does not constitute a rating action.