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EU 2020 Offshore-Wind Targets

The €110 Billion Financing Challenge

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The €110 Billion Financing Challenge

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AT A GLANCE

To attract the estimated €110 billion in investment necessary to meet the EU's offshore-wind-power (OWP) targets through 2020, utilities must take a proactive approach to reduce the risk and cost profiles of these renewable-energy projects, which are expected to play a growing role in reducing carbon emissions.

A More Attractive Future Risk-Return Profile

According to industry stakeholders interviewed by BCG, OWP is a business with high risk, but interviewees see substantial declines in construction, turbine availability, and grid access risks over time. BCG's analysis also found declining risk: the impact of construction and operations risks on OWP returns will lessen with experience over time, yielding a risk-return profile more attractive to investors.

What Utilities Need to Do *Now*

Facing serious capital constraints in the medium term, utilities must actively optimize the risk-return profile of OWP by, for example, creating innovative collaboration models that will allow them and the rest of the industry to productively work together to reduce risk and cost.

The European Union (EU) is pursuing an ambitious roadmap to reduce carbon emissions across all sectors. As part of this push, renewable-energy sources are set to account for a rapidly growing share of electricity consumption: some countries have established an overall 20 percent binding target for renewable energy by 2020, translating into approximately 35 percent for electricity production. For 2050, the EU is considering scenarios of up to 97 percent renewable electricity.

Offshore-wind power (OWP) will play an essential role in meeting the targets of major European countries such as Germany and the U.K. The European Wind Energy Association expects that by 2020, 40 gigawatts (GW) of capacity will have been installed, which is approximately ten times the current base of 4.9 GW across the European Union. At €110 billion, the required capital expenditures are also enormous. For comparison, leading European developers invested between €6.0 billion and €12.5 billion collectively in each year of the 2009 through 2011 period.

Three key starting points are necessary to understand the challenges facing the development of OWP in EU countries:

- Offshore wind is still a very immature industry with high risk, a view shared by potential large investors such as pension funds and insurance companies.
- Utilities are leading the way, but they will become capital constrained before reaching the 2020 targets.
- The financing challenge will take time to resolve because capital is not readily available, especially in the current macroeconomic climate.

Utilities need to think hard about how capital availability translates into risk capacity.

This means that it will take several years before utility balance sheets and new external-capital sources can be expected to be available at the required scale. Thus, utilities must assess the amount of capital they expect to have available for OWP through 2020. More importantly, utilities need to think hard about how capital availability translates into risk capacity—that is, given the various risk profiles of the utilities' OWP portfolios, how much OWP capacity will they be able to finance without jeopardizing their credit rating?

Utilities need to start thinking about financing now. In five to ten years, when the risk capacity of a utility's balance sheet is stretched to the limit, it will be too late to reduce the risk in ongoing projects, particularly projects that have reached the operation stage. Utilities must be financially and strategically prepared well in advance of

reaching this point—the time lag from investment decision and contracting to completion and proven uptime is significant, and making changes is difficult once the process has begun. A proactive strategic approach is more likely than a wait-and-see attitude to attract financing for OWP. Similarly, governments need to provide predictable, attractive, and efficient regulation; targeted subsidies; and reliable grid developments to support the industry. These are essential preconditions for accelerating the allocation of capital toward OWP from large capital providers such as institutional investors.

Where Is OWP Today?

Following the boom in onshore wind, industry and governments have looked increasingly to exploit the vast offshore-wind resources. Relative to onshore wind, offshore wind promises a number of benefits: more reliable and less fluctuant wind yields, fewer site restrictions, and less opposition from local interest groups.

The U.K. and Germany are planning to contribute the vast majority of additional capacity, with national targets of 13 and 10 GW, respectively. Other EU countries such as France, Denmark, Belgium, and the Netherlands are also pursuing ambitious OWP plans, with national capacity installations of up to 6 GW anticipated by 2020.

If the current investment ratio is used going forward, utilities would be responsible for €85 billion of OWP financing by 2020—well beyond the capacity of their balance sheets.

Over the past two years, offshore wind has experienced a bumpy ride. On the one hand, newly developed turbine generators and installation procedures have proved largely successful. On the other hand, environmental concerns and partially unresolved legislative issues related to offshore grid connections have resulted in delays of up to two years. Moreover, ongoing and planned adjustments to renewable-energy subsidy schemes pose another big challenge for investors that are looking for clarity and certainty in the regulatory environment.

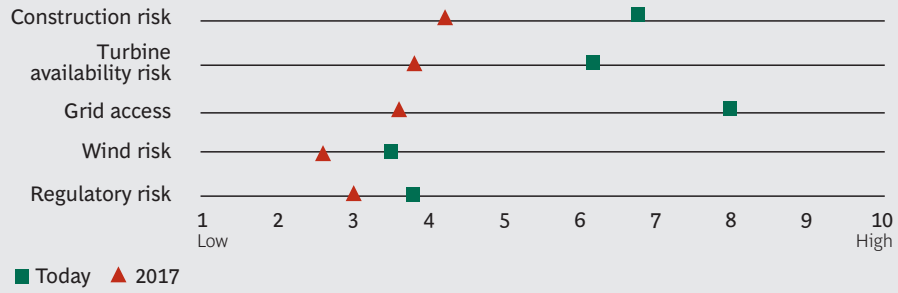
The key challenge is financing. As one U.K. investment banker interviewed by The Boston Consulting Group noted, "Two years ago the problem was a need for new equity, on top of utility equity and bank financing; now the problem has grown in size as banks deleverage." The investment cost for the 4.9 GW of OWP capacity recently installed in the EU was about €16 billion. BCG estimates that approximately 77 percent of this investment was financed directly over utilities' balance sheets and 23 percent was provided through debt financing from banks and equity from the developers, small utilities, institutional investors, and family investment offices.

If this same ratio is used going forward, utilities would be responsible for €85 billion of OWP financing by 2020—well beyond the capacity of their balance sheets. This truth is underscored by the current challenging economic environment and weakening cash flows that are resulting from fundamental changes in their business (in particular the rise of decentralized power generation, which is reducing the profitability of conventional power plants) and, in the case of Germany, from the phaseout of nuclear-power generation.

Industry Stakeholders Rank Current and Future OWP Risk

To assess the current and expected future OWP risk profile, BCG conducted interviews with more than 40 key representatives of European utilities, commercial and

EXHIBIT 1 | Stakeholders Say That OWP Risk Will Decline Over Time



Source: BCG interviews.

public banks, insurance companies, pension funds, supplier groups, and governments. We asked our interviewees to assign a ranking from 1 through 10 (with 1 representing low risk and 10 representing high risk) to five general types of risk, considering a current perspective and looking five years into the future. (See Exhibit 1.)

Our conversations with interviewees revealed that capital providers view offshore wind today as a business with high risk compared with other infrastructure investments. This group is particularly sensitive to construction risk and how it will evolve.

Overall, though, the rankings reveal that grid connection is the prominent concern for OWP stakeholders; this is not surprising given that current connection delays are having an adverse impact on several projects. For example, the German offshore parks Meerwind, Amrumbank West, and Global Tech I have been negatively affected by the one-year delay in grid connections.

Over the next five years, most interviewees expect, risk will decline substantially along all key dimensions including construction (for example, delivering on budget and schedule), turbine availability in the operations phase, and grid access. This is consistent with the pattern established in onshore-wind development, where the growth in accumulated experience led to a significant decrease in risk.

However, considerable risks will remain in the development and construction phases (in fact, our interviews see construction as the biggest risk area five years from now) simply given the sheer size and complexity of these offshore projects, which will make a successful track record critical to attract investors.

Assessing the Risk-Return Profile Reveals the Attractiveness of OWP Assets

To assess the risk-return profile for developing offshore-wind projects over the coming years, we used BCG's proprietary offshore commercial cost and risk models. Our risk analysis is based on value at risk, a standard risk measure that describes the risk of loss at a given probability.

Using a Monte Carlo simulation, we analyzed the impact of eight defined construction-phase-related risks and three operation-phase-related risks on the internal rate

of return (IRR) of OWP for a typical offshore park in both 2012 and 2017. (See Exhibit 2.)

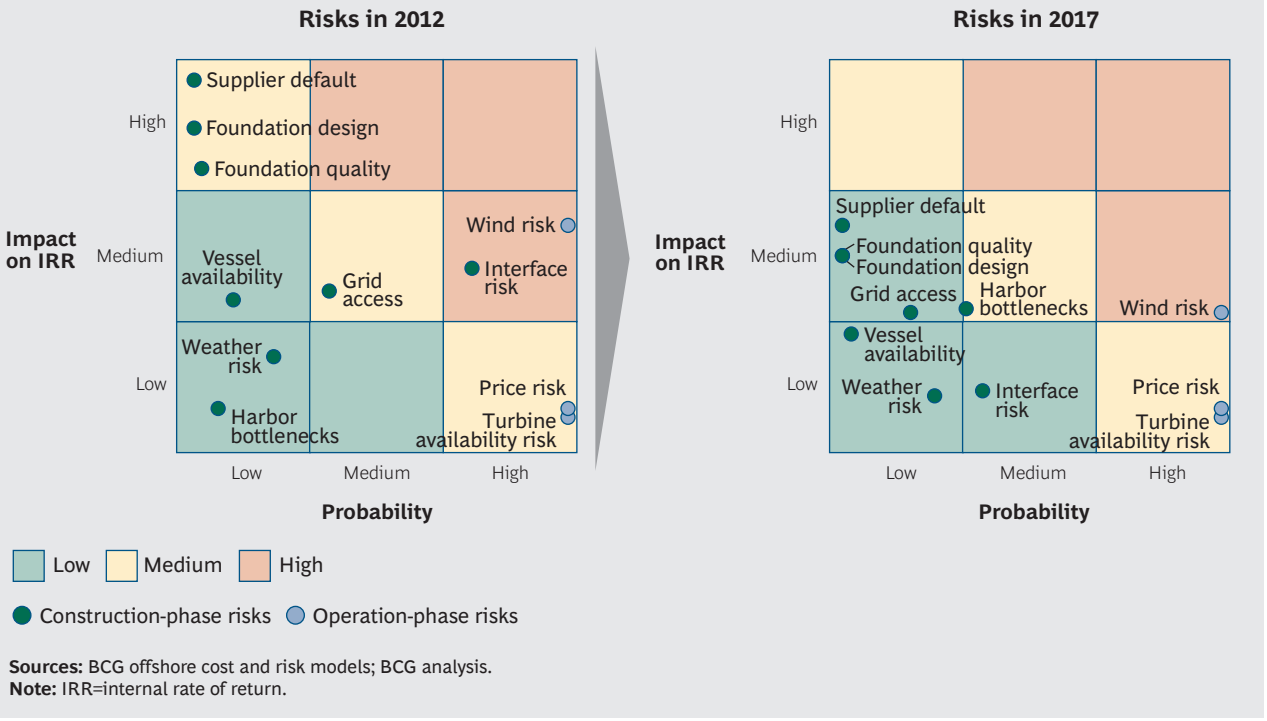
Assessment of Risks

The analysis of risks results in a picture that is characteristic of an early-stage technology: substantial risk and uncertainty at the start that decrease over time with experience.

Risks associated with early stages in the supply chain—such as supplier default and problems with foundation design and quality—have a low probability of occurring but a very high potential impact on IRR now because of their ramifications on other parts of the project's execution, particularly when organizations have limited execution experience or an immature supply chain. Early-stage risks can result in significant cost increases (arising from the need to amend contracts with subsequent suppliers), construction delays, and escalation of financing costs. If new turbine generators are heavier than current generators or new parks must be located farther from shore, new foundation designs will be required, contributing to overall risk. However, by 2017, these low-probability risks will have a lower potential impact on IRR.

The probability of technological risks such as turbine availability will remain high, according to our model, but with a low impact on IRR even now because the technologies in place have proved reliable and the risk of serial defaults is decreasing rapidly with experience.

Exhibit 2 | The Impact of Construction- and Operations-Related Risks on Returns Will Be Mitigated by 2017



Sources: BCG offshore cost and risk models; BCG analysis.
Note: IRR=internal rate of return.

The probability and impact of interface risk for the various parties will be reduced by 2017 as more single-source engineering, procurement, and construction providers emerge and as developers gain experience and improve their scope and ability to manage interfaces.

Uncertainty about future wind conditions represents a critical investment risk today, but the ability to forecast the expected mean wind speed will improve, and thus lessen potential impact on IRR, as more parks are built (especially in Germany, where wind parks are closely situated) and as better wind data become available. However, wind yield will remain a risk for project owners because mid- and long-term variations of weather patterns are inherently uncertain.

Reducing the Levelized Cost of Energy

Along with risk reduction, the levelized cost of energy (LCOE) needs to decrease to make OWP more competitive. The LCOE is the cost of generating energy and includes the initial capital costs as well as continuous operating costs.

If the OWP industry scales up, risk can be expected to fall and the standard deviation of expected returns should decrease.

There is a clear tradeoff between cost reduction and risk reduction. Better turbine capacities, larger rotor blades, new foundation structures, lighter materials, and faster installation processes are required to bring down costs, but these developments will not foster immediate risk reduction because the industry is sustaining some risk factors by continuously introducing technologies that, although better than their predecessors, have shorter track records.

Whereas a project developer's investment case focuses on return optimization, a "risk aware" investor focuses on a return for a certain risk profile. To ensure that cost reduction measures are not neglected, a risk impact assessment in monetary terms should be required for every procurement and investment decision, and development of risk mitigation measures should be required for every assumed risk.

Achieving a More Attractive Risk-Return Profile

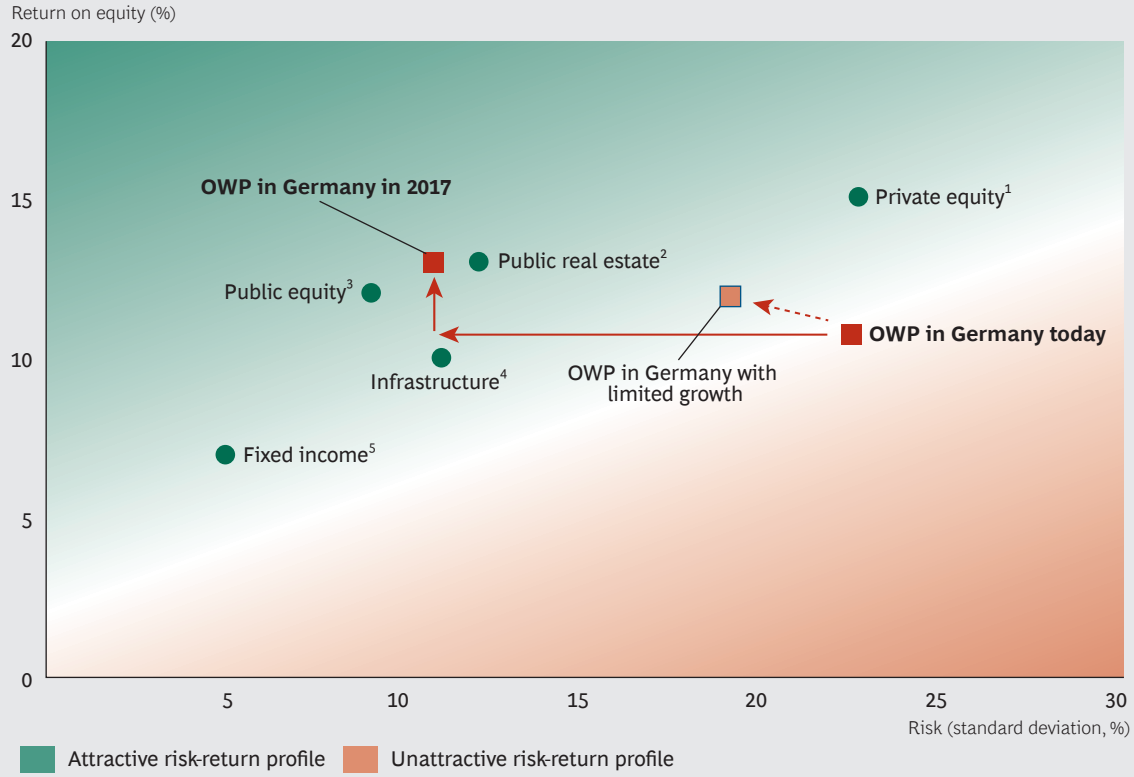
Implementing a strategy that balances reduction of OWP cost and reduction of OWP risk would result in a much more attractive risk-return profile for the industry. (See Exhibit 3.)

If the OWP industry scales up and increases its installed base as planned, risk can be expected to fall and the standard deviation of expected returns should decrease. This will mainly be driven by improved project development and execution.

Hence, from a risk-return perspective, OWP investments may become comparable to other infrastructure, public equity, and real estate investments over the coming years. This means that those currently investing in infrastructure, public equity, and real estate may also be attracted to OWP investments.

In addition, the correlation of OWP and both public equity returns and macroeconomic fluctuations in general is low. Thus, OWP potentially provides an attractive portfolio-diversification opportunity, especially in the current economic environment.

EXHIBIT 3 | Representative German OWP Projects Show a Path to an Improved Risk-Return Profile



Sources: Bloomberg; BCG offshore cost and risk models; BCG analysis.
Note: The return and risk calculations of indices are based on performance from 2010 through 2012.
[1]U.S. Private Equity Index.
[2]European Public Real Estate Association/National Association of Real Estate Investment Trusts (Public FTSE EPRA/NAREIT).
[3]Morgan Stanley Capital International Europe, Australasia and Far East index (MSCI EAFE).
[4]UBS Europe Infrastructure (UBS EUR Infra).
[5]J.P. Morgan Government Bond Index, all maturities.

Can New Investors Fill the Gap?

Thus far, utilities have carried the OWP financial burden by shifting substantial amounts of their investment budget toward renewable energies—including OWP. Most utilities invest approximately 20 percent of their budget in renewables; a few "green focused" groups invest as much as 40 percent (excluding hydro power).

As of the end of 2012, utilities had used their balance sheets to finance 77 percent of the €16 billion invested to build the 4.9 GW of installed offshore wind capacity in the EU. The challenge is the additional 35 GW of capacity planned for 2020 and the additional €110 billion in investment that that capacity requires. BCG's analysis of the utilities' balance sheets indicates that utilities will soon be capital constrained given their massive investment programs.

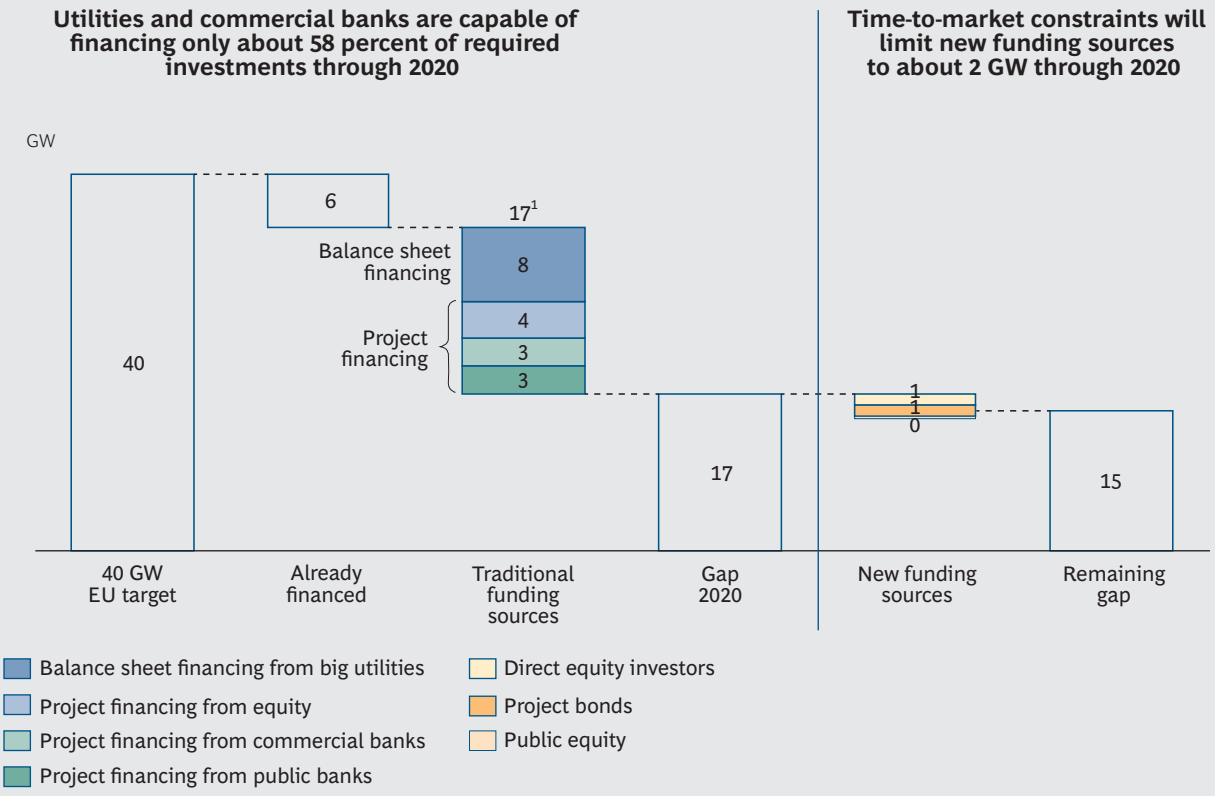
What are the other likely sources of capital? Project financing provided by European commercial and public banks is becoming a viable alternative; however, BCG estimates that the overall funding capability of these banks will be limited to 10 GW through 2020.

As a result of the financial crisis and associated new banking regulations such as Basel III, commercial banks are finding long-term financing less attractive and will seek to limit their "ticket size" in the projects in which they participate. A commercial banker BCG interviewed pointed out: "There is no reason for banks to provide financing over a period of more than five to eight years. Banks should provide their capability to structure finance; institutional investors should provide their money."

BCG estimates that the traditional funding sources—utilities and commercial and public banks—will be able to finance 18 GW through 2020, leaving a financing gap for the remaining 17 GW. (See Exhibit 4.) Can nontraditional funding sources be attracted to fill the gap? BCG estimates that direct equity investors and project bonds will finance another 2 GW. Institutional investors such as pension funds and insurance companies have been allocating increasing amounts of capital toward "alternative investments" such as private equity, infrastructure, and real estate funds that match their long-term liabilities. Consequently, they are good candidates that may see OWP as an emerging asset class.

That said, the risk-return profile of OWP projects does not yet line up to completely meet institutional investors' needs. For example, insurance and pension funds may

EXHIBIT 4 | A Lack of Financing Is Likely to Limit EU Growth to 25 GW Through 2020



Source: BCG analysis.
[1]The numbers in the segments of this bar do not add exactly to this total because of rounding.

be ready to invest in a low-risk phase, such as in parks that already have a proven track record in operational OWP projects or in earlier-stage undertakings if developers can provide viable construction-risk protection. Private-equity funds appear to be willing to take some measure of construction risk. But to accelerate their participation, further overall risk reduction is required, especially considering the significant scale of investment a private-equity firm will need to make to have ownership control in an OWP project. Finally, oil and gas majors, non-EU banks and investors, and sovereign wealth funds may provide financing and, indeed, may see a strategic purpose in doing so, but their participation will likely be limited by higher return expectations or concerns over risk.

There are a number of important reasons for utilities to begin to actively manage the long-term risk profile of their OWP portfolios.

Thus, the financing challenge will take time to resolve because capital is not readily available for a relatively newly emerging "high risk industry," especially in the current macroeconomic climate. The "time to market" for OWP will likely be at least five years; that is how long it will take for the risk-return profile of OWP to become sufficiently attractive and for new capital sources to get comfortable enough to invest at the necessary scale.

Key Industry Stakeholders Should Take Action

Reducing the risk and cost of OWP sufficiently to attract external investors will take a collaborative effort involving three main groups: utilities and their suppliers, financial investors, and governments.

Utilities

Against the backdrop of long-term capital constraints, it is critical for utilities to assess now the risk capacity they expect to have available for OWP through 2020. The risk capacity should be identified by evaluating available capital in the years to come and determining the required risk profile for their portfolio and for specific OWP projects. By quantifying their risk capacity, utilities will be in a better position to influence how much OWP capacity they will be able to finance with their balance sheets.

There are a number of important reasons for utilities to begin to actively manage the long-term risk profile of their OWP portfolios. These include the long-term commitment to each project, the difficulties of adjusting a project's risk profile once the investment decision is made, the need to proactively manage supply chain bottlenecks, and the capital constraints the industry will continue to face.

What are the elements of good risk assessment? It should start with a focus on defining the acceptable risk profile at the portfolio level. The portfolio risk, which is made up of the sum of the risk from independent projects, needs to be carefully evaluated from the perspectives of desired diversification of wind risk (geographic distance of wind parks), government support risk (park locations in different countries), and country-specific elements such as uncertainty related to grid development, harbor availability, and construction logistics.

Importantly, such diversification of the portfolio must be carefully balanced against possible loss of the scale benefits that would be gained from a physically concentrated portfolio or even colocated OWPs, in particular with regard to operating and

maintenance costs. Also, utilities should consider moving early to develop a proven, "integrated" supply chain, either through establishing alliances or partnerships or (as Dong Energy did in A2Sea) taking ownership stakes.

A necessary step to control risk is the use of well-qualified suppliers with a strong track record and solid financials. The complexity of OWP projects requires establishing a "fixed" set of suppliers that become familiar with working together and integral in further reducing risks. Having a "well-oiled installation machine" increases the bankability of projects.

Various kinds of partnerships or shared incentives in contracting models will be required for the industry to move rapidly in this direction. BCG's research indicates that only about half of LCOE reductions come from technology innovation. The other half comes from overall system and supply chain improvements, requiring close collaboration between the various stakeholders in the supply chain.

Risk allocation must be properly allocated between the developer (the utility) and the contractors (including suppliers). What entity is in the best position to manage these risks today and in the future? What is the expected optimal long-term solution? What risks must be removed from the equation for utilities, and how much are they willing to pay suppliers to take over these risks and thereby provide an attractive risk-return balance?

Utilities should consider joint ventures with other utilities to diversify development risk. While this doesn't bring more capital to the industry, it reduces the portfolio risk for each utility, potentially increasing the industry's overall ability to attract capital from other sources. A similar model is used in the oil and gas industry.

At the project level, many factors need to be evaluated and balanced. These include the risk profile of the project as measured by distance from the grid, weather conditions, water depth, and the geology of the sea bed. Choice of technology must be considered as well: newer turbine technologies (direct drive, larger turbines, and so on) may offer better economics (LCOE) but also may have less of a track record and thus represent a bigger risk for turbine failure.

The time lag from investment decision and contracting to completion and proven uptime is lengthy and late-stage changes are difficult to implement, so utilities need to think of their financial and strategic approach well in advance of reaching the limits of their risk capacity. Taking a proactive approach will result in the financing of more OWP capacity than a "step by step" or "wait and see" attitude will.

Those utilities that are best at managing their risk exposure and establishing a track record will capture the bulk of the external capital that becomes available.

Overall, the financing challenge could lead to a situation where those that are best at managing their risk exposure and establishing a track record of successful project execution and operation will capture the bulk of the external capital that becomes available. These utilities will then be positioned to grow at a much faster pace.

Financial Investors

Investors should carefully monitor the track record of both owners (utilities and developers) and suppliers (including OEMs), as well as their collaborations to best

identify where to invest. A good example of a developer strategy that succeeded in attracting external financing is that of Dong Energy, which secured investments from William Demant Invest and Kirkbi in the Borkum Riffgrund 1 project in Germany. The project's key attributes included a location in shallow water, sufficient subsidies, an experienced developer, reliance on turbines from a leading supplier, and a supply chain with a proven track record of successful collaboration. Investors should ask, How can this strategy be replicated at other parks?

Governments have an essential role to play in developing clear rules to ensure a reliable, credible, and efficient investment environment.

An important element for accelerating OWP investment is for financial investors to continue to build and strengthen their in-house OWP analyst teams so that they can quickly and accurately assess the attractiveness and risks of individual projects. Also, the industry's ability to meet governments' renewable targets will require asset managers to continue to push the frontier of larger and more-OWP-focused investment mandates as current infrastructure and renewable-energy funds establish successful track records. Ultimately, this process is likely to result in OWP becoming a recognized asset class on its own. Such progress is typically slow—it takes years for a new asset class to prove its ability to deliver attractive returns, and only then will it properly scale up and attract stable long-term investors.

Governments

Governments have an essential role to play in developing clear rules to ensure a reliable, credible, and efficient investment environment. This will involve facilitating permitting processes that minimize the time and costs related to various licensing processes, providing stable regulation especially with regard to subsidy schemes, and ensuring timely expansion of grid infrastructure. Without these critical first steps, the market will be unable to organize the tremendous amount of resources necessary to meet governments' ambitious targets.

Utilities Must Step Up to Shape a More Attractive Risk-Reward Profile for Investors

The EU OWP targets have the great merit of kick-starting the industry, even though they are likely to prove overly ambitious given the estimated gap of 15 GW between 2020 targets and 2020 estimated installations. The wild card is the timing of new investors' involvement. Only when they gain comfort with the industry's evolving risk-return profile will they increase their investments.

Accelerating investor interest in OWP depends critically on two parties: utilities and governments. The rewards for a productive partnership between the government and industry should be significant: lower-cost renewable energy as well as better competitive positioning for attracting future financing to a growing infrastructure asset class.

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