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Prospects for offshore wind: Lessons from Europe

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North America has been a high growth market for wind energy for much of the past decade. Installations last year were over 5,500 MW. All of that wind capacity was installed onshore. There are offshore projects currently being pursued in the U.S., such as the Cape Wind project off Massachusetts, and the Bluewater Wind project off the coast of Delaware. These projects are still in the early stages. Much of the discussion about offshore wind in North America tends to dismiss the prospects because it is too difficult, too expensive, and too far off in the future.

I recently spoke at the European Wind Energy Association annual conference in Brussels, and as is often the case, learned more than I taught. More than anything else, I was impressed by the significant progress being made in the offshore market in Europe. In this regard, presentations by Jerome Guillet of Dexia and Bo Morup of Vestas were particularly instructive.

The first European offshore wind projects installations occurred in 2000. As recent as three years ago, the offshore market was seen largely as the domain of strong balance sheet utilities who could handle the significant construction and operational issues. It was not seen as a market capable of non recourse project financing any time in the near future. And yet, by last year over 1GW of wind capacity had been installed in the EU and, more importantly two projects had been financed on a non recourse basis. I think that the North American market can take some valuable lessons from the European experience, and might in fact see better prospects for offshore wind.

The EU wind market is undoubtedly robust, with 56,535 MW installed in the EU-27 at the end of 2007. More impressive are the projections of further development through 2030. By that year, wind is projected by EWEA to have installed capacity of 300 GW – 120 MW of which would be offshore. Annual installations are projected at 19,500 MW per year – approximately 46 percent of all new installed generation capacity – and wind would be meeting 20 to 28 percent of the total electricity demand in the twenty seventy countries of the EU. Significantly, for the purposes of this discussion, offshore wind would also be an ever-growing component of the annual installed capacity, equaling onshore in around 2020, and being in the majority of annual installed capacity thereafter.

Offshore wind development and construction issues

There have been real issues in the development and construction of offshore wind projects in Europe, and these same issues will be faced in North America. These include the following.

1. **High capital costs**. Capital costs for all construction projects, including wind projects, have risen over the past few years simply as a function of rising commodity costs. Offshore wind projects have an additional cost burden because there are relatively fewer turbine manufacturers now selling to the offshore market. The volume of production has been low and hence manufacturing scale has not been achieved. Installation costs are also higher than onshore given the logistics of working offshore, including the competition with the offshore oil industry for construction equipment, vessels and personnel. The result is that today the offshore installed cost per MW is estimated by EWEA at 2,300 Euros compared to an onshore cost of 1,300 Euros.
2. **High construction risk.** Compared to an onshore wind project, an offshore project presents a much more complex logistics problem, and a much more challenging work environment. The different competencies and risk profiles of turbine manufacturers and the offshore marine construction industry (there is no entity that under one roof combines the two) has meant that offshore wind projects have been built without turnkey engineering, procurement and construction contracts, but instead have a series of contracts for separate scopes of supply and work. The prevailing wisdom until last year was that this structure mandated an equity only financing by a strong balance sheet sponsor.
3. **Grid interconnection.** Wind projects, whether onshore or offshore, have grid interconnection challenges. Onshore wind projects almost universally face transmission connection and upgrade issues. Regulatory developments at FERC and at the state level (such as the ERCOT CREZ program and the current RETI process in California) are meant to facilitate transmission connections and upgrades for the purpose of promoting renewable energy development. There is, of course, no transmission grid offshore. The cost of building an interconnect from an offshore facility to onshore and then also paying for onshore upgrades can present a crippling capital cost.
4. **Higher availability risk.** The lesson of offshore wind development thus far is that the environment is more hostile than onshore, and the ability to fix a problem is more time consuming and expensive than onshore. Ordinary maintenance costs more; and more significant problems can be much more difficult to fix, with a resulting greater loss of revenue while turbine availability is reduced during the repair period. The long term O&M risk is probably the most challenging issue to resolve because of the lack of a long term track record of offshore operation.

Addressing offshore wind development and construction issues

1. The solution to the capital cost has several elements. One is manufacturing scale as the industry grows. EWEA projects an increase in the onshore/offshore capital cost gap through 2010 and a narrowing thereafter as the offshore market grows and scale is achieved in manufacturing and dedicated watercraft and equipment. Another cost reduction will occur as construction techniques become better over time. Even with those improvements, EWEA projects a persistent higher cost margin for offshore from 2015 to address the very different environments in which off-

shore projects are built. But these environments may create a benefit. Offshore wind capacity can be greater than on shore given the absence of obstructions, among other factors. The strongest wind regions in the U.S., for example, sit offshore. As noted in a study by Vestas, relatively modest increases in wind capacity factor will have a more significant effect on the bottom line of a wind farm than seemingly more significant capital cost increases. Stated differently, better wind data and siting selection can make an offshore wind farm financially successful, even though it has a greater capital cost burden.

2. The construction challenge is being addressed through better contracting and better project management. Offshore projects are being built with separate contracts for supply and construction, with the construction being split again among separate contracts for the onshore work, cable installation, and tower erection. Instead of a "wrap" where one party guarantees the performance of the package, the contractors enter into an interface agreement covering the overall schedule, the interaction among the contractors with detailed hand-off procedures, and the consequences of delays by one contractor on the other contracts. The overall project management approach uses a higher level of float (extra uncommitted time in the project schedule) and a much higher level of detail in the schedule than would be found on an onshore project. Project management also needs to be considered in the initial project site selection and design, taking into account cable routes and design of the electrical infrastructure, design of foundations, number and location of boat landings and crew vessels, and the number and type of vessels for installation and maintenance.

   A major development in the past eighteen months has been the acceptance by project finance lenders of this split contract approach in non recourse project financing of offshore wind projects. In addition to emphasizing the detail of the contracts and the importance of the interface agreement, the lenders have relied on extensive due diligence by their independent engineer on the project schedule, including a heavy focus on downside scenarios of multiple contractor delays and increased costs. To support what might be the worst case scenario for increased construction costs (and/or increased interest costs during delay), the lenders have required a significant contingency (up to 16 percent of capital cost). This contingency is funded from a combination of debt and equity.

3. The interconnection challenge generally cannot be addresses within the confines of a single project's economics. A solution in the UK and Germany has been to improve the procedure of achieving grid connection and to make more of the cost of interconnection pass through to the network and ultimately to rate payers.

4. The long term operation risk is now being addressed with a new class of warranty from offshore manufacturers. The issue to be addressed is the potentially greater impact on availability from a problem with a wind project offshore, given the cost and time necessary to effect a repair. The offshore warranty terms have been developed in the context of recent project financings, and are designed to provide more coverage for debt service for a longer period of time, but with a potential for the turbine vendor to earn bonuses for enhanced performance. The bankable offshore warranty will be for a longer term than an onshore project – five or more years. The availability warranty terms are somewhat similar to onshore contracts, with availability warranted at 90 percent on an annual basis, but the key difference in the offshore warranty is that the penalties paid by the vendor will not kick in until a lower availability level is reached (negotiable, but around 80 percent) in exchange for a much higher cap on damages than is typical for an onshore contract. The vendor may also have a better bonus for high availability. The result is that the vendor carries less financial risk for modest availability shortfall but a heavier burden for a greater shortfall. This structure is really designed to keep the debt service maintained for a longer period (or more significant shortfall) than in an onshore warranty. Equity has less coverage, but benefits from the ability to achieve a project financing, and at a higher leverage ratio, than would be the case without the enhanced turbine warranty.

Moving forward

The evolving solutions to these risks of offshore wind projects has meant that greater non recourse financing is available, in turn meaning that offshore projects can be developed and financed by a broader range of sponsors, and the cost of capital will be reduced as debt replaces equity in the capital structure.

The Q7 project in the Netherlands is a 120 MW project that closed on debt financing in October 2006. C-Power is a 30MW project in Belgium that closed debt financing in May 2007. Dexia and Rabobank arranged the Q7 debt, and Dexia arranged the C-Power debt with Rabobank providing mezzanine debt. The maturities are consistent with the fixed revenue periods of the projects, and the interest rates, while higher than European onshore project financings, are not unremarkable by U.S. standards (margins commence at 125 basis points and 110 basis points respectively). Debt sizing is conservative in using a P90 wind projection for the debt coverage ratio. There clearly are greater contingencies built into the project budgets and financed in part by debt. What is noteworthy, compared to the market just two years ago, is that the challenges of offshore are addressed and the deals closed. That is remarkable progress.

So what are the lessons for North America? While the markets are different, most notably in the great expanse of reasonably good onshore wind regions in the U.S. and Canada, many of the issues are the same as faced in Europe and the solutions reached there can (and should) be the solutions here. That in turn will mean the offshore market here may be able to access capital sooner and at a lower cost than is generally believed. As the European market continues to evolve – with likely improvements in project and debt stricture and pricing, the North American offshore developers will have the opportunity to jump the learning curve cut by the European offshore market. So while there may be some skepticism in North America about the viability of the offshore market here, I say watch for the rapid development of the market on this continent as the offshore developers jump the learning curve cut by their European cousins.

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