

FOR 10 2013

ISSN: 1500-4066

October 2013

Discussion paper

The likely impact of Basel III on a bank's appetite for renewable energy financing

BY

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Abstract

The new Basel III regulations are likely to make long-term financing more expensive, which will affect the financing of capital-intensive renewable energy technologies, because they typically rely on long-term financing. In addition, the capital and liquidity requirements of Basel III are likely to limit the amount of capital available for renewable energy financing from banks in the future. Together, these are threats to renewable energy deployment because limited financing may prevent the financing of some projects and because more expensive loans are likely to make a number of projects uninteresting financially. A potential solution is proposed here, which requires financing capital-intensive energy projects, pooling these investments into a portfolio and selling down the portfolio in tranches to various types of investors. The benefit of this solution for banks is that it will allow them to maintain the financing of capital intensive renewable energy projects, while complying more easily with Basel III.

1. Introduction

In response to the 2007 financial crisis, a new set of financial regulations will be implemented as of 2015 to push banks away from risk. These regulations are known as Basel III. Given the importance of banks in financing renewable energy, it matters to understand how banks will be impacted by these new regulations, especially since these new rules may temper banks' appetite for renewable energy financing in the future (Warren, 2011).

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Excluding large hydro, USD 244 billion were invested globally in renewable energy in 2012 (UNEP/BNEF, 2013). Although this number was down 12% compared to 2011, 2012 was the second year with the highest investment level in renewable energy. Of the total amount, USD 148.5 billion went into utility-scale project asset financing. This type of financing can be divided in three categories; on-balance sheet financing by utilities and large energy companies, bonds and non-recourse project finance. Of these three, on-balance sheet financing clearly dominates the market, whereas the importance of bonds remains limited. The last category: non-recourse project finance accounted for nearly USD 46 billion globally (UNEP/BNEF, 2013), or in other words, to nearly a third of all asset financing. Nearly 90% of the total asset financing is dominated by wind and solar projects (UNEP/BNEF, 2013), two capital-intensive technologies requiring long-term financing.

Non-recourse project finance means that a bank will lend money to a single purpose entity, such as a wind farm, based solely on the revenues generated during the operation of the asset owned by the entity. This type of financing has emerged as a solution for financing large infrastructure projects, including renewable energy utility scale projects, which would otherwise have been too expensive or speculative for a corporate to finance them using its balance sheet (de Jager et al., 2011; Groobey et al., 2010). Project finance pertains to the creation of a project company, which is a legal entity created with the purpose of fulfilling a specific or temporary objective such as the construction and the operation of a single power plant. In addition to moving liabilities off a corporate balance sheet, lenders have limited or no recourse to the parent company in case of default of the project company, thus limiting the parent company's project risk. Non-recourse project finance is of particular interest in this study, because this source of financing is likely to be impacted by the Basel III regulations.

In this study, the emphasis is on the role of banks in providing long-term financing for capital-intensive renewable energy generating technologies. In particular, the possible impact of the Basel III regulations on banks' willingness to invest in capital-intensive renewable energy technologies via project finance will be investigated and an alternative approach for financing renewable energy under Basel III will be proposed.

This study is structured as follows; the characteristics of financing wind and solar compared to financing natural gas are described in section 2. The Basel III regulations and their possible impact on banks' willingness to finance capital-intensive renewable energy technologies are discussed in section 3. An alternative financing approach, useful under Basel III is suggested in section 4, followed by a practical example in section 5. Section 6 concludes.

2. Difference between lending to wind and to natural gas

The fundamental difference between a wind farm and a natural gas power plant lies in the portion of the total costs due to upfront costs (see figure 1). In the case of a wind farm, the investment costs make the quasi-totality of the levelized costs of electricity, whereas these account for only a fifth of a natural gas power plant costs, the rest being mostly related to fuel costs (Timilsina et al., 2012). Moreover, investment costs per MW of a typical natural gas power plant will be roughly half those of a wind farm. The high level of capital intensity and the comparatively high cost per unit of capacity installed, imply that the tenor of a construction loan needs to be significantly longer (10-15 years) for a wind farm than for a natural gas power plant (<10 years).

Fossil-based power plants require fuel in order to generate electricity, whereas renewable technologies do not, with the exception of bio-energy. Consequently, working capital loans may be necessary for a natural gas power plant to purchase fuel, when the need for such loan in the case of a wind farm is limited. Future fossil-fuel prices are uncertain and depend on a number of factors, including national environmental regulations, global supply and demand, the emergence of substitutes¹ and the cost of extracting the resource. Renewable electricity generating technologies such as wind and solar power face no uncertainty in the future cost of their primary resource, although fluctuations in wind patterns and solar irradiation levels can affect the output of these technologies.

In addition, fossil-based power plants can rely on a long track record to prove that the risk of technological failure is minimal. Track records are shorter for less mature technologies such

¹For example, shale gas is a substitute to natural gas.

as wind power and especially for solar power. This means that these intermittent electricity generating technologies are more likely to suffer failures than more mature technologies, which heightens the risk that the lender will not recover its investment.

Both renewable- and fossil-based technologies eventually feed electricity into the grid. However, the cost of renewable technologies such as wind or solar power is generally more expensive than the cost of conventional fossil-based power plants. In order to facilitate the deployment of these technologies, over hundred countries have implemented some type of policy instruments leading to preferential treatment (REN21, 2012). These policy instruments include, among others, feed-in tariffs and tradable certificates which aims at making renewable energy more attractive towards potential lenders. Of these policy instruments, feed-in tariffs are the preferred instrument of lenders (Menanteau et al., 2003) because sales of electricity are guaranteed at a given price for a set duration of time, thus suppressing a category of risk.

The cost and loan profiles per megawatt of installed capacity for a particular natural gas power plant and a particular wind farm are illustrated in figure 1. In order to create this figure, a debt equity ratio of 70:30² is assumed as the funding mix of both technologies. The 70% is provided under the form of a construction loan. At the end of the construction period, the construction loan is converted into a term loan, which is repaid within seven years in the case of the natural gas power plant and fifteen years in the case of the wind farm. A working capital loan equivalent to 10% of the total cost of the plant is made available to the natural gas power station for the first six years of operation. This revolving loan can be used by the natural gas power station to purchase its feedstock. Interests and discount rates are left aside of this example and future natural gas prices are held constant for simplification purposes.

In summary, capital intensive renewable energy projects have shorter proven track records, higher capital costs and require long-term loans. However, their main advantage over technologies relying on fossil fuels is that there is no uncertainty in the future cost of a resource

²Construction loan of 70% and 30% being equity.

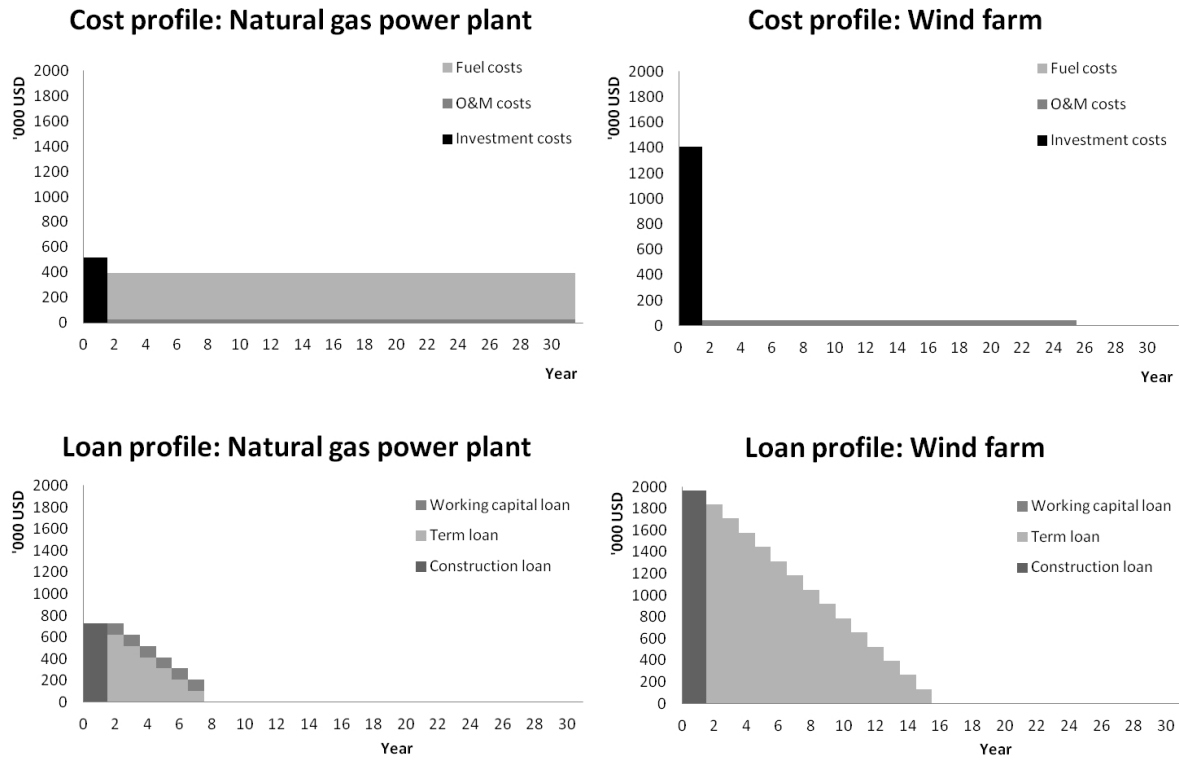


Figure 1: Cost and loan profile per MW of installed capacity for a natural gas power plant and a wind farm.

and requirements for working capital are limited. The implication of this section is that different energy technologies have different inherent characteristics. Therefore, two technologies may be impacted differently by new rules, thus providing ground for this study. The capital intensity of some technologies makes them particularly sensitive to regulations affecting the cost of borrowing and as this study will show, Basel III is likely to result in higher borrowing costs.

3. Basel III accords and implications

Banks failed to absorb systemic trading and credit losses (BCBS, 2011) during the 2007-2009 financial crisis, due to an insufficient capital base. This situation led the Basel Committee on Banking Supervision to edit new and strengthened existing standards that banks will need to comply with in the upcoming years. In an effort of promoting a more resilient banking

sector, minimum requirements on the quantity of common shares and retained earnings in relation to risk-weighted assets are imposed and two liquidity ratios will be introduced in the years to come: the Liquidity Coverage Ratio and the Net Stable Funding Ratio. These ratios address short-term and long-term financing issues respectively (BCBS, 2011).

3.1. Liquidity coverage ratio

The aim of the liquidity coverage ratio is to promote short-term resilience to potential liquidity disruptions (BCBS, 2013). This ratio ensures that the stock of unencumbered high quality assets that can be converted into cash is sufficient to cover the bank's liquidity needs for 30 calendar days under a predefined short-term stress scenario. The metric behind the liquidity coverage ratio is reproduced below:

$$\frac{\text{Stock of high quality liquid assets}}{\text{Net cash outflows over a 30 days period}} \geq 60\% \quad (1)$$

This ratio will become a minimum requirement from January 2015 onwards and it will be increased by 10% annually until January 2019 (BCBS, 2013). Cash, central bank reserves and high quality marketable securities which are assigned a 0% risk-weight under the Basel II Standardized Approach for credit risk, are the principal high quality liquid assets. These assets have the common advantage of being easily and immediately converted into cash in short-term stress periods at little or no loss of value. Thus, these assets have the potential to guarantee a bank's liquidity needs in short-term stress periods.

Net cash outflows are cash outflows net of cash inflows over a 30-days period. Cash outflows are subject to run-off rates, while cash inflows are subject to hair-cut rates. Under the liquidity coverage ratio, cash inflows are capped to 75% to ensure that banks retain a minimum level of high quality liquid assets compared to their total net cash outflows.

For the bank, funding capital-intensive renewable energy projects might become less interesting when the liquidity coverage ratio enters into force. First of all, holding such energy assets will not help a bank to improve its stock of high quality liquid assets because capital intensive renewable energy projects funded through project finance or special purpose vehicles do not qualify as such. Second, this type of projects does not receive any preferential

treatment. Under the stress scenario, a drawdown rate of 100% on the undrawn portion of liquidity facilities to special purpose vehicle has to be used. Consequently, investing in capital intensive renewable energy projects through project finance and special purpose vehicles worsen the bank's liquidity coverage ratio as long as liquidity facilities are made available (e.g.: during the construction phase), simply because it strengthens the denominator, while the numerator remains untouched. Renewable energy financing will thus force banks to hold a given quantity of high quality liquid assets on their balance-sheet. Holding these assets comes at a cost (D'Olier-Lees, 2011) and therefore, the cost of lending money is likely to increase in the future as a response to this ratio. Eventually, this increase in cost will be passed onto the borrowers through an increase in interest rates (Lowder, 2012), making financing via banks less attractive for capital intensive renewable energy project owners. Capital intensive energy technologies will particularly suffer because of their need for a comparatively large amount of capital prior to the commissioning of the plant.

Recent studies from the European Banking Authority and the Basel Committee on Banking Supervision found that banks are between EUR 1,000 bn and EUR 1,730 bn short of complying with the full liquidity target (Winkler, 2012). In order to comply with the minimum requirement, banks can either choose to increase their high quality liquid assets holdings, scale back their business activities that are most vulnerable to a short-term liquidity shock or prolong the terms of liabilities beyond the 30 days period (Winkler, 2012). The gradual phase-in of the ratio decided in January 2013³ will ease the burden of banks in meeting with the target, although European banks will still have to build up a significant amount of cash buffers to cope with their liquidity concerns, which are greater than in other parts of the world (Jones, 2013).

Investigating these solutions from a renewable energy perspective indicates that if the demand for high quality liquid assets increases, the amount of capital available for financing renewable energy projects will be reduced since these do not qualify as high quality liquid assets. Scaling back business activities would also contribute to the shrinkage of the capital

³In a former version, the liquidity coverage ratio was supposed to enter into force in full as of January 2015.

available for capital-intensive renewable energy financing.

In summary, the liquidity coverage ratio is likely to reduce the amount of capital available for financing renewable energy projects and might lead to higher interest rates. This obviously is a threat against the development of capital intensive renewable energy via financing from banks in the future.

3.2. Net stable funding ratio

The net stable funding ratio aims at limiting a bank's reliance on short-term funding to finance its operations (Winkler, 2012). Practically, the net stable funding ratio ensures that the bank holds enough stable funding in relation to the liquidity risk profile of its assets over a one-year horizon (BCBS, 2011). The net stable funding ratio will become a minimum requirement in January 2018. The preliminary new liquidity ratio metric (BCBS, 2010) is reproduced below:

$$\frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} > 100\% \quad (2)$$

A bank's weighted capital, preferred stocks and liabilities with maturities of at least one year are examples of funding deemed to be available and stable. The amount of stable funding required depends on the characteristics of an asset and each asset will be assigned a required stable funding factor, which is in proportion to the expected liquidity and availability of an asset in a stressed environment. The less liquid and less available an asset is in a stressed environment, the more stable funding is required. Energy technologies financed via project finance have a required stable funding factor of 100%. This ratio ties up the capital to match assets with a maturity of over a year with liabilities with a maturity of over a year as well. It means that in order to finance a renewable energy project for over one year, a bank will be requested to maintain stable funding for at least the same duration of time in order to back the loan (Lowder, 2012; Watson, 2012). The cost of holding this amount of stable funding in order to guarantee a sufficient level of liquidity over the period of one year in case of operations related to renewable energy might become prohibitively expensive in the long-term, which may imply that banks will want faster repayment (Carr, 2012). It is believed

by some (Eckhardt, 2012) that long-term capital loans will not exceed seven years in the future, which falls short of the 10 to 15 years financing needed to support most renewable energy projects. This duration of time is however sufficient for natural gas power plants. Therefore, and similar to the case of the liquidity coverage ratio, the inherent characteristics of capital intensive renewable energy technologies puts them at a disadvantage.

Perhaps as a result of Basel III, banks increasingly turned towards mini-perms to finance capital intensive renewable energy technologies until recently when they revert back to project financing. Mini-perms are short-term lending facilities, which assume a partial repayment of a debt over a limited period of time (5-7 years) after which refinancing needs to take place. This need is triggered either by a steep increase in interest scheduled to take place at maturity (soft mini-perm) or by the conditions that without refinancing before maturity, it leads to default (hard mini-perm).

Overall, Basel III could tighten banks' provision of long-term finance (Kaminker, 2012) or result in increased interest rates compared to a Basel III-free situation. Either of these changes are unlikely to deter investment in very profitable capital-intensive renewable energy projects (e.g.: those that benefit from very favorable feed-in tariffs or that show a high debt coverage ratio), although it will make them marginally less profitable. At the margin, some projects might become unprofitable and will therefore not be financed. This will result in less renewable energy capacity installed at the time when a large investment in these technologies is needed in order for the European Union to reach its renewable energy target. It is important to stress the marginal impact of Basel III, because changes in energy policies, technological progress improving the competitiveness of a technology or a surge in fossil-fuel prices all are example of shocks which have a potential to completely change the level of investment of any specific energy technology.

4. Alternative financing approach

The emphasis in this section is on exploring a solution which would allow banks to keep investing in renewable energy while offloading their balance-sheet and thus not worsen their liquidity coverage and net stable funding ratios.

The solution proposed here is for banks to provide loan to renewable energy projects structured as project financing. Several loans could then be pooled to form a portfolio of renewable energy projects, which would be tranching in order to make it attractive to a variety of investors in order to transfer the risk and the assets from a bank's balance sheet to investors. Such investors could include pension funds and socially responsible investors.

Pension funds, e.g.: the Norwegian Government Pension Fund, are looking for steady, inflation adjusted income streams (Croce, 2011) and in this respect, investing in wind and solar power is interesting as these will be in operation for over 20 years and as they will yield steady returns over that time period. Yet, few pension funds have been significantly involved in renewable energy financing so far, perhaps because of a lack of expertise or perhaps most likely, because of a mismatch between risk and return (Croce, 2011) on renewable energy investments and due to a lack of appropriate investment vehicles (Kaminker, 2012).

Taking this mismatch into account, a first tranche of a bank's portfolio could be a bond-like vehicle secured on a number of renewable energy projects, yielding an interesting return for pension funds for a corresponding level of risk. Repayment terms would be contractually set at issuance. This type of products is likely to be of interest to pension funds.

Socially responsible investors are investors who care about environmental issues. It seems that the amount of money that banks could tap into if they were to offer a product allowing socially responsible investors to invest into renewable energy is fairly large. For example, Mosaic in the USA raised USD 3.8 million from crowd funding and the company is investing this capital in solar energy projects with internal rate of return between 4 and 6%. The World Bank has raised over USD 4 billion in Green Bonds since 2008. The maturity of the bonds ranges from five to ten years with a yield from 0.375% to 10%⁴. Zouk Capital created a fund worth EUR 230 million, which primarily invests in renewable energy projects (UNEP/BNEF, 2013). A product, which may attract socially responsible investors is another bond-like vehicle linked to the performance of the project, allowing private investors to benefit from some of the government support towards renewable energy. This vehicle would

⁴High yields are valid for bonds labeled in currencies subject to high inflation rates.

Total cost	USD 25.8 mio.
Installed capacity	11.5 MW
Debt equity mix ¹	70/30
Debt interest rate ¹	6%
O&M costs ¹	1.2 US cent/kWh
Capacity factor ¹	36%
Feed-in tariff	6.65 US cent/kWh

Table 1: Data related to the *Ardoch and Over Enoch* wind farm. ¹ estimated.

yield comparatively higher returns for a more than proportional risk compared to bonds for pension funds.

5. Practical example

An example is proposed to illustrate how a project could be tranching and sold to different groups of investors. The following practical example is based on the data available for the *Ardoch and Over Enoch* wind farm planned to come online in October 2014. Each unit of electricity generated by this wind farm will be remunerated at an inflation-adjusted rate of 6.65 US cent/kWh for the first 20 years of operation. This feed-in tariff is valuable since it suppresses one category of risk, namely the uncertainty in future electricity prices. Consequently, fluctuations in wind conditions become the main source of risk as wind fluctuations will influence the quantity of electricity generated, hence the revenues. Key data used for this example is summarized in table 1.

With a 70:30 debt equity mix, this 11.5 MW wind farm is able to borrow USD 18.6 millions. In addition to this loan, the deal includes working capital and debt coverage reserves facilities. These are omitted in this example. The conditions of the debt include repayment over 15 years and an interest rate of 6%. Revenues can be estimated by combining the installed capacity, the capacity factor and the feed-in tariff. These revenues are needed to service the debt, cover the operation and maintenance costs of the wind farm and generate a return

for the plant owner (see figure 2). If the assumptions are correct⁵, the owner of the plant will achieve a return over investment (ROI) of approximately 75%, which is equivalent to an annualized ROI of 2.7%.

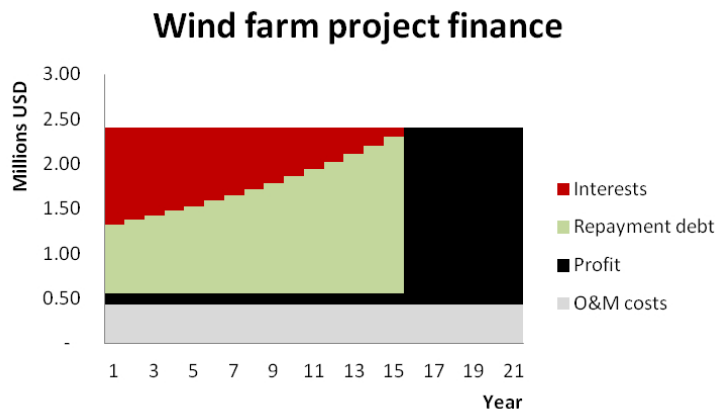


Figure 2: Revenue allocation for the *Ardoch and Over Enoch* wind farm over its economic plant life.

Financing this type of project under Basel III means that the conditions faced by the borrower may worsen. In this special example, an extra 0.5% in the interest rate would make the project uninteresting financially as the cash flow would not suffice to service the debt and cover the O&M costs.

As suggested earlier, the bank may choose to provide a construction loan to the wind farm developer and once the wind farm is commissioned, sell-down the debt instead of keeping the asset on its balance-sheet. If this debt is to be sold to private investors, it is useful to know what type of yield investors are expecting for a given risk.

Figure 3 shows an estimate of the relationship between risk and yield in Norway. This figure shows seven data points. Each data point represents the average of the standard deviation over the last three years of all Nordea funds falling under one of the seven categories of risk as defined by Nordea, compared to the average annualized yield over the same period of

⁵Inflation is omitted and since the feed-in tariff is inflation-adjusted, whereas the rate of interest is stable, inflation will improve the ROI of the plant owner and clearly improve the debt coverage ratio of the plant.

time as of September 2013. The trend is a forced linear fit, which is used to estimate what type of yield an investor wants for a given risk.

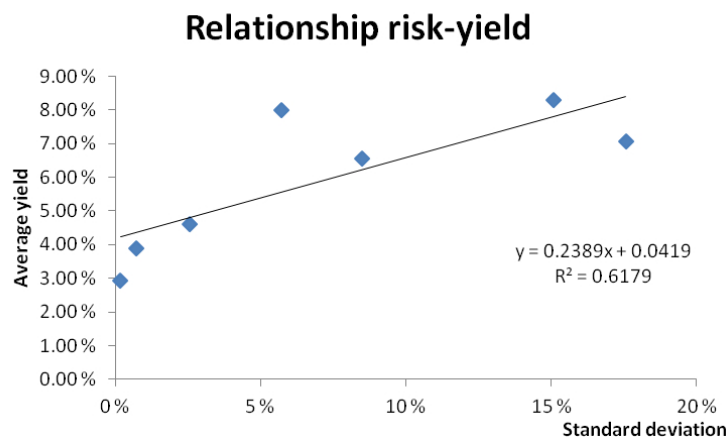


Figure 3: Cost and loan profile per MW of installed capacity for a natural gas power plant and a wind farm.

This example assumes that revenues will be stable over time, which implicitly means that variations in annual mean wind speed are ignored. In practice, the annual mean wind speed at a location is likely to vary over the years, which will affect the number of full load hours of a wind farm and hence, the annual revenues of the wind farm. The wind farm used in this example has an estimated capacity factor of 36%, which corresponds to 3,150 full load hours. In average, the standard deviation in year to year mean wind speed for such a wind farm amounts to 200 full-load hours per year (Green, 2012), which corresponds to a standard deviation of 6%.

Using the linear relationship between risk and yield, private investors would require a yield of 5.6% for investing in the wind farm, provided that all the risk is related to wind variation. Yet, selling down the debt to private investors seems to make sense in this case. However, the base of investors may be limited; in which case reaching out to several categories of investors becomes valuable. For example, if at least 2,750 full load hours are “guaranteed”⁶, a first tranche of the debt, perhaps up to 60% of the debt could be sold down to interested

⁶Two standard deviations from 3,150 full load hours indicates that 2,750 full load hours can be guaranteed in 95% of the years.

pension funds. Standard deviation of wind conditions on this tranche is low and yield needs not be huge (in the range of 4%). The rest could be sold to private investors, which means that 40% of the debt would need to bare most of the risk related to variations in annual mean wind speed. For this second tranche of the debt, the risk would amount to:

$$200 / (0.4 \cdot 3150) \approx 16\%$$

and the corresponding yield is 7.8%. One of the benefits for a private investor to hold such type of asset is that the yield depends on wind, which is uncorrelated to the economic situation, thus allowing an investor to diversify his portfolio. For the project, debt could consequently be obtained at a rate of:

$$(0.6 \cdot 0.04) + (0.4 \cdot 0.078) = 5.5\%$$

to which other risks (i.e.: construction, operational and policy risks) and fees perceived by the bank managing the project need to be added. Now, pooling together the debt provided to a number of wind farms and solar projects could reduce the risk related to wind variations and other categories significantly, as well as increase the liquidity of the asset.

The example provided here is intentionally simplistic since only one category of risk is considered. Yet, it shows that this type of approach should be implementable in practice. The benefit of this approach is that a parent company can still offload the risk associated to a wind farm or a solar power plant similarly to a case where a project is financed via project finance. Banks benefit from this approach because it will allow them to comply more easily with the new Basel III requirements⁷. Private investors benefit from this approach because they get access to a type of asset which will greatly help them diversify their portfolio.

A threat to this type of approach is whether pension funds will be subject to Solvency II like regulations, which might be the case in the future, although how the regulations will be shaped is uncertain. Another challenge would be to generate a bond that is large enough to reach an institutional investment grade level. Finally, ownership of the underlying asset in case of default would obviously need to be clarified.

⁷In terms of the LCR, the NFSR and the new leverage ratio, which sets a limit to the amount of assets and commitments a bank can possess with respect to its Tier 1 capital.

6. Conclusion

Basel III is likely to reduce banks' appetite for renewable energy financing via project finance. This result is due to two distinct aspects. First, long-term financing is likely to become more expensive because of the newly introduced *Liquidity coverage ratio* and *Net stable funding ratio*. Second, new capital requirements mean that banks will have less funds to invest in illiquid assets. In particular, Basel III is likely to hit capital-intensive renewable energy technologies harder than other technologies, because of their inherent characteristics.

With Basel III, banks will need to be creative to find ways to finance capital-intensive renewable energy technologies. A possible approach is suggested in this study, where a bank would provide loans to capital-intensive renewable energy projects, pool these loans, tranch them and sell them down to various groups of investors. This approach would have the benefit of taking the risk off a bank's balance sheet and thus facilitate a bank's compliance with Basel III, while allowing the bank to keep investing in capital-intensive renewable energy technologies.

Acknowledgement

The author wishes to thank Einar Kilde Evensen, Per Aage Jacobsen, Aksel Mjøs and Gunnar S. Eskeland for their valuable input. All opinions expressed in this study are solely those of the author.

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