MOODY'S ANALYTICS

Credit Risk Management for Renewables Energy Project Finance

Global resources are finite – but human resourcefulness is not. Renewable sources of energy are steadily increasing their share of the world's energy market, creating a wide range of project finance opportunities, each of which must be carefully evaluated. This article examines these energy technologies and presents a methodology for assessing the associated credit risks.

The state of the global renewable energy market

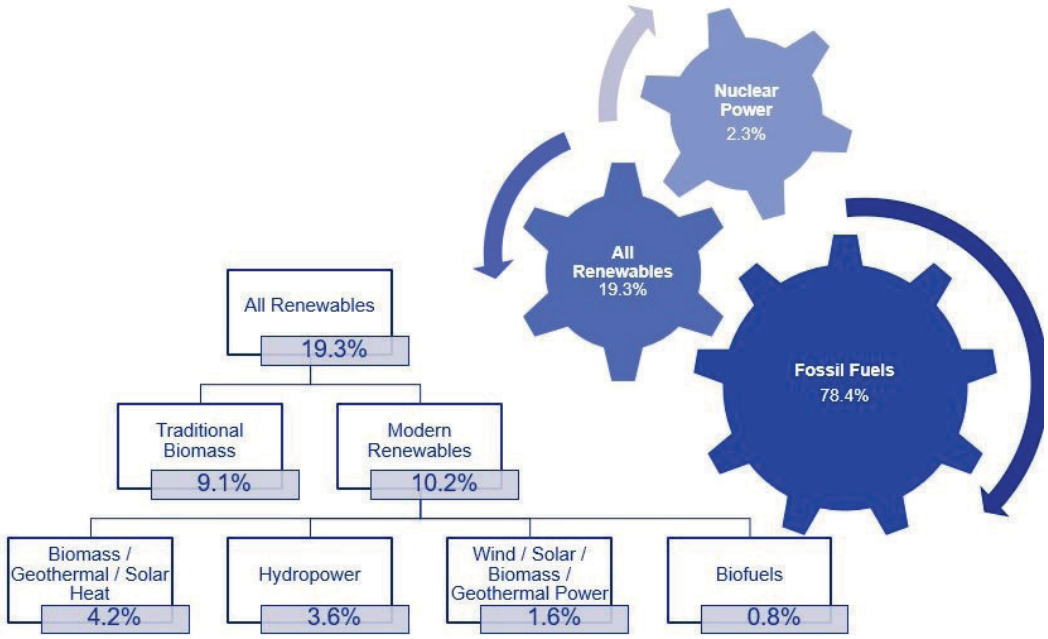
Renewable energy sources account for approximately one-fifth of global energy consumption according to REN21, the global renewable energy policy network (Figure 1).

The main growth area is modern renewables, which now account for 10.2% of global energy consumption – and the trend continues upwards. Wind and solar energy sources represent a still small, but significant and rapidly growing share of the market. The Paris climate accord, in which the global community undertook to take appropriate actions to mitigate greenhouse gas emissions caused largely by fossil fuels, is driving further investments in renewables. In fact, these now exceed investments in other forms of power generation. In 2003, global investment in renewable energy stood at US$39.5 billion; in 2016 it was US$241.6 billion.

Of the mainstream renewable energy technologies, there is a slowdown in the growth of new hydropower capacity (currently 1096 GW) but plant modernization is a major driver of new orders in many regions, with the use of multiple turbines in place of fewer large ones requiring different technology, materials, and expertise.

Wind power (currently 487 GW capacity) has benefited from lower construction costs and technological advances and is now in line with fossil fuels in terms of cost-competitiveness. According to a 2011 projection by the International Energy Agency (IEA) solar power generators may produce most of the world's electric energy within 50 years (current capacity: 303 GW). China continues to lead new capacity growth.

Figure 1: Market shares of respective renewable energy sectors.



Modern biomass and biofuels such as ethanol (113 GW capacity) use technologies that are not exclusive to renewables and face difficult regulations as a result of rising concerns about the sustainability of this energy source. Although the resource is widely available it faces serious technical hurdles in many geographies and current capacity is a mere 13 GW.

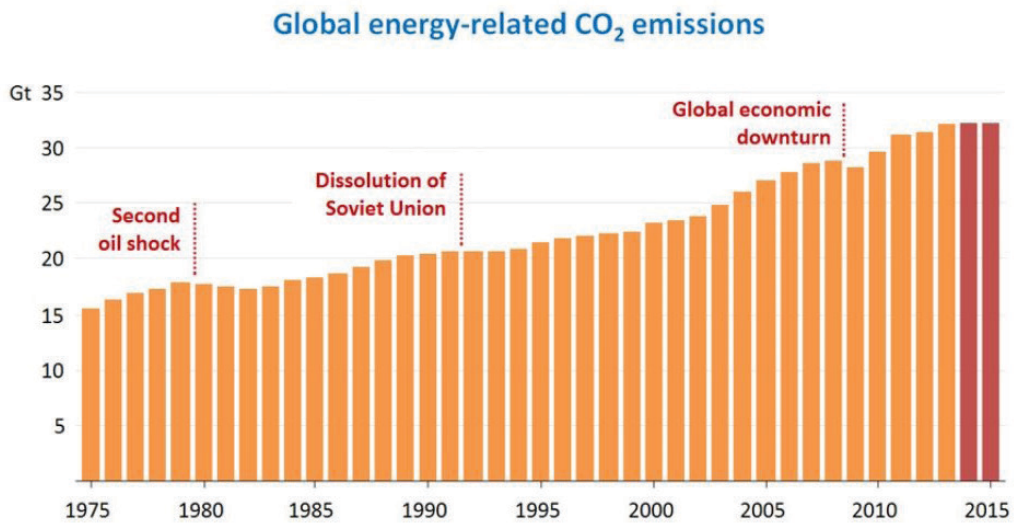
Despite these challenges, with the growth in renewable energy sources (together with improvements in energy efficiency) we are finally seeing a de-coupling of economic growth and energy-related CO2 emissions. According to the International Energy Agency (see Figure 2) global emissions of carbon dioxide stood at 32.1 billion tonnes in 2015, having remained essentially flat since 2013.

Fundamentals of Credit Risk Management for Project Finance

If we look at the overall picture, there is plenty of scope for developing the sectors that are both technologically advanced and genuinely sustainable. Governments are keen to give their backing to projects. But creditors and investors face a lot of tough decisions. They commonly face the following challenges when assessing any infrastructure initiatives:

- Evaluating a counterparty with limited information and insight, especially for private deals where public information is not accessible;
- Limited access to data and the absence of standardized lending processes;

Figure 2: Growth in emissions has been essentially flat since 2013.



Progress in the power sector, where government support has been focused, is significantly outpacing that in the heating/cooling and transport sectors. Investments in renewable power (primarily solar and wind) are now more than double investments in fossil fuels, a gap that is expected to widen, not least because dramatic declines in the price of several renewable energy technologies are making them more competitive. There is an increasing emphasis on systems for enabling and integrating renewable sources, such as storage and distribution infrastructures.

Developing countries are aggressively investing in renewable energy capacity, which reflects the priorities of government policies: distributed renewable energy projects are crucial for expanding access to electricity in poor regions.

- Obtaining effective early warning indications of a credit event, the ability to look ahead and respond in a timely manner to changes in your credit risk profile;
- Documenting processes and procedures to reflect risk exposures in the portfolio and meet new regulatory requirements to do so;
- Monitoring exposures and managing portfolios in a consistent manner; and
- Using credit risk analytics to inform other decisions such as pricing, setting credit limits, and allowance reserves accurately.

These challenges are often exacerbated when assessing project finance deals for renewable energy projects, where investments are typically very large. For one thing, the relatively

the market seeking higher yields and offering new instruments. These new investors, who are not as knowledgeable about project finance, demand experience and proven solutions to compensate for their initial lack of in-house experience and tools. With this increase in market competition, it is essential to price deals for risk correctly, and this calls for granular and robust assessment of the two main risk factors: first the likelihood that a project will default on its obligations – probability of default (PD). And secondly, what losses will the lender incur if the project does default – loss given default (LGD).

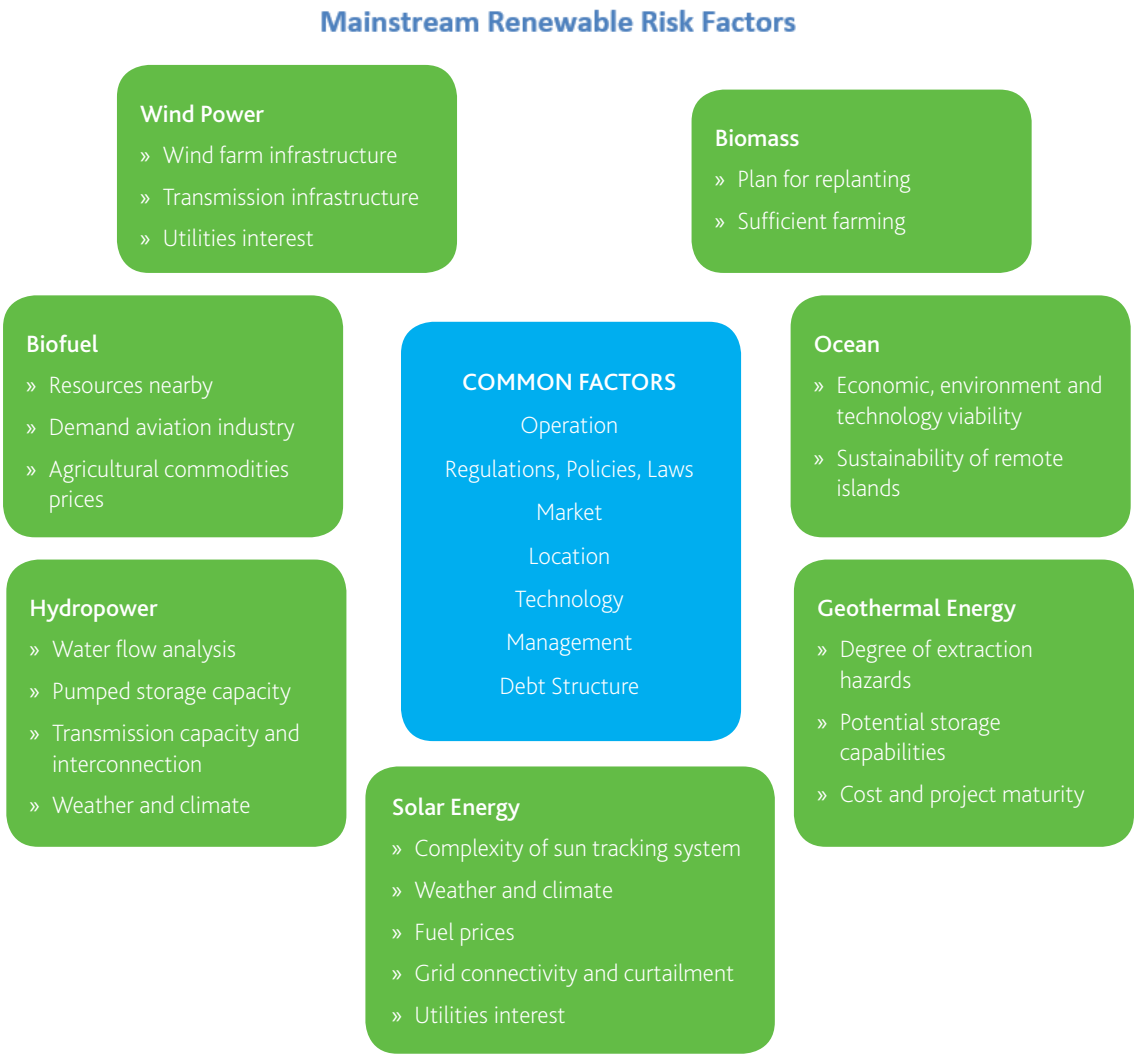
Additionally, any of these risks could trigger a default event (though some of these may be considered more technical defaults and would not necessarily result in default and losses).

- failure to make payments under the terms of the agreement;
- failure by the project finance company to fulfill any of its covenants or undertakings under the finance documentation;
- changes of ownership or control of the project finance company prior to an agreed date;
- insufficient funding remaining to complete construction of the project: revocation of the permit or license;
- default by any of the other parties under a project contract.

Common Risk Drivers

Each type of renewable energy technology and each project will need to be evaluated on its own merits, but there is a common set of credit risk drivers that apply across all the renewable energy sub-sectors (see Figure 3). These include operational risk, the regulatory environment, the competitiveness of the market in which the project operates, geographical conditions and how these impact production capacity, and the experience and management structure of the project team. Technological considerations are particularly important in assessing risk in the renewables industry because of constant innovation and

Figure 3: Common core and sector-specific risk factors to be assessed.



refinement of existing technologies and the resulting questions surrounding their efficacy and reliability. Finally, the ability to cover principal and interest obligations based on the cash flow profile of the project, such as the debt structure, must be assessed.

The slotting criteria for specialized lending set out in Basel III lay particular emphasis on financial strength, with a number of quantitative and qualitative metrics covering financial ratios, market conditions, stress analysis and financial structure. There is also emphasis on the political and legal environment, including risk of force majeure, government commitment to the project and the legal framework within the jurisdiction of the project (for example, enforceability of contracts and security of collateral protection).

Best Practices & Tools for Project Finance Credit Risk Management

Tools and methodologies already exist for lenders to conduct a rigorous internal assessment of a project finance deal. A robust project finance credit risk tool rests on the following pillars:

- Default and recovery data – either internal or provided by external ratings agencies – that can be used to calibrate PD and LGD models empirically
- Comprehensive experience of the industry leaders, for example from relevant professional associations and internal teams in assessing project finance projects to developing and using the appropriate credit risk frameworks
- Predictive analytical models that are tested for predictability against project finance data and/or external ratings of the various asset classes
- Precise capital and pricing requirements giving you the ability both to meet the applicable regulatory requirements (e.g. Basel internal ratings based calculations, IRB) and to optimize capital, increase profitability, and generate more project finance business

Data determines the right approach

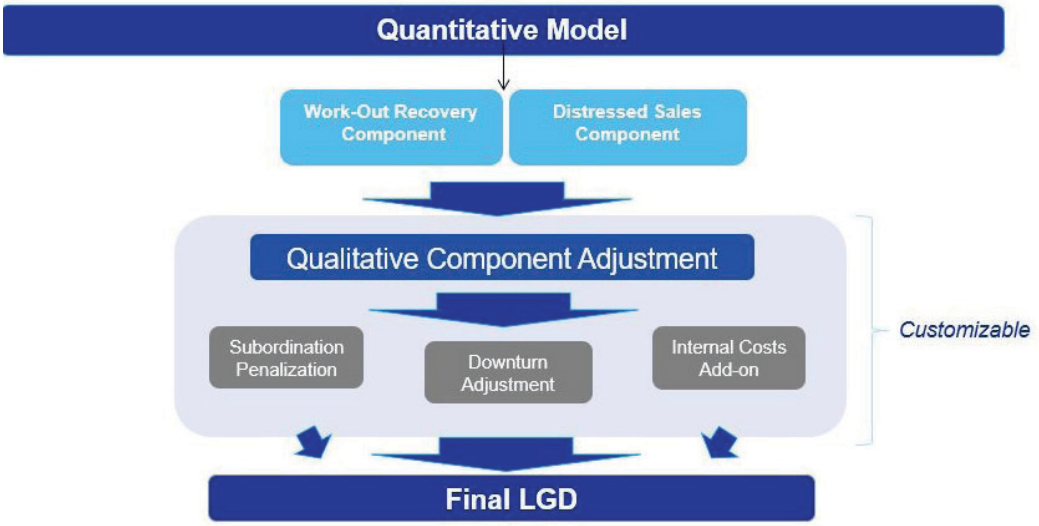
Selecting the right approach to PD and LGD modeling largely depends on the amount of existing data and your organization's experience. If you have no data and limited experience you will need to take an "off the shelf" approach. The advantage is that it will be easy to implement and aligned with the available public ratings. The downside, of course, is that this will not necessarily be aligned to your portfolio. If you have a limited amount of data and relevant experience you will be able to take a "localization" approach, which will allow light customization of your models to fit portfolio and internal practices, which can then be tested against public ratings.

With relevant data and experience available, you will be able to customize scorecards fully with statistical optimization to fit internal experience and portfolio characteristics. It is vitally important for any organization that is getting into project finance to make data collection part of its day-to-day practice.

Renewables PD risk factors

A renewable energy project finance credit risk scorecard will assess probability of default factors for any asset class under

Figure 4: project finance LGD model structure.



three sections: Qualitative Section, Quantitative Section, and Notching Factors. To give a few examples:

QUALITATIVE:

These include the predictability of cash flows, regulatory risks, political risks, technology track record, operational risks, and the track record of the project sponsor(s). By definition, these will vary enormously from project to project and there is a high degree of subjectivity.

QUANTITATIVE:

There are a number of key quantitative factors to consider. First, consider the debt service coverage ratio, such as the ability of the project finance company to meet its debt obligations. You should also consider break-even or stress-test analysis, for example "what -if" analyses of different scenarios, including costs going up or revenues going down. Finally, think through liquidity, for example what happens in the event of project disruptions resulting in delays that impact the available funds for project completion.

NOTCHING FACTORS:

This refers to factors that can notch the PD up or down, including strength of structuring, refinancing risk, construction risk, termination payment, and capital expenditure management.

Renewables LGD risk factors

Two components matter from a loss given default standpoint (Figure 4): a quantitative model and an expert view. The quantitative model must be developed using the data available, for example data sets from a project finance consortium. The expert view helps capture other relevant risk drivers that cannot be easily quantified, and increases the level of granularity of the measure. On the quantitative side the model estimates the expected level of losses based on intuitive regression analysis. It should include two main scenarios in order to give a comprehensive view: the default in work-out component and the distressed sales component. Average ultimate recovery rates realized through a work-out process substantially exceed average recovery rates achieved through distressed sale exits. This effect has a regional differentiation. The qualitative component adjustment then includes factors that are not available in the database, such as technology risk, the legal framework, the strategic importance of the project, and its competitive positioning.

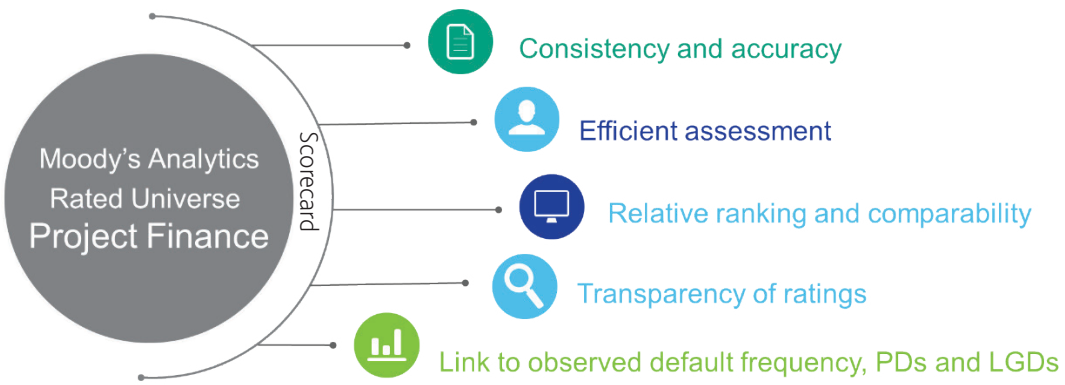
Conclusion

Increasing investment in renewable energy requires the identification, evaluation, and monitoring of credit risk in project finance investments. The diversity of renewable energy resources and countries investing in renewable energy (including developing countries) drives the need for detailed analysis and a standardized approach, as each has differing risk factors, political risks, and market dynamics.

Changes in political risks (such as the Paris Accord on climate change) and growing uncertainty further accentuates the need for transparent investment analysis. Renewable energy companies and investment projects typically have high volatility in terms of returns on investment, hence the need for standardized credit risk metrics, particularly probability of default (PD) and loss given default (LGD).

A best practice credit risk solution includes diverse and robust data sets and combines quantitative (empirically proven) and qualitative (expert-based) methodologies. Project finance credit risk management practices should be consistent through periods of stability and volatility.

Figure 5: Moody's Analytics Project Finance Consortium



THE PROJECT FINANCE CONSORTIUM

The Project Finance Consortium is driven by Moody's Analytics. It is the largest project finance database in the world, with data on 7, 052 projects representing 63.6% of all project finance transactions originated worldwide over a 33-year period January 1983 to December 2016. Around 43% of these projects are in the energy sector. The database includes 510 defaulted projects, based on Basel II criteria; 242 ultimate recoveries, 51 distressed sales and 217 defaults in work-out.

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