Is Belgium Overshooting in its Policy Support to Cut the Cost of Capital of Renewable Sources of Energy?

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April 2015

ECARES working paper 2015-13
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Abstract
The main purpose of this paper is to document the differences in the cost of capital in Belgium across electricity generation companies, depending on whether they rely on traditional thermal sources or on RES. The average results are quite surprising and in sharp contrast with the results obtained for the UK or Germany by other researchers for instance. Comparing 3 main categories (renewable, non-renewable and mixed), the Non-Renewable appear to have a lower CoC than the other in contrast to what the literature suggests should be expected. The Vanilla CoC for the RES of our sample show lower CoC levels by around 30bps than for non-RES. The conclusion is the same from the analysis of the Pre-tax WACC. We take this as evidence that Belgium may have overshot in its efforts to stimulate investment to increase the relative importance of renewable energy sources, at least until the reduction in these efforts started in 2013.
1. Introduction

An increasing concern for environmental issues, and particularly climate changes, has encouraged many European countries to take actions and introduce ambitious targets to increase the share of renewables in the sources of energy they rely on. Due to the current lower cost-effectiveness of renewable energy technology (RET) compared to conventional power plants, member states put in place a wide range of incentive schemes designed to change the relative return on renewable energy sources (RES) and speed up their overall deployment through private investments.

This concern has also been built-in Belgium’s energy policy. The country relies largely on a quota-based mechanism. Electricity suppliers need to demonstrate that a minimum share of the electricity they provide to the end consumers is recognized as green or from RES (“the minimum renewable energy requirements”). The verification that this minimum is achieved goes through the award of “green” certificates to the electricity suppliers.\(^1\) The implementation of this regulation is in theory shared between the federal and the regional governments but, in practice, renewable energy is, de facto, now a regional policy in Belgium, except for offshore wind power and hydro power which depend on national regulations.

Each region has established its own system and some differences across regions are obvious. One difference is the way they fix annual quotas allocated to suppliers. While in Wallonia, they are related to avoided CO\(_2\),\(^2\) in Flanders they

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\(^1\) These certificates are also available on the market for suppliers that do not produce electricity or those suppliers that do not provide enough renewable energy are able to buy the certificates on the market.

\(^2\) More specifically, in Wallonia, until 2015, the number of certificates depended on the amount of electricity generated (in kWh); one certificate is issued for every MWh divided by the amount of CO\(_2\) saved. Since 2013, however, rules have been changing annually, contributing to the sense of risks in the sector.
depend on the technology and assesses in terms of MWh of green electricity. These differences render the strict comparison of minimum price guarantees quite challenging. In practice, it implies differences in the minimum prices at which system operators are required to buy certificates from producers. It also means differences in levels of fine for non-compliance. A second important difference is that the guaranteed minimum prices vary with technology (i.e. solar, biomasses, wind,…).³

A key component of the current complexity of the Belgian policy is that it could increase uncertainty and hence impact the return to investment in the sector and, in particular, in RES. Some of this uncertainty could for instance stem from the fact that the minimum prices are adjusted on a regular basis. This adjustment is in itself a source of uncertainty for investment decisions that involve multiple years commitments⁴.

In any context, unpredictable price adjustments are a source of concern for investors and the negative reaction to the recent green certificate price collapse illustrates this perfectly. But in the current European context, there are more sources of uncertainty than those linked to the pricing of the green certificates. For instance, the financial crisis has reduced the policy efforts to finance subsidy schemes and improvements in demand management to reduce overall consumption. In Belgium as in other countries, highly publicized changes in policy aiming at cutting support to RES and energy savings program have resulted in changes in the investor's risk perception of the sector.

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³ Solar electricity enjoys the highest support because it is the most costly to produce under standard weather conditions in Belgium. Of course, this is not to say that this is the most cost effective use of public resources since there are alternative RES that may be more cost-effective.
⁴ In addition to these minimum prices, a key driver of the support for RES and energy saving investment in Belgium has until recently been financing and subsidisation of state of the art technologies identified in limitative lists. The financial support could reach up to 50% of the investment cost in some cases as well as benefiting from corporate income tax reductions. Fiscal constraints have significantly reduced these sources of financing.
Many of these changes started to be implemented in 2013 in Belgium.

This is a crucial observation from a policy perspective since the risk perception surveys show (and in many ways confirm) that the effectiveness of efforts to deploy electricity generation projects relying on renewable energy sources (RES) depends on a key metric: the hurdle rate perceived by investors. The latter is commonly approximated by the cost of capital in regulated industries in a large number of countries (but not in Belgium where it is only relevant in the regulation of the main transmission company) and is commonly used by investors in their evaluations of investment projects.

The current decisions to invest are thus the outcome of a synthesis of evolving sources of concerns for investors and of evolving policy efforts to mitigate this concerns and to minimize any negative effects of risk perceptions associated with RES. To do so, the federal and regional Belgian governments have been quite creative as mentioned earlier. They have relied on a very broad range of fiscal instruments aimed at favouring RES. The diversity in the choice of instruments and in the intensity of their use across regions makes any diagnostic quite challenging but they may have improved the odds of leading to a desirable outcome whether in generation, transmission, distribution or commercialization. Theory and some evidence discussed later suggest that the specific choice of an instrument can be quite effective at cutting the costs of capital and hence improve the incentive to invest. In the UK, for instance, the switch from quotas to prices based incentives has resulted in a lowering of the cost of capital (OXERA 2013).

The main purpose of this paper is to document the differences in the cost of capital in Belgium across electricity generation companies, depending on whether they rely on traditional thermal sources or on RES. This analysis contributes new
insights on the extent to which policies aiming at increasing the greening of energy are managing to offset the differences in risk perceptions in the complex Belgian context.

Unless differences in risk perceptions are offset or minimized for specific firms, they can distort the incentive to invest in RES for a given electricity generation price level. Indeed, higher costs of capital reduce the incentive to invest unless the average price or the subsidies the firms get for their output compensate for the increase in risk levels.

But, if policies work in mitigating the expected additional risks, the main risk becomes that of an overshooting which, in the current environmental context, may be a desirable outcome. And this is precisely what seems to be happening in Belgium based on a sample of 26 firms we have been able to analyse. Belgian policies seem to be leading to a cost of capital for renewables below the cost of capital for non-renewable in our sample.

The paper is organized as follows. Section 2 reviews the European energy policy context and the main policy tools used to stimulate RES generators. Section 3 explains how these policies could influence the risk perceptions in the sector. Section 4 summarizes our approach to the assessment of the cost of capital. Section 5 discusses the results of a comparison of the cost of capital for green and non-green generators in Belgium. Section 6 concludes.

2. What do we know about the differences in the cost of capital across energy sources?

At a very general level, stability and predictability are particularly important for a sector characterised by many small and middle companies and private investors as shown for Germany by Kirsten (2014). Unpredictable changes in policies undermine
investor confidence, raising risk premiums and costs. To get a sense of the diversity of sources of uncertainty, it is useful to take stock of the various sources that have been identified in policy debates on the risks drivers of the cost of capital in the sector and to assess the extent to which these can have a different impact across energy sources.

The first driver is technological and is anchored in key differences across energy sources. Renewable energies are not yet cost effective and thus not yet able to compete with conventional power plants. In most countries, the electricity price is not able to cover all the costs attributable to RES. In any regulatory system based on merit order, the more costly sources represent a higher risk level for investors.

The second driver is also linked to the design of regulation. Since returns on assets depend on volatile electricity prices that vary on an hourly basis, conventional power plants have an advantage over RES plants. They are able to determine when to produce a certain volume of electricity and thus benefit from high prices when demand soars. This is not the case for intermittent RES-E (OXERA 2013). The longer the expected life of the asset and the larger the size of the asset, the more likely that the volatility of prices will represent a threat in net present value computations and hence, the larger the expected risk premium. Schaeffer and Weber (2013) suggest however, that size may be negatively correlated with the costs of equity because smaller firms tend to be intrinsically more risky than larger firms are. This is also one of the reasons why integrated infrastructure firms are usually expected to have lower betas.

A third regulatory source of uncertainty is more subtle but quite relevant to the Belgian context. It depends both on the characteristics of the energy system and on the way the regulatory system tackles the weakness of this energy system. The combination of both dimensions can indeed also influence
the risk perceptions associated with RES. The specific issue stems from the fact that a fast increasing share of RE in the total energy mix induces system intermittency. This is quite important for a country considering an exit from a nuclear capacity for instance. Conventional electricity plants are still needed, even with a large commitment to RES, since they assure system reliability and flexibility by filling shortfalls in supply when RES are not available. This imposes significant restrictions on price regulation. Indeed, the extent to which price regulation and market prices in the sector account well enough for the need to maintain this flexibility and reliability in an environment is a further driver of uncertainty.

Increases in the share of renewable are likely to increase risk perceptions as long as the regulatory design of the sector has not addressed this concern. Held et al. (2006) had already suggested that regulatory risk was the largest risk faced by generators. Their conclusion was reinforced by Fagiani et al. (2013) when they argued that even though mechanisms based on tariffs are expected to yield better results, “their performance is strictly dependent on regulatory choices”, since the support mechanism is entirely based on governmental decisions instead of market forces.

A fourth driver of risk perceptions and hence premia was identified by Masini et al. (2013). They suggest that investors, particularly venture capitalists, prefer to invest in "low-risk low-return profiles", in mature and well-established technologies rather than “radically innovative systems”. Governments have thus a key role to play in supporting R&D programs and to minimize the risk of new technologies. The maturity of technologies is thus a key argument for investors when considering the risk of projects. Uncertainty of government intervention on this front is thus also a driver of risk.
Finally, as for any business, it would seem reasonable to assume that the risk perceptions shrink as technologies mature and better evidence on their performance becomes available. Technological Darwinism leads to the survival of the fittest and the “fittest” technologies are safer investments.

Although these various studies clearly point to the various ways in which government can interfere with risk perceptions they do not really generate a clear quantification on the cost of capital of the various sources of energy. This gap was first filled partially by OXERA(2011) for the UK through a survey of discount rates considered by investors for different technologies conducted in May 2011. The example is useful in the Belgian context since the main promotion scheme for RES in the UK was then equivalent to a quota system such as the one Belgium has today.

Table 1 summarizes the results of the indicative cost of capital in 2011 for a wide range of technologies based on UK investors’ perceptions and their assessments of added risk. The cost of capital for the conventional generators is reported in the table to provide a benchmark. The cost of capital for many low-carbon technologies was around 3-4% higher than for a conventional source. For some of the high-risk technologies the premium could reach 100% of the base cost of capital and be substantial, in particular as one moves towards technologies that are perceived as higher risk.

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5 Estimated ranges of discount rates were computed by aggregating the evidence gathered in literature as well as survey responses
The OXERA study also largely confirmed many of the drivers for risk discussed earlier. The table shows that the more mature technologies are the lower the required premium and the lower the range (e.g. solar PV: 6-9% vs. 13-18% for tidal and wave technologies (13-18%). The highest the capital intensity, the higher the rate (and hence the higher rate quoted for nuclear plants). Although Table1 does not report the information, the OXERA survey also found that the specific project sponsors types, the capital structures and investment strategies influenced the CoC levels, further confirming the relevance of finance dimensions as cost drivers.

NERA (2013) validated this big picture in a comparison of the CoC of power plants in the UK and Germany. However, this study
added an essential insight regarding the effectiveness of public policies. Recognizing that the support to the development of RES in Germany had mostly relied on price based mechanisms (Feed in Tariffs or FIT) while they had initially been relying on quota is the UK, the NERA study tested the relevance of this difference. The conclusion is that the risk premia had been lower under FIT than under quotas (i.e. in Germany rather than in the UK). NERA argued that this could also be explained by the fact that the German FITs was a mature promotion system, associated with a higher confidence of investors in achieving the expected return.

Steichen (2014) further increased the robustness of the results. She first validated the theoretical assumption that, without incentive, the CoC was initially higher for RES generators. She then compared the CoC in 2009 (the year before the major German 2010 reform that included an active support to the operator relying on RES) to the CoC in 2012. This allowed her to show that once the reform had been fully adopted, there was a reversal in the level of CoC, with a lower CoC for RES generators than for the non-RES generators thanks to the adoption of the policy.

Although none of these papers relied on advanced statistical treatment techniques and hence established correlations rather than causality, the fact that several authors relying on different approaches come up with comparable results generates some degree of credibility for the main broad empirical conclusions which tend to validate the expectation building on theoretical identifications of the sources of risks.

As mentioned earlier however, it is still possible that the differences between policies could be due to some specific implementation details that drive risk perception.
3. Methodology followed of the Belgian case study

The approach followed here to assess the cost of capital at the firm level does not rely on perceptions as those reviewed earlier. Instead, we focus on quite a standard approach to assess the cost of capital and rely on accounting data available at the firm level as well as the values of key parameters as assessed by regulators or by the market. The approach is clearly backward looking in contrast to the adjustments made by OXERA or NERA for instance, but it is generates a value for the common proxy used to assess the hurdle rate in regulated industries (Alexander et al (2000)). Over time, it has also become a key metric for companies and regulators in order to compare companies and sectors.

The academic literature and regulators have widely discussed which methodology is ideal when computing the CoC (Jenkinson(2006)). The standard approach used by regulators is the weighted average cost of capital (WACC), the average sum of a company’s cost of debt and cost of equity, estimated by the following equation:

\[
\text{WACC} = (1 - g) \times k_e + g \times k_d
\]

Where:

- \( g \) is the level of gearing of the firm (i.e. the share of debt in total capital)
- \( k_d \) is the cost of debt finance, equal to the risk free rate to which is added a debt premium, specific to each company
- \( k_e \) is the cost of equity finance.

The cost of debt is usually estimated through the yield of a company’s bond or through comparator information. The estimation of the cost of equity is more complex to determine and subject to discussions in the literature. A common approach
among regulators (UK and most other countries in the EU) is to use the CAPM. The latter estimates the $k_e$ as follows:

$$k_e = r_f + \beta_e \times (r_m - r_f)$$

Where:

- $k_e$ is the cost of equity finance
- $r_f$ is the risk-free return
- $\beta_e$ is the equity beta
- $r_m$ is the level of market return
- $r_m - r_f$ is the market risk premium, the expected return in excess of the $r_f$

The CAPM model links the $k_e$ to a single company specific factor, the equity beta corresponding to the “relative responsiveness of the return of an individual share compared to the market portfolio’s return” (Lockett 2002). The $k_e$ computed in the CAPM takes into account only systematic risk factors, which are non-diversifiable. Even though the CAPM is the most frequently used model to compute the cost of equity, it also has its caveats since respecting all the hypotheses is impossible\(^6\).

The WACC described so far is known as the Vanilla WACC. Other computation methods take into account the impact of corporate taxes such as the pre-tax WACC mentioned previously:

$$\text{Pre} - \text{tax WACC} = k_d \times g + k_e \times \frac{1}{1-t} \times (1 - g)$$

To generate the data set, we proceeded as follows. We explored the Amadeus database to build up a preliminary sample of generation companies by setting the selection criteria regarding

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\(^6\) The CAPM model is based on the following hypotheses: no taxes, risk-averse investors, no transaction costs when buying and selling shares, perfect information, risk can be measured by the standard deviation, all investors are able to borrow and lend at the risk-free rate.
the industry classification (NACE code 3511: production of electricity), company status (active), size (very large and large), the type of accounts (unconsolidated only) and the available year (2012). We then manually removed companies not operating in Belgium, owned by municipalities or for which the information about the production type was insufficient.

The data sample for which we have all the necessary information includes 26 firms, which is somewhat less than 10% of the number of firms in the generation market but this market includes a very large number of microgenerators. These are not the main concern of this paper but overall, the sample size is still relatively small to be able to draw major robust lessons. Moreover, the type of producers are not distributed evenly across generation types. We only count 3 non-renewable generated, 3 firms producing a mix-of renewable and non-renewable and 20 firms specialising in renewables. The renewable firms count 7 onshore wind generators, 4 offshore wind generators, 1 solar generator and 3 biomass generators.

To get to generate the actual estimates of the cost of capital for each firms, we faced another common challenge. Since these firms are not quoted on stock exchanges, we also exploit all the accounting data available on the Amadeus database to generate some of the core data needed to compute the WACC. We complemented this source with additional information collected from the firms’ web site and other official public and private sources such as the national energy regulator (CREG), the National Bank, Amadeus and Thompson-Reuter. All the relevant information is summarized in Table 2. The table shows that, for the equity beta, we considered two values (0.6 and 0.8). These are the lower and upper bound value for the firms in the sector.

7 In order to find out which energy source is in use, we consulted companies websites if existent, CREG’s list of licensed producers as well as the website of the Fédération des énergies renouvelables (edora.com)
for which the data was available. In our computations, we will use both values to generate a lower and an upper bound for the value of the cost of capital.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of debt</td>
<td>Effective interest rate: Interest paid / Debt</td>
<td>Accounting Data from Amadeus</td>
</tr>
<tr>
<td>MRP – market risk premium</td>
<td>MRP computed in 2011 by electricity regulator for the period 2012-2017 3.5%</td>
<td>(CREG 2011)</td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>Long term interest rate (OLO, 10 years) 3% (2012)</td>
<td>(Banque Nationale de Belgique 2015)</td>
</tr>
<tr>
<td>Equity beta</td>
<td>0.6-0.8</td>
<td>Thompson-Reuters</td>
</tr>
<tr>
<td>g (gearing)</td>
<td>Total Debt / (Debt+Equity) where total debt is equal to non-current liabilities + current liabilities</td>
<td>Accounting Data from Amadeus</td>
</tr>
<tr>
<td>T</td>
<td>Corporate tax rate: 33.99%</td>
<td>(KPMG 2015)</td>
</tr>
</tbody>
</table>

4. The comparison of the cost of capital across energy types

Table 3 reports the average Vanilla WACC as well as the Pre-tax WACC for firms categorized according to their energy source. We report two values for the firms relying on mixed sources because one of the 3 firms (E.ON Belgium) in the sample is an outlier in that it has hardly any debt. Hence its cost of capital is essentially the cost of debt.
The average results are quite surprising and in sharp contrast with the results obtained for the UK or Germany so far. Comparing only the 3 main categories (renewable, non-renewable and mixed (without E-ON), the Non-Renewable appear to have a lower CoC than the other in contrast to what the literature suggests should be expected. With the exception of the unique solar plant we have in our sample, the detailed results confirm this observation. The Vanilla CoC for the RES of our sample show lower CoC levels by around 30bps than for non-RES. The conclusion is the same from the analysis of the Pre-tax WACC.

<table>
<thead>
<tr>
<th></th>
<th>Vanilla WACC (%)</th>
<th>Pre-tax WACC (%)</th>
<th># of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta 0.6</td>
<td>Beta 0.8</td>
<td>Beta 0.6</td>
</tr>
<tr>
<td><strong>Renewable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onshore</td>
<td>3.78%</td>
<td>3.93%</td>
<td>4.35%</td>
</tr>
<tr>
<td>Offshore</td>
<td>4.02%</td>
<td>4.13%</td>
<td>4.42%</td>
</tr>
<tr>
<td>Solar</td>
<td>5.49%</td>
<td>5.55%</td>
<td>5.70%</td>
</tr>
<tr>
<td>Biomass/Waste</td>
<td>4.68%</td>
<td>4.67%</td>
<td>4.66%</td>
</tr>
<tr>
<td><strong>Non-Renewable</strong></td>
<td>4.23%</td>
<td>4.37%</td>
<td>4.75%</td>
</tr>
<tr>
<td><strong>Mixed</strong></td>
<td>2.40%</td>
<td>2.66%</td>
<td>3.37%</td>
</tr>
<tr>
<td>Mixed without E-ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>3.46%</td>
<td>3.84%</td>
<td>4.87%</td>
</tr>
</tbody>
</table>
For solar power plants thus, although the sample size is limited to one firm, the results for that firm are also in contradiction with the expected outcome. The literature suggests that it should have been expected them to have the lowest CoC among RES since they have reached technological maturity. However the single solar power plant of our sample shows the highest CoC level. This is hard to reconcile with the fact that in Belgium, solar energies enjoy a higher minimum price guarantee almost six times higher than biomasses for instance.

The other results on the RES are more coherent with the literature. As expected, offshore wind installations carry a higher risk than onshore plants. Biomass plants however show higher CoC levels than offshore wind parks even though Oxera (2011) described their risk perception to be lower. Considering our sample of RES, the relation between mature technologies and the CoC is thus not as clear-cut as suggested by literature.

The third type of producers are those relying on mixed energy sources. At first sight, they seem to present the lowest CoC associated and it would be tempting to argue that this is because they are able to diversify their risks among various technologies. But it could be the wrong explanation. Before jumping to that conclusion, it is necessary to recognize that the low level is in large part attributed to one company, E.ON Belgium, showing an extremely low CoC (around 0.3 % for the Vanilla WACC) due to a leverage of 97% and a very weak cost of debt (0.09%). When removing this firm, mixed energy sources still show the lowest CoC levels with regard to the Vanilla WACC however but not with respect to the Pre-tax WACC. Due to a lower leverage, the impact of taxes makes the CoC increase, turning mixed energy firms into the riskiest firms in our sample.

A final comment on the results concerns the level of the cost of capital as compared to the levels discussed in the British context also regulated through quotas for RES. This can be done by
focusing on the pre-tax WACC levels. Table 3 shows that the computed CoC levels for our sample of Belgian firms in 2012 are significantly lower than those discussed in the UK in 2011. The changes in market risks between the two years could not explain alone the differences. Moreover, the differences between technologies are also smaller than for the UK and the absolute levels differ by around 400bps except for solar power plants. These differences are unexpected at this level, even if they are good news for Belgium since they make investment cheaper, whether in renewable or non-renewable sources.

Overall, the empirical results for 2012, associated with what is a standard theoretical approach to assess the CoC, are so different from what was expected based on the theoretical literature and on the modest earlier empirical evidence that there has to be a major dimension that has not been picked up by the analysis. Assuming that we did not make mistakes in our computations, one option, of course, is some statistical bias linked to the sample we worked with. It may be too small, it may be skewed or it may be that the data was particularly bad for this set of firms. However, this would not have led to the consistency of the results when the sample size was a bit larger for a specific generation type. A second explanation is that our data already internalizes the corrections to the risk levels due to the policy decisions taken by the federal and the regional governments. This is not an unreasonable assumption and if it is the right one, it suggests that the various government levels may have overshot since the cost of capital is now lower for the more risky sources of energy. A recent paper by Daxbek and Estache (2015) shows that in a sample of 10 EU countries, Belgium has been the second most effective (after France) at minimizing its effective income tax rate on production thanks to the many tax incentives granted for investment in the sector. Most of these investments aim at
supporting increases in the share of RES. This may be why up to 2012, Belgium was on schedule to meet its RES share target.

5. Conclusion

Despite the positive flavour left by the assessment of the level of the cost of capital faced by the sector in Belgium and by the relative attractiveness of renewable and non renewable firms, the conclusion needs to take a negative view. This is because the policy environment has changed quite significantly since 2012. Starting in 2013, the policy commitment to support renewables has suffered from a significant increase in uncertainty. Wallonia had changed its policies every year since 2013 and that includes a change in 2015. In addition, the price of Green Certificates has collapsed to a level such that new investments are being postponed, and some of the past projects are being questioned. Moreover, many long known concerns for grid connection capacity are starting to become a real issue for some actors. The slow phasing out of the nuclear capacity and the slow associated adjustment in generation and transmission capacity largely explain the risks of outages widely discussed in the media during the 2014-15 winter.

Many of the cuts and many of the postponements are justified by increasingly binding fiscal constraints. These are fair concerns. But their consequences for the sector are important. Once the detailed data for 2013 and 2014 will have become available, it would not be surprising to see that the policy overshooting reflected in the cost of capital of RES will turn into an undershooting given all the cuts decided since 2013. If that is the case, the comparative advantage of investing in RES signalled by the 2012 data is likely to be reversed and start favouring non-

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8 See Eufores (2014) for a detailed assessment of the Belgian likelihood of meeting its 2020 RES targets.
RES. Moreover, if risk perceptions continue to increase, it is very likely that, despite the very low borrowing cost available on the market in 2015, the cost of capital will increase because market and regulatory risks will increase a lot for all sources of energy. This would in turn further slow investment in the sector and not just in generation.

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