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Modeling business risk: The effect of regulatory revision on renewable energy investment - The Iberian case

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ABSTRACT

Regulatory risk is commonly accepted as one of the most important risks in the energy business, particularly renewable energy. With the recent changes (in June 2014) in the Spanish regulatory framework, investors' returns might be significantly affected. Further, as the Spanish and the Portuguese electricity systems are integrated, a change in the regulatory framework of Spain might also affect renewable energy policies and investment strategies in Portugal. This study is a projection of business risk under the assumption that the Portuguese government may adopt similar regulatory changes. Monte Carlo method is used to simulate the data under different scenarios. Applying Net Present Value and Real Options approaches, a 50 MW wind power project is evaluated. This study has considered the delay option to study five regulatory scenarios. A higher value for the delay option suggests that a high financial loss is expected if new wind power projects of similar capacity are implemented under the new regulatory framework.

1. Introduction

The renewable share of electricity generation has considerably increased in EU in the last 15 years (Eurostat[1]). Under current EU estimates in 2030, the share of renewable energy in the electricity sector will increase to at least 27%.[2] However, achieving this target will likely require effective implementation of several policy revisions, namely support schemes. For instance, investment support policies may influence renewable energy generation and increase profits in the business. The scientific literature suggests a two way relationship between investment and technology: investment leads to adoption [1], and adoption leads to investment [2]. Notwithstanding, uncertainties in the regulatory framework could considerably alter investment patterns. The current study is focused on the modeling of renewable energy business risk in Iberia associated to current energy regulation changes in Spain. The Iberian Electricity Market (MIBEL) was initiated in 2001, but started to operate regularly in 2007. In order to implement MIBEL, the Governments of Portugal and Spain chose to agree on a plan for regulatory harmonization. As a result, revision of regulations in one market may significantly affect the other market.

In June 2014, the Spanish government announced a revision of the renewable electricity regulation in accordance with the Royal Decree Law no. 413/2014. Zamarro (2014) states, *"The main reason for the reform of the regulatory regime applicable to the generation of electricity using renewable energy sources is the tariff deficit encumbering the electricity system, which, for the year 2013, has reached 3188 million Euros (while the total tariff deficit amounted, in May 2013, to more than 26,000 million euro). Accordingly, the Government has adopted a series of financial measures aimed at reducing this deficit, including the reduction of premiums imposed on the generation of electricity using renewable energy."* [3]. This revision[3] reduced the

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[1] Eurostat.com.
[2] https://ec.europa.eu/energy/en/topics/renewable-energy.

[3] Details are available on EDP renewables website http://www.edpr.com/.

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regulation period to 6 years, setting remuneration for the first regulatory period at 7.4% (pre-tax). An additional revision relates to pool prices i.e., investors are eligible for the subsidy only if standard production is maintained between caps and floors. As a result of these regulatory changes, EDP Renewables, one of the world's largest renewable energy generation and supply companies, has estimated a loss of 30million Euros.

The current regulatory uncertainty associated with Royal Decree Law no. 413/2014 presents a unique opportunity to conduct a new study on energy investment uncertainty under the Portuguese framework.

To understand issues related to businesses in this context, at the micro level, a 50 MW wind project was carefully reviewed in order to evaluate investment decisions through traditional NPV and Real Options approaches by performing sensitivity and scenario analyses.

Several factors including government policies, business environment, competition, production, consumers, suppliers, etc., typically dictate investment in a particular business. The renewable energy market is considered to be dynamic [4], and demand and supply are expected to be dependent on such factors as government policy changes, national targets (and vice versa) business profits, etc.

Uncertainties associated with the revision of the regulatory and legal framework together with energy policy strategy, are expected to affect the renewable business profits [5]. The period of transition from one policy framework to another may be particularly crucial, in that a business may decide to delay any investments until new information related to government policy arrives. In addition, because policy changes may affect a specific sized project, it is important to consider the size of the plant while evaluating a project.

The objective of this study is to investigate whether this is the right time to invest in wind-generated energy projects, within the context of governmental policy changes associated with Royal Decree Law no. 413/2014. The article is organized as follows: Section one introduces the study, section 2 highlights on evaluation approaches, section 3 puts forth methodology and data, whereas, section 4 describes results. Finally, section 5 concludes the study.

2. Evaluation approaches

A debate, on whether renewable energy can be competitive with conventional sources of energy, is primarily due to an initial higher investment cost [6]. To overcome this barrier, adequate government support programs have typically played a significant role in making renewable energy competitive and increasing its share in electricity [7]. Developing these potential alternative means of supporting renewable energy will require the ability to model and to understand the uncertainties associated with various policy revisions [8].

Traditional approaches to strategic decision-making, such as NPV and DCF have substantial limitations when addressing uncertainties and flexibilities. The Real Options approach effectively addresses these limitations [9] [10] [11] [12]. A vast literature is available on the use of Real Options in several fields. Examples of such fields being researched include development [13] [14], information technology [15] [16], and renewable energy [17] [18] projects.

Since 1970, the worldwide energy market has gone through extensive changes in terms of regulation, technology, distribution, etc. [19]. Along with dynamic shifts in the market, changes such as increased competition, government intervention, and uncertainty have also been observed [20]. The Real Options approach has been applied to various issues related to the energy industry such as copper mines [21] and oil industry [22] [23]. The academic use of the Real Options approach seemed to increase over the period 1990–2000. Dixit & Pindyk (1994), Trigeorgis (1996) and Amran & Kulatikala (1999) published books containing cases related to the use of Real Options in energy [24] [25] [26]. In another study, Felder (1996) and Ghosh & Ramesh (1997) noted that power sector reforms can lead to market risk and proposed an options pricing method for future electricity markets [27] [28]. They also observed the constraints associated with power sector planning, its operations, and distribution requirements.

Further, Moreira et al. (2004) studied the investment attractiveness for power generators in Brazil using real option [29], whereas, Hlouskova (2005) investigated the optimal value of operating electricity generating turbines in electricity markets [30].

In another study related to energy policies and climate change, Yang & Blyth (2006) quantified the effect of climate change policy on investment in the power sector [31], using the Real Options to model price uncertainty and market risk. Similarly, Chorn & Shokhor (2006) addressed the application of real option valuation for framing policy guidelines in the energy sector [32]. This article was also the first research that mathematically demonstrated the use of real option and the Bellman equation.[4] Further, Marreco & Carpio (2006) applied the Real Options theory to understand the operational flexibility in the complex Brazilian Power System [33].

Abadie (2009) valued the long-term investment in renewable energy company assets through Real Options [34]. Additionally, to address the expansion of a project, Boniset. al. (2009) used the Real Options approach in the Latin-American market [35]. Recently, Santos et al. (2014) evaluated a mini hydro project using the Real Options approach with a delay option [17]. Results suggested the higher delay value through Black and Scholes modeling approach.

3. Methodology and data

For the current study, a 50 MW onshore wind power project was considered. The 50 MW plant consists of 39 units of 1.3 MW wind towers. It is assumed that each tower is mounted at optimal altitude in order to receive the required wind speed for electricity generation. The installation cost of the project may vary due to several factors such as labor cost, steel cost, availability of technically viable land. Three scenarios were considered when calculating installation costs for this study: optimistic, pessimistic, and “most likely.” In the optimistic and pessimistic scenarios, per unit megawatt installation costs were estimated at 1200 Euros/KW and 1800 Euros/KW, respectively, whereas in the most likely situation, installation cost of 1500 Euros/KW was used [36]. This cost is assumed to consist of labor cost and other costs, including official/regulatory formalities. It is assumed that 4 years are required to start a project, and according to the literature, it is considered an irreversible investment (Fuss et al., 2012) [37]. Project life is assumed to be 25 years, and it is assumed that there will be no salvage value at the maturity of the project.

Leasing the land on which project will be installed is assumed to cost Euros 100,000 per year increasing 10% every five year for 25 years of economic life. Operations and maintenance cost (O & M) is estimated to be in the range of 12.51–17 Euros per MWh. However, in the “most likely” situation 13.91 Euros/MWh is accounted. Staffing and insurance are assumed to be 305,932 Euros per year also increasing 10% every five years. Present value (PV) factor ranges from 2 to 5%, being 2.5% in the “most likely” scenario. Monjas-Barroso & Balibrea-Iniesta (2013) made similar assumptions for a valuation of wind power in Denmark, Finland and Portugal [38].

[4] Bellman equation is a dynamic programming equation. For details see http://www.princeton.edu/~moll/ECO521Web/Lecture4_ECO521_web.pdf.