Overview
In the electricity sector, wind power generation showed a 23.06% growth in installed capacity at the end of 2016, compared to the end of 2015, constituting one of the main vectors of sector expansion. The source has advantages from the environmental point of view, have been attracting high investment volumes around the world. In Brazil, however, investments have been predominantly focused on financing through public banks, mainly the National Development Bank (BNDES) and the combination of some factors has put in check that model. These are: the economic crisis associated with the fiscal crisis; prudential regulation that penalizes financing for periods of more than 10 years; changes in BNDES operational policy; absence of incentives for foreign investments, among others. The BNDES has been the most important financier of infrastructure in the country in the last decades, being significant for the development of the wind sector. BNDES offers financing for up to 80% of the investment at attractive rates. However, the current situation of resource constraints leads to a scenario in which BNDES plays a potentially reduced role, using only its traditional funds. From the point of view of the wind energy industry, it is imperative to look for alternatives; and the government should work towards making other forms of long-term financing for infrastructure possible. Thus, as part of a general analysis methodology and applicable to any renewable energy projects, we present an approach that allows the comparison among different financing structures and their effects on various indicators and metrics of value creation, including firm/project value (FCFF, FCFE, DDM), cost of capital/rate of return (WACC/IRR) and financial sustainability (DSCR). Additionally, the impacts of structures that are still absent or not commonly used in Brazil are evaluated: funding from ECA’s (Export Credit Agencies); Mini-Perms; specific funds from IFC (International Finance Corporation) and FX (foreign exchange) funding with hedge mechanisms or PPA indexation.

This paper is organized as follows: after the introduction, which provides more details about the situation of renewable energy and wind power plants in Brazil, the second section describes the sources of funding already available in the country and how to improve them, including the role of project bonds and institutional investors. The third section presents more details about other potential alternatives using foreign exchange products and the needed hedge. The fourth section presents the simulations for different capital structures and their impacts. The final section discusses policy implications and recommendations.

Methods
Valuation Methods, Cost – Benefit Analysis, Simulation, Risk Management

Results
The base case takes into account two production scenarios: Project (SPE of 30 MW, composed of 15 wind turbines of 2 MW) and Wind Complex (Complex of 150 MW - 5 SPEs of 30 MW) and comprises a capital structure with 20% of Equity and 80% of Debt from BNDES. Simulations have been made for seven scenarios that include different mixes for Debt and Equity, participation of project bonds and capital markets, different roles for BNDES, foreign exchange funding from ECA’s and institutional investors, the use of derivatives for hedge and/with PPA indexation and alternative structures for surety and insurance. As mentioned, the effects of different financing policies are measured in terms of Value Creation, Rate of Return and Debt sustainability. The results show that BNDES should still have an active role in the expansion of the sector, in combination with infrastructure bonds and access to international capital through specific hedge mechanisms and some PPA indexation. Domestic and foreign
private participation must be improved, considering Brazilian constraints in capital markets, the needed evolution concerning surety and insurance for infrastructure in the country and current macroeconomic environment.

Conclusions
This paper presents a framework to evaluate different financing policies for renewable energy generation projects in Brazil using wind power plants as a base case. Simulations performed show that participation of BNDES is still fundamental for the expansion; however, some different products and structures have potential to create value if used properly and with a portfolio point of view, including project bonds, foreign exchange funding and hedge mechanisms. As explicit policy implications we have the introduction of specific hedge products for foreign exchange debt, already used by Brazilian government in a recent airport privatization, PPAs that allow for some indexation on foreign exchange, improvements on the regulation of banking guarantees, insurance and related surety and developments that are needed on local capital markets to facilitate the access for entrepreneurs.

References
Deloitte. (2014). Establishing the investment case – Wind Power