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Investment Risks and Obstacles in Wind Energy Generation in Brazil

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Abstract – *The planned short and medium term investments for the private sector in the construction and exploration of wind energy generation plants in Brazil are considered in this article. The objective is to lay out the investment demand projected by the government plan, aside from points of general and specific risks of the venture and operation of the main Brazilian financial sponsor, BNDES [Brazilian Development Bank]. The possible obstacles to planning, implementation and operation that investors come across with during the period prior and after the business' contracting process were analyzed. In accordance with the results, we can conclude that the growth of generation in Brazilian wind energy, just as in the last two years, must be sustained above the national PIB [Gross Domestic Product – GDP] up to at least the next five years.*

Keywords: *Clean Energy, Investment, PDE [Ten-Year Energy Expansion Plan], Risks, Wind Power Plant*

I. Investment Demand in the Brazilian Wind Energy Generation Scenario

The Brazilian Electric System has an installed generation capacity of 124.6 GW, whereby 64% is by water source, 15% by thermal source, 14% by renewable source and 7% by imported and nuclear source. In the government plan, a boost in growth is pointed out and in 2022; we could have 183.1 GW of installed capacity, that is, a 47% growth in the country's energy generation.

Today we have 78% clean energy in the national energy matrix and this figure should grow with the wind energy expansion, an indicator way above the international average, which is 20% in share [1].

The socioeconomic benefits of the Brazilian wind energy go beyond the reduction of greenhouse gas emissions; they extend to technology transfer, reduction of emissions of other pollutants and creation of employment. All this will reflect on the Brazilian social, economic, environmental and territorial aspects [2].

The origin of wind expansion in Brazil is more recent than in other regions in the world [3]. In 2004 with the creation of the PROINFA [Incentive Program for Alternative Electric Energy Sources] aimed to increase the share of wind energy ventures and of alternative sources in the energy matrix. PROINFA [Incentive Program for Alternative Electric Energy Sources] brought in the possibility to the Brazilian market of getting to know the technology and of acquiring expertise in using the source, which influenced directly the price.

Another incentive is the tax through the Special Incentive Regimen for the Development of Infrastructure [REIDI] where it suspends the requirement of PIS/PASEP [Social Integration Program] (0.65% rate over the presumed profit) and COFINS [Social Security Financing Contribution] (3% rate over the presumed profit) tax contributions. Aside from PROINFA [Incentive Program for Alternative Electric Energy Sources], what has boosted wind generation a lot, have been the auctions in regulated contracting environment [4].

The Brazilian government began to implement the wind energy system in 2004; however, it was in 2011 that 1 GW of installed capacity was achieved and in 2014, it reached the amount of 5.9 GW [5]. In 2014, the risk of transmission to the wind farm was defined in the guidelines of the 19th A-3 auction for the first time.

The government's projected demand until 2023 foresees the accumulated amount of 22.4 GW in the wind energy system, which could represent 10% share of the energy matrix. Therefore, in order to supply the difference of 16.5 GW private investment in the magnitude of BRL 74 billion in new contracts should be required considering the current average cost of BRL 4.5 million per MWh installed.

The energy generation cost (BRL/MWh) covers all expected costs during the useful life of the generator farm, which is 20 years in the case of wind energy. The generation costs must include implementation costs, financial return of capital, annual operation and maintenance costs and overhaul costs. These costs must be distributed during the plant's useful life.

Wind energy generation is the one that has grown most in auctions since 2009; the wind contracts of the last five years showed that entrepreneurs fine-tuned competitor prices and that the manufacturers that have settled in Brazil contributed in cost decrease. It was when the price became competitive, even in comparison with other sources. The initial price observed at PROINFA [Incentive Program for Alternative Electric Energy

Sources] was BRL 365.56 per MWh and in the last wind energy auction the observed price was BRL 129.97 per MWh.

According to the BEN [National Energy Balance] accounting, wind energy production in 2013 had a 30.3% increase in relation to 2012. The balance even points out that the installed wind energy generation capacity is somewhere 66.5% in the northeastern region, 1.3% in the southeastern region and 32.2% in the southern region of the country. When we speak of installed capacity in self-sustained producers, 92% are found in the northeastern region and 8% in the southeastern region of the country.

When we speak of economic indicators, the study points out that the growth of internal energy offering was 4.5%, above the GDP [Gross Domestic Product – GDP], which was 2.3% in 2013 [6].

To reach the goals stipulated by the government the wind projects are in accelerated pace, there are 518 plants and with a capacity of 13 GW accounting for the projects in operation, under construction, under testing, available and granted projects which are planned in the country until 2018 [7].

The Northeastern region is the one that has more representativeness in number of wind power plants, which are located along the coastline of Ceará, the coastline of Rio Grande do Norte and in the countryside of Bahia. In relation to the South, the representativeness is found along the coastline of Rio Grande do Sul.

Among all generation ventures that are in operation in Ceará, we have a 32% index of wind power plants.

Rio Grande do Norte currently places at disposal an installed capacity of about 900 MW, where 40% of this total refers to wind power plants. In relation to location of the planned wind energy growth projects for the next 10 years, they will be directed at the northeastern and southern regions, followed by the southeastern region, according to government study. We have the expansion contracted at the upper northeastern region until 2015 and there is a planned growth expansion in the southern and southeastern region from 2016 until 2022 [6]:

USD 1 = BRL 3.18

I.1. Considerations of Wind Energy Potential of the Brazilian Northeastern and Southern Regions

There is an information feedback cycle in the government's energy planning, which through its multi-term studies, they guide the auctions and the contracts signed in them. The closed (contracted) deals become indicators in the long- and medium-term offering and demand scenario for the succeeding studies. Aside from this, the subsidies provided by the studies serve as guideline to investors, regarding which generation possibilities will be taken to auction [6].

In the electric power atlas launched in 2008, the outstanding regions with major measured potential were at the coastline of the Northeastern region, presenting a potential capacity of 75 GW, followed by the Southeastern region with capacity of 30 GW and the Southern regions 23 GW, which led to a larger investment in the northeastern region until 2013. Even so, the states of the northeastern region with higher percentage of exploration are Bahia with 21%, Ceará with 10% and Rio Grande do Norte with 13%.

As consequence, there is still a high percentage of wind energy potential to be explored in the region. Nine studies in 2013 highlight the southern region as another investment promising area; aside from this, the Brazilian wind energy potential was updated to a capacity of 350 GW, which makes Brazil the largest potential wind energy producer of the Americas, with speed above 7.0 m/s and 45% capacity factor.

The northern region is the one that has the least wind energy potential and has a high humidity rate, in contrast to the northeastern region during the dry periods when the reservoirs are below the level, the winds are more intense.

The wind energy potential in Rio Grande do Sul is highlighted with 115 GW, with capacity of generating the annual power of 247 TWh, which represents 33% of the entire national power. Rio Grande do Sul will have until 2018, an installed capacity of 2.26 GW, which represents only 2% of its explored wind energy potential [6]. Investments in infrastructure will continue on the upswing on a global level for the following years; what will be instigating are the management and financial approaches, which will become more and more demanding [8].

II. The Institutional Scenario of the Wind Generation sector in Brazil

The current Brazilian Institutional Model was implemented in 2004; it has a legal framework in Laws 10.847/2004 and 10.848/2004 which prescribe the whole formulation of policies on the part of the MME [Ministry of Mining and Energy] which is the main inducer and supervisor of the implementation of policies in the energy sector in Brazil and responsible for the firmness of offering versus demand of energy resources. The MME [Ministry of Mining and Energy] receives advisement for formulation of long-term policies and guidelines in the energy field from the CNPE [National Council of Energy Policy].

Law 10.847/2004 regulates the EPE [Energy Research Company] public company tied to the MME [Ministry of Mining and Energy] and which conducts studies and researches that subsidize planning of the electric energy sector.

The EPE [Energy Research Company] following the guidelines of the CNPE [National Council of Energy Policy] elaborates three studies: PNE [National Energy Plan], BEN [National Energy Balance] and the PDE [Ten-Year Energy Plan]. The PNE [National Energy Plan] is a long-term study, the BEN [National Energy Balance] presents the offering and demand accounting and is diffused annually by the EPE [Energy Research

Company], and the PDE [Ten-Year Energy Plan] because it is ten-year study and updated annually by the MME [Ministry of Mining and Energy], became the main planning instrument for the energy sector, by going in parallel with the medium and short-term strategies.

The second law, 10.848/2004, provides on the commercialization of energy in two existing electric energy contracting environments: ACR [Regulated Contracting Environment] and ACL [Free Contracting Environment] [9]. The ACR [Regulated Contracting Environment] or distributors market is done mostly through auctions and with invitation to bid elaborated by ANEEL [National Electric Energy Agency] and with MME [Ministry of Mining and Energy] guidelines, therefore, the contract conditions, like price and term between vendors and buyers are stipulated previously in this document of public tender.

The contracting of the ACR [Regulated Contracting Environment] environment is formalized through the Energy Commercialization Contract in Regulated Environment [CCEAR], between the distributors and the vendor agents, namely, marketers, self-sustained producers and energy generators. The distributors contract energy in this regulated market to supply energy to captive customers, also called end consumers.

The contracting decision criterion in this regimen is through the least price offered and can be new energy proceeding from ventures that have not started yet their construction or existing energy, proceeding from ventures in operation [9]. In Brazil, the main wind motivator was the auction system, where the offering from producers is disputed by concessionaires and the one with the least value wins. A contract is signed as stipulated in the auction between both parties, where they commit to supply on a long-term basis and to pay as agreed upon. In Brazil, wind energy was stipulated in 2009 in auctions.

The auctions have the prerogative of satisfying the planning and the MME [Ministry of Mining and Energy] determines the date of the auctions, which are conducted by ANEEL [National Electric Energy Agency] and by CCEE [Electric Energy Commercialization Chamber]. Through ordinance, it sets the ceiling price for MWh to be offered, in accordance with the energy source.

The auctions can be conducted directly by ANEEL [National Electric Energy Agency] or indirectly when delegated, as per Law 10.848/2004, by CCEE [Electric Energy Commercialization Chamber]. The auctions are the main form of contracting of energy in the Brazilian market and most part is conducted in the ACR [Regulated Contracting Environment] environment.

It is in the ACR environment and in that of PROINFA [Incentive Program for Alternative Electric Energy Sources] that occur 85% of the total wind energy contracts. Only 15% occurred in the ACL [Free Contracting Environment] environment [5]. In the ACL [Free Contracting Environment], the bilateral contracts are set right between two parties involved: vendors and buyers, with this, the consumer is free to choose the contract that most suits him in cost and objective.

Even so, there are rules from the electric sector for this free commercialization; buyers and vendors must present total reserve for this buy and sell and which are determined monthly by the MCP [Short-Term Market] and prices set by the PLD [Difference Liquidation Price] [5]. Regulating and inspecting we have the ANEEL [National Electric Energy Agency] – which operates in the generation, transmission, distribution and commercialization of energy.

The auctions take place at the CCEE [Electric Energy Commercialization Chamber] which has as main function that of accounting and financial liquidation in two environments of its contractual relations: regulated and free. The contracts signed in auctions may have divergences of production and consumption volume, because they are long-terms. To adjust the difference of the contract and the real volume, the CCEE [Electric Energy Commercialization Chamber] performs short-term operations called spot operations so that every month both parties involved may be able to reset their positions to zero.

The Short-Term or Spot Market is the difference of what was generated in the National Interconnected System – SIN – and the contracted energy in the ACR [Regulated Contracting Environment] or ACL [Free Contracting Environment], that is, it is the physical difference of what is negotiated and what is liquidated, or better yet, what is contracted and what is produced or consumed. This difference is treated by the CCEE [Electric Energy Commercialization Chamber] with the use of MCP [Short-Term Market] or Spot Price [4].

The price is determined weekly on 3 load levels, namely, heavy, medium and light and for the four submarkets, which are, north, northeast, southeast/central west, and south. At the end of the operations, on a monthly basis, a list of every agent comes out, showing the credit or debit position. For the execution of buy and sell, it is necessary for the agents to contribute financial guarantees, to ensure that all negotiations will be liquidated. The Spot market determines how the short-term compensations will be for the marketers; in the case of wind energy, it is not possible, because as soon as it is generated, it is launched into the transmission network [5].

II.1. Physical Guarantees of the Auction: of Participation and of Faithful Compliance

A financial institution is contracted by the CCEE [Electric Energy Commercialization Chamber] to exercise the role of trustee to assume the responsibility of receiving and managing the necessary guarantees to participate in the auction process. There are two guarantees to be made, that of participation and that of faithful compliance. The two guarantees can be done through: [i] Cash bond; [ii] Surety Bond; [iii] Bank Guarantee; [iv] Government Bonds, which should be issued in the form of book-entry through registry in a centralized liquidation and custody system authorized by

the Brazilian Central Bank and evaluated for their economic values [5].

In the guarantee of Participation, the energy generators that originate from ventures without concession or classified dually as without and with concession should contribute 1% of the investment value; energy vendors that originate from ventures with concession should contribute a value of BRL 2,000.00 for every energy lot to be offered.

In the Guarantee of Faithful Compliance, the generators that negotiate energy should collect 5% of the investment value declared to the EPE [Energy Research Company] [5].

II.2. Energy Availability Contract

The contract of new wind energy ventures is of the Energy Availability Contract type and presents an average duration of 20 years, which can be changed according to the power plant's scheduled concession.

The wind energy contracting regimen considers the medium and long term production to define the contracting of reserve energy on account of the need of readjustments and compensations. One of the disadvantages of wind energy buy sell contracts refers to the fact that the source is dependent on the action of the winds [4].

II.3. Generation Venture Cost Benefit Index (ICB)

One of the ways of evaluating and choosing investment projects is through the Cost Benefit Index – ICB (Índice Custo Benefício) – method, which estimates how much the energy of the venture will cost the buyer during the term of the contract and is chosen by the least price. It is found through the ratio of total and energy benefit, which can be calculated annually or monthly [6].

III. Risk of the Wind Generation Power Plant Venture

Risks may not be influenced by the company (interest rates, liquidity risks, guarantees) or provoked by a succession of neglected processes (efficiency, production cycle, environmental impact) by the company or due to bad information management (delegation) as consequences in company decisions [10].

When deviations in productivity (production) occur, it is not possible to correct them, but to compensate them with certain level of uncertainty if it will be possible to compensate. The uncertainties will always exist, even because it forms part of the sector's nature to have them [11]. However risk mitigation management must be effective (to win) and efficient (to be prepared to continue winning) [11].

"In this sense, to make feasible or to conduct a venture without the least notion of the risks involved is unfeasible, as well as to evaluate and to work with all risks.

It is necessary to locate an ideal point of knowledge, that is, to know that risks are relevant and even up to the point where each one must be examined or up to what level to invest in each one's study." [12].

There are four types of general risk that affect investments in infrastructure on a global level, according to Table I: [i] Macroeconomic risks; [ii] Regulatory risks; [iii] Market risks and [iv] Resource risks.

When we speak of recognition of stages, it is possible to create means of mitigation of risks, development strategies and control methods. When we refer to variables, they can be passive or active. Passive variables refer to variables of the environment, like inflation and prices of materials.

The active variables are variables of the venture, like productivity, which is structural and capable of being monitored [12].

TABLE I
CONTROL FOR MITIGATION OF GENERAL RISKS FOR INFRASTRUCTURE

Risks	Description	Control
Macroeconomic	Companies cannot control and that they include political, natural or financial factors (like interest rates, exchange rates)	Passive
Regulatory	Changes in regulation of the law or taxation	Passive
Market	The competition and market demand	Passive
Resources	The lack of availability of natural, financial and management resources	Active

Other authors classify furthermore some specific risks for infrastructure, according to Table II: [i] Technical risks; [ii] Construction risks; [iii] Operating risks; [iv] Revenue Risk; [v] Risk of force majeure; [vi] Environmental risks; [vii] Logistic risk; [viii] Source risk and [ix] Funding Risk [12].

TABLE II
CONTROL FOR MITIGATION OF SPECIFIC RISKS FOR INFRASTRUCTURE

Risks	Description	Control
Technical	Conception and construction of the venture	Active
Construction	Due to manufacturing defects, labor problems, delay or poor quality of materials and delays in execution.	Active
Operating	Related with the risk of exceeding the planned cost for operation and maintenance	Active
Revenue	Related to the risk that the price agreed in the contract during the auction is coherent (well regulated and volatile) with what is going to be practiced in the operation.	Active
Force majeure	Related to natural disasters or others	Passive
Environmental	Related to negative effects that the investment may have on the environment.	Active
Logistic	Refers to transportation and access connections to the generator farms, which are mostly precarious	Partial Active
Wind Source	In the case of decreasing or ceasing wind intensity	Passive
Resource Source	Funding Risk	Active

III.1. Risks Related to Environmental Factors

Through the study of the government, there are no planned projects in the northern and central western regions; the southeastern region does not have interference on sensitivities, therefore the risks of releases are not known; the northeastern region has landscape conservation areas and agrarian issues to be analyzed prior to disputing on the auction and in relation to the southern region, we have the issue of protected areas and which must be raised by the entrepreneur.

These are release issues that the entrepreneur should raise prior to registration in the auction [6].

The license and permit obtainment process includes the approval of the following items: that of building, of emitting noise, that of use of the land, that of having connection with the network, that of environmental aspects, of public safety, of occupational safety, of cultural assessment of the region and of technical certification of the turbine [13].

Environmental licensing is an instrument of national environmental policy. There are three licenses to be issued to the energy sector project: [i] Previous license (PL), for when it is in the planning stage of the venture, it serves to approve the activity, the site, the design, the environmental viability and establishes what will be needed for the implementation phase; [ii] Installation license (IL), it authorizes the construction of the venture according to what is approved and includes environmental control measures and [iii] Operation license (OL), authorizes the operation of the venture, as long as in accordance with previous licenses and with environmental control measures for operation [14].

To require the establishment of a wind generator farm it is necessary to submit a Previous Environmental License: simplified environmental licensing is stipulated for ventures with small potential of environmental impact, as it is the case of wind power plants and of other alternative energy sources. For the previous environmental License, in the case of auction, the protocol can be presented during registration and the PL up to 35 days prior to the date of execution of the auction. The low environmental impact studies and reports form part of the process: like the Environmental Impact Assessment (EIA), Environmental Impact Report (EIMR), Environmental Basic Project (EBP), and Simplified Environmental Report (SER) [4], [14].

III.2. Risks of Auctions Taking in Consideration the Region

The Applied Economics Research Institute – IPEA – showed that the current system of auctions is misaligned with the location of primary sources. The auctions take into consideration who competes with the least price, but is still below considering the specific advantages of every source with its location and load distribution [4].

This misalignment generate some distortions and for this reason regional auctions are taken into consideration or by energy source, with the intention of reducing investment in transmission and bringing closer the generation of loading centers. Aside from this, auctions by energy source would decrease the competition among diverse energy sources when they are in the same auction, which is what happens currently [4].

III.3. Risks in the Planning, Implementation and Operation Stages of the Wind Energy Venture

When deviations occur in the implementation stage (production) it is not possible to correct them, but to compensate them with certain degree of uncertainty if it will be possible to compensate. Uncertainties will always exist, even because it forms part of the sector's nature to have them [11].

"In this sense, to make feasible or to conduct a venture without the least notion of the risks involved is unfeasible, as well as to evaluate and to work with all risks. It is necessary to locate an ideal point of knowledge, that is, to know that risks are relevant and even up to the point where each one must be examined or up to what level to invest in each one's study." [12].

Through cost control, it is possible to increase the advantage over the result. The costs arise before starting the implementation phase of the venture; they are planning costs, namely: costs with research, costs with consulting firm, environmental costs, social impact costs, investment costs, and cost of economic transactions [12].

They are financial costs referring to advanced investments for the venture feasibility study, aside from this, capital interests not yet remunerated during implementation. This planning phase with studies and consulting services is necessary because it will be at this time that the product will be formatted with innumerous possibilities and awry [11].

In the venture formatting cycle, which lasts two years in media, technical and commercial feasibility studies are done, once approved prior release is asked. After it has been in the bidding process for over a year and the basic project has been performed, once this stage is concluded the installation license is requested. During the following two years, the wind energy venture is built through the implementation license and then the concession of 20 years is obtained in the operation cycle, together with the license for this cycle.

In the formatting cycle the competitive offering and the market demand are taken into consideration, generally, it concerns an unattended or unsatisfied demand from there the idea of venture is formulated.

In Real State, the demand status is not repeated; at a future time, the market will interfere another movement of necessity [11].

III.4. Draining risks by the Transmission Lines

The availability for energy production drainage is decisive in the feasibility of the venture, because it is unfeasible with additional costs of construction of large extents of transmission and substations [15].

"An alternative to decease this cost is the construction of wind farms close to existing transmission networks, since, wind energy is being used as complement before hydraulic generation" [12]. Through data of implemented wind farms, the average distance is 30 km and the incurred cost is 7% under construction [15].

III.5. Macroeconomic Risks

Financing interests can be contracted on fixed, variable or fixed plus variable bases. In the case of BNDES [Brazilian Development Bank], the interests are tied to the TJLP. Aside from this, the interests can be updated due to inflation or variation of exchange rate.

Another issue to be considered is the volatility of inflation, which, because it does not follow what is planned, influences planning, implementation, operation, and maintenance costs.

The evolution of the exchange rate also influences profitability if foreign currency is used for purchase of aerogenerators [16].

III.6. Funding Risks

In the global financial crisis from 2008 to 2010 in some economies like the United States, European Union and Japan, a new type of risk emerged, that of financier's funding risk, not of the financed. Prior to the crisis, the financing risk turned around the project related requirements, since it did not satisfy the guarantees or the project values did not add up for the financier.

The new issue that arises is the risk of the project that meets all requirements of the financier, not having sufficient financing due to lack of source, not having conditions to contributing. It is the opposite of the issue that is tackled until now, the risk is that of losing ventures due to lack of funding from the financier.

The Banks, the principal ones affected, began to work on the liquidity of their financial operations, aside from this, from the crisis a retraction is noticed in the global scenario, with higher costs for loans, longer terms, and reduction of the average value of the financings. One of the solutions found was that of dividing into smaller projects the ventures or dividing them into phases, others had intervention from the government with tax policies and incentives that benefitted projects, others with share in the project company's capital, other through guarantees and signed contracts. Some risks can be mitigated and even liquidated when transferred to the external partners, like customers, suppliers, insurance and guarantee companies [8]. Funding risks remained high and in the company project although this financing related risk management may continue progressing, the vestige of the crisis will influence the financing costs.

III.7. Logistics Risks

Since they concern heavy and indivisible loads, they have to be transported with adequate vehicle that supports the weight and dimension.

Aside from transport, the weight and size influence in the tracked route, because urban circulation and limits of total gross weight of some roads, become mandatory for the choice of alternative route, which often raises the price and propitiates delay in delivery.

IV. Investment Strategy

Project finance is one of the most recurrent mechanisms for obtaining private resource for infrastructure investments and it is a way of capturing resources to finance an economically separate capital project, where the financiers see the venture's cash flow as primary source of resources to liquidate loans and to provide return on investment.

Financing is based on the payment capacity shown by the estimated cash flow, then, the revenues that will be generated during the operation will be amortizing the loan [17]

In the project finance the venture self-finances itself, there is minor commitment of the partners, there is no need for real and personal guarantees, the balances of the entrepreneurs stay less indebted, there is transparency on the results of the venture, liquidity of guarantees loaned to the financier and for this reason, it began to be used more and more.

The fact that the project finance operation is tied only to the venture's environment is the great differential in relation to other traditional forms of corporate catchment. Furthermore, according to the author, the traditional form classifies the risk above the company's credit, while the project finance does it above the venture, which turns the operation isolated [16].

More adequate ventures are those that have projects with a solid or continuous demand in production and with well structured long-term contracts. Still according to the author, financing engineering has the following division: [i] Construction loan, which is a kind of financing directed toward implementation of new ventures and because it has greater risk through the construction period it is long (3 to 3.5 years, interest rates are higher); [ii] Permanent loan, which is a kind of financing directed after conclusion of the construction and entry into operation of the venture or for expansion projects, usually acquired in a pool of banks or from a pension fund exclusively for the project operation period with an average term from 15 to 17 years. Since it operates with minor risks for the fact that the venture is already concluded, lower interest rates are paid [17].

A Project finance does not turn the project bad or good, but rather it brings security that if everything goes well, the loan will be paid on the agreed period. Once in order to ensure that the amortization of installments and interests will be paid, an escrow account is created in a trustee bank through where the revenues of the venture pass and which retains future amortization installments of the financing and only then, it is made available to the entrepreneur.

In spite that the main source of amortization of the debt is coming from the cash flow (it self-finances itself) of the venture, some guarantees may be needed, the three modes practiced in the market are presented as follows:

[i] a limited recourse, guarantee is requested from the partners during the construction phase and they decrease in accordance with the exploitation of the venture, until the guarantee of payment extinguishes and remains solely with the venture's cash flow. The guarantee can be a surety, bond or shareholder agreement. The construction phase is significantly riskier which could imply in irrecoverable costs in case the projects have been interrupted, now in the operation phase it is a safer phase and with more stable cash flow;

[ii] a full recourse (limited guarantees), also known as corporate guarantees and today they are the most common, they concern guarantees given during the construction phase. The guarantee can be a surety, bond, shareholder agreement or insurance policy, provided that it covers the financed value up to the time of the problem;

[iii] a non recourse (loan with no guarantee or pure Project finance), which eliminates any type of bond from the partners during the construction phase, but it is not used in Brazil because it is totally covered by the venture's cash flow. The pure Project finance does not request any type of guarantee or contribution of resources on the part of the partners. In practice, generally it is not what happens [17].

In more advanced economies, many financiers have in their contracts a guarantee item that brings the possibility of assuming the execution of the venture in case it is necessary.

IV.1. Sources of Funding

Private funding must also play a major role in expansion and must come accompanied by policies and incentives of public initiative [18]. Financing and Real Estate go in parallel, once essentially Real Estate demands third party resources [11].

The best scenario for long-term ventures, in the case of wind energy ventures, are financing of moderate interests and long-term collections, in advanced economy entrepreneurs are able to create portfolios, once they finance 90% of the need and pay in 20 to 30 year cycles, however in Brazil the resource obtainment or funding structures are conservative and have BNDES [Brazilian Development Bank] as one of the main supporters [11].

BNDES [Brazilian Development Bank] has operated supporting the Growth Acceleration Program – PAC – which was founded by the government in 2007 with the intention of stimulating private and public investment in infrastructure ventures. BNDES [Brazilian Development Bank] operated in PAC 1 from 2007 to 2011, in PAC 2 from 2011 to 2014 and as of 2015, the beginning of the PAC 3 phase is highlighted.

From the PAC, the Bank had been granting better conditions for financings to the infrastructure sector and especially that of renewable energy.

The year 2013 of BNDES [Brazilian Development Bank] closed with 1,144,262 operations and disbursement of BRL 190 billion, being spearheaded by the Southeastern region with BRL 87 billion, we have then disbursements of BRL 43.1 billion in the South, BRL 25.7 billion in the Northeastern region, BRL 20.9 billion in the Central-West and lastly BRL 13.8 billion in the Northern region.

The Southeast and the South still lead the representativeness with 68% of the total national disbursement. In spite that large companies represent only 2% of the operations, they held 61% of the disbursements.

IV.2. Characterization of Applied Rates by Operation

For long term financings of infrastructure in the energy operation segment, there are two possibilities, the first for financings of up to BRL 20 million and the second for financings above this value.

Financing is given automatically in an indirect manner for values lower than BRL 20 million and directly and/or indirectly not automatically for values higher than this. Customers must have management and headquarters in the country, and Brazilian companies of foreign capital with unspecified economic activity are excluded (Decree no. 2.233/1997). Next is how the rate of the two possibilities is composed [1].

The first, for values above BRL 20 million. Since it is not automatic, that is, above BRL 20 million, the financial cost is based on long-term interest rate (TJLP) which is valid on a quarterly basis and is calculated through the inflation goal and the risk premium.

For 2014, we had the TJLP at 5% and for the first quarter of 2015, the percentage points to 5.5%. In relation to other conditions, we have the same rules which are those applied to the BNDES [Brazilian Development Bank] Finem financing which has a specific item for renewable energy, of basic remuneration of 1.5% p.a. for micro, small and medium companies and from 1.2% p.a. for medium large and large companies.

There is even the credit risk rate which is 1% p.a. for states and cities and of up to 4.18% p.a. for the rest and it is stipulated according to the customer's credit risk.

Therefore the applied interest rate is the sum of the financial cost plus BNDES [Brazilian Development Bank] basic remuneration and plus the credit risk rate. Furthermore, for the case of the venture that has been conducted in auction prior to program entry, the financial condition of what is agreed upon can be used.

For value equal to or lower than BRL 20 million: For the automatic, that is, the financial cost is for the TJLP, with BNDES [Brazilian Development Bank] basic remuneration of 1% p.a. and financial intermediation rate of 0.5% p.a. The remuneration of the accredited financial institution is negotiated with the investor directly [1].

The maximum participation of BNDES [Brazilian Development Bank] in wind projects is up to 90% of the value for both cases, higher than that of other infrastructure ventures that vary from 75 to 85% [1].

From 2003 to 2012 BNDES [Brazilian Development Bank] financed in wind energy the sum of BRL 9.8 billion, in the year 2013 it approved BRL 3.6 billion and in the year 2014 it had an increase of 83.3% in relation to the previous year and closed with BRL 6.6 billion of financing for wind farms, which is equivalent to 2.6 GW of installed power and places Brazil among the five major global investors in renewable energy.

Therefore, BNDES [Brazilian Development Bank] supported the totality of BRL 20 billion for 7.3 GW in wind energy ventures. Based on the 2013 closing values of BNDES BRL 63 billion were financed to infrastructure, of this amount, only BRL 3.6 billion was dedicated to wind energy, that is, 5% of the total destined to infrastructure. In 2014, we had an increase of BRL 6.6 billion, something around 10% of the total destined to infrastructure.

Given that the BNDES financing was about 56% of the venture, it will be necessary to look for other sources to close the venture's funding [1].

V. Conclusion

Brazil in comparison with developed economies had the beginning of a much slower wind energy insertion, but now it takes full advantage of accelerating at a time when worldwide technology has reached levels of development and competitive costs with that of other sources [19]. Just as in the last two years, the growth of the wind energy market will continue higher than the national PIB [Gross Domestic Product – GDP] until the realization of what is stipulated by the government plan.

The risks that must be controlled and mitigated by the investor are those, which are related to logistics, that is, of highways and cabotage, on account of lack of the country's road infrastructure.

Another risk to be considered attentively is in relation to drainage through the transmission lines; this is an item that must be solved prior to the commencement of the projects. Another frustrating risk is that the main wind energy financier, BNDES [Brazilian Development Bank], in face of its background, will not have funding to finance the totality of the projects and more and more, commercial banks and other financing sources will be participating in the wind generation investment project finance.

According to the results of numerous studies, can be seen that the numerous possibilities for sustainable generation projects, especially the wind [20].

Finally, Brazil has an attractive economy in terms of opportunities, but with uncertainties, elevated risk, high cost and lack of financing, even so, with a good economic feasibility of the venture, it is possible to maintain attractiveness to investments of the country's electric sector [12].

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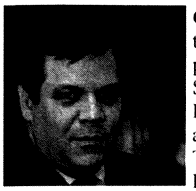

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